Jersey Water
for Island life

APPENDIX G:

Option appraisal

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Executive Summary

This appendix has been prepared to describe the planned approach to options appraisal for the Water Resource & Drought Management Plan (WRDMP).

The approach to forming and progressing from an unconstrained list to a position of implementing the decision making tools to arrive at a preferred plan for Jersey Water has been formed from four principal activities as follows:

- Understand the current position and objectives
- Update unconstrained and constrained lists
- Identify, shortlist and appraise feasible options
- Collate information to inform the programme appraisal stage

The Environmental appraisal of options (including Strategic Environmental Assessment (SEA) related activities) is an integral part of the options appraisal activities. The detail around the approach taken is described in the SEA report (Appendix J).

1. Purpose

This appendix describes the appraisal of a range of alternative options to address the forecast supply deficit and identified resilience risks. The key objectives of this phase of water resource and drought planning work were to:

- Develop a suite of supply and demand management options for detailed evaluation that will enable Jersey Water to address the forecast deficit over the next 40 years, taking account of the population and housing growth projections for the island.
- Assess the options against a range of evaluation criteria to compare the feasibility and risk, cost, customer acceptability, engineering requirements, reliable supply or demand saving benefit, operational constraints and environmental and social impact.

This appendix documents the options appraisal assessment approach, from developing an 'unconstrained' list of options to deriving a final 'constrained' shortlist of options and the detailed evaluation of those shortlisted options.

2. Methodology

2.1 Overview

The options appraisal and subsequent decision-making process has been developed to largely follow the process that was adopted for WRDMP21, with updates or adjustments to align to the latest version of the Water Resource Planning Guidelines[1] (WRPG) and the most recent option information. With reference to best practice, a staged approach has been adopted to progressively develop and screen the options list, thus ensuring effort was focussed on options that showed most likelihood of progressing to the next stage, e.g. those more likely to be selected in the preferred or alternative plans.

Figure 2-1 provides a simplified overview of the option appraisal process, showing the defined screening and shortlisting points at each stage. These screening stages used defined criteria to either screen out or progress options to the subsequent stage. Generally, the activities required to develop the options in a consistent manner and to a comparable level of detail at each stage was driven by the screening criteria definitions; the sensitivity of determining / distinguishing factors between options; and the desired level of confidence at each stage.

[1] *UK Government, Water Resources Planning Guidelines, Updated 14 April 2023,* https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline *[Accessed 18/03/24]*

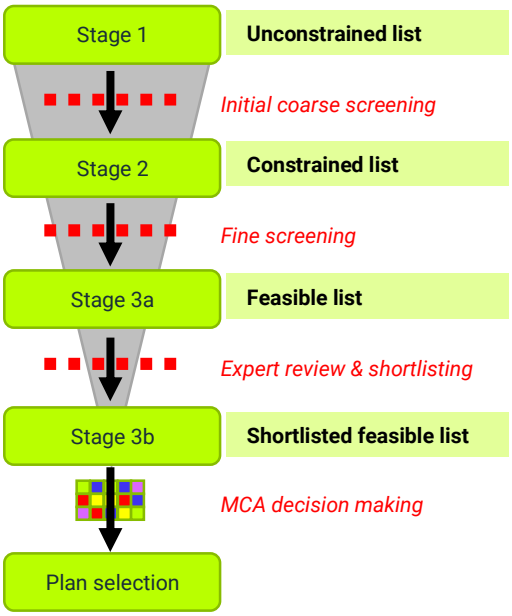


Figure 2-1 – WRDMP option appraisal stages

Recognising the time, effort and detail that went into the option information prepared for WRDMP21, we have used this information wherever possible to inform WRDMP24. At each stage we included review decision points to check that previous assessments remained appropriate and in line with current best practice.

The staged approach of Figure 2-1 commences with development of the unconstrained list and arrives at the feasible list after two rounds of screening. That part of the process was largely the same as WRDMP21 with only minor variations for new or excluded options. We applied a 'light touch approach' to those stages, ensuring that we were adopting best practice. As work developed on the feasible and shortlisted feasible list an increasing level of detail was required and that is where most of our attention was focused.

The majority of the engineering detail and basis for metrics was developed from a combination of WRDMP21 outputs and any more recent engineering investigations available since WRDMP21.

In parallel to the development of options, we also set out to define and update where necessary the scenarios and criteria for developing a final feasible set of options that were then available for the selection of a preferred plan in the economic modelling. This informed the option data required to carry out the comparative evaluation, option selection and formation of a best value investment programme for the different scenarios. The approach to the economic modelling and development of a best value adaptive plan (including stress testing the plan) is described within Appendices H and I.

2.2 Stage 1: Developing the unconstrained option list

Development of the constrained option list in Stage 2 was preceded by two key steps:

1. Development of the unconstrained options list
2. Coarse screening of the unconstrained options list.

2.2.1 Developing unconstrained options list

The unconstrained options list was developed through a review of options using the option functional type categories from the Economics of Balancing Supply and Demand guidance as a basis for a framework to ensure all possible option types were considered. The option categories considered were:

- Supply-side measures
  - Direct river abstraction
  - New reservoir storage
  - Reservoir raising
  - Groundwater wells (boreholes)
  - Infiltration galleries
  - Aquifer storage and recovery
  - Desalination
  - Reclaimed water
  - Bulk transfers
  - Tankering of water
  - Sophisticated conjunction management
  - Third party imports
  - Catchment measures
  - Innovative
  - Other
- Distribution-side measures
  - Customer supply pipe leakage reduction
  - Leakage reduction
  - Leak detection
  - Pressure reduction programmes
  - Advanced replacement of infrastructure for leakage reasons
  - Distribution capacity expansion
- Customer-side measures
  - Compulsory metering
  - Meter installation policy
  - Metering of sewage flow
  - Introduction of special fees
  - Changes to existing measured tariff
  - Introduction of special tariffs for specific users
  - Targeted water consideration information
  - Advice & information of direct abstraction and irrigation techniques
  - Advice & information of leakage detection and fixing techniques
  - Water saving devices
  - Recycling & re-use
  - Other
- Production-side measures
  - Diagnostic studies
  - Improved leakage detections and reduction on raw water mains
- Drought management options
  - Singular category based on functionality in a drought

The generation of new option ideas was prepared from discussions with operational and strategic planning staff at Jersey Water, and consideration of options that have been considered by other water companies in the British Isles. The unconstrained options list includes, demand management, leakage control and distribution management, water production and new water source options. This initial stage involved considering a wide range of alternative options with no assessment criteria applied to filter out any options.

An initial unconstrained options list was then reviewed in a structured meeting with operational, engineering, regulatory and strategic planning staff from Jersey Water to ensure that all potential options had been identified. The information available from WRDMP21 formed the basis of the unconstrained list for WRDMP24.

2.2.2 Coarse screening of unconstrained options list

The coarse screening process involved an assessment of each of the identified options on the unconstrained option list against the criteria set out in Figure 2-2 with the key considerations being any over-riding constraints to option promotion, development and implementation (e.g. legislation or policy, unacceptable risks, customer acceptability or environmental impact). The coarse screening process also helped to rationalise some options from the unconstrained list that were very similar in nature.

The unconstrained options were all subject to the coarse screening process. Where unconstrained options were assessed as having an over-riding constraint, or performed poorly against most criteria, they were rejected and not taken forward to the fine screening stage (Stage 2).

Those options rejected at this stage were recorded in the option rejection register (Section 3.5) where the rationale for rejection was recorded. Options passing through the coarse screening stage formed the “constrained options” list, which was carried forward into Stage 2.

Figure 2-2 - Coarse screening assessment criteria used in Stage 1

		1. Feasibility & risk				2. Engineering & Cost		3. Performance & resilience			4. Operational		5. Environmental	
Assessment Score	Contribution to Jersey Water	1.1 Is option straightforward to implement / technically feasible?	1.2 Is option beneficial to customers? Customer acceptability?	1.3 Does option impact States of Jersey policy objectives?	1.4 Does option impact JW assets?	2.1 Complexity in construction required	2.2 Estimated financial impacts	3.1 Is the option reliable round the year?	3.2 Resilience to hazards, drought and climate change?	3.3 Does the option improve resilience?	4.1 Does the option improve drinking water compliance?	4.2 Does the option require additional training / resources for JW staff?	5.1 Are there any impacts to environment including flood risk and climate impacts (especially nationally designated and European designated sites, irreplaceable habitats, sites with high heritage / amenity value and WFD objectives) and can these be mitigated?	5.2 Indicative Carbon impact
0	Positive impact	Straightforward and all permissions in place	Yes, beneficial to customers and acceptable	Yes, beneficial to policy objectives	Results in improvement of assets	No construction required	JW money saved	Confirmed round the year reliability	Yes	Yes, option yield > 10% of deficit	Improves compliance	Reduced demand on staff	Environmental improvements, reduced flood risk and climate change mitigation	JW Carbon saving
1	Zero / negligible risk	Delivery within 2 years, all permissions in place	No negative impacts to customers and acceptable	No negative impacts on policy objectives	No impact to assets	Minor construction works required	Minor CAPEX / OPEX	Expected round the year reliability	Neutral	Yes, option yield < 10% of deficit	No impact on compliance	No impact on staff	No adverse impacts	Minor Carbon impact
2	Low risk	Delivery within 5 years, additional permissions required	Minor impacts to customers and less acceptability	Minor impacts to policy objectives	Minor negative impacts to assets	Low complexity construction	Low-Moderate CAPEX / OPEX	Minor risk of outage	Low vulnerability to hazards, drought and climate change	Limited improvement and uncertainty of supply benefit	Minor impact on compliance	Minor training / resource requirements	Minor adverse risk with mitigation possible	Low-Moderate Carbon impact
3	Medium risk	Delivery takes up to 10 years, additional permissions required	Moderate impacts to customers and less acceptability	Moderate impacts to policy objectives	Moderate negative impacts to assets	Low complexity construction with significant site specific issues	High-Moderate CAPEX / OPEX	Moderate risk of outage	Moderate vulnerability to hazards, drought and climate change	No improvement to resilience and moderate uncertainty of yield uncertainty	Significant deterioration of drinking water compliance	New resource / upskilling required	Moderate adverse risk with some mitigation possible	High-Moderate Carbon impact
4	High risk	Significant barriers to implementation and delivery over 10 years, permissions required	Major impacts to customers and no acceptability	Major impacts to policy objectives	Major negative impacts to assets	Complex engineering solution	High CAPEX / OPEX	Major outage risk	High vulnerability to hazards, drought and climate change	Resilience reduced and high uncertainty of yield benefit	Significant deterioration of drinking water compliance leading to enforcement action	Significant new resource / upskilling required which may not be readily available	Major adverse risk with little to no mitigation possible	High Carbon impact

At this early stage in the option understanding and development process the criteria for screening category '5. Environmental' was based on judgement and local knowledge prior to formal consideration of environmental performance, which features in later stages.

2.3 Stage 2: Constrained options assessment

2.3.1 Fine screening

Options passing through the coarse screening stage formed the “constrained options” list. These options were subject to a greater level of assessment against a wider and more detailed set of assessment criteria (“fine screening”), building on the headline criteria used for coarse screening.

The fine screening assessment was informed by evidence and dialogue with relevant planning, regulatory and operational teams across Jersey Water, including cross-company appraisal workshops and special interest sessions on option types (e.g. leakage control, catchment management, production management).

The assessment approach helped to identify:

- any potential ‘over-riding’ constraints that would result in an option being discounted, thereby helping to focus effort and resources on options that are promotable.
- early consideration of operational and engineering feasibility and risk.

Figure 2-3 sets out the multiple criteria adopted for the fine screening assessment of those options taken forward for assessment from the coarse screening stage. For each criterion, options were assessed against a five-point grading scale: from 0 (positive/beneficial effect) through to 4 (major adverse/ high risk) (with an appropriate colour code assigned to each grade to summarise the assessment in tabular form). The graded scales were defined for each criterion to ensure consistent assessment across all the options.

The findings of the constrained options assessment were used to determine those options to be carried forward to a final short-list of feasible options for more detailed appraisal.

