Jersey Water
for Island life

Our 2025 Water Resources and Drought Management Plan

Contents

Tables

Figures

Executive summary

Our Water Resource and Drought Management Plan is a **strategy for maintaining the balance between supply and demand for water over the next 40 years.** It aims to ensure a **secure and sustainable supply of water to meet forecast customer demand during dry years.**

Our Water Resource and Drought Management Plan addresses the supply deficit over the 40-year planning period by implementing a balanced portfolio of demand management measures, water source enhancements to increase supply and, if needed in extreme circumstances, temporary water use restrictions. Our plan meets the forecasted water needs of the island community, our on-going commitment to customer service and protection of the environment. It is consistent with planning objectives, is adaptive and provides a "no regrets" approach to investment in new infrastructure. We have identified the schemes that should be implemented in the next 5-10 years, and those for which we need to commence feasibility and planning activities to ensure they are available when needed if the future supply situation requires them.

Based on our decision making modelling which includes assessment of 'best-value' runs that maximise resilience and environmental objectives, we have identified that our core short-term strategy includes:

- Smart metering and catchment measures that have environmental and social benefits.
- Base leakage reduction strategy (schedule of activities from the start of plan)
- La Rosière desalination plant extension to be effective from 2030
- Continuation and enhancement of ongoing catchment measures (driven by environmental and social objectives)
- Implementation of the Fernlands stream abstraction scheme (driven by resilience objectives)
- A PFAS targeted solution by 2030, with an exact solution dependent on resolving uncertainty around PFAS regulation.
    - This will improve overall resilience as well as responding to the ongoing uncertainty over the level of PFAS regulation we will be held to.

Our preferred plan is adaptive dependent on the future we end up in and has been assessed against a scenario framework consisting of differing potential futures of the water resources situation in Jersey. Under this strategy our immediate actions are enough to provide a robust and resilient service in the Mid-Range and Benign futures. However, if we are in a more adverse future (Plausible Adverse or Reasonable Worst), then further options may be needed including a second large resource option, such as an additional desalination scheme.

Background

Jersey Water's purpose is to supply the water needed for the island to thrive, today and everyday. Our water supplies are provided by an integrated water resource system comprising reservoirs and stream abstractions, groundwater boreholes and our La Rosière desalination plant. The water provided from these different water sources is treated at our two water treatment works for supply to our customers through an interlinked network of water distribution pipes. We currently supply an average of around 19 million litres of water per day to some 39,000 homes and 3,400 commercial properties across Jersey. More information about Jersey Water is available on our website at www.jerseywater.je

Jersey Water has a responsibility to maintain secure, high quality, reliable and affordable water supplies to our customers over the long-term. We have developed this long-term Water Resources and Drought Management Plan (WRDMP), covering the 40-year period from 2025 to 2065, to understand the likely future changes in demand for water and reliability of water supplies so that we can determine the actions required to maintain high standards of water supply reliability to our customers which are resilient to potential future events and uncertainties.

The key objectives of this WRDMP are therefore to:

- Develop a robust evidence base to characterise the scale and complexity of the water resource and drought management challenges facing Jersey's water supplies over the next 40 years, including consideration of risks and uncertainties.
- Review the current components and trends in demand for water and to forecast the future water demand over the next 40 years, taking account of the latest population and housing growth projections for the island.
- Assess the reliable supply of water available in drought conditions of different severities, taking account of the risks to future water supply availability over the next 40 years, such as from the impacts of climate change.
- Assess the key water supply resilience risks and uncertainties over the next 40 years.
- Quantify the water supply-demand balance over the next 40 years to assess the future vulnerability to drought and other pressures affecting the reliability of water supply provision.
- Consider a range of alternative options to maintain water supply reliability, including temporary drought management measures alongside permanent measures to manage demand or augment supply.
- Carry out multi-criteria appraisal of alternative programmes of measures to balance supply and demand to inform decision-making on the preferred plan to secure future supply reliability for our customers.
- Provide an 'adaptive plan' (in line with the latest UK best practice) that considers the strategic risks and options to produce a robust and resilient best-value plan.

Water supply-demand forecasts

In 2022, Jersey Water supplied 18.7Ml/d to approximately 39,000 homes and 3440 commercial properties across the island. In a normal weather year, it is expected that the average consumption per domestic customer will reduce by about 5% over the planning period as a result of future installations of more efficient water appliances and expected changes in water appliance use. However, strong growth in Jersey's population and the number of new homes is expected; it is anticipated that the number of domestic properties served will increase by 10% to approximately 49,200 by 2065. The overall effect is that domestic water consumption is expected to increase by 9% by 2065 to 20.7Mld in a normal year.

The estimated volume of leakage from Jersey Water's distribution system and customer underground supply pipes was about 2.4Ml/d in 2018 but has reduced to less than 2.2Ml/d in 2022 and 2Ml/d in 2023 (around 10% of the water we typically supply). Jersey Water is at the frontier of leakage control performance, with our leakage levels lower than most other parts of the UK and Ireland.

The total quantity of water required by our network is projected to increase by approximately 5% from 18.8Ml/d in 2022 to 19.7Ml/d in 2065 under normal weather conditions, and to about 20.8Ml/d by 2065 under dry weather conditions; this is our demand forecast.

An assessment of the volume of water we can reliably put into supply forms the foundations of our supply forecast; this is referred to as our deployable output (DO). This supply can vary between different years based on a number of factors including climate variability and is often lower in dry or drought years. Therefore, DO is often described by the return period of climatic conditions, or drought event, for example: 1 in 2-year (normal year) or 1 in 500-year (extreme drought). These provide an estimate of the average probability of a given drought event and the associated DO of our water supply system in a drought of that magnitude. As part of this WRDMP, and in line with best practice guidance used in England and Wales, we have taken the opportunity to move to a 1 in 500-year level of drought resilience.

Table 1-1 presents our most recent assessment of baseline DO for a range of return periods The table includes a 'normal year' 1 in 2-year return period through to an extreme drought of 1 in 500-years return period.

Table 1-1 - Deployable Output Summary Table

Return Period	NYAA (1in2)	DYAA (1in10)	1in100	1in200	1in500
Deployable Output (DO) (Ml/d)	31.51	25.84	20.38	19.38	18.38

Figure 1-1 presents our supply demand balance under a mid-range future scenario. This shows that at the beginning of the planning period (2025) there is already a risk of a supply deficit in a drought of approximately 1 in 100 years or greater severity. Under a relatively benign future (in terms of water resource drivers), the supply deficit risk decreases over the planning period; however under more adverse future scenarios, the deficit may increase by as much as 10Ml/d to a potential deficit of minus 14Ml/d in our most adverse future scenario under the 1 in 500-year drought planning condition.

The supply demand balance forecasts are used as inputs to the decision-making process. We use an investment model to identify appropriate options (based on cost and other factors) to meet the various deficits under the different futures and planning conditions.

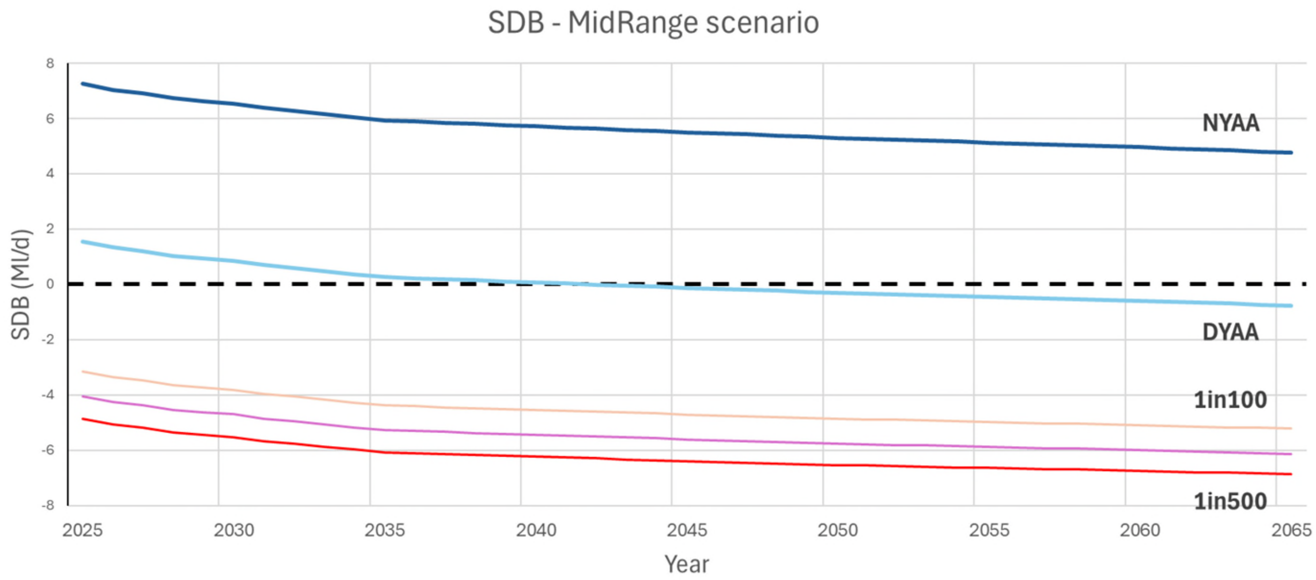


Figure 1-1 – Range of forecast supply demand balances for the Mid-Range scenario

Options to address the current and forecast supply deficit

We have developed and applied a multi-criteria appraisal process to evaluate a wide range of alternative options to address the forecast supply deficit.

Our option appraisal process comprised the following key steps:

- Development of an “unconstrained” list of options that considered a wide range of options that may be feasible.
- Development of screening evaluation criteria relating to technical feasibility, customer and political acceptability or environmental and social impacts, to objectively evaluate each option on a consistent basis.
- Appraisal of the unconstrained option list against the evaluation criteria to determine a final feasible set of options that can be used to address our forecast deficits.

We evaluated over 100 unconstrained options against high level screening criteria. Where options were assessed as having an over-riding constraint or performed very poorly against most criteria, they were rejected. Options which passed through the first stage of screening evaluation were then subject to a greater level of evaluation against a more detailed set of "fine screening" evaluation criteria that built upon the high level criteria used initially. Table 1-2 sets out the evaluation criteria for the fine screening of the options list. For each criterion, we evaluated the options against a five-point grading scale: from positive/beneficial effect through to major adverse/ high risk.

Table 1-2 - Outline of fine screening criteria

Evaluation category	Fine screening evaluation criteria
Feasibility and risk	▪ Political acceptability and customer acceptability ▪ Ease of implementation and technical feasibility ▪ Timeframe / programme to implement ▪ Scheme dependencies ▪ Technological ▪ Experience of delivery ▪ The Construction (Design and Management) Regulations issues ▪ Quality and confidence of design information
Engineering and cost	▪ Engineering complexity ▪ Likely capital and operational cost requirements ▪ Land availability, ownership and tenure
Performance and resilience	▪ Likely scale of reliable supply benefit or demand savings relative to anticipated scale of the supply deficit ▪ Supply resilience benefits ▪ Vulnerability or resilience of the option to climate change ▪ Ability to carry out phased or incremental delivery ▪ Resistance to vulnerability due to undesirable physical site occurrences, such as flood, pollution, power loss etc. ▪ Resistance to vulnerability due to undesirable external factors of energy pricing changes and future regulatory/legislative changes
Operational	▪ Compliance risks ▪ Resource and skills requirements
Environmental	▪ Anticipated impacts to the environment, including flood risks, climate impacts and impact to designated sites, irreplaceable habitats, sites with high heritage / amenity value and WFD objectives. ▪ Qualitative appraisal of embodied and operational carbon. ▪ Impact to: ▫ Aquatic environment. ▫ Biodiversity and fisheries ▫ Planning considerations ▫ Flood risk ▫ Landscape and visual amenity ▫ Material asset and resource usages ▫ Geology and soils ▫ Cultural / heritage and archaeological ▫ Human health and well being

Following the screening process we investigated the options that had passed through in detail and further developed/refined these options in terms of their design/implementation considerations, costs and benefits. Our final feasible option set is presented in Table 1-3.

Table 1-3 – 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 - Queen's 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	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.*

Our preferred WRDM Plan

Our preferred WRDM Plan addresses the supply deficit over the 40-year planning period by implementing a balanced portfolio of demand management measures, water source enhancements to increase supply and, if needed in extreme circumstances, temporary water use restrictions. To determine our preferred plan, we have reviewed the outputs from our scenario assessments to identify which options are selected and when. We have considered the selected portfolios of options in three time-based groupings:

- **Immediate "no regrets" options** – these are required in the near term and, in all (or most) futures, (i.e. they are options that should be implemented regardless of what the future looks like)
- **High chance short/medium term options** – these are options that are often selected in the short to medium term in the Mid-Range, Plausible Adverse and Reasonable Worst futures. It would be prudent for further investigations to be scheduled to facilitate timely implementation of these options for when they may be required in future.
- **Potential long-term solutions** – these are options which are only selected towards the end of the plan and only in the two most adverse futures, and hence there should be sufficient time to implement them in future should they be required.

Based on our decision making modelling, including the best-value runs that maximise resilience and environmental objectives, we have identified that our core short-term strategy includes:

- Smart metering and catchment measures that have environmental and social benefits.
- Base leakage reduction strategy (schedule of activities from the start of plan)
- La Rosière desalination plant extension to be effective from 2030
- Continuation and enhancement of ongoing catchment measures (driven by environmental and social objectives)
- Implementation of the Fernlands stream abstraction scheme (driven by resilience objectives)
- A PFAS targeted solution by 2030, exact solution dependent on resolving uncertainty around PFAS regulation.
  - This will improve overall resilience as well as responding to the ongoing uncertainty over the level of PFAS regulation we will be held to.

As part of this we have accepted that there may be a risk of deficits in extreme 1 in 500-year type events for the first 10 years (up to 2035) and in severe 1 in 100 type drought events for the first 5 years of the planning period (up to 2030).

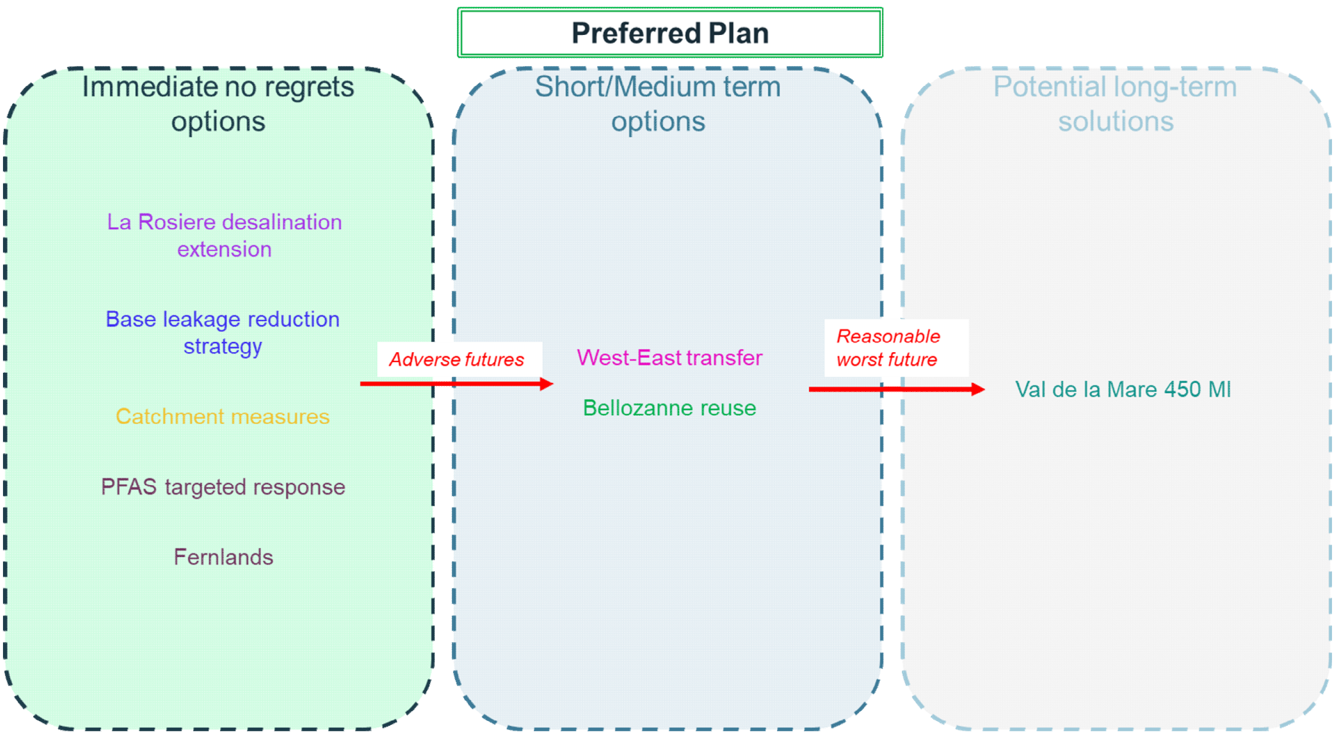


Figure 1-2 – Summary of components of preferred plan

An adaptive plan

We have developed our scenario framework consisting of 5 plausible futures that will have differing impacts on the water resources situation in Jersey. Our preferred plan is adaptive dependent on the future we end up in. Figure 1-3 illustrates that under this strategy our immediate actions are enough to provide a robust and resilient service in the Mid-Range and Benign futures. However, if we are in a more adverse future (Plausible Adverse or Reasonable Worst), then further options may be needed including a second large resource option, such as the Bellozanne water reuse plant or a 2nd desalination scheme. The West-East transfer scheme may be utilised to slightly delay the need for this, however in a more adverse future delaying the decision on a second large resource may increase the risk of future deficits during a drought. This suggests the prudence of undertaking feasibility studies and investigations in the short term to reduce lead-in times for such a scheme if we end up in a more adverse future.

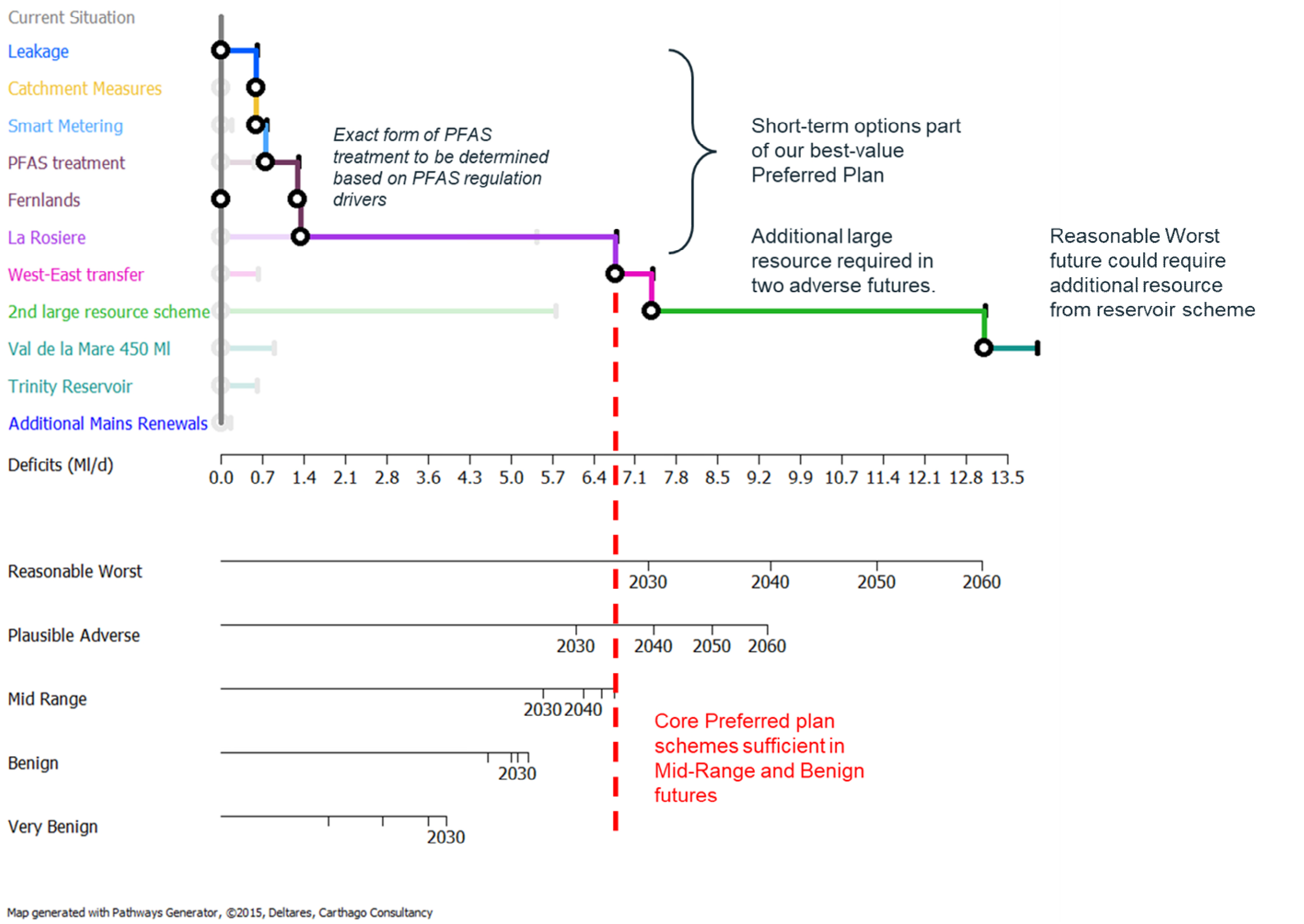


Figure 1-3 – Illustration of our adaptive preferred plan. Potential deficits in a 1 in 500 drought scenario are shown on the x-axis alongside the 5 future scenario timelines. Scheme potential to resolve deficits are shown along the y-axis with the highlighted path showing our preferred plan. This shows that our short-term core plan schemes are resilient to all but a more adverse future.