Figure 2-3 - Fine screening assessment criteria

Assessment Score	Contribution to Jersey Water	1. Feasibility & risk										2. Engineering & Cost			
		1.1 Is option straightforward to implement / technically feasible?	1.2 Is option beneficial to customers? Customer acceptability ?	1.3 Does option impact States of Jersey policy objectives?	1.4 Does option impact JW assets?	1.5 Timeframe to implement including obtaining permissions?	1.6 Scheme Dependencies	1.7 Is the technology to be used established with more than one example in use world wide?	1.8 Experience in delivering similar solutions (technology or construction methodology known to JW)	1.9 Are there any CDM issues that has a potential to change the scope and impact the delivery of the option?	1.10 Quality and confidence of design information	2.1 Complexity in delivery / engineering / construction	2.2a Indicative costs (Capex)	2.2a Indicative costs (Opex)	2.3 Land availability, ownership & tenure?
0	Positive impact	Straightforward and all permissions in place	Yes, beneficial to customers and acceptable	Yes, beneficial to policy objectives	Results in improvement of assets	Resource is currently available with no further works or permissions required	Enables other options	Well established and widely used in Jersey, UK and other parts of the world	Well experienced in delivering similar solutions	N/A	Quality and confidence of design information is high - feasibility complete	No construction required	Provides CAPEX benefit by avoiding or delaying significant planned spend on existing assets	Scheme will enable existing higher operational cost assets to be used less frequently	Land available and owned by JW
1	Zero / negligible risk	Delivery within 2 years, all permissions in place	No negative impacts to customers and acceptable	No negative impacts on policy objectives	No impact to assets	Can be designed and delivered and all permissions obtained within a 2 year period	No dependencies	Well established and increasingly being used (new to Jersey)	Technology easy to implement without prior experience	No issues / changes	Typical concept level of development (existing assets)	Minor construction works required	CAPEX up to £0.5m per Ml/d of DO benefit	OPEX comparable to the mix of resources currently used in Jersey	Additional land not required
2	Low risk	Delivery within 5 years, additional permissions required	Minor impacts to customers and less acceptability	Minor impacts to policy objectives	Minor negative impacts to assets	Can be designed, delivered and all permissions obtained within a 5-year period	Requires other options but indifferent	Established to some extent and used in few parts of the world	Limited experience in delivering similar solutions exists but expertise available	Minor issues / changes	Typical concept level of development (new assets)	Low complexity construction	CAPEX between £0.5m - £1.5m per Ml/d of DO benefit	OPEX likely to be slightly higher than those for the mix of resources currently used in Jersey	Land available; no challenges in buying
3	Medium risk	Delivery takes up to 10 years, additional permissions required	Moderate impacts to customers and less acceptability	Moderate impacts to policy objectives	Moderate negative impacts to assets	Can be designed, delivered and all permissions obtained within a 10-year period	Requires other options (less preferred)	Less established, further R&D required	Limited experience in delivering similar solution / expertise unavailable	Moderate issues / changes	Significant risk areas unexplored	Low complexity construction with significant site specific issues	CAPEX between £1.5m - £3m per Ml/d of DO benefit	OPEX in line with the higher OPEX cost resources currently used in Jersey	Land available; challenges in buying
4	High risk	Significant barriers to implementation and delivery over 10 years, permissions required	Major impacts to customers and no acceptability	Major impacts to policy objectives	Major negative impacts to assets	Significant promotional hurdles to overcome. Delivery programme in excess of 10 years	Requires other options (notably unfavourable)	New technology, no precedents	No experience / expertise	Major issues / changes	Information lacks quality	Complex engineering solution	CAPEX will be significant - greater than £3m per Ml/d of DO benefit	OPEX likely to be higher than the other resources currently used in Jersey	Land unavailable

Assessment Score	Contribution to Jersey Water	3. Performance & resilience									4. Operational	
		3.1 Is the option reliable round the year?	3.2 Resilience to hazards, drought and climate change?	3.3 Does the option improve resilience?	3.4 Phased or incremental delivery of the option	3.5 Indicative / expected yield	3.6 Resilience to drought and climate change?	3.7 Does the option improve operational resilience?	3.8 Resistance to vulnerability due to failure/outages caused by flooding, pollution, damage, loss of power supply etc	3.9 Resistance to vulnerability due to increasing or energy commodity prices and future regulatory / legislation changes	4.1 Does the option improve drinking water compliance?	4.2 Does the option require additional training / resources for JW staff?
0	Positive impact	Confirmed round the year reliability	Yes	Yes, option yield > 10% of deficit	Phased / incremental delivery possible	Yield benefit is very certain and provides at least 10% of the required 2045 deficit	Option is insensitive to climate change risks	Very high resilience factor from resilience assessment. Option contributes positively to the improvement of resilience in the supply zone and / or water management area	High resistance to vulnerability due to outages	High resistance to vulnerability due to financial and regulatory uncertainty	Improves compliance	Reduced demand on staff
1	Zero / negligible risk	Expected round the year reliability	Neutral	Yes, option yield < 10% of deficit	Phased delivery not required	Yield benefit is very certain and provides less than 10% of the required 2045 deficit	Option is neutral to climate change risks	High resilience factor from resilience assessment. Option positively improves the resilience of the supply zone and / or water management area	No impact due to outages	No impact due to financial and regulatory uncertainty	No impact on compliance	No impact on staff
2	Low risk	Minor risk of outage	Low vulnerability to hazards, drought and climate change	Limited improvement and uncertainty of supply benefit	Minor challenges in implementing phased delivery	Some limited uncertainty as to yield benefit (within +/- 10%)	Option has a low degree of vulnerability to climate change risks	Medium resilience factor from resilience assessment. Option makes no improvement to resilience of the supply zone and/or water management area	Low resistance to vulnerability due to outages	Low resistance to vulnerability due to financial and regulatory uncertainty	Minor impact on compliance	Minor training / resource requirements
3	Medium risk	Moderate risk of outage	Moderate vulnerability to hazards, drought and climate change	No improvement to resilience and moderate uncertainty of yield uncertainty	Major challenges in implementing phased delivery	Moderate uncertainty as to yield benefit (within +/- 10% to 30%)	Option has a medium degree of vulnerability to climate change risks	Low resilience factor from resilience assessment. Option makes no improvement to resilience of the supply zone and/or water management area	Very low resistance to vulnerability due to outages	Very low resistance to vulnerability due to financial and regulatory uncertainty	Significant deterioration of drinking water compliance	New resource / upskilling required
4	High risk	Major outage risk	High vulnerability to hazards, drought and climate change	Resilience reduced and high uncertainty of yield benefit	Phased / incremental delivery not possible	High uncertainty as to yield benefit (in excess of 30%)	Option has a high level of vulnerability to climate change risks	Very low resilience factor from resilience assessment. Option leads to reduction in current level of resilience of the supply zone and/or water management area	No resistance to vulnerability due to outages	No resistance to vulnerability due to financial and regulatory uncertainty	Significant deterioration of drinking water compliance leading to enforcement action	Significant new resource / upskilling required which may not be readily available

Assessment Score	Contribution to Jersey Water	5. Environmental				
		5.1 Are there any impacts to environment including flood risk and climate impacts (especially nationally	5.2a Qualitative assessment of embodied carbon impact	5.2b Qualitative assessment of operational carbon impact	5.3 Impacts to aquatic environment	5.4 Impacts on biodiversity and fisheries	5.5 Planning considerations

		designated and European designated sites, irreplaceable habitats, sites with high heritage / amenity value and WFD objectives) and can these be mitigated?					
0	Positive impact	Environmental improvements, reduced flood risk and climate change mitigation	Scheme could help mitigate the impacts of climate change (e.g use of trees / wetlands)	Scheme could help mitigate the impacts of climate change (e.g use of trees / wetlands)	Potential improvement in water quality or flow (e.g. the water body has flow impedance or over abstraction problems and the proposed scheme may include removal of a structure or reduction in abstraction	Potential improvement to a protected site / species (e.g. improvement in water quality or creation of new habitat). Avoids spreading invasive species.	Scheme has positive environmental/social/cultural benefits
1	Zero / negligible risk	No adverse impacts	No new structures or infrastructure	No increase in energy or chemical usage	No deterioration of waterbody condition is likely (e.g., the option will not intercat with the water environment or change the existing conditions)	No adverse impacts on protected site / species (option doesn't interact with such sites or species and not alter them). Doesn't spread invasive species	Scheme has neutral environmental/social/cultural benefits
2	Low risk	Minor adverse risk with mitigation possible	Some minor new structures. Mitigation is possible	Some minor increase in energy or chemical usage. Mitigation is possible	Minor risk of significant short term impacts on waterbody condition (e.g. a new scheme might involve a new pipe crossing, a river or parallel to its course)	Minor risk of adverse impacts on protected site / species and spreading invasive species (option marginally interacts with such sites or species and low risk of altering them). Mitigation is possible	Scheme has a minor adverse impact on environmental/social/cultural planning conditions, mitigation is possible
3	Medium risk	Moderate adverse risk with some mitigation possible	Some minor new structures or lack of information about the scheme, so a precautionary approach is being taken. Mitigation is possible depending on the scheme.	Some minor increase in energy / chemical usage or lack of information about the scheme, so a precautionary approach is being taken. Mitigation is possible depending on the scheme.	Potential minor deterioration in waterbody condition. Scheme could include short term impacts or information indicates only a potential deterioration with low-moderate certainty or there is not enough information on the scheme so a precautionary approach has been used for the assessment	Potential significant adverse impacts on protected site / species and spreading invasive species (option interacts with such sites or species and low - moderate risk of altering them). Mitigation may be possible	Scheme has a moderate adverse impact on environmental/social/cultural planning conditions, mitigation may be possible
4	High risk	Major adverse risk with little to no mitigation possible	Involves significant construction) e.g.new pipeline and use of concrete) and mitigation is unlikely	Involves significant increased energy / chemical usage (e.g. pumping water) and mitigation is unlikely	Significant deterioration in waterbody condition and the option will prevent waterbody from recovering (e.g., the scheme would either increase long term abstraction or involve the construction of a new structure which would cause a deterioration in flow or water quality. Mitigation is unlikely	Significant adverse impacts on protected site / species and spreading invasive species (option interacts with such sites or species and high risk of altering them). Mitigation is unlikely	Scheme has a major adverse impact on environmental/social/cultural planning conditions, mitigation is unlikely

Assessment Score	Contribution to Jersey Water	5. Environmental (continued)					
		5.6 Flood risk	5.7 Landscape and visual amenity	5.8 Material assets and resource use	5.9 Geology and soils	5.10 Cultural heritage and archaeology	5.11 Human health and well being
0	Positive impact	Scheme helps reduce flood risk (e.g. new reservoir)	Protects and enhances visual amenity	Protect, and enhance, built and natural assets (including agricultural land and strategic services). No waste generation	Protect designated geological sites and quality and function of soils	Protect and enhance cultural heritage and archaeology	Protect public health and promote well being. Recreational amenity and public access is protected and enhanced. Option contributes to raising awareness of water conservation
1	Zero / negligible risk	No impact on flood risk	No impact	No impact on assets and no waste is generated	No impact	No impact	No impact on public health, well being, recreational amenity and access

2	Low risk	Slight increase in flood risk but compensation flood storage can be provided	Minor impact on landscape and visual amenity. Mitigation is possible	Minor impacts on assets and amount of waste generated is low. Mitigation is possible	Minor impacts to geological sites and slight deterioration in quality and function of soils. Mitigation is possible	Minor impacts to heritage and sites of archaeological importance. Mitigation is possible	Minor impacts on public health and wellbeing. Recreational value deteriorates and public access is affected slightly.
3	Medium risk	Significant increase in flood risk but compensation flood storage can be provided	Moderate impact on landscape and visual amenity. Mitigation may be possible	Moderate impacts on assets and amount of waste generated is quite high. Mitigation may be possible	Moderate impacts to geological sites and significant deterioration in quality and function of soils. Mitigation may be possible	Moderate impacts to heritage and sites of archaeological importance. Mitigation may be possible	Moderate impacts on public health and wellbeing. Recreational value deteriorates significantly and public access is affected
4	High risk	Significant increase in flood risk but compensation flood storage is not feasible	Major impact on landscape and visual amenity. Mitigation is unlikely	Major impacts on assets and amount of waste generated is high. Mitigation is unlikely	Major impacts to geological sites and significant deterioration in quality and function of soils. Mitigation is unlikely	Major impacts to heritage and sites of archaeological importance. Mitigation may be possible	Major impacts on public health and wellbeing. Recreational value and public access is affected significantly

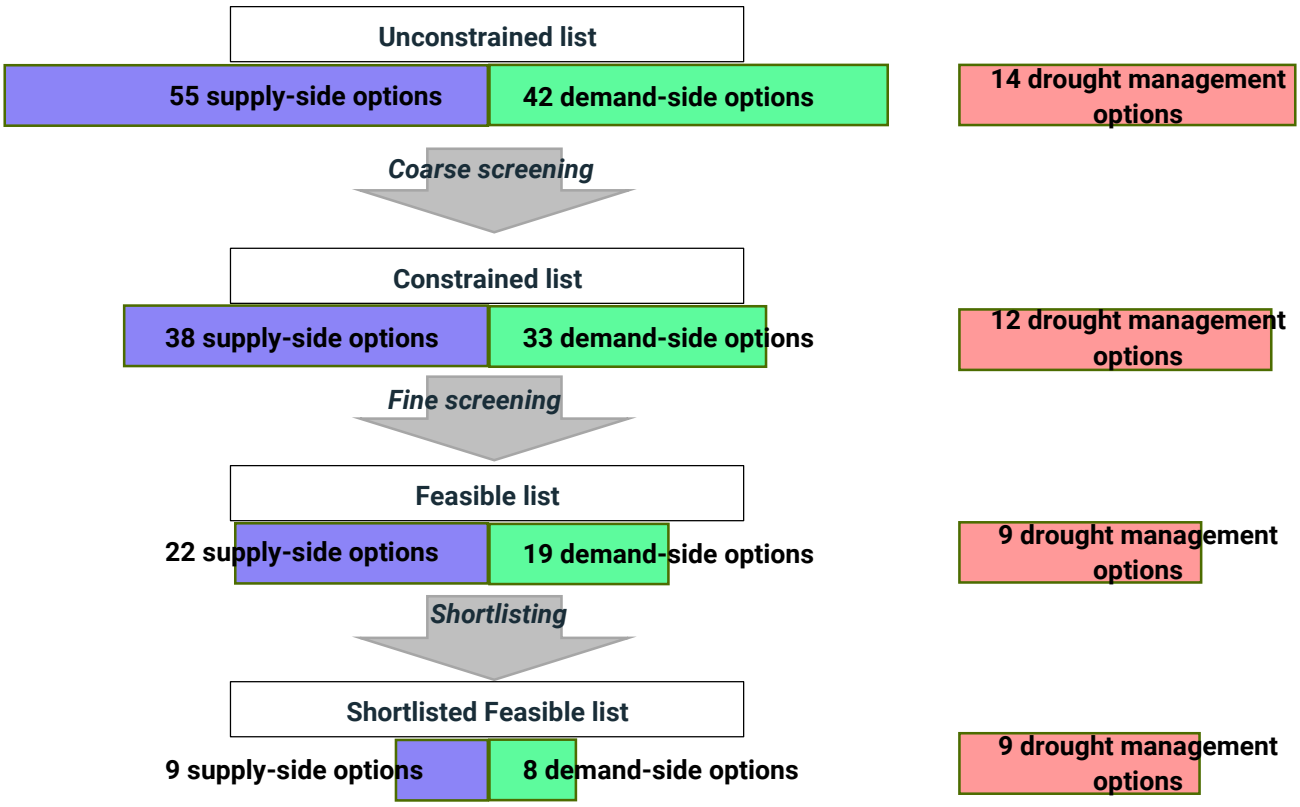
2.3.2 Short-listing the feasible options list

The initial Feasible Options List (Stage 3a), following fine screening of the Constrained list at the end of Stage 2, included 22 supply-side options, 19 customer, distribution and production-side options and 9 drought management options. This was considered to be too many options to enable a more detailed and focused assessment of each option at Stage 3 of the option appraisal process. Consequently, further evaluation work was carried out to refine the Feasible List to reduce the number of options to a manageable number. This further work included dialogue with Jersey Water staff, as well as a more detailed examination of the performance of each option against the evaluation criteria and consideration of the opportunities to consolidate options.

The shortlisting was carried out with the aim of retaining a broad mix of option types. The scale of the supply benefits of each option was also considered in the context of the anticipated scale of supply deficit. This was to ensure that sufficient volume of additional supply or savings in demand remained in the options in the feasible list so that forecast deficits under different scenarios could be solved. The operational benefits of each option beyond drought benefits were also considered at this stage, in particular wider supply resilience benefits.

The demand management options were consolidated into three "packages" of water demand management measures, reflecting the fact that the demand savings invariably depend on the synergies or inter-dependencies between different demand management options. These packages were smart metering, leakage reduction options and changes to building regulations and policy.

Figure 2-4 – Progressive screening of options



2.3.3 Option development

An outline scope for each option in the Feasible shortlist was completed to inform the detailed appraisal stage. An option dossier and assessment proforma was produced for each option outlining the option design, option costs, and an assessment of the supply-demand and supply resilience benefits of each option. Environmental and social impacts, planning risks and engineering and operational risks were also considered at this stage.

3. Option appraisal findings and discussion

3.1 Stage 1: Developing the constrained option list

Stage 1 comprised two key steps: the first was developing the unconstrained option list and the second was the coarse screening of the unconstrained option list.

3.1.1 Stage 1.1 Developing unconstrained list of options

The unconstrained options list was compiled in discussion with Jersey Water's planning staff, as discussed in Section 2.2.1. The Unconstrained Options were reviewed in accordance with UK best practice guidance to ensure appropriate option types (both supply-side and demand-side) had been considered in compiling the list. Following this activity, a total of 55 supply-side options, 42 customer, distribution and production-side options and 14 drought management options had been identified for subsequent considerations and coarse screening. These were categorised as follows:

- Supply-side measures (55 options total)
  - Direct river abstraction (4 options)
  - New reservoir storage (6 options)
  - Reservoir raising (4 options)
  - Groundwater wells (boreholes) (11 options)
  - Aquifer storage and recovery (1 option)
  - Desalination (4 options)
  - Reclaimed water (2 options)
  - Bulk transfers (2 options)
  - Third party imports (6 options)
  - Catchment measures (5 options)
  - Innovative (7 options)
  - Other (3 options)
- Distribution-side measures (12 options)
  - Leakage reduction (6 options)
  - Leak detection (4 options)
  - Pressure reduction programmes (1 option)
  - Advanced replacement of infrastructure for leakage reasons (1 option)
- Customer-side measures (27 options total)
  - Compulsory metering (1 option)
  - Meter installation policy (1 option)
  - Introduction of special fees (1 option)
  - Changes to existing measured tariff (1 option)
  - Targeted water consideration information (10 options)
  - Advice & information of direct abstraction and irrigation techniques (2 options)
  - Advice & information of leakage detection and fixing techniques (1 option)
  - Water saving devices (6 options)
  - Recycling & re-use (2 options)
  - Other (2 options)
- Production-side measures (3 options total)
  - Improved leakage detections and reduction on raw water mains (3 options)
- Drought management options (14 options total)
  - Singular category based on functionality in a drought (14 options)

A full list of the unconstrained options is provided in Section 3.5 which highlights those options that progressed to the various appraisal stages (the green boxes in Table 3-3 indicate those options that were progressed to the next stage; red boxes indicate those options that were rejected at that stage). The options have been divided into supply options and demand management options.

3.1.2 Stage 1.2 Coarse screening

The coarse screening process involved assessment of each option on the unconstrained option list against the criteria set out in Section 2.2.2, with the key considerations being any over-riding constraints to option promotion, development and implementation (e.g. legislation or policy constraints, unacceptable delivery or operational risks, engineering feasibility, cost, customer acceptability or environmental impact). The coarse screening process also helped to rationalise some options from the unconstrained list that were very similar in nature to create a smaller number of single, integrated options.

A total of 111 unconstrained options went through the coarse screening process. Where options were assessed as having an over-riding constraint or performed poorly against most of the appraisal criteria, they were rejected and were not taken forward to the fine screening stage (Stage 2). The coarse screening assessment was carried out through workshop with relevant Jersey Water staff and further refinements to the assessment were made considering the feedback and comments made. Those options rejected at this stage were recorded in the option rejection register where the rationale for rejection was clearly set out.

The outcome of the coarse screening process was that the majority of the options were retained and included in the constrained option list for the subsequent fine screening process (Stage 2). A total of 38 supply-side options, 42 customer, distribution and production-side options and 12 drought management options in the process went through to Stage 2. The rejected options are presented in Table 3-3 in Section 3.5, including the rationale for rejection.

3.2 Stage 2: Constrained options assessment

Stage 2 involved the fine screening assessment of the constrained options list. Section 2.3.1 above sets out the multiple criteria considered in the fine screening assessment. In deciding which options should be to be taken through to the next, more detailed stage of assessment from the fine screening assessment, the following factors were taken into consideration:

- The likely scale of the supply-demand deficit over the planning period
- The level of uncertainty and risk associated with the available options
- The range of different option types to ensure an appropriate mix of alternative options were retained for more detailed assessment
- Those options identified as mutually exclusive or having a dependency on other options.

Following the fine screening exercise there remained a total of 24 supply-side options, 33 customer, distribution and production-side options and 9 drought management options remaining in the process and forming the feasible option list. Due to the similar nature of the large number of customer, distribution and production-side options, we consolidated those 33 options by grouping them into 19 option ‘baskets’ of broadly similar measures. Similarly, 3 of the 24 supply-side options were also consolidated into an option basket, resulting in 22 supply-side options being progressed.

Options that performed least well against the evaluation criteria were rejected from inclusion in the Feasible Options list. Options rejected at this stage are detailed in the option appraisal decision log (Table 3-3 in Section 3.5).

3.3 Option appraisal findings

The outcome of the option fine screening process was a list of 22 supply-side options, 19 customer, distribution and production-side options and 9 drought management options (Table 3-1) to be taken forward for further more detailed assessment, in particular to refine the costs and benefits to water supply, assessment of resilience benefits and appraisal of environmental performance.

The feasible list covered a broad mix of both supply and demand management options: from catchment protection measures to increasing household metering; from "smart" water use audits to the extension of La Rosière desalination plant; and from water efficiency promotion to developing additional raw water storage. Further details about these options are presented in the options appraisal decision log (Table 3-3).

Table 3-1 – Initial feasible option list and associated volumetric benefit of the option

Option Nr	Option	Supply benefit or demand saving	Option type
Supply-side options			
S101	New stream abstraction (Fernlands)	0.04 Ml/d	New source (10 options)
S6	Increased abstraction from St. Ouen's boreholes (PFAS removal required)	Not modelled	
S8	Extend the St Ouen's groundwater wellfield	Not modelled	
S15a	Enhance groundwater abstraction: a. Little Tesson	Not modelled	
S15c	New groundwater abstraction: c. St Clements	Not modelled	
S15d	New groundwater abstraction: d. Pont Marquet	0.5 Ml/d	
S15e	New groundwater abstraction: e. Ponterrin	Not modelled	
S15f	New groundwater abstraction: f. La Chaise Diable	Not modelled	
S9	La Rosière desalination plant extension	5.4 Ml/d	
S18	Bellozanne indirect treated effluent water reuse scheme	5.7 Ml/d	
S25	Gigoulande Quarry partial conversion to raw water storage	Not modelled	Increase storage (5 options)
S35	New storage reservoir option (Les Mourier)	Not modelled	
S103	New storage reservoir option Trinity reservoir.	0.6 Ml/d	
S105	Expansion of Millbrook reservoir to combine with Dannemarche reservoir. Or have an intermediate reservoir between the two sites.	Not modelled	

S24b	Expansion of Val de la Mare reservoir (new dam)	2.2 Ml/d	
S14	Raw water infrastructure system enhancements (La Hague -Queens Valley)	0.6 Ml/d	Supply resilience (3 options)
S29	Increase raw water transfer capacity	Not modelled	
S-B1	Basket 1: Catchment Measures	0 Ml/d *	
S110	Grands Vaux catchment / reservoir - maintain current purposing	Not modelled	Other (1 option)
S27	Raw water treatment to address adverse surface water quality constraints	Not modelled	Removal of water quality constraints (3 options)
S114	As S27, but specifically targeting the PFAS contaminated sources.	Not modelled	
S115	As S27, but specifically targeting other contaminations in addition to PFAS (Algae, nitrates, pesticides, Manganese)	Not modelled	
Customer, distribution and production-side options (Demand-side options)			
<u>Smart metering and tariff updates</u>			
D2	Smart meter installation		
D3	Increased volumetric tariffs	Not modelled	n/a
D4	Incentive-based tariffs		
<u>Audits and engagement following smart metering installation</u>			
D9	“Smart” water use audits (Domestic)		
D10	“Smart" customer engagement (Domestic)	Not modelled	n/a
D20	“Smart” water use audits (Commercial)		
D21	“Smart" customer engagement (Commercial)		
<u>Educational campaign (Domestic)</u>			
D5	Targeted water conservation information (Domestic)		n/a
D6	Education and publicity programmes (Domestic)	Not modelled	
D101	Educational campaign on private supplies (especially those for non-potable supply).		
<u>Educational campaign (Commercial and industry)</u>			
D16	Targeted water conservation information (Commercial)	Not modelled	n/a
D17	Education and publicity programmes (Commercial)		