Conclusions

Our WRDMP meets the forecasted water needs of the island community, our on-going commitment to customer service and protection of the environment. It is consistent with planning objectives, is adaptive and provides a "no regrets" approach to investment in new infrastructure. We have identified the schemes that should be implemented in the next 5-10 years, and those for which we need to commence feasibility and planning activities to ensure they are available when needed if the future supply situation requires them.

1. Introduction

Jersey Water has a responsibility to maintain secure, high quality, reliable and affordable water supplies to our customers over the long-term and which are resilient to potential future events. We have developed this long-term Water Resources and Drought Management Plan (WRDMP), covering the 40-year period from 2025 to 2065, to understand the likely future changes in demand for water and reliability of water supplies so that we can determine the actions required to maintain high standards of water supply reliability to our customers.

1.1 An overview of Jersey Water

Jersey Water's purpose is to supply the water needed for the island to thrive, today and everyday. Our water supplies are provided by an integrated water resource system comprising reservoirs and stream abstractions, groundwater boreholes and our La Rosière desalination plant. The water provided from these different water sources is treated at our two water treatment works for supply to our customers through an interlinked network of water distribution pipes. We currently supply an average of around 19 million litres of water per day to some 39,000 homes and 3,400 commercial properties across Jersey. More information about Jersey Water is available on our website at www.jerseywater.je

1.2 Structure of the plan

Jersey Water's previous WRDMP, published in 2021 (and referred to in this documents as WRDMP21) was structured alongside relevant UK guidelines for water resource and drought management plans. The structure and supporting appendices contained in this plan are presented below in Figure 1-1.

Section	Description	Supporting technical analyses
Introduction Section 1	Jersey Water overview and structure of our WRDMP	
Policy and strategy background Section 2	Sets out the objectives, and summarises relevant policies & key guidance that underpins the development of the plan	
The water supply system Section 3	Describes the key features of our water supply system and the operational challenges we face	Problem Characterisation Appendix A
Water supplies Section 4	Explains how we calculate the availability of our supplies in drought conditions and our forecast of water supplies	Appendix B: Climate change assessment Appendix C: Stochastic data Appendix D: Supply forecast
Demand forecast Section 5	Describes how we calculate the components of water demand and how these could change in the future	Appendix E: Demand forecast
Risk and uncertainty Section 6	Describes how we have derived allowances for risk and uncertainty in our planning forecasts	Appendix F: Headroom uncertainty
Supply demand balances Section 7	Sets out the range of possible future scenarios we face and the supply demand balances over the next 40 years	
Options appraisal Section 8	Describes the appraisal of different options to secure our future water supply reliability and resilience	Appendix G: Options appraisal Appendix J: Strategic Environmental Assessment
Decision-making approach Section 9	Sets out our approach to selecting and testing our plan	Appendix H: Decision-making approach
Programme appraisal: The Plan Section 10	Presents the conclusions of our assessments to develop our preferred plan, and how it can adapt to future uncertainties	Appendix I: Programme appraisal

Figure 1-1 - Structure of our water resource and drought management plan

1.3 Our technical partner

For the delivery of this WRDMP we have partnered with AtkinsRéalis who have served as a key technical partner on the project, providing strategic guidance and technical support on all aspects of water resource and drought planning to ensure successful project delivery.

2. Policy and strategy background

2.1 Purpose of the WRDMP

Water companies in England and Wales have a statutory duty to prepare a Water Resource Management Plan and a Drought Plan every 5 years. Although Jersey Water is not regulated in the same way and has no statutory requirement to publish such plans, Jersey Water recognises the benefits of taking a long-term view of water supply provision and managing supplies during drought conditions. We have therefore developed this Water Resources and Drought Management Plan ('WRDMP' or 'the Plan') to update and refresh the previous WRDMP that we prepared in 2021.

The WRDMP considers long-term planning for water resources and how essential water supplies can be maintained during future drought events. This is important to consider for long-term pressures such as demographic changes and climate change. Long-term planning encourages the early identification of new resources necessary to maintain reliable water supplies when demand for water in Jersey is growing. It enables us to include for an appropriate amount of time to undertake key tasks such as feasibility investigations, planning and construction that are required to successfully develop any measures by the time they are needed in future, to reduce the risks of supply shortfalls during future drought conditions. A 40-year planning period has been adopted for the plan to 2065.

The key objectives of this WRDMP are therefore to:

- Develop a robust evidence base to characterise the scale and complexity of the water resource and drought management challenges facing Jersey's water supplies over the next 40 years, including consideration of risks and uncertainties.
- Review the current components and trends in demand for water and to forecast the future water demand over the next 40 years, taking account of the latest population and housing growth projections for the island.
- Assess the reliable supply of water available in drought conditions of different severities, taking account of the risks to future water supply availability over the next 40 years, such as from the impacts of climate change.
- Assess the key water supply resilience risks and uncertainties over the next 40 years.
- Quantify the water supply-demand balance over the next 40 years to assess the future vulnerability to drought and other pressures affecting the reliability of water supply provision.
- Consider a range of alternative options to maintain water supply reliability, including temporary drought management measures alongside permanent measures to manage demand or augment supply reliability.
- Carry out multi-criteria appraisal of alternative programmes of measures to balance supply and demand to inform decision-making on the preferred plan to secure future supply reliability for our customers.
- Provide an 'adaptive plan' as detailed in the latest UK guidance that considers the strategic risks and options to produce a robust and resilient best-value plan

We have split the planning period into three time-based categories to help to prioritise the implementation of our Plan to address potential future supply shortfalls:

- Immediate “no regrets” options and activities – these should be implemented in the short term, regardless of what the future looks like.
- High chance short/medium term options and activities – these are likely to be required in the near-term, and therefore require that relevant investigations and planning activity are started in the very short-term to facilitate timely delivery of these options as required in future.
- Potential longer-term solutions – these are only likely to be required towards the end of the plan (i.e. last 20 years or so), and hence there should be sufficient time to undertake appropriate planning activity to implement them in future should they be required. However, it is useful for us to identify a body of next options that may be needed, as we see start to see which path we are on in future.

2.2 Best practice

In preparing our Plan, we have considered relevant technical guidance for water resources management planning and drought management planning principles that have been developed in the UK, including:

- The latest Water resources planning guideline, prepared by Defra, Welsh Government, Environment Agency, Natural Resource Wales, Ofwat and Defra.
- The latest water company Drought Planning guidelines prepared by the Environment Agency.
- UK Water Industry Research (UKWIR) (2016), series of Water Resources Planning Methodologies.
- UKWIR (2020), Developing a Best Value Water Resources Management Plan.
- Adopt and apply the latest climate change projections for the UK (UKCP18) products.

We have also benchmarked our existing and proposed standards of service for water supply reliability against those offered to water company customers in other parts of the British Isles.

2.3 Policy context

Our Plan has been developed in the context of the relevant Jersey statutory provisions relating to water catchments, water abstraction, water supply provision, drinking water quality and water charging as covered by the follow legislation:

- The Water (Jersey) Law 1972.
- The Water Pollution (Jersey) Law 2000.
- The Water Resources (Jersey) Law 2007.

We have also considered relevant aspects of Government of Jersey planning activities, including:

- Challenges for the Water Environment of Jersey (2014)
- Water Management Plan 2017-2021
- Common Strategic Policy 2018-2022
- Island Plan (revised 2011) and the Island Plan Review (ongoing). This is superseded by the “Bridging Island Plan 2022 - 2025”. The next Island Plan will commence in 2026.
- Govt. of Jersey water strategy (in development)

Our WRDMP focuses on how we are going to ensure the reliable supply of water that meets drinking water quality standards to our customers whilst safeguarding public health. We also recognise the importance of securing water supplies for our commercial customers in both the public and private sector to help support the future economic growth of Jersey.

2.4 Jersey Water strategy

There are five key pillars to our business strategy and all our work at Jersey Water, as presented in

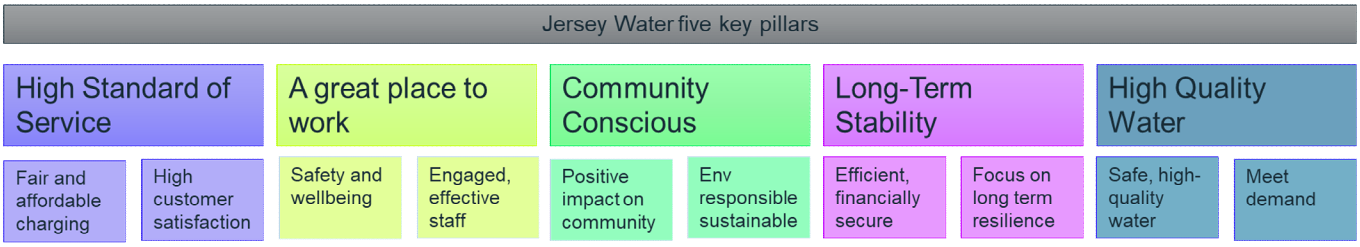


Figure 2-1 - The five key pillar's to Jersey Water's business strategy. These strategic objectives support and underpin the development of our WRDMP.

Following a review of our previous plan, we have identified a number of priorities that we wanted to consider in this current WRDMP – to strengthen the robustness of our plan to inform our long term strategy. The following is a summary of our priorities in the development of this current WRDMP:

- To better understand risks to the supply system in terms of resilience to a wider range of drought conditions (including more severe droughts) that could plausibly occur, but which may not have been observed in the historical record, by developing long time series of drought data sets and modelling the impacts of these.
- Development of a stochastic (artificial weather) data set to explore a wider set of climatic conditions.
- Improving our hydrological assessments and development of hydrological models to enable us to explore the wider range of stochastic weather conditions.
- Development of a water resources model for stress testing the supply system against a wider range of drought events and return periods (including investigating and understanding the implications of a move to a 1 in 500-year drought condition (in line with latest UK best practice).
- Apply the latest climate change projections in our assessment of the impacts of climate change.
- Review and update of other components of supply and demand, including reflecting the latest population and property projections in our demand forecast.
- Review and update our list of options to address any deficits in supplies that we have identified.
- Focus on scheduling of solutions to address forecast deficits, through planning scenarios, and identify those options requiring further / more detailed feasibility assessment in the near future.
- Explore the potential for use of our Grands Vaux reservoir for flood attenuation and assess the potential risks this could present to water supply during droughts.

2.5 How the plan is constructed

2.5.1 Planning conditions

In the WRDMP, our aim is to ensure a secure and sustainable supply of water to meet forecast customer demand during dry years. In normal or wet years, there is generally plenty of water resource capacity to meet customer demand. Whereas, in dry years, a lack of rainfall during the autumn and winter recharge period, coupled with higher demands as a result of hot and dry summer conditions, result in an increased risk of a shortfall of supplies available to meet demand. In a succession of dry years (i.e. drought), drought interventions are needed to reduce demand or to allow a temporary increase to the amount of supplies that can be delivered. The plan aims to develop the strategy to strike a balance between the frequency of drought interventions and the costs of having additional supply or demand measures in place to reduce the frequency of interventions.

In order to explore the “dry years” for the WRDMP, we consider a range of planning conditions, reflecting higher demand than in a normal year (“dry year annual average demand”) in conjunction with reduced water available due to drought of different severities – e.g. a severe 1 in 100-year drought or an extreme 1 in 500-year drought. This aims to ensure that we have a resilient ongoing supply, by testing our system to drought events outside of the historic record, hence testing the system to drought of a 1 in 100-year or 1 in 500-year return period. The 1 in X year terminology is commonly used across the water industry to convey varying degrees of likelihood; however this can be hard to interpret for those not familiar with the concept. Table 2-1 therefore provides a reference to convert the frequency terminology (i.e. return period) to a percentage risk over planning period which may be easier to conceptualise.

Table 2-1 - Guide to understanding return periods as percentage chance over planning period

Return Period for drought event of a certain magnitude or higher	Chance of such a drought event occurring over the course of the 40-year planning horizon.
50	55%
100	33%
200	18%
500	8%

2.5.2 A supply demand balance

We forecast our supplies and expected demand for water over the planning period (i.e. 2025-2065). This is built up in each year of the planning horizon by combining the contributions of each component, including an allowance for uncertainty.

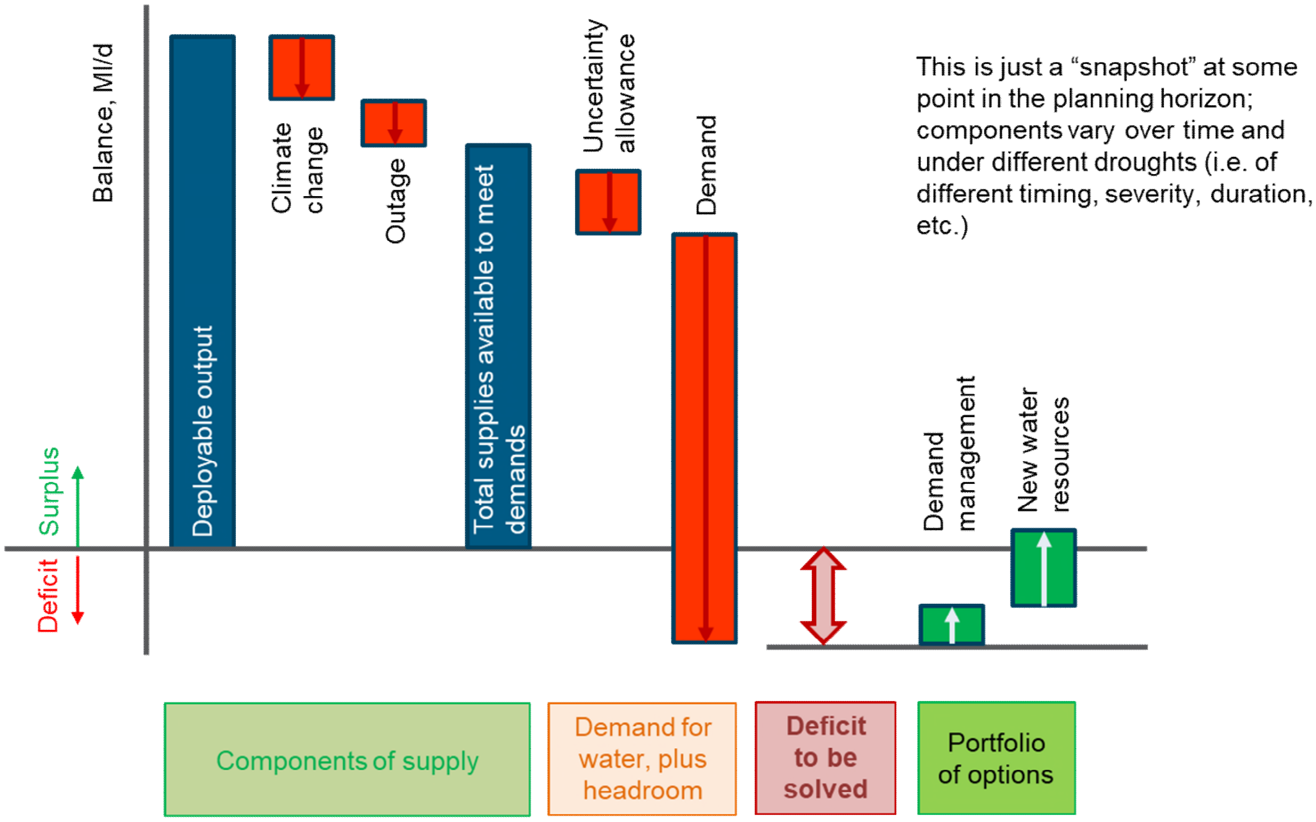


Figure 2-2 - How the supply demand balance is constructed

We do this over the planning period to build an overall supply demand balance (Figure 2-3). This shows us when in the future we anticipate that water demand, plus the planning allowance to cover uncertainty in forecasts, is likely to exceed the supplies available. This process also accounts for the potential for sources to be unavailable when required, and the potential impacts of climate change. Prior to reaching this point where there is a deficit in the supply demand balance, we need to implement action to reduce demand for water, for example through water efficiency and leakage reduction, or develop new resources to increase the supplies available.

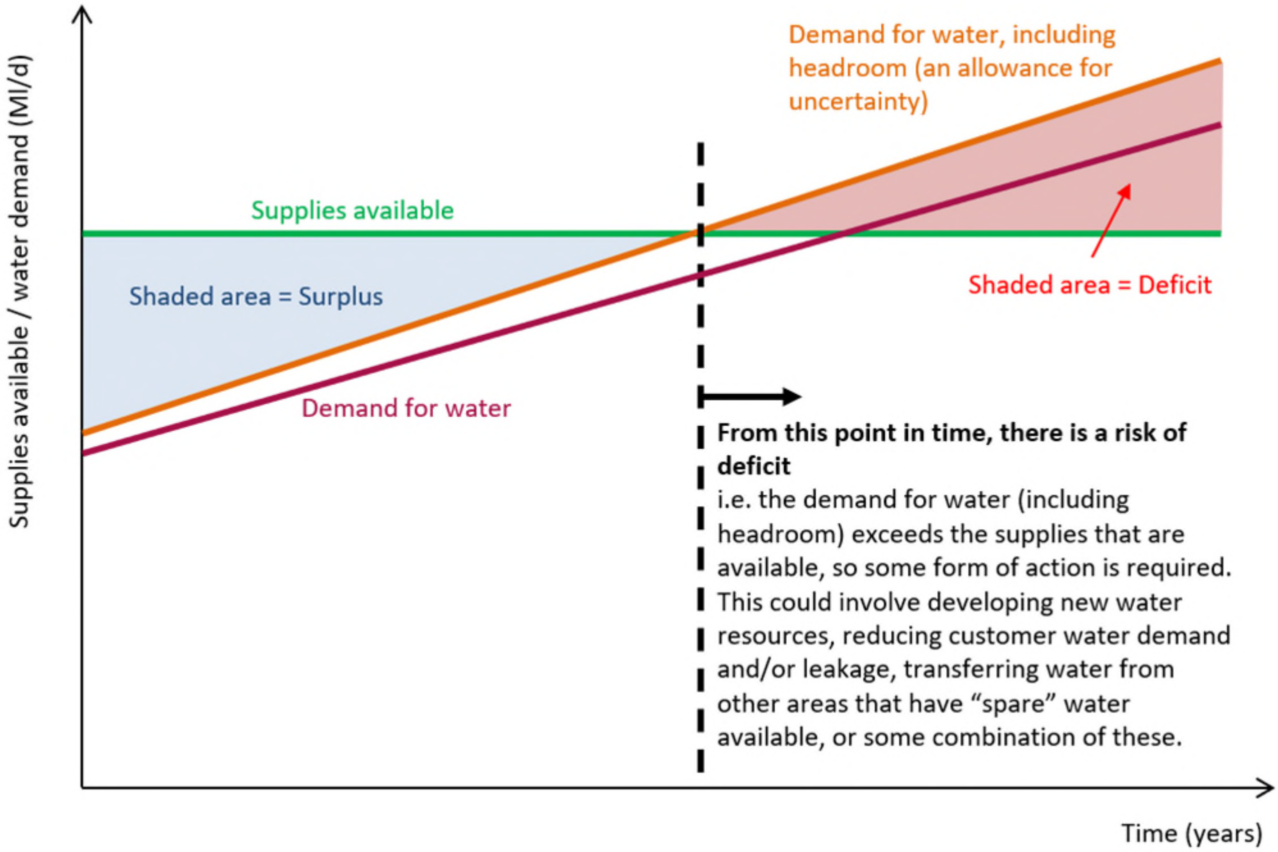


Figure 2-3 - A simple representation of the supply demand balance concept

2.5.3 Developing the plan

We have developed supply demand balances for each of the key planning conditions. We also developed supply demand balances for a range of plausible different future conditions – allowing us to explore the potential for a range of different population growth scenarios and for different climate change impact scenarios. This is discussed further in Sections 7 and 9.