	D102 Educational campaign regarding private supplies used for irrigation.		
Water saving devices			
	D7 Promotion of water saving devices (Domestic)	Not modelled	n/a
	D18 Promotion of water saving devices (Commercial)		
D103	Offer of a private repair service	Not modelled	n/a
Planning regulations and rain/grey water harvesting (domestic)			
	D11 Rainwater harvesting (Residential)		n/a
	D12 Greywater recycling (Residential)	Not modelled	
	D13 Planning regulation for new homes		
Planning regulations and rain/grey water harvesting (domestic)			
	D22 Rainwater harvesting - Commercial		
	D23 Greywater recycling - Commercial	Not modelled	n/a
	D24 Planning regulations for new commercial buildings		
D28	Service reservoir and trunk main leakage reduction	Not modelled	n/a
D29	Enhanced leak detection and repair	Not modelled	n/a
D30	Increased DMA coverage	Not modelled	n/a
D31	Improved DMA monitoring	Not modelled	n/a
D32	Improved distribution monitoring and modelling	Not modelled	n/a
D104	Dedicated leakage management system	Not modelled	n/a
D105	Raw water (upstream) leakage reduction (flow metering of raw mains)	Not modelled	n/a
D35	Pressure reduction programme (Active pressure management)	Not modelled	n/a
D36	Poor condition mains replacement	Not modelled	n/a
D106	Loss recovery: Reservoir raw water sample lines	Not modelled	n/a
D107	Loss recovery: Flushing points	Not modelled	n/a

** - Option S-B1 offers limited DO benefit but provides a benefit to source resilience.*

3.4 Shortlist of feasible options

The initial Feasible Options List (Table 3-1) included 22 supply augmentation/resilience options and 19 demand management options.. Further evaluation and shortlisting was carried out to reduce the number of options on the Feasible List to enable a more detailed and focused assessment of each option

In addition to removing some options from the options shortlist, some options were adapted or combined during the option design process. Options that have been changed or combined are detailed in the option appraisal decision log (Table 3-3).

3.4.1 Shortlisted demand management options

The demand forecast incorporates our base demand management activities as outlined in this section and in the demand forecasting appendix (Appendix E). In addition, Jersey Water have included demand management options within the investment decision making (the investment modelling is detailed further in Appendix H). These options comprise water efficiency measures and leakage reduction measures that aim to reduce the volume of water that needs to be supplied, including:

- Smart metering of customers and setting of tariffs to encourage customers to save money by reducing their water consumption. Water use at about 97% of properties served by Jersey Water are already metered. This is likely to be close to metering saturation point and therefore opportunities to reduce consumption further via additional standard metering are limited. Therefore, no option to roll-out standard metering to the remaining 3% of the population was included in the feasible options list. Instead, an option to roll-out smart metering installation and utilise incentive based tariffs was developed.
- Leakage reduction, which can be achieved by a variety of measures such as improved methods of finding and fixing leaks, enhancing monitoring of water flow in the distribution system in District Metered Areas (DMAs) and further optimisation of water pressure in the distribution system.
- Changes in house planning regulations to reduce new build household water consumption to 100 litres per person per day. This would require collaboration with the States of Jersey to implement new regulations. It would also require a modification of Jersey's Building Control regulations to require water efficient appliances to be used in all new properties and encourage other measures such as rainwater harvesting.

For investment modelling the demand management options were consolidated into three "packages" of water demand management measures, reflecting the fact that the demand savings invariably depend on the synergies or inter-dependencies between different demand management options. These packages were smart metering, leakage reduction options and changes to building regulations and policy and are summarised below.

Base demand management package

This package comprises possible extensions to the existing water efficiency promotion activities that Jersey Water is undertaking. The company is already very active, but it is important to consider whether there are additional activities that the company should be doing.

This package comprises:

- Development of a water efficiency strategy and communications plan
- Sustained enhancements to publicity, customer communications and water efficiency programme
- Schools engagement programme annually to all Year 4 pupils.
- Targeted water conservation information for domestic and commercial customers
- Education and publicity programmes for domestic and commercial customers
- Promotion of water saving devices for domestic and commercial properties.

It is expected that the combined, direct water savings from enhancements to such measures would be small. However, continuation of existing measures and sustained publicity across the island can help stimulate behavioural change such as adopting water saving tips or choosing low water using appliances when replacing them or installing a new bathroom or kitchen.

Demand Management Package 1 – Smart Metering

This package includes smart meter roll-out to houses alongside incentive-based tariffs. Savings have been estimated for initial leakage savings achieved through better visibility of customer-side leakage beyond Jersey Water's network. It also includes a saving achieved through the ongoing behavioural changes to household water use. The following assumptions were developed:

- In Jersey Water's previous WRDMP21 it was assumed that an average annual saving of 0.1Ml/d could be achieved from smart metering behavioural change. For this WRDMP these assumptions have been reviewed against estimated savings reported in UK Water Industry research such as Waterwise (2021) [2] which quotes savings between 2-3% of PCC reductions from behavioural change. During workshops with Jersey Water it was agreed that, due to existing high level of meter penetration in Jersey region and lower than UK average household PCC values, this package should assume the lower end of the range of savings quoted in UK research. Therefore, based on the base year property numbers (37,809), that 5% of properties will be smart metered per year and that they will reduce their household water use by 2%, the average annual savings of 0.1Ml/d were applied.

- The leakage savings achieved from the smart meter roll out will reduce through time as existing leaks have been found and fixed with opportunities for further savings from new leaks only. Therefore, the annual average savings were halved after the first 10 years of the strategy. Annual average leakage savings of 0.24Ml/d can be achieved in the first 10 years of the strategy with these halved for the remainder of the planning period.

- Jersey Water are currently undertaking a smart metering trial which is due for completion in Spring 2025. Results will inform the future roll out strategy so two alternative package programmes were incorporated into the investment decision making with the strategy starting in either 2026 or 2029.

Demand Management Package 2 - Leakage reduction options

The volume of total leakage across Jersey Water's water supply system was about 2.2 Ml/d in 2018, which represents about 11% of water put into the distribution system, which is a low percentage relative to UK and Ireland leakage levels.

Three leakage reduction options were included within this package for consideration during the option appraisal and programme development. During workshops with Jersey Water it was identified that many of these options are dependent upon the other and therefore they were packaged up as a single leakage strategy, as set out below:

- **Leakage Mains Renewal –** The early mains replacement was included in this package with two further package variations presented to the investment modelling so that the model had the choice whether to select additional mains renewal thereafter.
- **Enhanced Leak Detection and Repair –** This option includes leakage management software, an additional leakage technician and AI acoustic logging. This improvement to the quality of the data used by Jersey Water to target leak detection activities will improve their ability and speed of leak detection and repair activities, which in turn helps reduce leakage levels.
- **Advanced Pressure Management -** This option involves enhanced water pressure management, by further controlling the water pressure at certain points around the island where the pressure remains relatively high (whilst maintaining water pressure at an acceptable level for customers). Lower pressure reduces the volume of water lost from a leaking pipe.

[2] Smart-Metering-and-the-Climate-Emergency-2021-Final-1.pdf

The estimated volume of leakage reduction from this package were assumed to be 0.2 Ml/d in the base year increasing to 0.8Ml/d by the end of the planning period.

Demand Management Package 3 - Planning Regulations at new properties package

This package involves Jersey Water working in collaboration with the States of Jersey to implement new, or strengthened, regulations to require that all new household developments are water efficient. It was assumed that the regulations would ensure that the average new build household water consumption was 100 litres per person per day. This would require collaboration with the States of Jersey to implement new regulations. It would also require a modification of Jersey's Building Control regulations to require water efficient appliances to be used in all new properties and encourage other measures such as rainwater harvesting.

It is estimated that a demand reduction of about 0.2 Ml/d could be achieved if 525 new homes are built each year, with an average water saving of 13 litres/person/day, as a result of the new regulations. The annual savings are profiled to reduce over the planning period based on a reduction in forecasted new household build rates from 240 in 2023 to 86 by 2065.

3.4.2 Shortlisted supply options

For the supply augmentation and supply resilience options, several considerations influenced the decision on the options to be included in the final Feasible List:

- Need to retain a broad mix of different option types
- Need to reflect the scale of the supply deficit faced – ensure sufficient volume of additional supply remains in the Feasible List to provide real choice in the programme appraisal process
- Consider the operational benefits of each option beyond drought benefits, including for drinking water quality and supply resilience
- Consider the level of uncertainty and risk associated with the options
- Consider options identified as mutually exclusive or having a dependency on other options.

Shortlisting of options was carried out through workshops, similar to those used in the option screening stages, to rank/prioritise the options considered most likely to be implementable and identify the most appropriate and representative options to be developed further and made available for selection the decision making tool.

3.4.3 Feasible options shortlist

Table 3-2 lists the Feasible Options that were shortlisted to be taken forward for detailed assessment.

Table 3-2 – Final feasible option shortlist

Option Nr	Option	Supply benefit or demand saving	Option type
Supply-side options			
S101	New stream abstraction (Fernlands)	0.04 Ml/d	New source (3 options)
S15d	New groundwater abstraction: d. Pont Marquet	0.5 Ml/d	
S9	La Rosière desalination plant extension	5.4 Ml/d	
S103	New storage reservoir option Trinity reservoir.	0.6 Ml/d	Increase storage (3 options)
S24b	Expansion of Val de la Mare reservoir (new dam)	2.2 Ml/d	
S18	Bellozanne indirect treated effluent water reuse scheme	5.7 Ml/d	
S14	Raw water infrastructure system enhancements (La Hague -Queens Valley)	0.6 Ml/d	Supply resilience (2 options)
S-B1	Basket 1: Catchment Measures	0 Ml/d *	
S-B2	Basket 2: Treatment enhancement to target PFAS contaminated sources (as a combination of PFAS measures associated with options S6 and S114).	0.56 Ml/d	Removal of water quality constraints (1 option)
Customer, distribution and production-side options (Demand-side options)			
D-LMS	Leakage Management Software	0.31 Ml/d	Leakage related options (5 options)
D-APM	Advanced Pressure Management	0.16 Ml/d	
D-MRS1, 2, 3	Mains renewal / replacement	0.07 Ml/d (each)	
D-AT	Additional Leakage Technician	0.11 Ml/d	
D-AL	AI Acoustic Logging	0.1 Ml/d	
D-B11	Smart Metering (Start 2026)	0.15 Ml/d	Metering (2 options)
D-B12	Smart Metering (Start 2029)	0.15 Ml/d	
D-B3	Planning regulation and rain/grey water reuse - residential and commercial	Nominal	Regulation change (1 option)

** - Option S-B1 offers limited DO benefit but provides a benefit to source resilience.*

3.5 Option appraisal decision log

Table 3-3 provides the option appraisal decision log, summarising all the unconstrained options that were considered during the options appraisal process at each of the assessment stages: coarse screening; fine screening; final shortlisting. For options that were rejected (R) at any of these stages (red box), the decision log summarises the justification for the option rejection (or in some cases, this was simply due to its consolidation with other options). Where applicable, the green boxes indicate that the option has 'passed' (P) the relevant assessment stage; the red boxes indicate the stage at which an option was ruled out. In the feasible list shortlisting column an indicator of H, M or L shows a relative ranking of high, medium or low priority for progression of an option into the shortlist.

Table 3-3 – Option appraisal decision log

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
SUPPLY SIDE OPTIONS							
S4	Direct River abstraction	New stream abstraction (St Clement catchment)	This option involves developing a new stream abstraction within the St Clement catchment located as close as possible to the coast (taking account of water quality constraints) to maximise the available catchment area. A pipeline to the existing raw water conveyance system would be required, with the additional raw water supply augmenting storage in Queen's Valley Reservoir. The St Clement region is situated in the south-east of the island. This option has an estimated reliable yield benefit of 0.3 to 1.0 Ml/d. Further investigations would be required to confirm water availability and quality.	R	-	-	High risk source for pollution / WQ issue. Cost relative to benefit. Low flows in summer.
S5	Direct River abstraction	New stream abstraction (Rozel)	This option involves developing two new stream water intakes on the streams draining to Rozel Bay. The abstracted water would be pumped via a new main and discharged via a new outfall into the St. Catherine's catchment. This option has an estimated reliable yield benefit of 0.3 to 1.0 Ml/d. Further investigations would be required to confirm water availability and quality.	R	-	-	Constraints / challenges similar to S4 - dries up in summer. Low yield and small catchment. Technical solution would require pumping over high ground to Queens valley incurring additional infrastructure and relatively high opex for the benefit.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S101	Direct River abstraction	New stream abstraction (Fernlands)	The existing transfer of the Fernlands stream source into Grands Vaux reservoir can only occur when the reservoir is around 3m lower than top water level meaning water that may be available from the Fernlands catchment at times of higher water level in the reservoir are lost. This option will introduce additional infrastructure to the current arrangement that will enable a pumped inflow to Grands Vaux Reservoir from the Fernlands stream. Water from the Fernlands catchment can then be directed towards Grands Vaux reservoir whenever capacity exists.	P	P	M-P	n/a
S102	Direct River abstraction	New stream abstraction (Francheville)	Identify a new abstraction site to provide a new source of raw water from the Francheville stream.	P	R	-	Scale of benefit to be considered - estimate from hydrology study. Rejected at shortlisting workshop
S25	New reservoir storage	Gigoulande Quarry partial conversion to raw water storage	This option involves the conversion of part of the existing Gigoulande Quarry into a new raw water storage facility. This option will provide an additional water storage volume of around 700Ml and has a yield benefit of 1.1Ml/d. There would be enough excess winter flows to fill the quarry from the Val de la Mare and Waterworks Valley reservoir system. The option outline design conservatively includes the construction of a new dry well	P	P	L-R	Excluded from shortlist. Previous assessments have been complete - Feasible but unlikely to get implemented due to political position.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			pumping station within the quarry and the installation of a waterproof lining system on the quarry. It is possible that the lining may not be required and abstraction of water could be achieved by use of pumps attached to a floating pontoon (as is the case for quarry storage facilities in Guernsey). Two new delivery mains would be needed to transfer inflows and outflows from the quarry to a new connection point with existing raw water mains feeding to La Hague Reservoir.				
S35	New reservoir storage	New storage reservoir option (Les Mourier)	This option would involve construction of a new storage reservoir, pipelines and pumping stations. This option has been based on previous studies of a potential new reservoir (Les Mouriers) within Jersey Water's existing Le Mourier stream abstraction catchment. This option has an estimated yield benefit of 1-2 Ml/d depending on the selected capacity of the reservoir, how much additional new catchment area is developed and if it is developed in combination with other new sources.	P	P	L-R	Excluded from shortlist as there are alternative options of this type that are more likely to be implemented.
S36a	New reservoir storage	Other quarry - Ronez quarry	Adapted option from WRDMP21 - referring to the quarry conversion aspect of S36: This option is an alternative to the Gigoulande Quarry conversion option (S25) and could be implemented in the	R	-	-	Rejected due to ongoing operation at the site. May reconsider in the long term future once quarry minerals have been exhausted.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			event that the Gigoulande Quarry is not available for conversion to a water storage facility. This option has high associated cost in infrastructure, maintenance, monitoring, although might be a faster and cheaper option than creating a new reservoir. There may be a risk of leaching depending on the permeability of the quarry selected. There would be enough excess winter flows to fill a quarry or underground artificial storage facility from the Val de la Mare and Waterworks Valley reservoir system (as is the case for the Gigoulande Quarry option).				
S36b	New reservoir storage	New underground artificial storage - German tunnels	Adapted option from WRDMP21 - referring to the underground storage facilities (German tunnels) aspect of S36: Jesey has a number of tunnels associated with the German occupation during WW2. Some of the tunnels are large and could offer a potential raw water storage site. Conversion for the tunnels would be required, although the technical requirements are not known. This option focusses on tunnels in the Grands Vaux valley that can be used in combination with the existing reservoir.	P	R	-	Unlikely to progress due to technical reasons and heritage designation of the tunnels.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S103	New reservoir storage	New storage reservoir option Trinity reservoir.	New reservoir in the region of Trinity at the upstream of Grands Vaux reservoir.	P	P	H-P	n/a
S104	New reservoir storage	New storage reservoir option (Coastal reservoir)	Considered previously in the 1980s the idea is to provide a large body of water on the coast. possibly through repurposing a harbour / port area. The coastal reservoir (Le Coup) considered in 1980s was dropped due to practical storage difficulties and the option abandoned without site exploration. The large tidal range presents a challenge. A large dam may account for the tide. Whilst there could be suitable location there is also potential conflict with the marine community in terms of their desires/objectives. The option is only likely to be feasible if the St. Helier port was abandoned.	R	-	-	Rejected on the basis of no suitable sites yet identified.
S23	Reservoir raising	Increase existing reservoir capacity of Queen's Valley Reservoir	This option involves increasing the capacity of Queen's Valley Reservoir by raising the dam height, most likely in combination with other options to increase raw water supplies to the reservoir due to its slow refill characteristics. Queen's Valley Reservoir is located in the east of Jersey and is the biggest reservoir on the island. The existing top water level of the reservoir is already relatively high in elevation and this option may therefore require a completely	R	-	-	Extent is limited by topography

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			reconstructed embankment to support the extra storage. Furthermore, the reservoir has a unique spillway, which may make it difficult to increase the capacity. The estimated yield benefit is 1-2 Ml/d.				
S24a	Reservoir raising	Raising of Val de la Mare reservoir	This option involves raising the existing gravity dam at Val de la Mare Reservoir in order to enlarge the reservoir capacity and thereby increase the reliable yield. This option includes raising of the Val de la Mare dam by 9m with hardfill quarried from the reservoir basin. This option would provide an additional 1,200Ml of storage capacity, equivalent to around an additional 60 days of water supply storage, and an estimated yield benefit of 1.9 Ml/d.	P	R	-	Concern with technicality - suggest S24b progressed in favour of S24a
S24b	Reservoir raising	Expansion of Val de la Mare reservoir (new dam)	Expansion of Val de la Mare reservoir through the provision of a dam downstream of the existing. Considered to mitigate any engineering constraints associated with work to the existing dam.	P	P	H-P	n/a
S105	Reservoir raising	Expansion of Millbrook reservoir to combine with Dannemarche reservoir. Or have an intermediate reservoir between the two sites.	Millbrook reservoir is in the lower parts of waterworks valley, receiving raw water in a cascade manner from Dannemarche reservoir (and other inflows). This option is to increase the height of top water level in Millbrook reservoir, to in effect join it with Dannemarche reservoir, using the	P	P	L-R	Other storage increase approaches considered more favourable.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			existing (walled) boundary in the valley as the delineation for the area of inundation.				
S6	Groundwater wells (boreholes)	Increased abstraction from St. Ouen's boreholes (PFAS removal required)	The current maximum output of the St Ouen's boreholes is limited to approximately 0.3 Ml/d due to PFAS contamination of groundwater from historic fire-fighting foam runoff from training activities at Jersey Airport. Due to the persistence of this chemical compound in the water environment, the contamination of the groundwater is likely to continue for a considerable number of years. In the UK, Drinking Water Inspectorate (DWI) guidance restricts the PFAS concentration in drinking water to 1,000ng/l and PFOA to 5,000 ng/l, with a trigger to consult and monitor at 300ng/L. In order to fully use the available output from St. Ouen's boreholes, one option is to remediate the groundwater to prevent contamination of the water abstracted from the boreholes (S6) or to treat the borehole water using Granular Activated Carbon (Option S7). Following a review of the two options available, the option taken forward as Option S6 was the PFAS treatment using Granular Activated Carbon (GAC) or other suitable treatment process. Treatment is more cost-effective and more reliable than	P	P	R	Combined with option S114

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			groundwater remediation measures. The additional reliable yield of this option is assessed at 0.7 to 1.0 Ml/d.				
S8	Groundwater wells (boreholes)	Extend the St Ouen's groundwater wellfield	This option would extend the existing St Ouen's groundwater wellfield northwards and/or make use of the existing groundwater "Control Boreholes". This option would require significant work for minimal gain, although there is potential for up to 1.7 Ml/d of reliable yield at the upper-end of the yield estimates, with a central estimate of around 0.5 Ml/d.	P	P	L-R	Other groundwater options considered more favourable. Potential to bring in after S6 if that option is selected
S15a	Groundwater wells (boreholes)	New Enhance groundwater abstraction: a. Little Tesson	This option involves the development of a new borehole source in a suitable aquifer (for example, around Tesson or at Rozel), including borehole pump and around 5km of new rising main. The reliable yield estimate is up to 0.5Ml/d. Investigations will be required to confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to a. Tesson.	P	P	L-R	Other groundwater options considered more favourable.
S15b	Groundwater wells (boreholes)	New groundwater abstraction: b. Rozel	This option involves the development of a new borehole source in a suitable aquifer (for example, around Tesson or at Rozel), including borehole pump and around 5km of new rising main. The reliable yield estimate is up to 0.5Ml/d. Investigations will be required to	P	R	-	Other groundwater options considered more favourable.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to b. Rozel.				
S15c	Groundwater wells (boreholes)	New groundwater abstraction: c. St Clements	This option involves the development of a new borehole source in a suitable aquifer. Investigations will be required to confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to c. St Clements.	P	P	L-R	Other groundwater options considered more favourable.
S15d	Groundwater wells (boreholes)	New groundwater abstraction: d. Pont Marquet	This option involves the development of a new borehole source in a suitable aquifer. Investigations will be required to confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to d. Pont Marquet.	P	P	M-P	n/a
S15e	Groundwater wells (boreholes)	New groundwater abstraction: e. Ponterrin	This option involves the development of a new borehole source in a suitable aquifer. Investigations will be required to confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to e. Ponterrin.	P	P	L-R	Other groundwater options considered more favourable.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S15f	Groundwater wells (boreholes)	New groundwater abstraction: f. La Chaise Diable	This option involves the development of a new borehole source in a suitable aquifer. Investigations will be required to confirm water availability and quality. Various sub-options have been explored (a. Tesson, b. Rozel, c. St Clements, d. Pont Marquet, e. Ponterrin, f. La Chaise diable). This sub-variant relates to f. La Chaise Diable.	P	P	L-R	Other groundwater options considered more favourable.
S106	Groundwater wells (boreholes)	Abstraction from the Corbiere / La Moye marsh areas	This option involves the development of a new source from the 'Le Marshes' area in the south-west of the island.	P	R	-	Could be favourable due to proximity to existing infrastructure. However, no history of BHs available so requires further work outside of the WRMP process to appraise viability.
S17	Groundwater wells (boreholes)	New or refurbished groundwater source (e.g. at Rozel)	This option is to refurbish an existing groundwater source in the Rozel area. A borehole at Rozel has historically been used by Jersey Water and could be refurbished or a new borehole drilled. The reliable yield estimate is up to 0.5Ml/d.	P	R	-	No information on an existing GW source at this site.
S20	Groundwater wells (boreholes)	Develop / redevelop commercial borehole supplies (non-potable use)	This option involves the development of some small new boreholes to supply some commercial customers for non-potable needs. Due to limited demand the estimated yield benefit is no greater than 0.5 Ml/d.	R	-	-	Likely receptors will probably already have their own GW supply.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S26	Aquifer Storage and Recovery	Aquifer Storage and Recovery/Artificial Recharge of groundwater	This option involves aquifer storage and recovery or an artificial groundwater recharge solution in the west of the island. There is a need to consider issues with water quality/contamination of aquifer. Whilst this option is feasible, it is likely to be expensive and the yield benefit may be small, with a relatively high risk that only a small proportion of the volume of water injected into the aquifer can be recovered. A lot of additional handling and treatment/retreatment would be required in relation to this option as identified in previous work on this option by Jersey Water. The estimated yield benefit would be 0.5 Ml/d.	R	-	-	High risk from contamination & engineering challenge. Options available that could be a better use of the wellfield. Anticipated limitation in the aquifer capacity to accept the additional recharge. Risk of saline intrusion upon drawdown.
S9	Desalination	La Rosière desalination plant extension	La Rosière desalination plant is located on the south-west coastline of the island. This option is to increase capacity of La Rosière desalination plant with an additional new 5.4 Ml/d treatment stream. It is assumed that current delivery pipelines are adequately sized to sustain the increase in output. A new pumping station will likely be required, as well as other ancillary assets. Operation of the desalination plant for very prolonged periods is not an environmentally sustainable or financially viable option. This option	P	P	H-P	n/a