Water resource plans develop the strategy to strike a balance between the frequency of drought interventions and the costs of having additional supply or demand measures in place to reduce the frequency of interventions. We therefore use an investment model to help us look at the best set of options to address the risk of a future supply shortfall for the least cost, whilst also taking into account other important considerations such as environmental risks, resilience of the plan, etc.

We can select from any of the options in our feasible list – i.e. options that have been assessed for robustness and deliverability, particularly in terms of technical viability, planning risks, costs, etc. This options appraisal process is discussed in Section 8.

Uncertainty is inherent in forecasting the future for water resource planning purposes. We therefore need to ensure that our plans can adapt to uncertainty. It is not possible to predict exactly what will happen in the future and producing a best-value plan that responds to just one future cannot guarantee it will be the optimal strategy if an alternative future occurs. We therefore develop our plan based on a range of scenarios that represent plausible alternative futures.

We select our preferred plan that can solve for these different planning conditions and future scenarios. As noted before, this involves identifying the no regrets options and activities to take in the near term – i.e. those that are sensible regardless of what the future looks like. We also identify the key schemes that are most likely to need to be developed in the future, so that any feasibility investigations and planning activity can be undertaken in time to allow the construction of the scheme for when it is needed. The outcomes of our WRDMP are presented in Section 10.

2.6 Consultation on the plan

There are no statutory consultees in Jersey for water resource planning. However, the plan has been shared with regulators and key island stakeholders to ensure they are informed of our approach to long-term strategic planning for the island in areas such as provision of infrastructure, planning policy, and population growth.

Although there is no statutory requirement to consult on our Plan, we are also keen to engage and consult with our customers and stakeholders on the measures set out in this Plan. We intend to publish this Plan on our website during summer 2025 to provide the opportunity for customer and stakeholder comment.

3. The water supply system

3.1 The water resource system

Figure 3-1 shows our integrated water resource system comprising reservoirs (green circles), stream abstractions (blue circles), groundwater boreholes (yellow square) and the La Rosière desalination plant (blue triangle). Our largest (and newest) reservoir is Queen's Valley reservoir in the south-east of the island followed by Val de la Mare reservoir in the west. The "Waterworks Valley" cascade of reservoirs (Handois, Dannemarche and Millbrook) and Grands Vaux reservoir are strategically located but smaller capacity reservoirs. Mont Gavey and Beechfield (brown squares) are important balancing tanks to help control the conveyance of water around the raw water supply system. The water provided from these different water sources is treated at our Handois and Augrès water treatment works (purple triangles) for supply to our customers through an interlinked network of water distribution pipes.

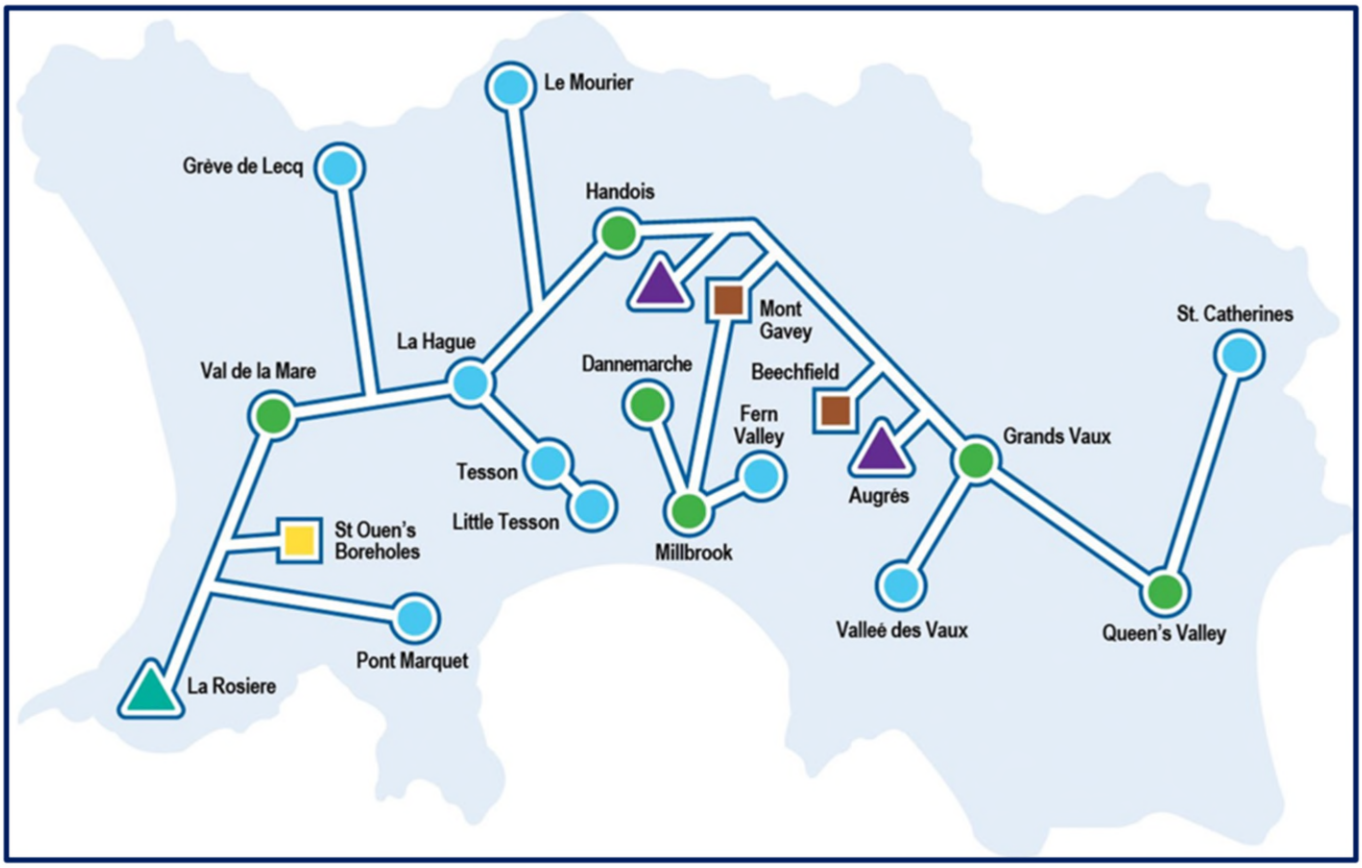


Figure 3-1 – Simplified schematic of the key raw water assets across the Jersey Water system

La Rosière desalination plant can produce up to 10.8 million litres per day (Ml/d), which is just over half of the average daily water demand in Jersey. The desalination plant is used when there is reduced availability of freshwater from our surface water and groundwater sources and when taking account of the risk of drought as indicated by water storage levels in our reservoirs.

Given the integrated nature of the water supply system, the whole of Jersey can be considered as a single water resource zone for the purposes of supply demand balance assessments and planning, in line with UK water industry water resource planning guidance. This remains unchanged from our previous WRDMP21.

3.2 Operating our Water Supply System

We operate our integrated raw water supply system to maximise raw water storage so that we can maintain a high standard of water supply reliability to our customers. In the event of a prolonged period of dry weather, we proactively move water around the raw water storage system to balance storage levels across the island as far as possible and maximise the abstraction from our water sources. If storage in our reservoirs falls, we commence operation of La Rosière desalination plant to supplement freshwater resources.

During periods of high demand for water, we have sufficient water treatment capacity available to be able to increase the output from our two WTWs to meet the peaks in demand. At other times when demand is lower, we aim to optimise the operation of our raw water system, water treatment works and treated water networks to ensure efficient delivery of water supplies to our customers at the lowest possible cost.

In periods of prolonged dry weather, we carefully monitor the rate of decline of raw water storage and assess the risks to water supplies on a weekly basis, taking account of the time of year, flow conditions at abstraction intakes and prevailing water demand. Based on these supply reliability assessments, we undertake appropriate management actions that reflect the level of risk, including:

- Actions to control demand, including more intensive leak detection activity and publicity to ask customers to reduce non-essential uses of water
- Maximising abstraction from all of our freshwater sources
- Commencing La Rosière desalination plant at 50% or 100% of capacity, depending on how much additional raw water supply is required to safeguard water supplies
- Moving raw water supplies around our supply system to balance storage levels across our storage facilities.

If the dry weather persists into drought conditions and raw water storage reduces further, we might need to introduce temporary water use restrictions (for example, temporarily banning household customers from using sprinklers and hosepipes for external water uses). In developing this Plan, we have reviewed our operational management practices and drought management measures as part of the consideration of options to safeguard future water supply reliability in drought conditions. We have also explored our system performance against a wider range of drought conditions to ensure we have identified the key water resource development schemes that may need to be investigated and implemented in future to maintain a reliable supply system. We aim to balance the trade-offs between investing in new resources with the frequency of needing to introduce restrictions on customer water use during periods of drought.

3.3 Operational challenges

We face a range of future challenges in respect of water resources reliability and resilience, in particular:

- Increased demand for water over the next 40 years, primarily driven by forecast population and housing growth. Different demand scenarios have a large impact on the forecast supply-demand balance, so our Plan needs to be sufficiently flexible to be able to respond to changing pressures on demand when they arise.
- Supply forecast uncertainties due to climate change and extreme weather. Climate change is expected to result in more frequent and/or intense periods of drought which could mean less reliable water availability from our water sources over the next 40 years and beyond. Our Plan needs to take account of the potential effects of climate change and extreme weather, particularly prolonged dry weather and drought conditions.
- Physical asset risks (unplanned outage). Our Plan needs to consider whether future demand for water can be met if a key asset, particularly our desalination plant, is taken offline due to an unplanned outage.
- Addressing uncertainty around the impact of PFAS and forthcoming regulatory standards, which could limit the water we can abstract from some of our sources without new treatment processes being implemented.

- Isolated supply position – we cannot readily bring in additional resources or replacement parts / assets at short notice to the island from elsewhere if required, so we need a high level of resilience in our supply system.
- There are current limitations to how much water we can convey from raw water sources in the west of the island to those in the east. Our Plan needs to examine if greater flexibility can be provided to the cross-island transfer of water to help further improve drought resilience and explore whether this is cost-effective.

3.4 Problem characterisation

The UKWIR (2016) guidance "WRMP 2019 Methods – Decision Making Process" includes guidance on characterising the problems faced by UK water companies in water resources planning for each Water Resource Zone. This characterisation process helps to understand the complexity of the zone to inform the choice of strategic planning approaches that may be applicable in developing our WRDMP. Alongside the UKWIR 2016 guidance, the most recent Water Resource Planning Guidelines also recommend considering the UKWIR (2020) "Deriving a best value water resources management plan" when considering decision-making approaches.

As recommended in the latest water resource planning guidelines and the 2016 UKWIR methodology, we have produced a Problem Characterisation assessment of the Jersey Water resource zone based on a review of the supply-side and demand-side data available for the Plan. The assessment concluded that (in a UK-wide context), the issues and challenges faced by Jersey Water should be characterised as being of a 'MODERATE LEVEL OF CONCERN'. This indicates that "extended" modelling approaches may add to the company's understanding where appropriate. This conclusion does not imply that there are no material risks or uncertainties to consider, but that existing and tested methodologies to assess them are available and should be appropriate to the problems we face in Jersey. The Problem Characterisation assessment is captured in Appendix A.

The assessment highlights that:

- The possible effects of climate change, water quality deterioration and population growth are the more uncertain elements of the supply-demand balance projections over the planning horizon.
- A move to a 1 in 500-year level of drought resilience compared to the previous worst historic will likely drive additional resource requirements. The impact of this on DO can be explored as part of the water resources modelling.
- There are potentially significant environmental and planning sensitivities associated with new water supply schemes (particularly new water storage if needed) so that robust and transparent decision-making approaches are needed.
- There is some remaining uncertainty around the long-term impact of the Covid-19 pandemic on the demand for and use of water although this is not anticipated to present a significant risk to the Jersey zone.
- There is uncertainty around the upcoming PFAS regulation which has the potential to impact the availability of multiple sources across the island.
- Decision-making techniques such as multi-criteria analysis and scenario testing are likely to be beneficial in addition to least cost optimisation methods. These will enable the us to provide a transparent demonstration to stakeholders of the reasons for choosing a particular programme of options instead of an alternative programme.

4. Water supplies

4.1 Calculating the reliable supplies available

This section of our WRDMP presents how much water we estimate is available to us to sustainably and reliably put into supply. There are two important measures of reliable water supply availability in drought conditions used in the UK water industry that we have adopted for this Plan:

- **Deployable output (DO)** is defined as the maximum quantity of water output from a water source, or group of sources, or conjunctively from the supply system as a whole, that can be sustainably utilised. This equates to the reliable yield of the raw, or untreated, water supply system. The deployable output can be constrained by the hydrological characteristics, the capacity and/or operation of the abstraction assets, constraints on abstraction volumes, source water quality and/or existing water treatment and supply system capacities. DO is often referred to in terms of the return period of classification of drought for example a 1 in 2-year (a "normal" year), 1 in 10-year (a "dry" year) or 1 in 200-year (a "severe" drought) event. These classifications provide an estimate of the probability of a given drought event, for example a 1 in 200-year drought event will have a 0.5% chance of annual occurrence, and the associated water resource DO is the expected magnitude available in that drought.

- **Water Available For Use (WAFU)** is the maximum quantity of water available for supply. It is calculated as the deployable output minus estimated losses (in our case zero loss, see Section 4.5) and minus an allowance for outage (see Section 4.6). WAFU also accounts for the potential impact of climate change on our supplies.

The key components included in this supply side forecast are presented in the following sections:

- Deployable Output assessment (Section 4.3)
- The potential impact of climate change (Section 4.4)
- Process losses (Section 4.5)
- Outage allowance (Section 4.6)

4.2 Water resources modelling

4.2.1 Supply system resilience

The DO assessment forms the foundations of the supply forecast. DO can vary between different years based on a number of factors including climate variability. DO is lower in dry or drought years and decreases as the severity of the drought increases. Consequently, DO is often described by the return period of climatic conditions, or drought event, for example: 1 in 2-year (normal year) or 1 in 500-year (extreme drought). These provide an estimate of the average probability of a given drought event and the associated DO of our water supply system in a drought of that magnitude.

As part of this WRDMP, and in line with best practice and Water Resource Planning Guidelines used in England and Wales, we have taken the opportunity to move to a 1 in 500-year level of drought resilience. Previous iterations of our WRDMPs have assessed the capability of our supply system against droughts that have happened historically. The historical record provides a dataset that allows comparison of the response of our supply system to actual events but does not allow for the testing of droughts which could plausibly happen in the future, nor for testing against a range of drought events of varying return period and characteristics outside of the observed record. In order to robustly assess droughts with a return period of up to 1 in 500-years a larger dataset has been required. To do this we need to generate 'stochastic' climate datasets, which have become a standard of UK water resource planning through recent WRMPs. This stochastic dataset, the development of which is described in more detail in Section 4.2.2, has been used to assess our DO in drought events up to and including a 1 in 500-year return period. We also needed to develop a new water resources model for Jersey to allow us to use the new long time series of data to assess how the supply system performs against a wide range of drought events.

4.2.2 Stochastic weather generation

Generating a stochastic rainfall and temperature / Potential Evapotranspiration (PET) dataset allows companies to test their system to droughts beyond those in the historical record including droughts with higher return periods (such as 1 in 500-years) and droughts of varying length and intensity. Considering the resilience of our system to 1 in 500-year drought events is now considered to be best practice, and so to generate the data required to do this we have used the AtkinsRéalis stochastic weather generator which was used to produce stochastic data for each of the regional water groups in England and Wales in the latest round of planning (WRMP24), meaning the model has already been well tested for this purpose across the industry.

The AtkinsRéalis weather generator is a multi-site rainfall generator based on a model originally developed by Serinaldi and Kilsby[1]. The model analyses the observed relationships between monthly rainfall and climatic drivers (referred to as teleconnections) along with 'random chance'. The basic concept behind this approach is that the observed record provides only one set of actual weather data (i.e. the one that did occur), out of the possible range of conditions that might have plausibly occurred.

While the overall model format has been well tested, it had not previously been applied to the Jersey area. We therefore carried out some initial analysis to analyse the best model fit in terms of length of historical record and driving teleconnection data. The final stochastic dataset comprises 200 sets of 98 year long date totalling 19,600 years which was generated from a set of observed rainfall data from 1900 - 1997 using three teleconnection explanatory variables: North Atlantic Oscillation (NAO), Sea Surface Temperature (SST) and East Atlantic Index (EAI). A detailed description of the stochastic weather generation can be found in the Appendix C.

For the purposes of likelihood and return period estimation the stochastic data has been treated as one long time series of 19,600 years of data, which will capture a wide range of drought events of differing severity and duration.

4.2.3 Hydrology assessment

The Jersey raw water system primarily comprises surface water sources, which means an accurate understanding of the associated flow regimes – in this case using hydrological modelling – is critical for ensuring a resilient and secure water supply. This section provides a summary of how catchment inflow datasets have been generated to inform this WRDMP. A more detailed description of this assessment can be found in Appendix D.

An understanding of historical flow regimes can come from observed streamflow records alone. However, with this system, a scarcity of long-term records meant hydrological models were required to construct a library of reliable flow estimates over the baseline period. Furthermore, hydrological models allow for flow regimes to be simulated under different climate conditions – e.g. beyond those which have been recorded or observed. This was done here with the simulation of stochastic baseline and climate change scenario flows. Stochastic flow series such as this are key inputs for modelling the supply system as a whole and they allow for stress-testing of the system under a range of conditions.

[1] Serinaldi & Kilsby (2012), A modular class of multisite monthly rainfall generators for water resource management and impact studies, Journal of Hydrology 465-465 (2012) 528-540

The hydrological assessment primarily involved calibration of an open-source GR6J rainfall-runoff model against a key streamflow record and transposition of this model to the other catchments across the island. The transposed models were then used to produce daily timeseries of catchment inflows (both historical and stochastic series) for input into the new water resources model. Additional hydrological modelling focussed on the development of a water balance model for the Grands Vaux reservoir system, which was used to inform validation of the rainfall-runoff model.

The output from this assessment was the production of a new suite of rainfall-runoff models and simulated catchment inflows.

4.2.3.1 Catchment summary

The Jersey supply system comprises six main raw water storage reservoirs. As well as direct runoff from their respected impounded catchments, the reservoirs can be fed by a combination of the indirect sources as detailed in Appendix D.

This assessment has modelled all the relevant surface water source catchments (both direct and indirect) that make up this system. It has also modelled an additional eight sub-catchments where streamflow monitoring sites are established, which are either located upstream of reservoirs or near pumped abstraction sites. The resulting 31 (sub-)catchments are summarised in Appendix D.

Long-term (relatively speaking) continuous streamflow monitoring only exists for two catchments (the Grands Vaux and La Hague streams), and the latter of these presents a significantly altered flow regime. As such, the Grands Vaux stream catchment has been the primary focus of this study. This long and relatively reliable record presented the best opportunity for successful calibration (and validation) of a rainfall-runoff model. Furthermore, the catchment aligns closely with the Trinity catchment which was used in previous rainfall-runoff modelling work[2].

4.2.3.2 Rainfall-runoff modelling (GR6J)

A rainfall-runoff model was utilised to produce daily streamflow series for all the relevant surface water source catchments. The open-source GR6J model[3] was adopted in this assessment. It is a six-parameter conceptual lumped hydrological model, the inputs to which are spatially averaged catchment daily precipitation (or rainfall), and PET. Refer to Appendix D for a more detailed description of the model.