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			also has relatively high associated capital costs.				
S12	Desalination	New desalination plant on the east coast	New desalination plant on the east coast of the island near to the Verclut quarry in St. Catherine's Bay. This option involves the construction of sea water intake near to St. Catherine's breakwater and a sea water discharge pipe and outfall to return the treatment process waste stream back to the sea.The plant would be capable of producing 10 Ml/d of new supply (probably with 2 treatment streams, each at 5 Ml/d capacity). It is assumed that the new desalination plant would have similar process design constraints as the existing La Rosière desalination plant. The water would be transferred via a new raw water main to St. Catherine's pumping station for onward transfer to the Queen's Valley Reservoir.	P	R	-	Not going to get more favourable than the west coast option. Capex concerns - review justification in desal optioneering report.
S107	Desalination	Transfer of PFAS affected sources for desalination (brackish water desal).	Transfer of PFAS affected sources for desalination (brackish water desal) using the existing desalination plant.	P	R	-	Doesn't benefit the desal plant (due to variability of WQ) - refer to desal optioneering
S108	Desalination	Offshore desalination	Provision of a floating / barge / rig mounted desalination plant with pipelines to transfer potable water to shore.	R	-	-	Unlikely to be more favourable than other land based desalination options
S18	Reclaimed water	Bellozanne indirect treated effluent water reuse scheme	Bellozanne wastewater treatment works (WwTW) serves the whole of the island and discharges treated	P	P	H-P	n/a

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			effluent into St Aubin's Bay in the south of Jersey. This scheme involves the treatment and reuse of the treated final effluent from Bellozanne WwTW to augment water resources in Jersey, primarily during times of drought. The final effluent would be treated to a very high standard by a four-stage treatment process: nitrification / denitrification, phosphate removal, filtration and activated carbon. This treated water would then be pumped via a rising main to Millbrook Reservoir for onward transmission into the reservoir storage system – mostly likely to Queen's Valley Reservoir to achieve the necessary freshwater blending requirements. The blended water would subsequently receive full potable treatment at the Handois and/or Augrès Water Treatment Works. The scheme would provide at least 6Ml/d of additional reliable yield based on the dry weather flow to the WwTW and the need for sufficient freshwater storage in the reservoirs for blending with the highly treated effluent. This option would include: 1) Pumping final effluent flows from downstream of the existing UV disinfection channel to a new effluent reuse treatment plant at the north of the Bellozanne site.				

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			2) Pumping flow through the proposed new effluent reuse treatment plant with a four-stage treatment process to remove any residual pesticides, pharmaceuticals, etc. 3) Treated flows to gravitate into a pump sump and be pumped via a new rising main to Millbrook Reservoir for onward transfer, probably to Queen's Valley Reservoir to achieve appropriate blending with freshwater. 4) The flows to be treated would need to be about 25% greater than the required 6 Ml/d output to the reservoir to allow for the backwash from the treatment processes employed.				
S19	Reclaimed water	Direct effluent reuse for commercial customers (non-potable use)	This option is to develop a direct effluent water reuse scheme based on the final treated effluent from Bellozanne WwTW. The final treated effluent would be further treated to meet industrial but non-potable water supply standards for direct supply to commercial customers, either via tankers (e.g. to golf courses for irrigation, construction and quarry works for dust suppression, or for non-food washing facilities) or via a new dedicated commercial, non-potable water supply distribution system. This scheme would have a limited benefit due to the limited demand for such a non-potable supply on the island.	R	-	-	Rejected as high costs and uncertain engineering feasibility. A separate network would be required and transferring treated effluent where needed would need whole new system

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S14	Bulk transfer	Raw water infrastructure system enhancements (La Hague -Queens Valley)	This option involves construction of a new raw water pumping station adjacent to Mont Gavey Tank and a new rising main to discharge raw water transferred from the west of the island into Queens Valley Reservoir. The new pumping station will have the capacity to transfer up to 15Ml/d from the existing (and any new) raw water sources in the west of the island to the east (in particular to support storage in Queen's Valley Reservoir).These asset enhancements would increase overall supply resilience and can be operated flexibly. They could be used in conjunction with any new sources of water, including helping to blend any desalination or effluent reuse scheme supplies with freshwater. The estimated reliable yield benefit in severe drought is 0.8 Ml/d (i.e. in a 2-year drought), but this option also provides improved resilience and greater yield benefit in other drier, but not severe drought, conditions.	P	P	H-P	n/a
S29	Bulk transfer	Increase raw water transfer capacity	This option is to enhance the raw water transfer capacity by overcoming some key infrastructure constraints (beyond the West-East transfer constraints noted in Option S14). No additional reliable yield is likely to be provided by this option, but it enhances supply resilience	P	P	R	Rejected as no further enhancements identified beyond S14

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S30	Third party import	Raw water transfer – Guernsey	This option would involve purchasing and investing in a transfer of raw water from Guernsey via a new undersea pipeline (which could include developing the Les Vardes quarry storage facility in Guernsey to provide this water reliably in a drought) as well as developing new infrastructure to take the raw water from the coast to the Jersey Water raw water reservoir system.	R	-	-	Lack of resource on Guernsey.
S31	Third party import	Raw water transfer – France	This option would involve the purchase and transfer of a raw water supply from France via a new undersea pipeline from the St Malo area and developing infrastructure to take the raw water from the coast to the Jersey Water raw water reservoir system.	P	R	-	Heavily dependent on external schemes - reconsider in the future when there is more certainty of tunnel etc.
S109	Third party import	Potable water transfer – France	As S31 but treated water transfer. Noting additional treatment requirements following delivery to Jersey. Suggested scaling the option at 20 Ml/d bulk potable transfer to maintain good storage levels in Jersey. WQ needs to be monitored	P	R	-	Heavily dependent on external schemes - reconsider in the future when there is more certainty of tunnel etc.
S32a	Third party import	Ship water by tanker to Jersey - planned shipment from another country (nominally England)	This option would involve the purchase and shipping of treated water by tanker from overseas and developing infrastructure at St Helier Port to transfer the water into the	P	R	-	Better options available. Complexity / surety / resilience (shipping movement certainty) cost.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			Jersey Water treated water supply network. Surplus water available in Portsmouth to be acquired and delivered to JW by ship. Selection of Portsmouth as a port with anticipated connectivity for shipping to accept / onboard water from shore (given naval and civilian shipping history). Largest available tanker could carry 400 Ml				
S32b	Third party import	Ship water by tanker to Jersey - Regular delivery of water as freight through existing ferry movements.	This option would involve the purchase and shipping of treated water from overseas and developing infrastructure at St Helier Port to transfer the water into the Jersey Water treated water supply network. Delivery of water from overseas through the use of existing ferry movements. Suggestions of containerised supply regularly being deposited on the island (similar to worldwide wine shipments).	P	R	-	Reject on the basis of scale. Practicality issues.
S32c	Third party import	Ship water by tanker to Jersey - Use of shipping ballast water	This option would involve the purchase and shipping of treated water from overseas and developing infrastructure at St Helier Port to transfer the water into the Jersey Water treated water supply network. Using water from ballast in ships arriving into Jersey. However this will only apply to shipping that is exporting product from Jersey (thus arriving with ballast tanks charged).	R	-	-	Rejected due to risk of heavy metal (and other) contamination issues through largely uncontrolled source.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S1	Catchment measures	Groundwater catchment management measures	This option focusses on implementing catchment management actions (e.g. engagement with farmers and also with Jersey Airport in relation to runoff risks to the St Ouen's boreholes catchment) to protect, and where possible improve, groundwater quality. This option will probably not result in any material additional reliable yield but will help secure existing reliable yield and enhance supply resilience. The Jersey Clean Water Action Group is currently already working with farmers to reduce the use of pesticides and improve farming practices to protect raw water supplies. Work has focussed on potato farming to date and Jersey Water has seen improvements in nitrate levels from the work of the Action Group. Physical measures (with possible Jersey Water funding/financial contributions) could include chemical storage, cattle management fencing, reducing stocking density, removing soil compaction, farm steading design, tillage, woodland planting, wetland buffers and attenuation ponds. It is understood that water quality protection measures are already in place at Jersey Airport, but additional measures could be necessary. This option aims to prevent a reduction of	P	P	H-P	n/a

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			reliable yield due to water quality deterioration and reduce unplanned outage risks due to adverse water quality conditions.				
S110	Catchment measures	Grands Vaux catchment / reservoir - maintain current purposing	Retain Grands Vaux reservoir. Effectively a 'sensitivity' of the model to assess impact of using Grand Vaux for flood alleviation.	P	P	L-R	Low priority – exclude from shortlist. But can consider in sensitivity testing
S2	Catchment measures	Surface water catchment management measures: education and influencing of land owners and farmers	This option focusses on implementing catchment management educational actions (e.g. engagement with farmers) to protect (and where possible improve) surface water quality. This option will probably not result in any material additional reliable yield but could help secure existing reliable yield and enhance supply resilience. The Jersey Clean Water Action Group is currently already working with farmers to reduce the use of pesticides and improve farming practices to protect raw water supplies. Work has focussed on potato farming to date and Jersey Water has seen improvements in nitrate levels from the work of the Action Group. Approaches to further increasing education and engagement with farmers to encourage use of water-friendly farming methods includes provision of information pamphlets/website pages, stakeholder meetings, promoting catchment	P	P	R	Combined into S-B1 Basket with S1

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			management techniques through education/farm demonstration days and events, mobile visitor centres, employment of catchment advisors, a dedicated website and helpline, and on-line assistance/dedicated online forums. Work is already ongoing with farming groups, but further actions could be beneficial, principally in relation to nitrates and pesticides. This option aims to prevent a reduction of reliable yield due to water quality deterioration and reduce unplanned outage risks due to adverse water quality conditions.				
S3	Catchment measures	Surface water catchment management measures: physical catchment land improvement activities	This option focusses on implementing physical catchment management measures to protect (and where possible improve) surface water quality. This option will probably not result in any material additional reliable yield but will help secure existing reliable yield and enhance supply resilience. Physical measures (with possible Jersey Water funding or financial contributions) may include chemical storage, cattle management fencing, reducing stocking density, removing soil compaction, farm steading design, tillage, woodland planting, wetland buffers and attenuation ponds. This option has not previously been attempted and would extend Jersey Water's reach into	P	P	R	Combined into S-B1 Basket with S1

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			supporting (either directly or indirectly) the introduction of physical measures on farms to reduce diffuse and point pollution risks. This option aims to prevent a reduction of reliable yield due to water quality deterioration and reduce unplanned outage risks due to adverse water quality conditions.				
S28	Catchment measures	Increase catchwater capacities of existing supply catchments	This option would involve enhancing the existing catchwater systems or developing additional catchwater systems to augment abstraction at existing stream intakes. The solutions would be small scale (in terms of reliable yield), but the infrastructure is already in place, therefore there would be relatively low construction costs and minimal construction impacts. The estimate yield benefit is less than 0.5 Ml/d and there is significant uncertainty in the yield assessment. This option is similar to Fernlands (option S101), so focusses on the marshes in the south west.	P	R	-	Unlikely to be viable in terms of locations where it can be implemented (except S101)
S22	Innovative	Offshore storage	This option is to develop an offshore storage solution (creating some form of storage facility offshore - could include floating or submerged storage containers for freshwater abstracted from groundwater and/or surface water on the island). Water would need to be piped offshore and then back onshore when needed for supply.	R	-	-	Sea conditions, and tidal range issues. Scalability / benefit challenges.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S34	Innovative	Shipping icebergs from Scandinavia	This option would involve shipping of icebergs from northern Scandinavia to supplement raw water supplies during severe drought conditions and developing infrastructure to take the raw water from the coast to the Jersey Water raw water reservoir system.	R	-	-	Not appropriate in current form. Suggestion to modify to draw on Norwegian fjords.
s21	Innovative	Water harnessed from fog	This option relies on the latest technology to capture water from fog via condensation. The option would need to be implemented close to the shoreline in a location where fog is most likely to form on a regular basis. Any water collected would need to piped and pumped inland to existing reservoir storage.	R	-	-	Not considered to offer a reliable source at scale required
S38	Innovative	Dedicated seawater supply system	This option involves the supply of partially treated seawater for certain non-potable uses, e.g. toilet flushing. It would require the installation of new abstraction infrastructure on the coast and investment in a whole new water supply network on the island, separate to the existing potable, treated water network.	R	-	-	Rejected on the basis of infrastructure needs / network requirements and 'treatability'.
S111	Innovative	Rainwater harvesting at Garden centres / nurseries	Provision of water storage assets at garden centres and nurseries to provide a resource for irrigation / plant watering in preference of using potable supply, or to make more groundwater available for Jersey Water to use.	P	R	-	Combined with educational options. Uncertainty of benefit.