Table 4-1 presents a summary of the calibrated GR6J model for the Grands Vaux stream catchment, in the form of various performance metrics. This reveals that the calibrated model performs well over both the calibration and validation periods, with Nash-Sutcliffe Efficiency scores greater than 0.8 and percentage biases within 10%. Overall, we consider this to be a good model fit, especially given the data limitations (e.g. significant gaps present in the observed streamflow record). This is further emphasised in Figure 4-1 which presents a comparison of flow duration curves (FDCs) between observed and simulated flows. Also included in this figure is a FDC representing the previously calibrated HYSIM rainfall-runoff model, the dataset for which was pulled from HYSIM exports provided by Jersey Water[4]. The HYSIM FDC sits lower than both the observed and GR6J curves. This suggests that

[2] MWH, 2006. Jersey Water Resources Modelling - Water Resources Modelling Report.
[3] Pushpalatha, R., Perrin, C., Le Moine, N., Mathevet, T., Andréassian, V. (2011). A downward structural sensitivity analysis of hydrological models to improve low-flow simulation. *Journal of Hydrology*, 411 (1-2), 66-76, doi: 10.1016/j.jhydrol.2011.09.034
[4] Refer to 'Grand Vaux HYSIM output comparison.xls'. Note: runoff (mm/d) data used. It has been trimmed to the calibration period and scaled based on catchment area to be equivalent to Grands Vaux stream catchment (MWH 2006 reservoir sub-catchment area of 7.19 km^2 compared to stream catchment of 6.851 km^2.

the new rainfall-runoff model presents an improvement over the previous HYSIM model, with the GR6J simulated curve matching the observed flow regime very closely across both the calibration and validation periods.

A trial water balance model was developed for the Grands Vaux system in the hope that it could help validate the rainfall-runoff model outputs. The Grands Vaux reservoir was selected because it was the simplest system within Jersey Water's integrated network with the best chance of being modelled successfully. The trial model and its results are discussed in more detail in Appendix D/ All in all, the model outputs were found to be noisy and unreliable in many periods. As such, it provided limited benefit towards validating the GR6J model. However, alignment between the water balance and GR6J simulations were observed in some key periods/sequences. This suggests a cautious pass in terms of GR6J validation.

The general approach for model transposition has been to take the successfully calibrated Grands Vaux stream GR6J parameter set and apply it to the other 30 catchments. The only input parameters to vary between the catchments is the precipitation scaling factor and catchment area. In the case of sub-catchments with their own streamflow gauges, some bespoke calibrations were explored. However, only two of these alternative calibrations presented potential improvements in simulated flows. For the sake of simplicity and consistency, the decision was made to proceed with the original approach and apply the transposed Grands Vaux calibration everywhere.

Once the calibration and transposition of the GR6J models was finalised, these parameter sets (which are presented in full in Appendix D were used to simulate stochastic flow series for each of the required inflow points, for both the baseline and climate change perturbed scenarios. For reference, a comparison of these scenario flows is presented in Appendix D.

While a successful calibration was obtained in this assessment, possible future refinements could be made if more reliable streamflow data becomes available. In 2024, Jersey Water began installing and implementing a continuous monitoring system. If reliable records can be obtained across this new gauge network, this assessment could benefit from GR6J models being calibrated more locally – e.g. at a reservoir basin level. This would improve the spatial accuracy of the assessment by capturing changes in catchment characteristics and run-off behaviour across the island.

Table 4-1 - Performance summary for the Grands Vaux stream GR6J calibration

Metric	Dataset	Calibration period	Validation period
Mean flow (m^3/s)	Observed	0.079	0.084
	Simulated	0.076	0.09
	Difference	*-3.8%*	*+7.1%*
Q90 (m^3/s)	Observed	0.013	0.012
	Simulated	0.013	0.012
	Difference	*0.0%*	*0.0%*
NSE	-	0.839	0.817
NSE (log flows)	-	0.900	0.871
Percentage bias[1]	-	1.2%	8.2%

1. Percentage bias is a measure of the average tendency of the simulated flows to be larger or smaller than the observed ones. Low-magnitude values indicate accurate model simulation (with 0% indicating a perfect match). Positive values indicate overestimation bias, while negative values indicate model underestimation bias.

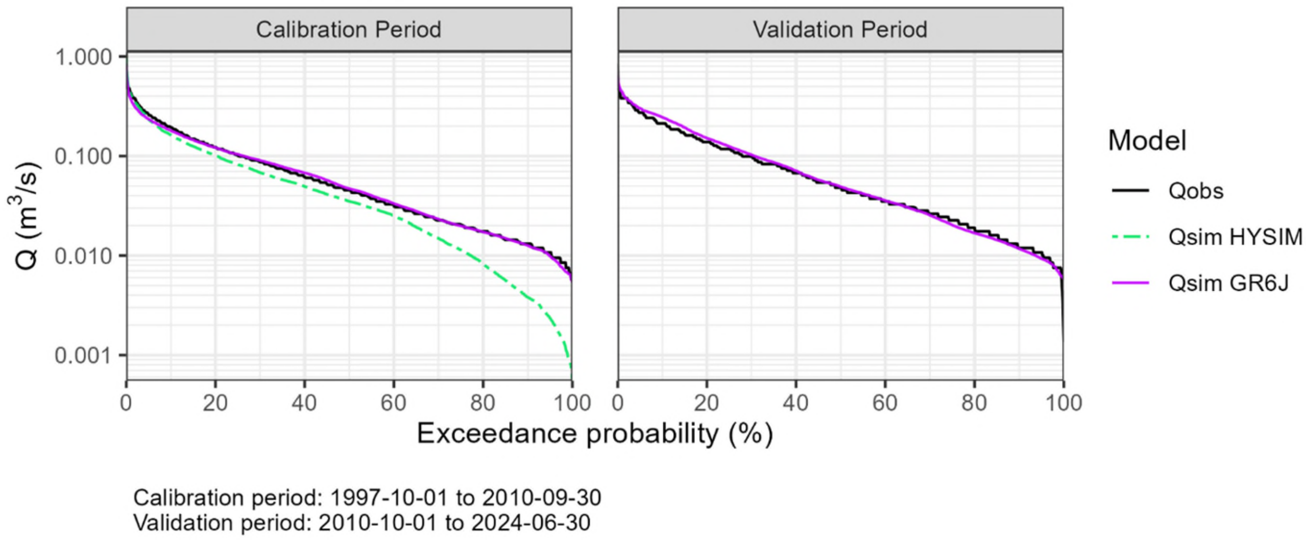


Figure 4-1 - Flow duration curve comparison for Grands Vaux stream, observed in black, HYSIM simulated in green, and GR6J simulated in purple Model transposition

4.2.4 Modelling the supply system

In our previous WRDMP21 four storage models were developed for each key reservoir storage system (Val de la Mare, Waterworks Valley reservoirs, Grands Vaux and Queen's Valley) to simulate the refill and drawdown of the reservoir systems. This modelling was undertaken using the estimated flows from the previous rainfall runoff model over the period 1901 to 2007. DO was determined from these water storage models, taking the worst historic drought flow conditions (the 1991-92 drought) and assessing the maximum demand that could be met without raw water storage volumes falling below a defined minimum acceptable level. This approach was based on 2014 guidance from UK Water Industry Research (UKWIR).

Whilst the WRDMP21 storage models can provide a useful indication of anticipated reservoir response to drought events, more recent water resource planning guidance has steered assessment towards broader system understanding. For this WRDMP24 we have therefore developed a networked water resource model of our system. The model has been developed using the Python for Water Resources (Pywr) modelling software which aligns with a number of regional and company level models currently used in the UK for water resource planning. Using a networked model increases the confidence in our DO assessment as we can represent and consider a greater number of constraints, particularly those relating to the transfer of water supply, across our system. The Pywr software is also designed to work efficiently with large, complex datasets and is therefore well suited to utilising the stochastic datasets required for higher return period water resources DO assessments (see Sections 4.2.1 and 4.2.2).

The Pywr model has been developed to include representations of the key features and assets within our supply system, such as our reservoirs, water treatment works and the La Rosière desalination plant. Detail on these components is provided in Appendix D alongside plots presenting the validation of the Pywr model against observed data.

4.3 Assessment of deployable output

We have undertaken our DO assessment using the Python for Water Resources (Pywr) model. The Pywr model uses individual source and network constraints, resource availability (based on the hydrological assessment) and a profile of demand to assess our system's DO across a range of drought return periods. Our DO assessment follows the 'Scottish' method of DO assessment and is in line with UK best practice. In the Scottish method, simulated demand is steadily increased to understand the point at which deficits occur at our demand centre. At each level of demand the frequency of deficits is recorded and used to determine the return period of a given system output until we have assessed the DO at all the required return periods, up to a 1 in 500-year drought. Therefore, the return period of our DO is driven by modelled supply-demand failures, rather than the return period of rainfall events or the storage levels of our reservoirs. As mentioned in Section 3, given the integrated nature of our water supply system, the whole of Jersey is considered as a single entity for the purposes of supply demand balance assessments and planning and therefore our DO has been assessed at a system-wide level.

4.3.1 Levels of service and demand restrictions

We operate our water supply system to minimise the risk of having to ask our customers to reduce non-essential uses of water or introducing formal water use restrictions. However, in more severe drought conditions we do need the help of our customers to conserve water. Therefore as drought conditions begin to materialise and worsen there may need to be a consequent escalation of restrictions on the demand for water. Our first step is to try to save water by raising awareness of drought conditions to our customers and requesting voluntary restraint on water use, but this may then need to escalate to the implementation of temporary use bans (TUBs) and non-essential use bans (NEUBs).

The DO benefit of TUBs reductions has been determined through analysis of the recent 2022 drought, where TUBs were implemented over the summer period. The analysis demonstrated a split in the benefit between the summer and non-summer period which has been accounted for by applying the benefit as a monthly profile. The assessment of the benefit of NEUBs remains as WRDMP21, as there has not been any more recent data on which to base an update, however this has also been applied with a monthly profile with a summer peak. The demand reduction factors associated with each formal intervention for demand reduction are:

- TUBs: 3% during October - May (i.e. 97% of demand remains) and 8% during June – September (92% of the demand remains).
- NEUBs: 4.5% during October - May (95.5% of demand remains), 9.5% during June and August – September (90.5% of the demand remains) and 10.5% during July (89.5% of the demand remains).

Our level of service for implementing temporary water use restrictions approximates to once in every 20 years, with restrictions on a wider range of non-essential water use being required no greater than once in every 50 years. This customer level of service for water supply reliability is consistent with many water companies, particularly those in Southern England.

Demand restrictions, in the form of TUBs and NEUBs as described above, have been included in our baseline DO assessment.

4.3.2 Deployable Output Results

Our previous WRDMP21 DO assessment estimated a reliable system DO of 20.46 Ml/d. This was based on historical data and the 1992 drought event. Previous analysis suggested this event had an estimated return period of 1 in 191-years. Table 4-2 presents our most recent assessment of baseline DO for a range of return periods generated using the Pywr water resources model, updated hydrological assessments and stochastic baseline dataset. The table includes a 'normal year' 1 in 2-year return period through to an extreme drought of 1 in 500-years return period. A slight reduction in DO can be observed between WRDMP21 and WRDMP24 around the (approximately) 1 in 200-year drought event. However this is an expected outcome due to the development of a more accurately constrained water resource model in the Pywr software compared to the approach used in our previous plan (See Appendix D).

Table 4-2 - Deployable Output Summary Table

Return Period	NYAA (1in2)	DYAA (1in10)	1in100	1in200	1in500
Deployable Output (DO) (Ml/d)	31.51	25.84	20.38	19.38	18.38

4.4 Impacts of climate change on supplies

The England and Wales Water Resource Planning Guidelines require that companies assess the risk and possible impact of climate change on their supply systems. We also recognise the importance of assessing, reporting and planning for the potential impact of climate change on our deployable output. Our previous assessment for WRDMP21 was based on UK Climate Change projections released in 2009 (known as UKCP09). As part of the update for WRDMP24 we have adopted the latest industry best practice by using the most up-to-date climate change projections for the UK (UKCP18).

12 possible Climate Change (CC) futures have been assessed and the DO impact quantified from UKCP18 probabilistic data. Each future consists of 19,600 years of daily stochastic weather data which is assessed using the Pywr Water Resources model. The assessment follows the same DO methodology approach as the baseline assessment described previously (Section 4.3). The futures selected represent a spread of CC scenarios in the 2070s, which cover a range of temperature increases and rainfall patterns which vary the magnitude and timing of temperature and precipitation. Consequently, the impacts of climate change include both drier futures, in which available water resources could decrease, and wetter futures, where increased winter rainfall could lead to increased supply availability. Climate change could therefore hold a positive or negative long term impact and our assessment must account for this range of possibilities. The impacts on DO in the 2070s were then scaled through the planning period. Further detail on our climate change assessment is described in Appendix D. Table 4-3 presents a summary of the impacts of climate change on DO, and Figure 4-2 provides a visual representation of the impact on DO at the 1 in 500-year return period.

Table 4-3 - Deployable Output impact by 2070, by drought return period, across the Climate Change scenarios.

CC scenario	2070's NYAA (1 in 2) DO impact	2070's DYAA (1 in 10) DO impact	2070's 1 in 100 DO impact	2070's 1 in 200 DO impact	2070's 1 in 500 DO impact
CC01	-2.08	0.74	2.82	2.85	2.07
CC02	0.97	1.60	2.13	1.90	1.51
CC03	-0.96	0.25	1.34	0.84	0.73
CC04	-1.92	0.02	1.25	0.82	0.60
CC05	-1.50	0.16	1.07	0.79	0.57
CC06	-1.96	-0.28	0.36	0.29	0.27
CC07	-1.68	-0.75	-0.28	-0.32	-0.15
CC08	-2.25	-1.09	-0.58	-0.45	-0.31
CC09	-2.55	-1.66	-1.09	-0.99	-0.76
CC10	-3.40	-1.82	-1.13	-1.04	-0.92
CC11	-3.90	-2.32	-1.38	-1.18	-0.98
CC12	-5.84	-4.03	-2.81	-2.36	-1.96

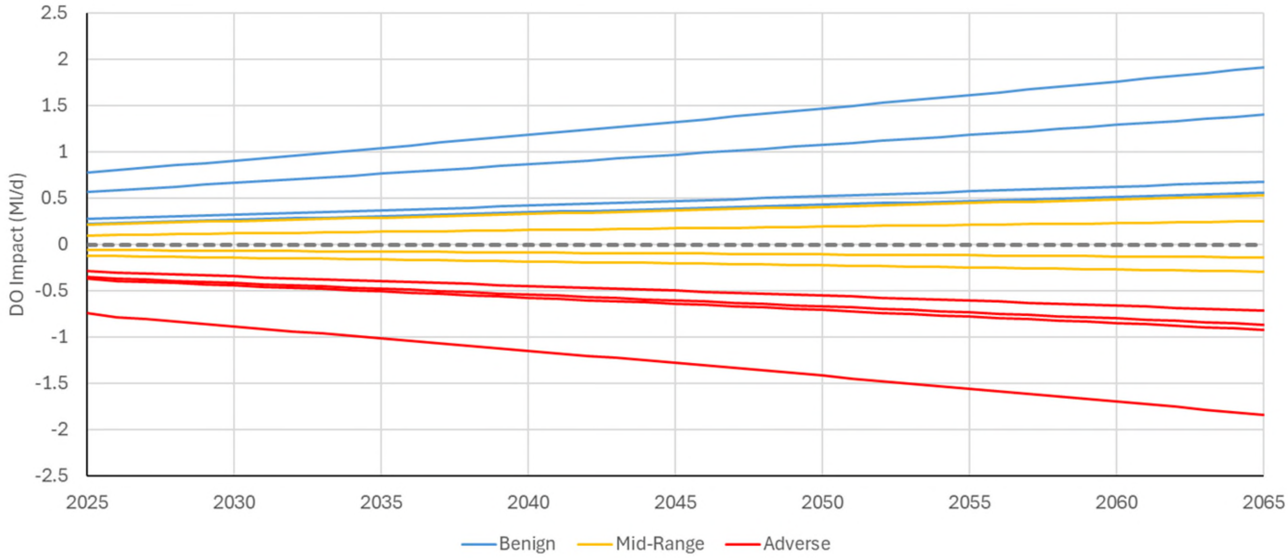


Figure 4-2 – 1 in 500-year Deployable Output impact across the Climate Change scenarios, scaled through the planning period.

4.5 Process losses

Process losses occur between the point of abstraction and the point at which water enters the supply network and account for the loss of water during the treatment process. Losses can occur at both groundwater and surface water sources. The volumes lost within the network are assessed as very low to negligible as a proportion of the total reliable water supply. We have previously invested in comprehensive treatment and recycling facilities for our water treatment works (WTW) processes so that we do not lose our raw water resources. Therefore, as in WRDMP21, we have not included any allowance for raw water system losses or WTW losses in our supply assessment.

4.6 Outage allowance

An outage allowance has been included in our assessment of WAFU, in accordance with best practice. Outage is described as an allowance for planned and unplanned events that lead to the temporary loss of output from supply sources. It can relate to planned or unplanned events and covers a range of influences from power failure to short term pollution incidents. Our outage risks are assessed as at the lower end of the scale compared to other UK water companies: this reflects our very high maintenance standards and rapid response times to asset failures for our raw water supply and WTW assets, reflecting their critical importance to water supply security. In view of Jersey's isolated position, we operate a critical spares retention policy to avoid potential delivery delays (particularly in bad weather) and we have also invested in standby arrangements for key assets so that any outages that may arise can be quickly addressed to minimise impacts to our customers.

We have assessed outage impact to be effectively zero for our storage assets. This is because temporary loss of our storage assets does not impact our ability to meet peak supply requirements before the outage can be resolved and the storage reconnected to the supply network. Therefore, we have only considered the desalination plant in our outage assessment as the supply lost during a desalination outage cannot be recovered. Although we have made recent investments (for example, spare High Pressure Motors, Replacement Couplings, Dry Standby Quarry Pool Pump) in the desalination plant, which will improve our resilience and ability to maintain full output, it is unrealistic to assume that there could be zero outage allowance.

Through assessment of the operation of the desalination plant since WRDMP21 we have estimated a 12.5% outage allowance for the La Rosière plant. This equates to an outage allowance for planning purposes of 1.35 Ml/d which has been included in our supply demand balance assessments.

4.7 Supply forecast conclusions

As described in Section 4.1 our Water Available For Use (WAFU) across our supply system is calculated as the deployable output minus estimated climate changes impacts on DO and minus an allowance for outage – i.e. it represents what we can supply our customers during droughts, and represents our supply forecast. Table 4-4 provides an example of the WAFU calculations for the most adverse climate change future (CC12) for the 1 in 500-year return period drought. This calculation has been undertaken for each drought return period, each climate change impact scenario, and each year of the planning period. Full WAFU tables are provided in Appendix D. Figure 4-3 presents a visualisation of the results for the 1in500 return period.

Table 4-4 - An illustrative WAFU calculation using the most adverse future (CC12) for the 1in500 return period.

Water Available for Use Component (Ml/d)	2025	2045	2065
Baseline Deployable Output (1 in 500)	18.38	18.38	18.38
Scaled Climate Change impact (CC12)	-0.74	-1.28	-1.84
Raw water and Water Treatment Works Losses		Assumed as 0	
Outage allowance	-1.35	-1.35	-1.35
Water Available for Use (Ml/d)	**16.29**	**15.75**	**15.19**

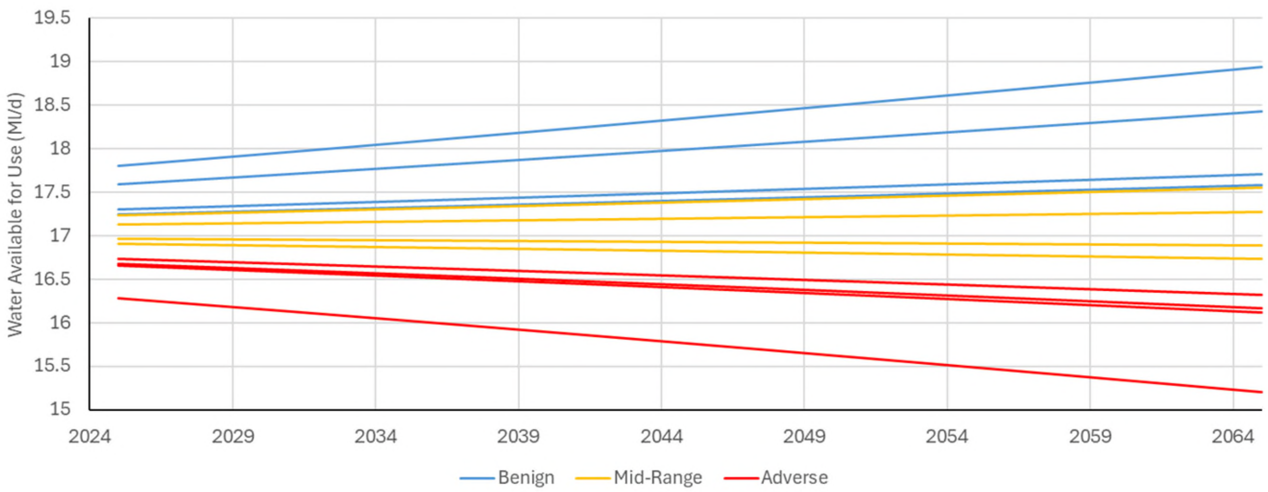


Figure 4-3 - Water Available for Use across the range of CC scenarios for the 1 in 500-year return period, across the planning period.

5. Demand forecast

5.1 Overview of water demand in Jersey

We supply around 19Ml/d to 39,000 homes and 3,440 commercial properties across the island. Approximately 97% of properties are metered and so our customers have a direct incentive to conserve non-essential water use to save on their water bills. Customers can benefit from various water saving advice and devices that we make readily available to them.

Demand for water is higher in the summer months than the rest of the year, due to increased water use by domestic households (for example, due to garden watering, increased frequency of washing etc.) and agriculture/horticulture in hotter, drier weather combined with more visitors to the island during the summer.

Overall, except for some increased leakages due to issues with meter cases around 2015-17[5] (see Figure 5-1), the average amount of water we put into supply each year has remained relatively steady at about 19-20Ml/d from 2010 to 2019 with a slight decrease more recently since 2019 of 0.5Ml/d. Over this time, the population on the island has increased by 6% from 97,100 in 2010 to 103,200 in 2022 (our base year for the demand forecast). However, the potential increase in water demand associated with population growth over this time has been cancelled out by our demand management actions to reduce leakage and our comprehensive customer metering programme. The further 0.5Ml/d decrease in demand for water since 2019 is likely driven by reductions in tourism and leisure and changes to water-using behaviours driven by the Covid-19 pandemic. The volume of water lost due to leakage has also reduced from 3.5Ml/d in 2010 to less than 2.1Ml/d in 2023, whilst our customer metering programme has resulted in 97% of customers being metered in 2022 compared with only 43% in 2010.

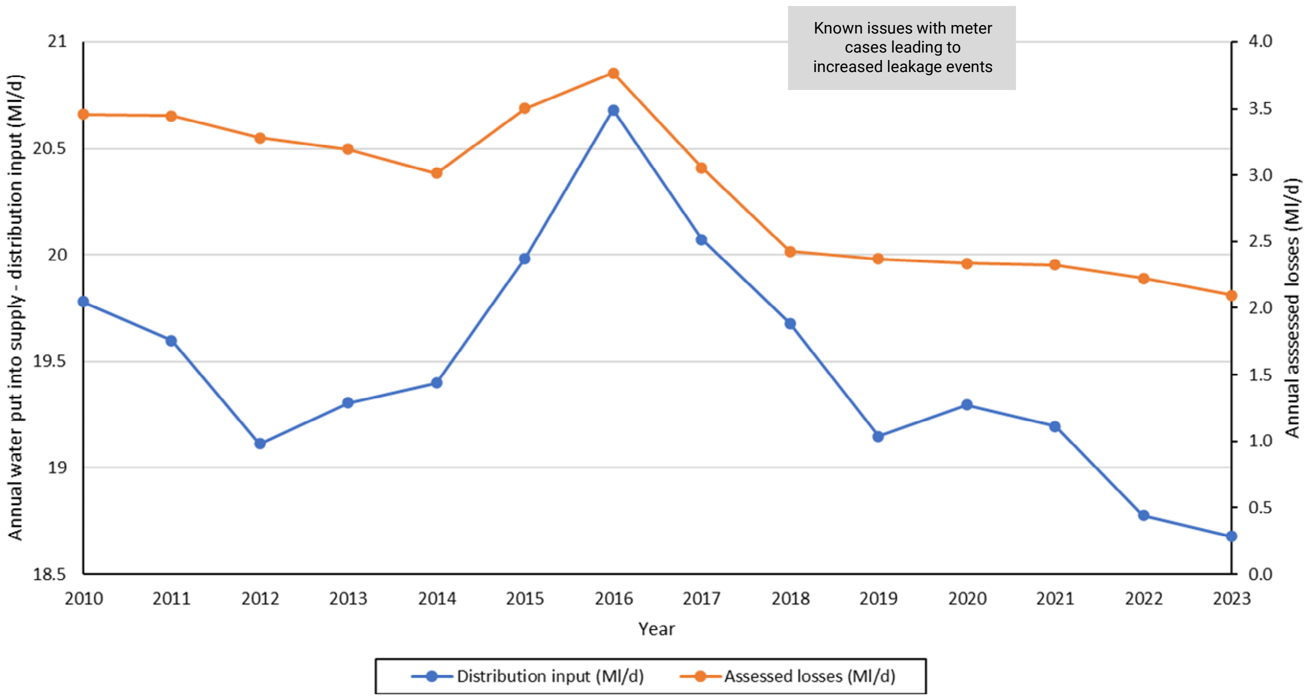


Figure 5-1 - Water put into supply and losses since 2010

[5] Please see Appendix E for further detail.

5.2 Current activity to manage demand

Our actions to manage water demand, and hence minimise the quantity of water needing to be put into supply, play an important part in maintaining reliable water supplies. Demand management measures can be categorised as:

- Customer metering
- Promotion of water efficiency actions
- Leakage control measures
- Educational campaigns

5.2.1 Customer metering

Customer water meters are acknowledged as an effective way of incentivising using less water and avoiding wastage. Customers on a meter pay according to the amount of water they use and so have a direct financial incentive to minimise their non-essential use of water.

All new properties in Jersey have been metered since the early 1990s, and since 2000 domestic customers have been able to voluntarily opt to be metered through our free meter option scheme. In 2010, a universal metering programme commenced, which was a critical water conservation measure to help ensure adequate reliable water supplies for Jersey. In consequence, about 97% of customers now have water meters installed, of which about 95% are charged on an individually metered consumption basis, and the remaining 2% are “bulk” metered (e.g. groups of flats with only one meter). The residual 3% of properties remain unmeasured as for these customers it was found to be impractical to install a meter because of common supply pipes or other complex pipework arrangements.

Customer supply pipe leakage can be detected when the meter readings are downloaded using “drive-by” technology, after which we analyse the meter readings to identify cases of high customer water consumption that may indicate underground customer supply pipe leakage or customer property plumbing losses such as leaking or over-flowing toilet cisterns or dripping taps. Where appropriate, we visit the customer and/or contact the customer to inform them of potential leakage or losses, with the aim of achieving prompt resolution of the leaks or water wastage.

Metered properties are charged a standing charge (i.e. fixed charge irrespective of the volume used) and a volumetric charge in accordance with the quantity of water used. Other types of tariff for metered customers (e.g. seasonal or rising block) are not in use. The remaining unmeasured customers are charged on an assessed charge or rateable value basis.

5.2.2 Promotion of water efficiency

We recognise the importance of taking action to help our customers manage their water use, and so we carry out a wide range of activities to promote water efficiency by customers to help them save water. These include the provision of:

- Benchmark information presented on billing leaflets to help customers compare their consumption with that of a typical home
- Water saving tips published on our website
- Free water saving devices available for example via our website
- Free water audits and advice to domestic customers found to have high consumption
- Free school visits and water saving advice
- Media campaigns by radio, social media and TV to promote water savings tips during the summer and advise on cold weather pipe protection measures during the winter

- Meetings with our key customers including farmers and housing associations, to discuss opportunities for water saving
- Water fittings visits to commercial sites to check compliance with regulations and provide advice on efficient water appliances
- Attendance by Jersey Water at major farming and trade shows on the island to offer advice

5.2.3 Leakage control

We take a proactive approach to controlling leakage and have successfully reduced the volume of our already low levels of leakage by a quarter from about 3.5 Ml/d in 2010 to less than 2.2 Ml/d in 2022 and 2.1 Ml/d in 2023. This has been achieved through intensive monitoring of night-time flows in each District Meter Area (DMA, each of which is a small discrete part of the distribution network with a meter to continuously monitor water flows). Each day the metered flow information is used to identify any areas with high nighttime flows (indicating leakage) and to then direct our leakage detection activity to those areas. We have a dedicated leak detection team who determine the exact location of leaks identified by our flow monitoring or any reports of leaks from our customers. We recognise that it is important that leaks are repaired as quickly as possible to reduce the total amount of water lost from the pipe: leaks are generally repaired within 6 hours of their precise location being determined.

As described above, we have also been pro-active in identifying cases where there is leakage on customer pipework and asking customers to repair those leaks as quickly as possible. The current estimated volumes of leakage represent about 11% of the water put into the distribution system, which is a low percentage relative to UK and Ireland norms.

5.3 Forecasting demand

5.3.1 Approach

Water demand forecasting for water resources planning has been undertaken in the UK for many years. As a result, there is an extensive set of methodologies for carrying out demand forecast calculations: in particular the good practice methods developed by UK Water Industry Research Limited (UKWIR) and the latest national guidance for water resources planning prepared by the Environment Agency in England and Wales (2023).

The demand forecasting approach we have used, and our demand forecasting model (developed for our previous plan) remains consistent with good practice methods developed by the UK water industry. As such we have followed a similar approach to that reported in our WRDMP21 but have updated data inputs and assumptions where necessary to reflect the most up to date understanding of our customer base, future population projections, water-use consumption and demand-weather relationships. Updates are detailed throughout this chapter with further detail provided in Appendix E.

5.3.2 Demand components

In line with good practice, the starting position for forecasting future demand is to first assess the water for each of the main components of demand in the base year. For this WRDMP 2022 was chosen as the base year as it provided the most recent complete record of how we supplied our customers. It also aligned with the base year used for the latest Jersey Statistic population and property forecasts. Each demand component can then be forecast from that starting point into the future over the planning horizon to 2065. The demand components are summed to calculate the total demand in each year.

Our demand forecasting has been undertaken for each of the following demand components:

- Measured domestic consumption – i.e. water use at homes with a meter, where customers are charged according to their measured consumption
- Unmeasured domestic consumption – i.e. water use at homes without a water meter
- Measured commercial consumption – i.e. water use at commercial (non-domestic) premises with a meter, where the commercial customers are charged according to their measured consumption
- Unmeasured commercial consumption – i.e. water use at commercial premises without a water meter
- Minor water use – e.g. water used at hydrants by the fire service and local authorities etc., and operational water use by Jersey Water (e.g. to clean water pipes)
- Total leakage – including distribution losses from our water distribution system and underground supply pipe leakage from customer pipes
- Unaccounted for water – i.e. the small volume of water put into supply in the base year that cannot be specifically allocated to one of the above components with any certainty.

The values for these components sum to give the total demand and can be compared to the measured amount of water put into supply from our two water treatment works, known as "distribution input".

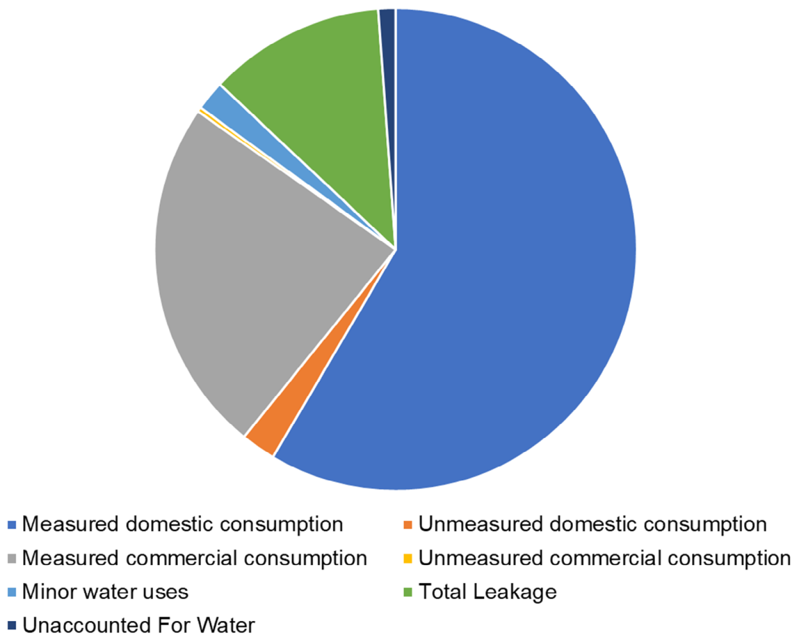


Figure 5-2 - Breakdown of water into supply 2022

5.3.3 Planning conditions

Water resources planning requires assessment of a variety of planning conditions that take account of different levels of resilience. Demand forecasts have been assessed for the following conditions:

- Normal year annual average (NYAA)
- Dry year annual average (DYAA). The DYAA was calculated by applying uplift factors to the NYAA demands to reflect higher demands that are experienced during dry or drought conditions (hotter, drier weather).

In our previous WRDMP21, the dry year peak week was also examined, however, given the system resilience to peak events, this was not analysed for our current plan.

The baseline demand forecasts presented in this 'Demand Forecast' chapter exclude the effects of any additional demand management measures considered in our Plan for resolving any forecast supply demand deficits and/or water supply resilience requirements. The effects of such measures are included in the final planning supply-demand balance forecasts.

5.3.4 Base year demands

The demand forecast was calibrated to a base year of 2022 using actual consumption data for different types of customers. Table 5-1 outlines our billing system data for consumption from 2019 to 2022.

Table 5-1 – Consumption volumes taken from Jersey Water's billing system[6]

	2019	2020	2021	2022
Estimated consumption volume (Ml/d):				
Measured domestic	10.8	11.9	11.7	11.2
Measured commercial	4.7	3.9	4.1	4.3
Total measured	15.5	15.8	15.7	15.5
Total unmeasured (based on Assessed charges)	0.4	0.3	0.3	0.3
Commercial metered volume by sector (Ml/d)				
Agriculture	0.1	0.1	0.1	0.1
Industry	0.3	0.2	0.2	0.3
Miscellaneous	0.8	0.7	0.7	0.7
Offices and retail	0.7	0.6	0.6	0.6
Public services	1.2	1.2	1.1	1.1
Tourism and leisure	1.7	1.2	1.4	1.6
Total (all sectors)	4.8	4.0	4.1	4.4

5.3.5 Population and property forecasts

Observed population and property numbers were taken from our billing system for the forecast base year of 2022. Our historic trends show that the population and number of homes that we supply water to are increasing year on year as more people live on the island and more houses are built. To forecast future growth in domestic customers we have used the latest available projections produced by the States of Jersey Statistics Unit (2024)[7] for a range of demographic scenarios, which are illustrated in Figure 5-3. These represent an updated set of projections since our last plan and key changes include:

[6] Volumes before adjustments for meter under-registration and supply pipe leakage
[7] Government of Jersey. (2024, September 25). *Jersey population and migration statistics 2023*. Statistics Jersey. https://www.gov.je/SiteCollectionDocuments/Government%20and%20administration/Jersey%20population%20and%20migration%20statistics%202023.pdf

- The population projections forecast a less extreme increase in population than those used in our previous WRDMP21 with an upper migration limit of +1000 people to the island every year compared to an upper limit of +1500 people to the island in our previous plan.
- The latest population projections include a new consideration of negative migration. In our previous plan all population forecasts expected either no change or an increased movement of population to the island. For this plan, the updated and latest projections from the States of Jersey Statistic Unit also include a decreasing population scenario representing migration from the island (migration of -100 people per year from the island).
- The principal base forecast of population for the previous plan was +700 net migration each year as this was consistent with recent population growth rates at that time. However, population growth rates on the island have decreased in recent years and therefore for this plan the central growth rate (+325 net migration) is lower. We have used this as our base scenario as it is more representative of the reduced growth rates experienced in recent years. Alternative migration scenarios have been used for uncertainty analyses.
- In the previous WRDMP21 the Jersey Statistics Unit data were used as the basis for estimated future growth in domestic properties to be served to provide a trend-based forecast. The same approach has been adopted for this plan to ensure consistency. However, property forecasts from the Jersey Statistics Unit were only available up to 2040, while for this plan, our forecast period is longer than the previous plan. Therefore, to extend the property forecasts for the remainder of the planning period (i.e. from 2041 to 2065) we took an average of the occupancy rate based on the changes forecast for 2035 to 2040 and applied these rates to the Jersey Statistics Unit population forecasts beyond 2040 to derive property forecasts for the later years of the planning period.

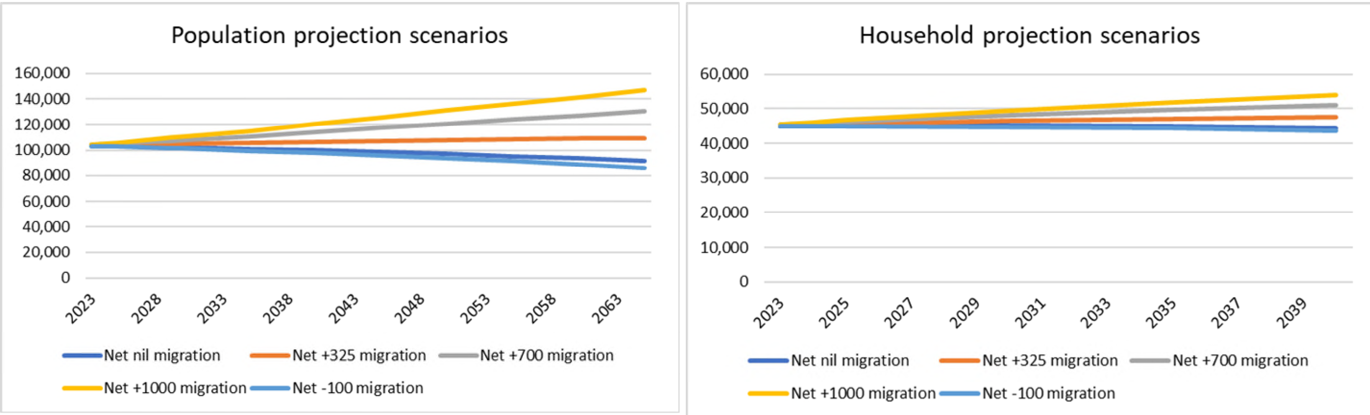


Figure 5-3 - States of Jersey Statistics Unit: projections of resident population and households

Table 5-2 summarises the key population and property information for the central scenario of the demand forecast. It shows that the total number of domestic properties receiving water supplies from Jersey Water is forecast to increase by 11% over the planning period from 2022 to 2065, excluding the small number of properties that have their own private water supplies. This rate of change is smaller than we forecast in our previous plan and is reflective of the revised central scenario of property growth in the range of Jersey Statistics Unit projections. This reduction in growth rate since we last reported is also reflected in the total population receiving water supplies from Jersey Water, with a smaller increase (8% increase between 2022 and 2065) in population living in domestic or commercial properties than was previously forecast in our WRDMP21 plan (30% increase between 2017 and 2045).