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S112	Innovative	Acquisition of raw water from Norwegian fjords and sea tankering supplies to JW		R	-	-	Moved to be considered as a drought option.
S113	Innovative	Cloud seeding to promote rainfall during dry periods.	Potentially a summer only option to carry out cloud seeding to help promote rainfall on the island during dry periods.	R	-	-	Rejected on basis of uncertainty in application and achieving the benefit.
S27	Other	Raw water treatment to address adverse surface water quality constraints	This option would provide new raw water treatment facilities to address adverse raw water quality constraints at some surface water sources, reducing risk of outage and possibly increasing reliable yield. This option could include treatment of inflows before reservoir storage, in-reservoir treatment (e.g. algae control measures) and/or between the reservoir source and the inlet to a water treatment works. Other treatment options could include a Nitrate removal plant at Le Mourier in central Jersey using “Phoslock”, noting that copper sulphate dosing is currently in operation. This option requires a trade-off between cost and improved supply resilience. The estimated yield benefit is less than 0.5 Ml/d, although option would also increase supply resilience.	P	P	R	To be removed as replaced by the sub-variants
S114	Other	As S27, but specifically targeting the PFAS contaminated sources.	As S27, but specifically targeting the PFAS contaminated sources.	P	P	H-P	n/a

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
S115	Other	As S27, but specifically targeting other contaminations in addition to PFAS (Algae, nitrates, pesticides, Manganese)	As S27, but specifically targeting other contaminations in addition to PFAS (Algae, nitrates, pesticides, Manganese)	P	P	H-P	n/a
CUSTOMER-SIDE, DISTRIBUTION-SIDE AND PRODUCTION-SIDE OPTION (DEMAND OPTIONS).							
D1	Compulsory metering	Compulsory customer metering	Compulsory installation of water meters for all customers. Probably very limited opportunity as there is already extensive metering of domestic and commercial customers (about 98%).	P	R	-	Limited benefit and already being implemented as BAU.
D2	Meter installation policy	Smart meter installation	Rolling programme of enhancing current meters with fully "smart" flow monitoring (i.e. frequent logging and more accurate alarming of unusual flow patterns). Prompt advice would be given to customers if supply pipe leakage or plumbing losses identified (e.g. leaking toilet). Smart meters would also provide opportunity for "smart water audits" (D9 or D20) or "smart customer engagement" (D10 or D21) to be considered.	P	P	H-P	Options D2, D3, D4 combined at shortlisting stage.
D3	Introduction of special fees	Increased volumetric tariffs	New tariffs (e.g. rising block tariffs or seasonal tariffs) to encourage reduced use especially of discretionary water use.	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
D4	Changes to existing measured tariffs	Incentive-based tariffs	Provision of rewards for reducing consumption. Also incentivise “bulk metered customers” to encourage demand reductions by individual customers within the bulk supply.	P	P		
D9	Targeted water consideration information	“Smart” water use audits (Domestic)	As traditional water use audits, but using information from smart meters (if D2 undertaken) to improve identification of the best homes to include and to target the retro-fit and repair programme, potentially supported by customer engagement (as for example the Thames Water "Smart Home Visit").	P	P	H-P	Options combined at shortlisting stage: Educational campaign (Domestic): D5, D6, D101 Audits and engagement post smart metering implementation: D9, D10, D20, D21. Educational campaign (Commercial and industry): D16, D17, D101, D102 Water saving devices: D7, D18
D10	Targeted water consideration information	“Smart" customer engagement (Domestic)	Using smart metering (if D2 undertaken) and in-home water use displays, real-time benchmarking, and behavioural science to "nudge" customers to reduce water use (for example the Anglian Water/Advizzo Newmarket trial).	P	P		
D20	Targeted water consideration information	“Smart” water use audits (Commercial)	As traditional retro-fit and repair water use audits, but being more targeted by (a) opportunist visits to streets with commercial properties or (b) using information from smart meters (if D2 undertaken) to improve identification of the best properties to include (see for example the Thames Water “Smart Business Audits”). May be applicable for offices, shops, pubs, etc., but unlikely to provide benefit above traditional audits for schools or for	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			sites with 24-hour use such as hospitals, hotels or industry.				
D21	Targeted water consideration information	“Smart" customer engagement (Commercial)	Using smart metering and water use displays and real-time benchmarking, and behavioural science (see for example the Anglian Water/Advizzo Newmarket homes trial). This is undeveloped and untested for commercial premises.	P	P		
D5	Targeted water consideration information	Targeted water conservation information (Domestic)	Providing advice to domestic customers on water use and identifying leaks, additional to current baseline activity, e.g. water use calculator, water efficiency check-list, smart visuals to communicate messages. Excludes specific information/media promotions to support water audits, which are included in water audit options.	P	P		
D6	Targeted water consideration information	Education and publicity programmes (Domestic)	Water messaging through media, social media, public events, school education, local group meetings etc, additional to current baseline activity.	P	P		
D16	Targeted water consideration information	Targeted water conservation information (Commercial)	Providing advice to commercial customers on water use and identifying leaks, additional to current baseline activity, for example water use calculator, water efficiency check-list, smart visuals to communicate messages. Excludes specific information/media promotions to support water audits, which are included in the water audit options.	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			Information would be targeted to specific sectors, e.g. schools, offices, hotels, etc.				
D17	Targeted water consideration information	Education and publicity programmes (Commercial)	Water educational messaging through media, social media, and visiting offices/other commercial premises to give talks/advice to staff.	P	P		
D101	Advice & information of direct abstraction and irrigation techniques	Educational campaign on private supplies (especially those for non-potable supply).	Educational programme on water usage best practices from private supply, with the intent of making available any surplus water for JW to acquire.	P	P		
D102	Advice & information of direct abstraction and irrigation techniques	Educational campaign regarding private supplies used for irrigation.	Targeting of farming community for educational campaign with the intent of making available any surplus water for JW to acquire, or reducing the requests from agricultural users to request abstraction permits from the watercourses.	P	P		
D7	Water saving devices	Promotion of water saving devices (Domestic)	Offer free/subsidised devices e.g. cistern displacement devices, shower timers, low-flow showerheads, tap inserts, water butts, or hose trigger devices. Provide retail portal for customers to request/purchase devices.	P	P		
D18	Water saving devices	Promotion of water saving devices (Commercial)	Provide advice on water saving devices and/or offer free/subsidised devices, for example cistern displacement devices, low-flow showerheads, tap inserts, water butts or hose triggers.	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
D103	Advice & information on leakage detection and fixing techniques	Offer of a private repair service	In-house team to offer repair service for private leaks to reduce leakage run time.	P	P	L-R	Low priority, rejected from shortlist
D11	Water saving devices	Rainwater harvesting (Residential)	These systems collect and use rainwater for toilet flushing. They could be installed in new homes either by (a) Jersey Water encouraging developers to install in some new developments; or (b) inclusion in new building regulations (D13). Installation in individual homes most unlikely, but at community level could be considered. Retro-fit to some existing homes may be possible.	P	P	M-P	Option combined at shortlisting: Planning regulations and rain/grey water reuse (Residential): D11, D12, D13. Planning regulations and rain/grey water reuse (Commercial): D22, D23, D24.
D12	Water saving devices	Greywater recycling (Residential)	These systems recycle shower water and other “greywater” for toilet flushing. There are potential health risks and maintenance concerns, so it is assumed it would be on a voluntary basis only. However, it could be included as a choice for developers in building regulations for new homes (D13).	P	P		
D13	Other	Planning regulation for new homes	Modify Jersey’s Building Control regulations to require water efficient appliances to be used in all new properties and encouraging other measures such as rainwater harvesting.	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
D22	Recycling & re-use	Rainwater harvesting - Commercial	These systems collect and use rainwater for toilet flushing. They could be installed in new commercial properties either by (a) Jersey Water encouraging developers to install in some new developments; or (b) inclusion in new building regulations (D24). Retro-fit to some existing commercial properties may be possible	P	P		
D23	Recycling & re-use	Greywater recycling - Commercial	These systems use shower or other "greywater" for toilet flushing. There are potential health and maintenance concerns, so it is assumed it would be on a voluntary basis only. However, it could be included as a choice for developers in building regulations for new commercial properties (D24).	P	P		
D24	Other	Planning regulations for new commercial buildings	Modify Jersey's Building Control regulations to require water efficient appliances to be used in all new properties and encouraging other measures such as rainwater harvesting	P	P		
D8	Targeted water consideration information	"Traditional" water use audits (Domestic)	Programme of visiting individual homes to retro-fit water saving devices, mend leaks and provide water conservation advice. Applicable to properties not covered by "Smart customer engagement" and which are not "bulk metered customers". Meter readings and benchmarking would be used to target priority homes. Needs	P	R	-	Rejected the option of a targeted campaign, but suggest continuation of current BAU operations

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			to be supported by media campaign. Implementation to be rolled out one area at a time (as for example Wessex Water's "Home Check" programme).				
D19	Targeted water consideration information	"Traditional" water use audits (Commercial)	Programme of visiting individual premises to retro-fit water saving devices, repair leaks and provide water conservation advice. These would be prioritised/tailored for specific customer types, e.g. schools, hospital, offices, care homes, hotels, restaurants and pubs, farms, leisure and sports centres, laundrettes, car washers, etc. Meter readings and benchmarking would be used to target priority homes. Would be supported by a media campaign.	P	R	-	Rejected the option of a targeted campaign, but suggest continuation of current BAU operations
D15	Water saving devices	Retro-fit programmes or appliance exchange programmes - domestic	To undertake subsidised water using appliance exchanges – e.g. toilet scrappage scheme and /or voucher programme for low flush toilets and high-efficiency white goods based on existing water labels (e.g. Waterwise WaterMark or EU Water Label).	P	R	-	Rejected due to anticipated high cost for the scale of benefit.
D26	Water saving devices	Retro-fit or appliance exchange programmes-commercial	To encourage commercial customers to replace or modify appliances to be more water efficient, e.g. low-flush toilets, efficient white goods. A subsidised appliance exchange programme could be considered for all sectors, or limited to certain target sectors, for example schools,	P	R	-	Removed and instead included in the educational piece for commercial customers

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			hospitals, other institutions and public toilets				
D27	Leakage reduction	Enhanced leak detection and repair	To use data from smart meters (if D2 undertaken) to enable rapid identification of supply pipe leakage and give prompt advice to customers. This would form part of Option D2. Jersey Water is already proactive with customers in using existing meter readings to identify high/unusual water use.	P	R	-	Removed
D28	Leakage reduction	Service reservoir and trunk main leakage reduction	Through more intensive programmes of service reservoir 'droptests' to check for leakage and trunk mains detection and repair techniques.	P	P	L-R	Low priority, removed from shortlist
D29	Leakage detection	Enhanced leak detection and repair	Better targeting of leak detection by making better use of DMA data. Possible increased resource deployment for leakage detection and repair across the distribution network.	P	P	H-P	Options combined at shortlisting: Leakage detection and associated activities: D29, D30, D31, D32, D104.
D30	Leakage reduction	Increased DMA coverage	Enabling installation of DMAs for those parts of St. Helier that are not currently within a DMA and to set up new and/or split existing DMAs elsewhere if appropriate.	P	P		
D31	Leakage reduction	Improved DMA monitoring	Using improved and/or smarter monitoring of flow and pressure at DMA sites to provide better DMA data and improve targeting of leakage detection	P	P		