Table 5-2 - Forecast domestic properties and population served by Jersey Water

	2022	2030	2045	2065
Number of properties served:				
Measured domestic	37,809	39,971	41,840	43,051
Unmeasured domestic	1354	1145	1015	1015
Population served:				

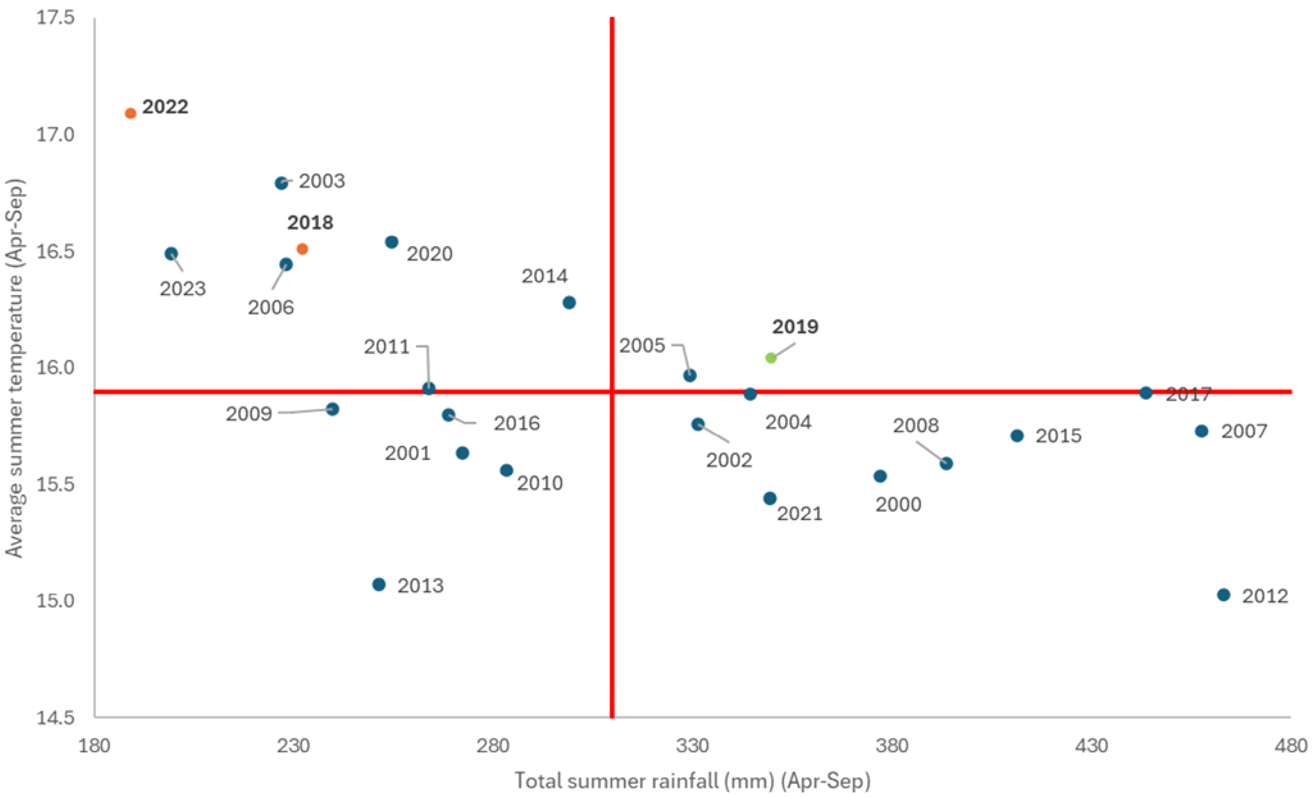
Domestic	95,038	97,335	100,315	102,518
Commercial	2,068	2,097	2,147	2,192
Total population supplied by Jersey Water	97,106	99,432	102,462	104,710
Average domestic property occupancy	2.42	2.36	2.34	2.33

5.3.6 Dry year assessment

For a WRDMP we are primarily interested in testing our resilience to dry weather years – i.e. the dry year annual average (DYAA) planning condition for our demand forecast. In WRDMP21, the dry year peak week was also examined, however, given the system resilience to peak events, this has not been analysed or reported for this current plan.[8]. In line with our previous plan we have only applied dry year adjustments to domestic customers water use as UKWIR research into the impact of climate change on demand[9] were unable to find a conclusive relationship between weather and commercial demand.

5.3.6.1 Identification of dry years

In the first instance we assessed the weather data for summer temperature and rainfall, where the summer months for each year were assumed to be April, May, June, July, August and September. To help identify the hottest and driest year a rainfall-temperature-quadrant plot was produced. This provides an easy way to visualise the hottest and driest year in terms *average* summer weather, and thus where we may expect higher corresponding water demand. Both 2018 (the previous base year) and 2022 (our current base year) sit within the top left quadrant and reflect expected hotter and dry years (based on average summer conditions).



[8] UKWIR, 2016, WRMP19 Methods – Household Consumption Forecasting
[9] UKWIR, 2013, Impact of Climate Change on Demand

5.3.6.2 Historic distribution input

We analysed historic distribution input (i.e. total demand) values to assess whether the dry years identified based on weather corresponded with increased distribution input values. As outlined in Section 5.1, there are known issues with meter readings around 2016 which have affected the quality of data and may have impacted adjacent years. Therefore, for the purposes of this plan we only considered data from 2018 onwards for this analysis. Furthermore, 2020 and 2021 were heavily influenced by changes in water-using behaviours driven by Covid-19 and therefore were also discounted from the dry year analysis.

Climatologically 2019 was considered a relatively normal year, in which we supplied 19.1 Ml/d of water on average throughout the year. 2018 and 2022 were both considered dry years based on their climatology, and had an annual average volume of water put into supply of 19.7 M/d and 18.8 Ml/d respectively. The hot dry year of 2022 had a lower demand than the more normal climatological annual average demand seen in 2019. However, another factor affecting demand in 2022 was the influence of Temporary Use Bans implemented in that year. As such, our calculation of dry year annual average was adjusted to reflect the assumed reductions from TUBS. Even allowing for this the adjusted annual average demand for a dry year such as this was still very low, at only 18.9 Ml/d.

As noted previously, the Covid-19 pandemic affected demand in 2020 and 2021, and demand in 2022 (and also 2023) seem to have been maintained at lower levels than before the pandemic, potentially reflecting long term changes to water using behaviour. However, we cannot be certain that this pattern will continue to be sustained in future, and so it is prudent to assume that pre-pandemic demands may return.

Noting all these factors, we have concluded that we should use the hot, dry year of 2018, as it was similar climatologically to our 2022 base year, was not affected by Temporary Use Ban restrictions, and occurred prior to any potential pandemic-induced effects on customer demand. The **2018 year was therefore selected as reflecting our dry year annual average demand**.

5.3.6.3 Dry year uplift factor

The dry year uplift factor was calculated to be able to uplift for 2022 base year annual average demands to those from 2018 (our selected representative dry year demand). Nominally 2022 was used as the “normal year”, but this was primarily on the basis of it being our base year, rather than it reflecting a normal year climatologically. Nevertheless, as the focus of the WRDMP is to identify the supplies required to meet the dry year demand, this was not considered to be a significant issue.

We have therefore applied a calculated DYAA uplift of 6.8% to produce the DYAA demand forecast (uplifting base year 2022 values to the 2018 demand that is representative of the dry year annual average). As mentioned previously this has only been applied to the domestic demand elements of our forecast. The figure below shows how the selected dry year annual average (plotted over the period of 2018 to 2022) compares to the annual average distribution input seen in each year since 2002.

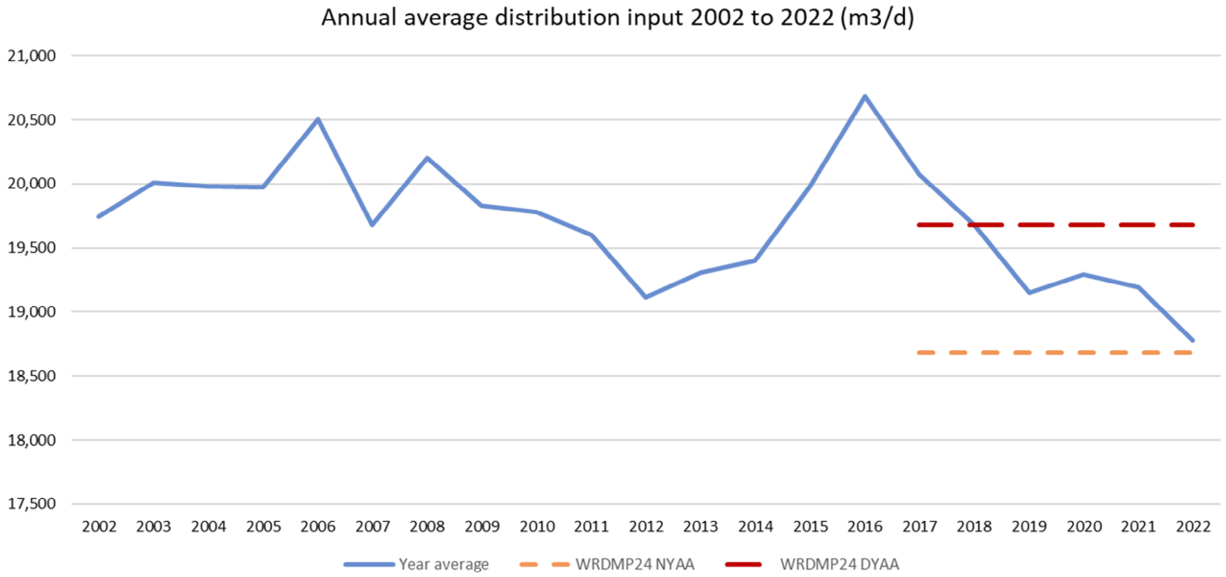


Figure 5-4 - Historic distribution input and the selected dry year annual average demand for this plan

5.3.7 Demand forecast scenarios

Uncertainty is inherently a key consideration in developing demand forecasts over the long-term (i.e. 40 years into the future) as it is difficult to accurately predict future trends. For example, growth in the number of homes, population growth, water use patterns by customers and climate change impacts may differ to the current best assessments. To help us understand the potential range of uncertainties, we developed 15 demand scenarios to represent a range of alternative futures. This has enabled us to test the robustness of our proposed plan to such uncertainties. Demand forecast scenarios were produced to cover the range of:

- 5 population and property projections from Jersey Statistics Unit
- The 10th, 50th and 90th percentile projections of water demand and climate change relationship taken from UKWIR (2013)[10] to represent a high, medium and low impact of climate change on demand.
- Variations in behavioural change in household water consumption forecasts (varied by +/- 10%)
- Variations in behavioural change in commercial water consumption forecasts (varied by +/- 20%)

5.3.8 Demand forecast results

Figure 5-5 and Table 5-2 summarise the dry year annual average (DYAA) demand forecast for our WRDMP24 plan under a medium climate change scenario. As discussed previously, to account for the uncertainty in the demand estimates, a range of demand forecasts have been derived which apply alternative assumptions as shown in Figure 5-6. These demand forecast results show that:

- The dry weather annual average demand is estimated to be 20.7Ml/d in 2065, compared with the current 19.7Ml/d DYAA in our base year (based on a medium climate change scenario). The overall effect is that distribution input is expected to increase by 5% even though the assumption that average consumption per domestic customer is forecast to reduce by about 5% as a result of future installations of more efficient water appliances and expected changes in water appliance use (described in more detail in Appendix E). However, this reduction is outweighed by strong growth in Jersey's population and the number of new homes expected

[10] UKWIR, 2013. Impact of Climate Change on Water Demand.

on the island; it is anticipated that the number of domestic properties served will increase by 10% to approximately 49,200 by 2065.

- Metered domestic demand will continue to be the largest component of total demand (see Figure 5-5) and is forecast to increase as the number of metered homes increases due the building of new homes and increasing population.
- In contrast to our previous WRDMP total commercial water use is forecast to decrease slightly, however this is negligible (only 0.07Ml/d over the planning period, from 2022 to 2065). In our previous WRDMP we forecast total commercial water use would increase by 6% to 2045. However, our latest analysis for this WRDMP forecasts commercial water use to decrease by 1.5% to 2065. Similarly to our last plan water consumption by some commercial sectors (Miscellaneous, Offices and Retail, and Public Services) has been forecast to grow. Our updated analysis has also forecasted an increase in agricultural water demand by 2065, compared to a decrease reported in our previous plan. However, the key change between the last plan and this current plan is in the forecast for the Tourism and Leisure sectors which are now forecast to decline rather than remaining constant as forecast in our last plan. This change in trend supports the experiences on the island following the Covid-19 pandemic.
- For the baseline demand forecast the volumes of total leakage and non-accounted-for water have been assumed to be held constant at the current low levels. The potential for further reduction in total leakage has been considered as part of the option appraisal and investment modelling process, and where it represents least cost and best value, selected leakage control measures are incorporated in the final supply-demand forecast.
- The potential effects of climate change on demand over the period to 2065 have been taken into account in line with UK water industry guidance.

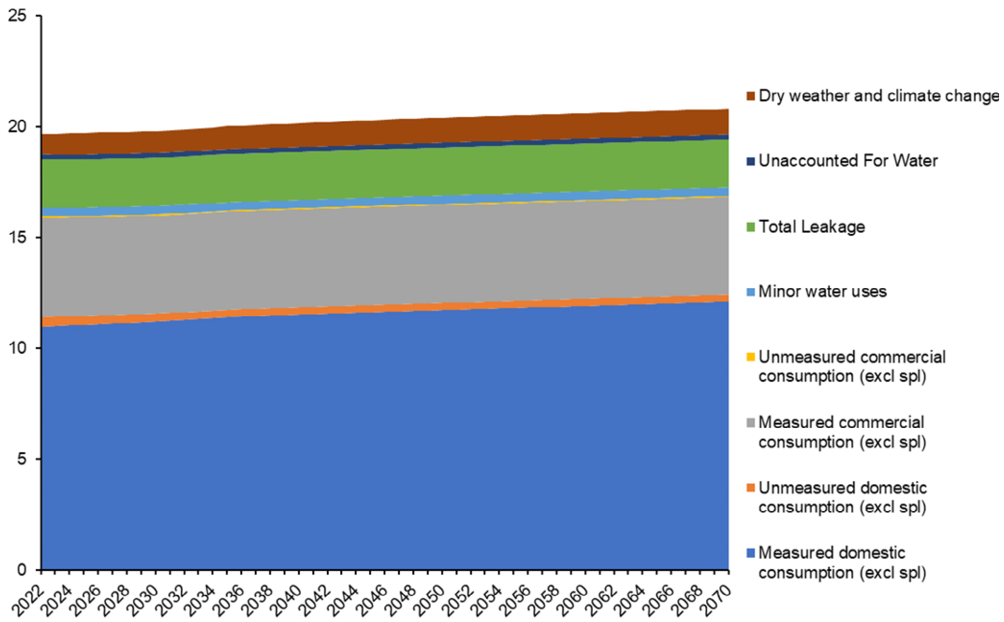


Figure 5-5 - Summary of Dry Year Annual Average demand forecast by component (Ml/d) – medium climate change scenario

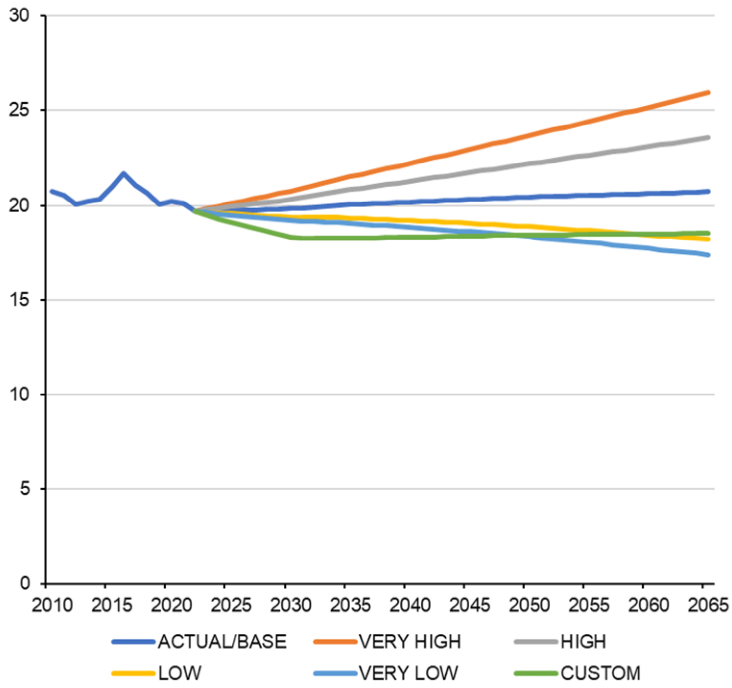


Figure 5-6 - Summary of Dry Year Annual Average demand forecast by uncertainty scenario (Ml/d) – medium climate change scenario

Table 5-3 - Baseline Dry Year Annual Average (DYAA) Demand Forecast for 2065 (Ml/d) – medium climate change scenario

	2022	2025	2035	2045	2065
Measured domestic water use	11.0	11.1	11.4	11.6	11.9
Unmeasured domestic water use	0.4	0.4	0.3	0.3	0.3
Total domestic water use	11.4	11.5	11.7	11.9	12.2
Total commercial water use	4.54	4.52	4.48	4.47	4.47
Minor water uses	0.38	0.38	0.38	0.38	0.38
Total leakage	2.22	2.18	2.18	2.18	2.18
Unaccounted for Water	0.22	0.22	0.22	0.22	0.22
Normal Year Annual Average (Ml/d)	18.8	18.8	19.0	19.2	19.6
Estimated extra demand due to dry year and climate change	0.90	0.97	1.03	1.10	1.15

Dry year Annual Average Demand (Ml/d) including climate change	19.7	19.7	20.0	20.3	20.7

Note: values may not sum exactly due to rounding

6. Headroom uncertainty

There are inherently many sources of uncertainty in forecasting the future as required for water resources planning, including estimation of supply capability under infrequent drought events, predicting population changes within the supply area, understanding how customer water using behaviour may change in future, and determining the impacts of climate change. These uncertainties in both supplies and demands for water need to be acknowledged and incorporated into the planning process to provide a reasonable balance between an acceptable level of risk of reliable water supply, and the cost of over-investment in the water supply system. This, in accordance with standard practice, is generally handled through the calculation of Target Headroom.

The methodology for estimating a Target Headroom allowance identifies a range of uncertainties in relation to both the demand and the supply forecast. There are three main guidance documents to support the calculation of target headroom:

- A practical method for converting uncertainty into headroom, UKWIR 1998.
- An improved method for assessing headroom, UKWIR 2002.
- WRMP19 Methods – Risk-based planning, UKWIR 2016.

For our previous plan WRDMP21, we adopted the first of these approaches, the UKWIR 1998 methodology. This approach uses a pragmatic scoring framework to assess the allowance for Target Headroom. This is a reasonable method where a relatively simple approach is most applicable. For the current plan we have retained the same approach for estimating headroom based on the 1998 methodology, but we have updated the assessment of the scores, including carrying out a separate analysis of supply-side uncertainty as well as removing specific headroom components in order to align with our scenario planning approach and avoid double counting.

We have recognised that one of the key uncertainties relates to the hydrological assessment, and so we have separated this from the scoring approach to carry out additional analysis. To estimate the scale of supply-side uncertainty as a percentage of DO we compared the outputs of two approaches, thus providing a level of confidence in the output. The approaches were:

- For this WRDMP21 plan we have built and calibrated new hydrological models. The final calibrated models were selected as the ‘optimal’ parameter set based on a set of best fit metrics. However, they were selected from a range of plausible parameters. We selected an alternative ‘plausible’ parameter set with lower flows and calculated the change in total system DO’s.
- We analysed observed and modelled storage during the summer and autumn of 2018 which was a drought year. We assessed the scale of potential DO uncertainty by analysing the difference in the minimum modelled and minimum observed storage during this period to calculate this as a percentage of total storage.

The results of these analyses suggested a potential supply uncertainty figure of between 7% - 11.4% of DO and a figure of 10% was selected and applied within the Target Headroom on the basis that this represents a conservative, but reasonable estimate based on the analysis carried out.

We have calculated target headroom values across the 40-year planning horizon. Table 6-1 summarises the calculated target headroom values (in Ml/d) that we have applied to the supply-demand balance forecast (Section 7). These show a relatively flat profile over time, largely due to the exclusion of climate change uncertainty which is already accounted for in our scenario analysis (Section 7.1.2), and so has been excluded in line with best practice to avoid double-counting. The allowance represents 11.6% of WAFU at the end of the planning period in 2065. This is on the higher end of target headroom allowances but is within plausible bounds. Full details of the target headroom calculations are provided in Appendix F.

Table 6-1 – Summary of final target headroom values

	2025	2030	2040	2050	2065
Target Headroom for 1in500 (as Ml/d)	1.93	1.94	1.95	1.96	1.98

7. Supply demand balances

7.1 Overview of the supply demand balance calculation

The forecast water supply-demand balance for Jersey can be calculated as follows:

$$\textit{Forecast supply demand balance} = \textit{Forecast Water Available for Use} - \textit{Forecast Demand} - \textit{Target Headroom Allowance}$$

Where:

- Water Available For Use (WAFU) (see Section 4) is the amount of water that can be reliably supplied from the raw water supply system (i.e. forecast deployable output minus treatment works losses minus outage allowance).
- Forecast demand for water for both dry year annual average and normal year annual average including forecast of leakage (see Section 5).
- Target headroom is the calculated allowance for planning uncertainties and risks that may impact either supply or demand (see Section 6).

Figure 7-1 illustrates this calculation. If the supply-demand balance is positive then there is adequate water supply availability to meet demand within the specific planning condition. If the supply-demand balance is negative, this indicates a potential risk to maintaining reliable water supplies under design conditions in dry years. In these circumstances, decisions need to be taken as to how to address the risk with strategy options including:

- A policy of “do nothing and accept the risk”
- Carry out demand reduction measures, including leakage reduction
- Increase water supplies
- Address uncertainties in the target headroom allowance
- A combination of demand side and supply side measures.

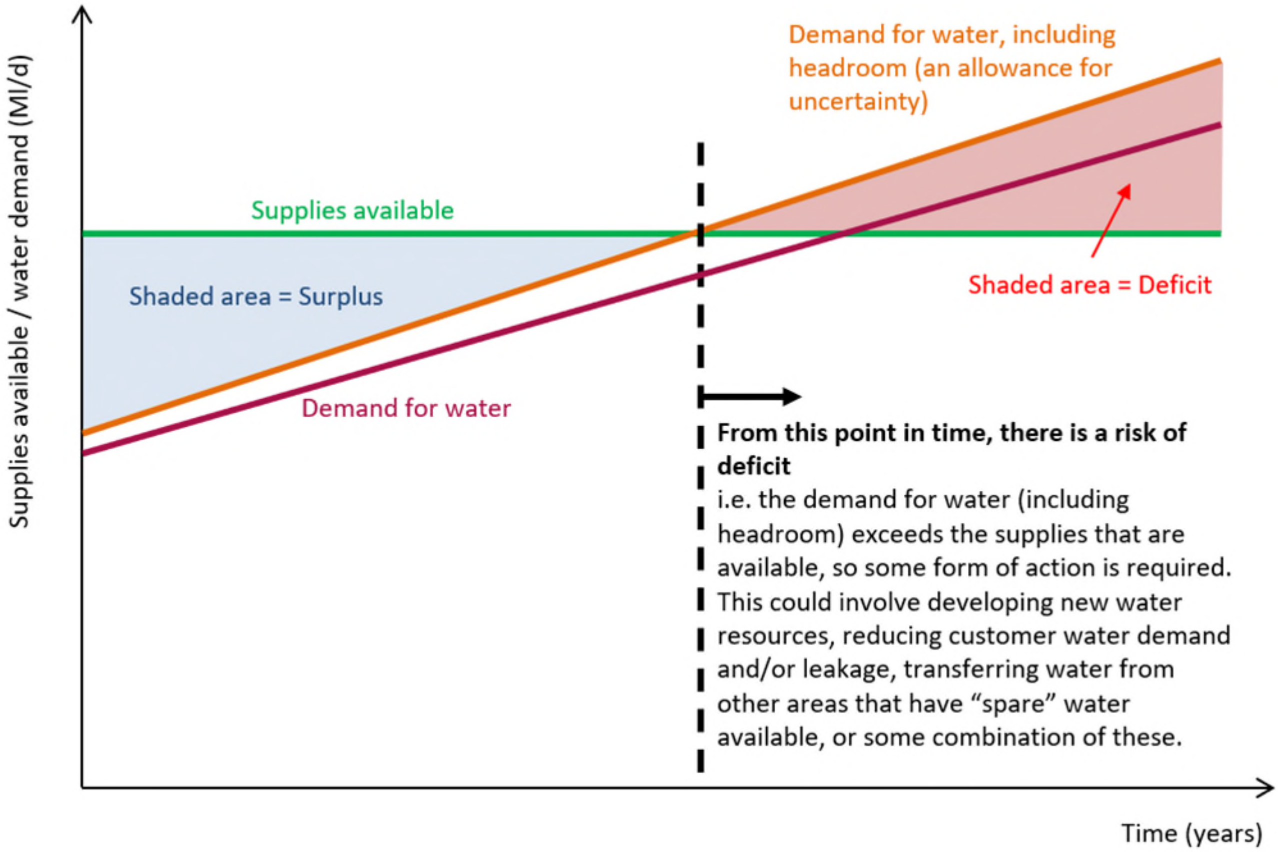


Figure 7-1 - The concept of the supply demand balance

7.1.1 Planning conditions

The use of large stochastic datasets has allowed us to take a risk-based approach to the supply-demand balance that considers the likely surplus/deficit within a range of planning conditions such as Normal Year Annual Average (NYAA), Dry Year Annual Average (DYAA), a 1 in 100-year return period drought scenario, a 1 in 200-year return period, and a 1 in 500-year return period drought scenario.

These five separate supply-demand balances have been calculated using the forecast water available for use in each planning condition and the dry year demand forecast mapped to each of the drought scenarios (target headroom is assumed not to vary across planning conditions). Figure 7-2 shows an example of our forecast supply-demand balances across each of the planning conditions for the Mid-Range scenario (see section below).

For the purposes of our modelling, we have focused on four planning conditions primarily:

- Normal Year Annual Average (NYAA)
- Dry Year Annual Average (DYAA)
- 1 in 100-year return period drought
- 1 in 500-year return period drought

We have looked at the 1 in 100-year return period drought planning condition as an interim position to allow time to move to a more stringent 1 in 500-year return period level of service (which aligns with best practice adopted by other water companies across England And Wales)

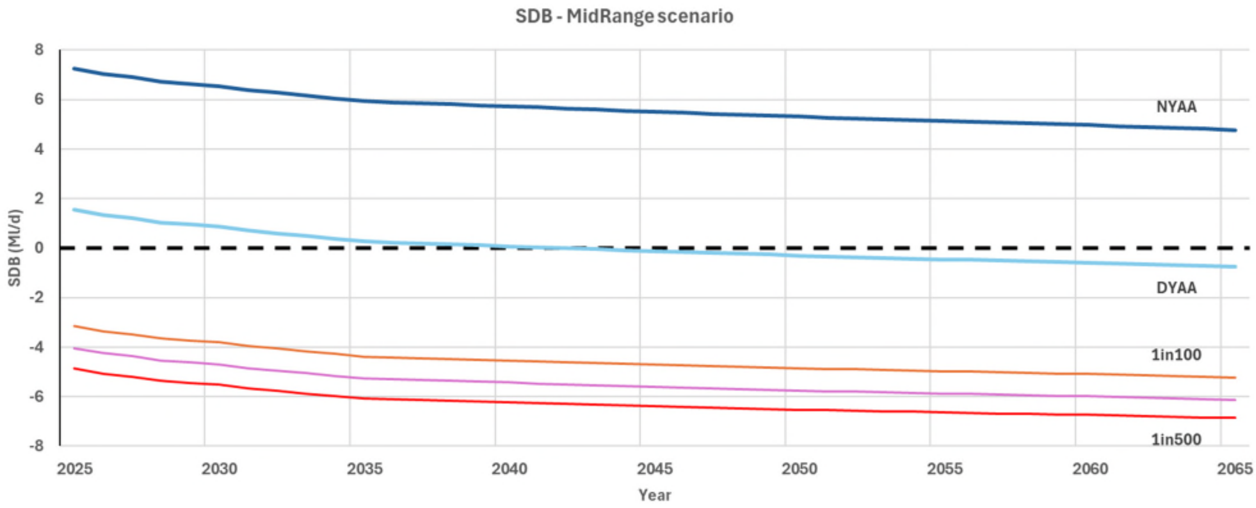


Figure 7-2 – Range of forecast supply demand balances for the Jersey Mid-Range scenario

7.1.2 Scenario planning

We have sought to develop a plan that will be resilient to a range of plausible future conditions and uncertainties. This requires understanding of the sources of uncertainty that affect our planning. Target headroom is one component of this (see Section 6), but we have also taken this further by defining a scenario framework based on key drivers for change or uncertainty in Jersey. This is a key element of the Adaptive Planning approach which seeks to understand how different futures may impact the best-value approach and identify options that will be "least regrets" in the face of future uncertainties.

It is not possible to predict exactly what will happen in the future and producing a best-value plan that responds to just one future cannot guarantee it will be the optimal strategy if an alternative future occurs. For this plan we have made a distinction between the identification and use of scenarios and sensitivity tests as follows:

- **Scenarios** – these describe the interplay of major drivers for change or uncertainty that are likely to have a significant and long-term impact on our supply-demand balance. Examples of these drivers include:
  - Population or demographics – changes in birth and death rates, employment trends or migration policies
  - Societal values – trends in customer priorities and/or water use behaviour (although this can be difficult to forecast in a meaningful way)
  - Climate change – long-term changes in the weather that influence water supply availability, and to a lesser extent, demand for water
- **Sensitivity tests** – these test the impact of specific policies, stresses, shocks or uncertainties, otherwise sometimes termed "what-if" tests. Rather than being designed to cover a range of potential outcomes these are often binary tests such as whether a specific option is available or not.

Combinations of future uncertainties can quickly multiply so it is necessary to seek a balance between considering the key drivers and producing outputs that are meaningful and can be readily understood. When assessing the drivers considered in the scenario framework, we have therefore focused on the impacts of the primary drivers of climate change and population growth (albeit with some variation around customer behaviour for water). Figure 7-3 illustrates the scenario build up and selection process to identify five scenarios to be taken forward for decision making using our investment model. These scenarios were selected to cover the range of plausible supply-demand balance futures and are characterised as follows:

- **Very Benign** – this represents a very low population growth future (<= nil migration) and low climate change impacts

- **Benign** – this represents a future with low population (limited net migration) and low to medium climate change impacts
- **Mid-Range** – the mid-range future spans a range of possible combinations that could include high climate change impacts but low population growth, low climate change impacts but high population growth or medium population and climate change impacts
- **Plausible Adverse** – this represents a future with likely high population growth (>= +325 net migration) and medium to high climate change
- **Reasonable Worst** – this represents a future with high population growth (>= +700 net migration) and high climate change impacts

Together the Plausible Adverse and Reasonable Worst futures are sometimes referred to as the “more adverse futures” in subsequent section of this document.

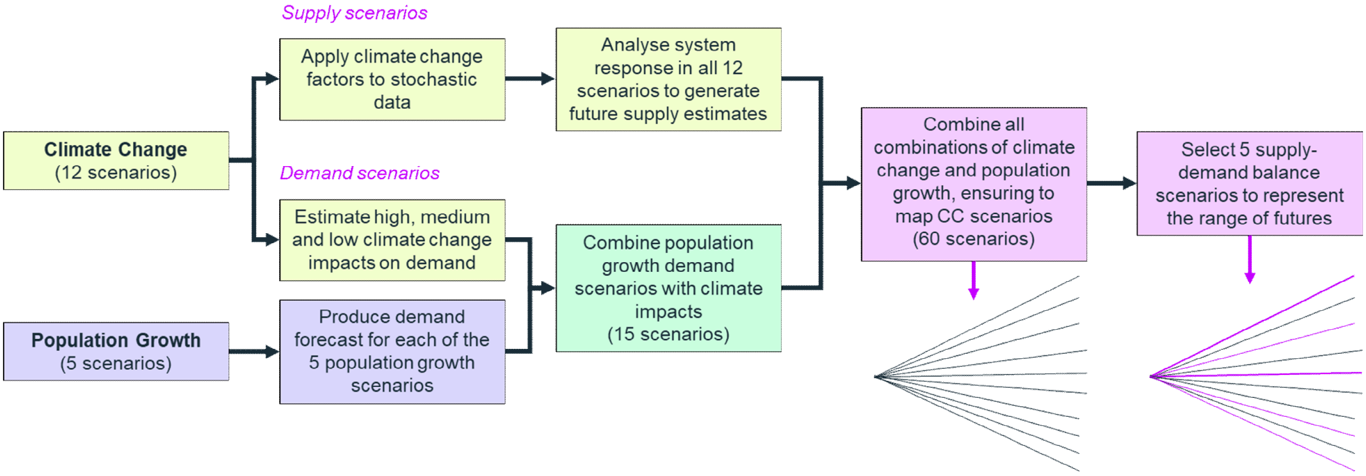


Figure 7-3 – Scenario build up and selection

7.2 The supply demand balance forecast

The supply-demand balance forecasts for each of our selected drought planning conditions are presented in Figure 7-4. This shows that at the beginning of the planning period (2025) there is already a risk of a supply deficit in a drought of approximately 1 in 100 years or greater severity. Under the benign future, the supply deficit risk decreases over the planning period; however under the adverse futures scenario the deficit may increase by nearly 10 Ml/d to a potential deficit of -14 Ml/d in the Reasonable Worst scenario under the 1 in 500 drought planning condition.

The supply demand balance forecasts are used as inputs to the decision-making process so that the investment model can be used identify appropriate options to meet the various deficits under the different futures and planning conditions. This is discussed further in Section 9.

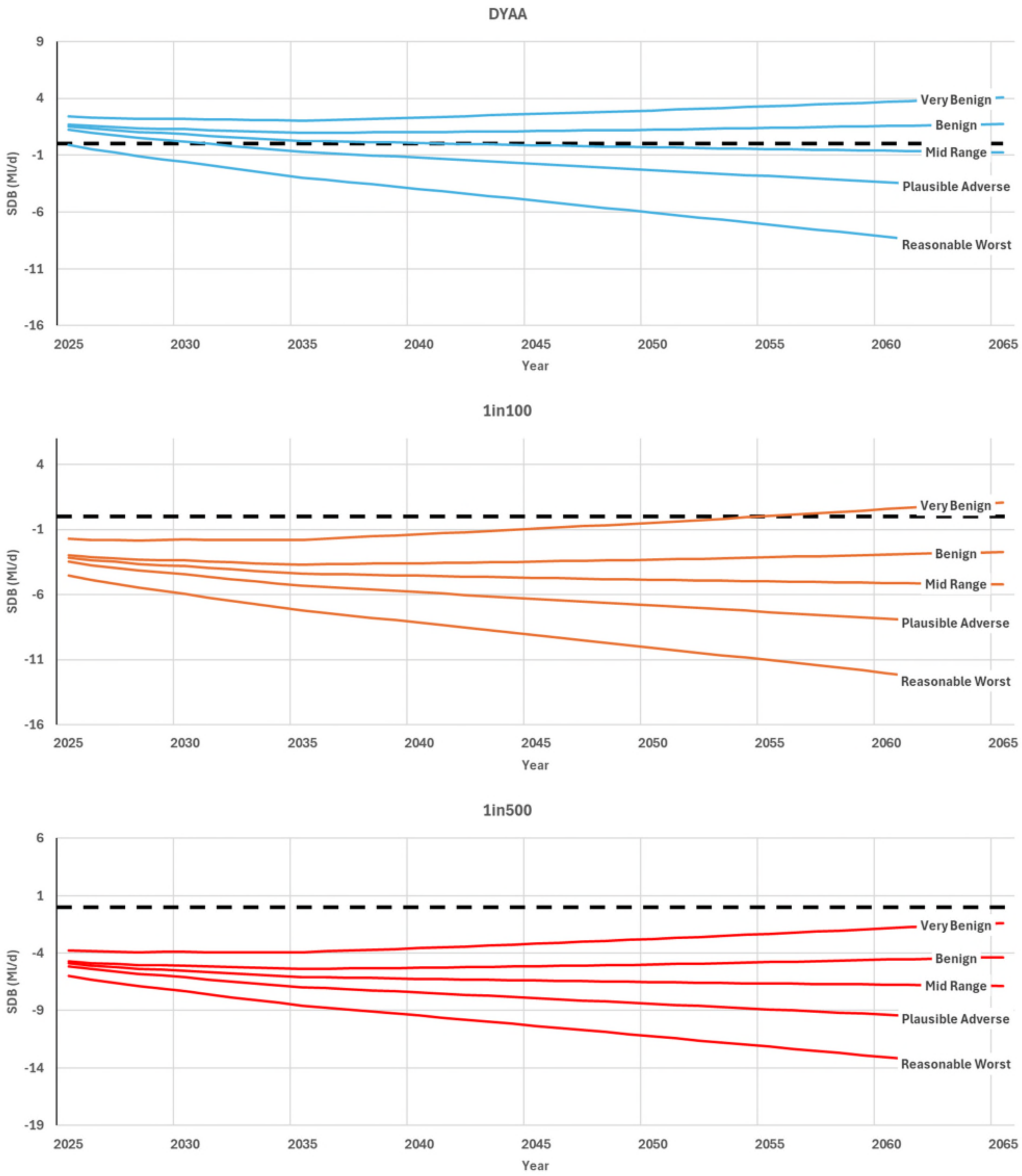


Figure 7-4 – Supply demand balance forecasts for each of the five future scenarios and three of the planning conditions

8. Option appraisal

8.1 Overview of the option appraisal process

We have developed and applied a multi-criteria appraisal process to evaluate a wide range of alternative options to address the forecast supply deficit. Figure 8-1 below summarises our overall appraisal process.

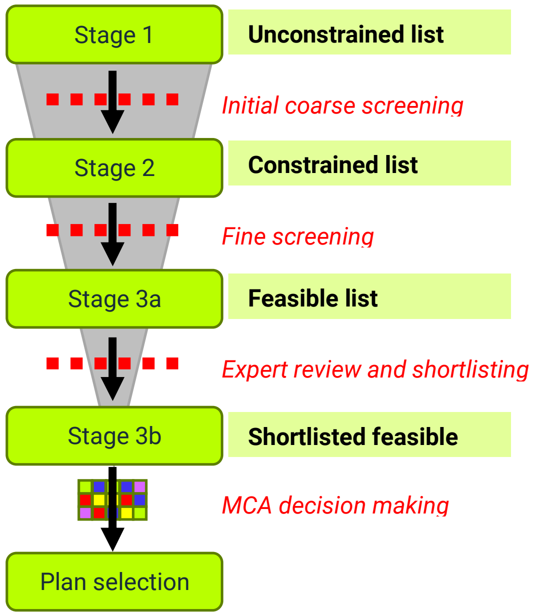


Figure 8-1 – WRDMP option appraisal stages

8.2 Developing constrained options set

Stage 1 of the option appraisal process comprised the following key steps:

- Development of an "unconstrained" option list that considered a wide range of options that may be feasible but without consideration of the potential cost, customer and political acceptability or environmental and social effects.
- Development of "coarse screening" evaluation criteria to objectively evaluate each option on a consistent basis.
- Appraisal of the unconstrained option list against the evaluation criteria to determine a "constrained" options list (for further assessment under Stage 2).

8.2.1 Unconstrained list of options

The unconstrained options list was developed through various activities, including:

- Review of options identified in the 2019 Water Resources and Drought Management Plan.
- Introduction, or further development of options, that were subject to other studies over previous decades by Jersey Water.
- Generation of new option ideas from discussions with operational and strategic planning staff.
- Other options suggested by Jersey Water staff.
- Consideration of options included in UK best practice guidance for water resources planning.

These activities led to the production of an initial unconstrained options list which we then reviewed in a structured workshop with operational and strategic planning staff to ensure that all potential options had been identified.

In total, 55 supply-side options, 42 customer, distribution and production-side options and 14 drought management options were identified for subsequent considerations and coarse screening (see Appendix G for more details).

8.2.2 Screening criteria to filter options (Coarse screening)

The coarse screening process involved evaluation of each option on the unconstrained option list against the criteria set out in Table 8-1. The purpose of coarse screening was to discard options that are infeasible or impractical to deliver in Jersey.

Table 8-1 - Outline of coarse screening criteria

Evaluation category	Coarse screening evaluation criteria
Feasibility and risk	▪ Political acceptability and customer acceptability ▪ Ease of implementation and technical feasibility
Engineering and cost	▪ Engineering complexity ▪ Likely capital and operational cost requirements
Performance and resilience	▪ Likely scale of reliable supply benefit or demand savings relative to anticipated scale of the supply deficit ▪ Supply resilience benefits ▪ Vulnerability or resilience of the option to climate change
Operational	▪ Compliance risks ▪ Resource and skills requirements
Environmental	▪ Option type anticipated impacts to the environment, including, but not limited to flood risk, climate impacts and impact to designated sites, irreplaceable habitats, sites with high heritage / amenity value and the water environment ▪ Indicative carbon impact

We evaluated each of the 111 unconstrained options against these high level criteria for the coarse screening process. Where options were assessed as having an over-riding constraint or performed very poorly against most criteria, they were rejected and were not taken forward into the constrained options list. Further details are provided in Appendix G.

8.2.3 Fine screening of constrained options to reach feasible options set

Options which passed through the coarse screening evaluation stage formed our “constrained options” list. These options were then subject to a greater level of evaluation against a more detailed set of “fine screening” evaluation criteria that built on the high level criteria used at the coarse screening stage. The purpose of the fine screening was to discard options that did not have a realistic chance of being selected in the Preferred Plan and thereby filter the option list down to a more manageable number of options for more detailed investigation and for decision-making.

Table 8-2 sets out the evaluation criteria for the fine screening of the constrained options list. This follows the style of the coarse screening criteria and demonstrates the progressive consideration and understanding of each option within the process. For each criterion, we evaluated the options against a five-point grading scale: from positive/beneficial effect through to major adverse/ high risk.