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
D32	Leakage reduction	Improved distribution monitoring and modelling	Installing acoustic loggers and/or more intensive flow and pressure monitoring throughout the distribution system and within DMAs. Supported by better use of the Jersey Water network model and data analysis to improve speed and accuracy of identifying leaks and, in conjunction with the Jersey Water network model, enable intelligent/calm network operation.	P	P		
D104	Leakage detection	Dedicated leakage management system	Improved monitoring system to move away from SCADA (& Excel). Data management improvement and reporting.	P	P		
D34	Leakage reduction	Novel pipe repair techniques	Use of innovative techniques for pipe repair, for example the emerging use of 'low-dig' and 'no-dig' techniques, to reduce impact on road users and speed-up repairs.	P	R	-	Challenging to implement. Potential limited benefits unless can be implemented more quickly than traditional measures.
D33	Leakage detection	Novel leak detection techniques	Implementation of innovative techniques for leak detection, for example drones, novel/smart noise detectors and leak detection sniffer dogs (as currently being investigated by United Utilities).	P	R	-	Challenging to get good results. Expensive to implement. Element of BAU in that the business continually seeks new innovations on the market
D105	Leakage detection	Raw water (upstream) leakage reduction (flow metering of raw mains)	Enhanced metering in the raw water transfer system to enable monitoring of losses in the pipeline system. Benefits to be appraised, noting potential for losses to be contributing	P	P	M-P	n/a

Option Nr	Option Type	Option Name	Option description	Coarse screening	Fine screening	Feasible shortlisting	Reason for rejection or screening out (where applicable)
			to other JW capture systems depending on location.				
D35	Pressure reduction programmes	Pressure reduction programme (Active pressure management)	Improved pressure management and pressure control optimisation, accompanied by a potential reduced property pressure standard for the island.	P	P	M-P	n/a
D36	Advance replacement of infrastructure for leakage reasons	Poor condition mains replacement	Replacement of poor condition pipes and other distribution system assets prone to bursting, including asbestos pipes.	P	P	L-R	Low priority, rejected as considered part of BAU activities of the business.
D37	Improved leakage detections and reduction on raw water mains.	Raw water losses reduction	Identifying and resolving losses from abstraction assets, and raw water pipes, tanks, pumps and overflows in the raw water supply system.	P	R	-	Removed option – considered to be included in the other options
D106	Improved leakage detections and reduction on raw water mains.	Loss recovery: Reservoir raw water sample lines	Raw water sample line at reservoirs to be re-routed to res or similar. Suggest about 20Ml/yr losses. Reduce the amount of 'run to waste' from the reduction of water age in dead ends.	P	P	L-R	Low priority, rejected as considered part of BAU activities of the business.
D107	Improved leakage detections and reduction on raw water mains.	Loss recovery: Flushing points	Potable water permanent flushing points to be recaptured. (e.g. Greve de L'ecq)	P	P	L-R	Low priority, rejected from shortlist.

3.6 Drought management measures

To help manage the risks to essential water supplies in drought conditions, a series of drought management options have also been considered, as summarised in Table 3-4 and Table 3-5.

Table 3-4 – Drought management options discarded during the option coarse screening process

Ref	Option	Reason(s) for discarding
DM12	Shipping icebergs from Scandinavia	As a drought option, rejected in favour of sourcing water from the Norwegian fjords (DM13).
DM13	Acquisition of raw water from Norwegian fjords and sea tankering on island	Rejected on the basis that this is a sub-variant of sea tankering and there are more preferable (closer) donors for supply considered in option DM1 (Import by sea).

Table 3-5 – Drought management options discarded during development of the final Feasible Options list

Ref	Option	Reason(s) for discarding
DM1	Import by sea - Ship water to Jersey from abroad	Rejected due to complexity of implementation
DM4	Recommission boreholes - Bring abandoned boreholes back into supply. Get sites into a state of readiness for a drought period.	Uncertainty of water availability during drought. Low supply benefit in a drought and water quality risks.
DM11	Direct effluent re-use for non-potable use - Tanker based option that does not rely on the distribution network. Potentially replacing farm abstractions from streams with water from Bellozanne STW during drought.	Rejected as not currently within Jersey Water's operational remit and would require more holistic consideration of the island's water usage across multiple stakeholders.

The remaining temporary drought management options shown in Table 3-6 were included in the final Feasible Options list for consideration during the programme appraisal process.

Table 3-6 – Drought management options included in the final feasible options list

Ref	Option	Reason for inclusion
DM2	Water rationing Water rationing using standpipes and rota cuts to the supply of water at customer taps.	Considered an appropriate measure for extreme drought events.
DM3	Temporary desalination Install additional temporary desalination treatment process plants	Option included as technologically viable but noted that there could be complexities to implement, particular associated with the provision of feed water. The option may require external support (e.g. military) to implement.
DM5	Temporary PFAS treatment	Jersey Water operate the St Ouen's boreholes in this manner as a drought measure (currently without the GAC unit in place). A decision on the practicality of

	Install temporary PFAS treatment (GAC unit) at St Ouen's boreholes to increase borehole output.	implementation of this option is to be made once the Jersey Water PFAS strategy is available, noting the locations are to be agreed for the in-situ treatment.
DM6	Customer awareness Enhanced customer water efficiency and "use water wisely" education and awareness campaign	Readily implemented with short lead time. Relatively low cost and achieves high level of awareness to customers of the need to conserve water use in a rapid timescale (radio, television, social media, print media, website, leaflets, promotion at events and public spaces).
DM7	Temporary Water Use Ban (NEUB Lite) Covering various non-essential water uses with minimal social or economic impact.	Readily implemented under existing legislation. Uses can be selected depending on time of year and likely volumes to be saved. Could include a ban on watering gardens with a hosepipe or sprinkler, washing private cars with a hosepipe (except any commercial car wash enterprises where water is recycled), filling private swimming pools (aside from commercial hotels/private leisure centres), paddling pools, ornamental ponds or fountains.
DM8	Temporary Non-Essential Water (NEUB Extensive) Use Ban Covering a wider range of non-essential water uses with some social or economic impact.	Readily implemented under existing legislation. Uses can be selected depending on time of year and likely volumes to be saved. Could include banning the use of: all car washes (except where water is recycled); washing of windows/buses/ boats/ outdoor surfaces; irrigation of sports grounds/ civic parks / newly laid turf; water for dust suppression (except for health and safety reasons), filling of all swimming pools except public swimming pools.
DM14	Water tankering on island This option would involve on-island tankering of treated water from service reservoir to areas of the island experiencing supply shortfalls in severe drought conditions	An outline plan is in place for such activity and could be implemented by us as necessary.
DM15	Reduce levels of service This option involves reducing the level of service that Jersey Water provides to its customers in respect of the frequency of implementing temporary drought restrictions on the use of hosepipes and sprinklers and wider restrictions on other nonessential water uses	Could be integrated with the WRDMP planning approach to set different levels of service and frequencies of other measures (e.g. increased rate of hose pipe bans). Customers previously showed reasonable agreement with this approach during drought events.
DM16	Reduce levels of service (pressure) Provision of water supply at a reduced pressure to reduce demand.	Technically viable although there is a need to carefully manage the indiscriminate nature of the measure that may affect sensitive customers. Good knowledge of supply network and location of water critical customers is required.

4. Option development

4.1 Stage 3: Develop outline scope for each feasible option

Following the development of the final Feasible Options shortlist, an outline scope was developed for each option to capture the detailed option appraisal. This included high level engineering development and assessment for the supply options, as well as development of capital and operational cost profiles for each option over an 80-year horizon.

An option dossier and assessment spreadsheet proforma was developed for each option, comprising the following information:

- Summary of the option and main scheme elements, as well as a summary of cost information, timeframe to implement and reliable yield benefit or demand saving
- Proposed works describing the work required to implement the option, any opportunities and benefits beyond reliable yield gain or demand saving, risks and constraints, and the uncertainties or opportunities that could be considered as the options develop.
- Resilience assessment, considering the resilience of the option and any resilience benefits provided by the option.
- Option appraisal against a range of appraisal criteria (as set out earlier in Section 2): Feasibility and Risk; Engineering and Cost; Performance and Resilience; Operational Risks; Environmental Effects. This assessment built upon the original screening multi-criteria appraisal.
- Cost worksheet with a detailed breakdown of capital and operational costs.

4.2 Stage 4: detailed appraisal and cost-benefit assessment

We used the outline concept asset sizing and cost information for each of the supply and demand options to determine the reliable supply or demand saving benefits, supply resilience benefits, capital and operating costs, delivery risks and any uncertainties, customer and political acceptability, plus any potential environmental and social effects.

We used the costs and supply or demand saving benefits for each option to prepare a whole life cost profile across an 80 year planning horizon as well as prepare an approximate annualised cost for the purpose of options comparison and programme selection. Table 4-1 provides a summary of the shortlisted options, water resources benefit and annualised cost that was used in the multi-criteria decision making model.

Table 4-1 – Summary of option benefit and estimated cost data.

Ref	Option	Benefit	Annuitised capex (£k/yr)	Fixed opex (£k/yr)	Variable opex (£/m3)
S101	New stream abstraction (Fernlands)	0.04 Ml/d	29	2.47	5.89
S15d	New groundwater abstraction: d. Pont Marquet	0.5 Ml/d	54	1.23	7.45
S9	La Rosière desalination plant extension	5.4 Ml/d	1,162	-	57.01

S103	New storage reservoir option Trinity reservoir.**	0.6 Ml/d	i) 7,707 ii) 4,379	i) 10.00 ii) 5.68	i) 5.23 ii) 5.23
S24b	Expansion of Val de la Mare reservoir (new dam)***	2.2 Ml/d	i) 12,405 ii) 8,464 iii) 5,846	10.00	4.34
S18	Bellozanne indirect treated effluent water reuse scheme	5.7 Ml/d	5,096	116.52	100.35
S14	Raw water infrastructure system enhancements (La Hague -Queens Valley)	0.6 Ml/d	954	-	6.22
S-B1	Basket 1: Catchment Measures	0 Ml/d *	-	50.00	-
S-B2	Basket 2: Treatment enhancement to target PFAS contaminated sources	0.56 Ml/d	607	26.17	12.14
D-LMS	Leakage Management Software	0.31 Ml/d	-	53.50	-
D-APM	Advanced Pressure Management	0.16 Ml/d	10	-	-
D-MRS1, 2, 3	Mains renewal / replacement	0.07 Ml/d (each)	-	333.33 (each)	-
D-AT	Additional Leakage Technician	0.11 Ml/d	-	-	-
D-AL	AI Acoustic Logging	0.1 Ml/d	-	10.00	-
D-B11	Smart Metering (Start 2026)	0.15 Ml/d	-	165.00	-
D-B12	Smart Metering (Start 2029)	0.15 Ml/d	-	165.00	-
D-B3	Planning regulation and rain/grey water reuse - residential and commercial	Nominal	-	-	-

** - Catchment measures have not been assigned a deployable output benefit but may be beneficial to water resources. Appraisal of the specific interventions included in this option is an inherent part of the option development, identifying measures to address or benefit water quality, water usage or treatment needs.*

*** - Two variants considered in the pricing*

**** - Three variants considered in the pricing*

A range of considerations other than cost also influence decisions on the selection of the options to be included in the preferred plan to secure water supply reliability. A detailed multi-criteria assessment was therefore carried out for each of the options against seven criteria: supply / demand benefit (Ml/d); cost; acceptability (political, customer and societal); delivery complexity (risk); performance and resilience; operational complexity (risk); environmental effects. The assessment took into consideration the additional design detail carried out for each of the feasible options. A summary of the input data (excluding costs, that are shown in Table 4-1) and outputs from the multi-criteria options appraisal is provided in WRDMP Appendix H 'Decision Making Approach).

The option appraisal process evaluated a wide range of potential options to address the forecast supply demand balance deficit. An objective, multi-criteria appraisal process was applied to develop a final feasible list of options for taking forward to the programme appraisal process to select a preferred plan. These feasible options, along with the demand management options, were considered as part of the programme appraisal process to determine the optimal mix of options to resolve the forecast supply deficit, as set out in detail in Appendix I of this WRDMP