In addition to the fine screening criteria, when deciding the balance of options to be taken through to the "feasible options" list, we also considered factors such as:

- Ensuring a range of different option types were included in the feasible list
- Whether options were mutually exclusive or dependent on other options.
- Variants of options including different sizes or whether options could be developed in a phased or modular way.

Table 8-2 - Outline of fine screening criteria

Evaluation category	Fine screening evaluation criteria
Feasibility and risk	▪ Political acceptability and customer acceptability ▪ Ease of implementation and technical feasibility ▪ Timeframe / programme to implement ▪ Scheme dependencies ▪ Technological ▪ Experience of delivery ▪ The Construction (Design and Management) Regulations issues ▪ Quality and confidence of design information
Engineering and cost	▪ Engineering complexity ▪ Likely capital and operational cost requirements ▪ Land availability, ownership and tenure
Performance resilience	▪ Likely scale of reliable supply benefit or demand savings relative to anticipated scale of the supply deficit ▪ Supply resilience benefits ▪ Vulnerability or resilience of the option to climate change ▪ Ability to carry out phased or incremental delivery ▪ Resistance to vulnerability due to undesirable physical site occurrences, such as flood, pollution, power loss etc. ▪ Resistance to vulnerability due to undesirable external factors of energy pricing changes and future regulatory/legislative changes
Operational	▪ Compliance risks ▪ Resource and skills requirements
Environmental	▪ Qualitative appraisal of embodied and operational carbon. ▪ Quantitative assessment of construction and operational impact to full range of SEA topics i.e. ▫ Biodiversity ▫ Soil ▫ Water ▫ Air quality ▫ Greenhouse gas emissions ▫ Climatic Factors ▫ Landscape ▫ Cultural heritage

- Population and human health
- Material Assets

8.3 Strategic Environmental Assessment

We recognise that some of the options outlined in our draft plan, for example those that increase supply or improve network resilience could have an adverse effect on the environment or on local communities, either during construction or through our operations. As such, throughout the development of the WRDMP an environmental assessment process, largely aligning with the steps as set out under the UK 'Environmental Assessment of Plans and Programmes Regulations' 2004 (SEA Regulations) have been applied to help identify and mitigate the potential impact of our strategic plans and operations on the environment.

Whilst we are not required under any statutory or legislative context to carry out an SEA of our WRDMP, we recognise the value added to plan making through the application of SEA and therefore committed to its undertaking to help inform our plan.

SEA is a process that follows a number of sequential stages, this includes:

- Stage A – Setting the context and establishing the baseline
- Stage B – Developing, refining and appraising strategic options and assessing the effects of the plan
- Stage C – Preparing the SEA Report
- Stage D – Consulting on the WRDMP and SEA Environmental Report

8.3.1 Scoping

Stage A of the SEA process was a scoping study to identify both the focus and extent of the SEA. This provided a framework and objectives for further assessment of the key environmental, socio-economic and sustainability issues on the island of Jersey and the implications and opportunities arising out of these for our WRDMP. The scoping study provided baseline data and information about the current and potential future environmental conditions in our area.

Our SEA objectives and criteria were derived, after reviewing links with other relevant processes, plans and policies and the environmental baseline information. An SEA framework of 13 objectives and associated decision-making / assessment aid questions were drawn up, aligning to the following topics:

- Biodiversity;
- Soil;
- Water;
- Air quality;
- Greenhouse gas emissions;
- Climatic Factors;
- Landscape;
- Cultural heritage;
- Population and human health; and
- Material Assets.

We consulted on our scoping report in July 2024 and met with the Government of Jersey on 12th August 2024 to discuss feedback received.

8.3.2 Environmental Assessment

Stage B of SEA involves developing, refining and appraising strategic alternatives and assessing the effects of the preferred plan, this was done iteratively throughout the plan development. In developing our plan, we identified a wide range of possible investment options that could address the water supply demand deficit in Jersey. These options differ significantly in scale, cost and reliability and include options to reduce demand for water (e.g. water efficiency measures and leakage reduction) and options to increase supply (e.g. storage reservoirs, reusing water, desalination of sea water, abstraction from groundwater and rivers).

In respect of Stage B and in order to determine the environmental effects of the options (including alternative options) for the WRDMP, the SEA adopted a Staged assessment approach, with input at the following key optioneering stages, as set out in section 8.2, in development of the Preferred Plan:

8.3.2.1 Environmental Assessment Stage 1 (unconstrained) and Stage 2 (constrained):

This reflected a high level SEA guided assessment of option types to inform selection from a 'Long list' of options. Options that made up the Long list and Feasible list were grouped into parent 'option types' and generic impacts (beneficial and adverse) against SEA objectives presented in Option Type proformas. This information was summated and included in the wider WRDMP options appraisal process. It is worth noting that the environmental assessment undertaken at this stage was limited by the option detail available, including design, location and programme for delivery. As such impacts presented were necessarily generic.

8.3.2.2 Environmental Assessment Stage 3a (feasible list) and 3b (shortlisted feasible)

Stage 3 of the Environmental Assessment reflected the undertaking of SEA of individual options that make up the feasible list and then Preferred Plan. Options were, for the most part, associated with sufficient design detail so as to allow a locational based assessment that considered, for example, proximity to sensitive receptors. Stage 3 adopted the full SEA Framework, utilising SEA objectives, assigned datasets and a defined scoring system based on a qualitative scale of minor, moderate, major positive and minor, moderate, major negative, and neutral. The effects of each option were assessed using this scale and a narrative justification provided.

The assessment was split into construction effects and operational effect. This recognised that options tend to have both positive and negative effects under an SEA objective. Rather than trading these effects to cancel each other out, both positive and negative scoring was used to show the potential mix of effects.

Potential mitigation and enhancement measures were also identified as part of the Stage 3 assessment process and fed back to the options development team as part of an iterative process. Options with major and moderate negative effects were highlighted for the attribution of appropriate mitigation. Alternatively, these options were flagged for rejection.

8.3.2.3 Summary of options assessment

Where construction activities are anticipated, a majority of options assessed where considered likely to result in significant adverse effects. These adverse effects concerned issues such as biodiversity (loss, fragmentation and disturbance), the introduction of air quality and noise pollution and impacts on the historic environment (such as on designated heritage assets and their setting) and to the built environment including potential impacts to communities, health and wellbeing. The SEA does however recognise that, for the most part, such effects would be limited to the construction phase, that they would be reversible and that a wide range of established mitigation measures could be adopted to minimise the potential for significant adverse effects. This includes consultation with stakeholders and affected communities and residents, the implementation of environmental management plans that include, for example, measures to reduce dust, noise and traffic related disturbances.

The SEA finds that some adverse effects would persist through to the operational phase, such as operational noise, lighting, increased vehicle movements and abstractions and associated pressures on the water environment. There is then a requirement that monitoring is implemented to ensure that effects are fully understood and managed. It is however also apparent that a range of beneficial and significant beneficial effects would be likely during the operational phase of options contained within the WRDMP. Such effects are associated with increased security of supply and increased resilience within the water network to extreme weather events, including droughts. The SEA also recognises increased efficiency, associated with demand management measures and benefits to health and wellbeing of communities that are consequent to the full range of options contained in the WRDMP.

Please see Appendix J for full details.

8.4 The feasible options identified

Following application of the fine screening, the initial Feasible Options List included 22 supply-side options, 19 customer, distribution and production-side options (i.e. demand-side management options), and 9 drought management options. This represents a reduction in option numbers from 111 separate options included in the unconstrained option list, reducing to 66 options following the initial coarse screening and to 50 options in the draft feasible options. Appendix I includes a register of the options we assessed as part of the fine screening evaluation but which we did not take forward to the draft feasible options list.

The draft feasible options list covers a broad mix of both supply augmentation and demand management options.

8.4.1 Further refinement of the feasible list (shortlisting)

As the feasible set of options was examined in greater detail, the options were sometimes refined or re-engineered, and the evaluation criteria were therefore re-applied in an iterative way to derive a final feasible list of options. Some options with the best performance against the evaluation criteria were carried straight through to the final feasible list (Table 8-3) whilst others we re-examined, re-designed or excluded. A key objective was still to ensure we retained a balanced list between demand management options and supply augmentation options (see Appendix G for details). As indicated in Table 8-3, whilst demand management options form an important consideration in the WRDMP, the likely savings that can be achieved from demand management measures will not be sufficient on their own to address the forecast supply deficits in many of the plausible futures and planning conditions examined in this WRDMP; so measures to augment supply will also be required.

We investigated the options in the final feasible options shortlist in detail and further developed these options in terms of their design/implementation considerations, costs and benefits to inform the cost-benefit assessment and programme appraisal.

During the shortlisting process, a number of the customer, distribution and customer side options were grouped and then further refined into the 8 demand-side options as listed in Table 8-3.

Table 8-3 – 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

S15d	New groundwater abstraction: d. Pont Marquet	0.5 Ml/d	(3 options)
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 -Queen's 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	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.*

8.4.2 Development and assessment of the options

An outline scope was prepared for each option in the final Feasible Options shortlist. This included high level engineering designs for the supply options, as well as development of capital and operational cost profiles for each option over an 80-year horizon.

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 annuitised cost for the purpose of options comparison and programme selection in the investment model to inform the decision-making process.

8.4.3 Drought management options

Drought management options were developed alongside other supply and demand side options as part of the options appraisal process, and coarse and fine screening applied to identify the feasible set of drought management options. The feasible temporary drought management measures are summarised in Table 8-4. The range of options shortlisted above for implementation during a drought can be divided into two main categories:

- Options to temporarily manage the demand for water
  - DM2, DM6, DM7, DM8, DM15, DM16.
- Options to temporarily enhance the water supply availability
  - DM3, DM5, DM14.

Further details about the development of these drought management options are provided in Appendix H. The drought management options may be considered either individually or cumulatively.

The potential benefit of implementing demand management options are somewhat uncertain (and are not necessarily cumulative, depending on which combination of measures are implemented). Communications, incentives and temporary use restrictions (both encouraged and enforced) rely heavily on the participation and goodwill of customers. Some measures have a seasonal variability, with the full benefit only being realised in certain times of the year, such as during spring and summer months (e.g. beach tap/shower use and garden watering with hosepipes is minimal during winter months).

Table 8-4 – Temporary Drought Management Options

<table>
<tr><th>Option Nr</th><th>Option</th><th>Potential benefit</th></tr>
<tr><td colspan="3">Temporary drought management options</td></tr>
<tr><td>DM2</td><td>Water rationing</td><td>In the order of 15% reduction to average dry year demand</td></tr>
<tr><td>DM3</td><td>Temporary desalination</td><td>In the region of 1-2Ml/d</td></tr>
<tr><td>DM5</td><td>Temporary PFAS treatment</td><td>Potentially enabling the full raw water output from the borehole to be realised. Although the resultant deployable output benefit has not been assessed</td></tr>
<tr><td>DM6</td><td>Customer awareness</td><td rowspan="3">As described in Section 4.3.1 the demand reduction factors associated with each formal intervention for demand reduction are:
▪ TUBs: 3% during October - May (i.e. 97% of demand remains) and 8% during June – September (92% of the demand remains).
▪ NEUBs: 4.5% during October - May (95.5% of demand remains), 9.5% during June and August – September (90.5% of the demand remains) and 10.5% during July (89.5% of the demand remains).

These reductions are already allowed for the in the DO calculation</td></tr>
<tr><td>DM7</td><td>Temporary water use ban (TWUB) – Non essential Use Ban (NEUB): Lite</td></tr>
<tr><td>DM8</td><td>Temporary water use ban (TWUB) – Non essential Use Ban (NEUB): Extensive</td></tr>
<tr><td>DM14</td><td>Water tankering on island</td><td>Maintaining customer supply using tankers has the potential to address localised supply shortfalls and have limited impact on customer experience. However, a large scale application of tankering would likely need to be supported by</td></tr>
</table>

		another option to provide water for tanker transportation whilst existing sources are low. In contrast to other measures with greater impact to customers tankering is thought to offer limited benefit to promoting customer demand reduction behaviours at times of reduced water availability. Combined with reliability concerns and extent of operations necessary, this option can only be considered a means of managing localised supply shortfalls, likely limited to key and critical customers, in conjunction with other drought management measures.
DM15	Reduced level of service (frequency of restrictions)	Planning to provide a lower level of service and the acknowledgment of implementing service restrictions more frequently may reduce the investment and interventions needs to maintain the supply-demand balance.
DM16	Reduced level of service (pressure)	The reduction in pressure would mean reduced outflows at customer taps resulting in less water use for time dependant activities such as leaving taps running whilst carrying out ablutions. Reduced pressure in the network may also result in the reduction of water lost through leakage.

8.5 Option appraisal conclusion

We evaluated a wide range of potential options to address the forecast supply demand balance deficit and through an objective, multi-criteria appraisal process developed a final feasible list of options for taking forward to the programme appraisal process to select a preferred plan. Section 9 and 10 discusses how the assessment of these options informed development of a range of alternative programmes of measures to address the forecast supply demand balance deficits.

9. Decision-making approach

The following sub-sections describe our decision-making approach which is given in greater detail in Appendix H. The results on applying the decision-making approach are described in Section 10. Figure 9-1 illustrates the process we have followed to determine our preferred best-value adaptive plan.

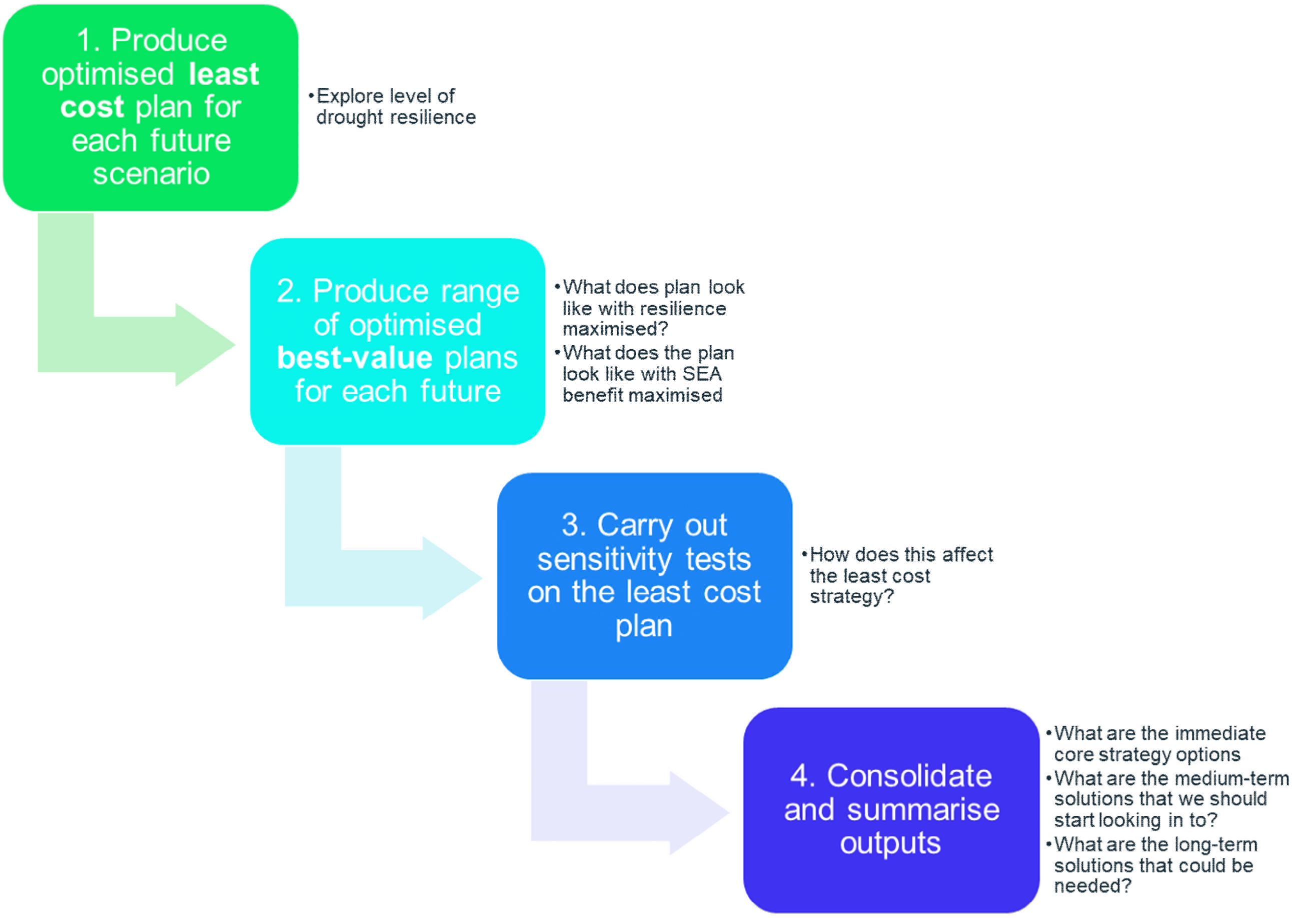


Figure 9-1 - The process of decision making

9.1 Least cost scenario planning

We have used an investment model developed by AtkinsRéalis based on the traditional Economics of Balancing Supply and Demand (EBSD) approach used widely by the water industry in the UK. This essentially uses a mixed integer linear programme to select the mix of options that will solve the supply demand balance for the least cost over the planning horizon. Hence the EBSD model needs to schedule the options to identify when each option is required to meet forecast deficits for the least cost. In other words, the objective function is set to minimise the total net present value cost, and the constraint is to satisfy forecast deficits.

9.1.1 Defining our level of service

We are committed to providing a high standard of reliable service to our customers. For this plan we have significantly extended our methods and approaches in terms of data analysis and modelling to try to improve our system resilience. This has included the use of stochastic weather data which has allowed us to explore a much wider range of drought return periods than we have seen in the historical record (see Section 4.2).

The current best practice (described in the Water Resources Planning Guidelines for England and Wales) is for water companies to aim to reach a ‘1 in 500 year’ level of water supply system resilience by 2039 (where failure is defined as an event causing the need to implement emergency drought orders).

For our previous plan we worked to a worst historic event (the 1991/92 drought) and this was estimated to be in the region of a 1 in 191 year event[11]. In order to maintain our objectives of providing a high standard of service and long-term resilience, we are setting ourselves the goal of meeting a 1 in 500-year level of service by 2035 across all of the future scenarios. This is demonstrated in the outputs described in Section 10 below.

9.2 Best value planning

The latest best practice guidelines for decision-making in WRDMPs (used by water companies in England and Wales) require companies to develop a ‘best-value’ plan rather than simply the least cost plan[12]. The planning guidelines state that a best value plan “considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society”.

Delivering an effective best-value plan therefore requires careful selection and formulation of the objectives and metrics against which *value* can be measured. Figure 9-2 illustrates the framework used to develop a set of meaningful metrics for this plan. The high-level objectives have been taken from our five key business strategy pillars and the range of value criteria and metrics were formulated to map to these pillars (see Figure 9-3). This shows that alongside cost and the constraint to satisfy the supply demand balance we have developed metrics to denote Resilience benefits as well as Environmental and Social benefits.

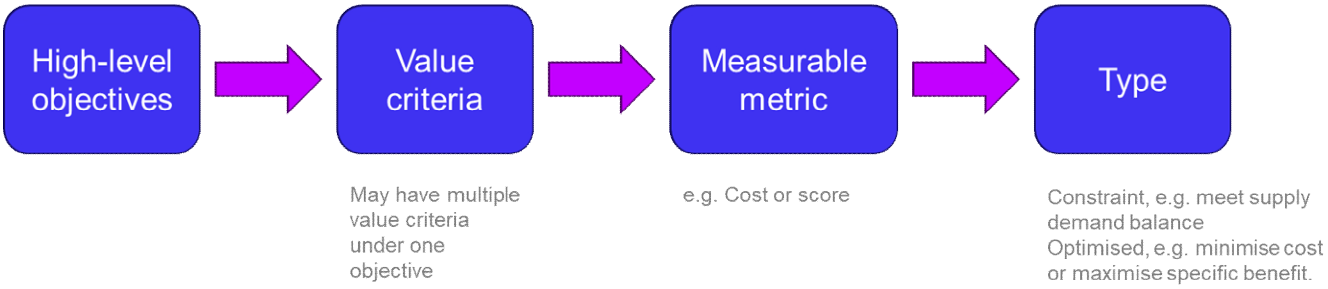


Figure 9-2 - Framework for developing metrics for best value planning

[11] Appendix C. Water Source Yield Assessment, WRDMP21, Jersey Water
[12] Water Resource Planning Guidelines, April 2023

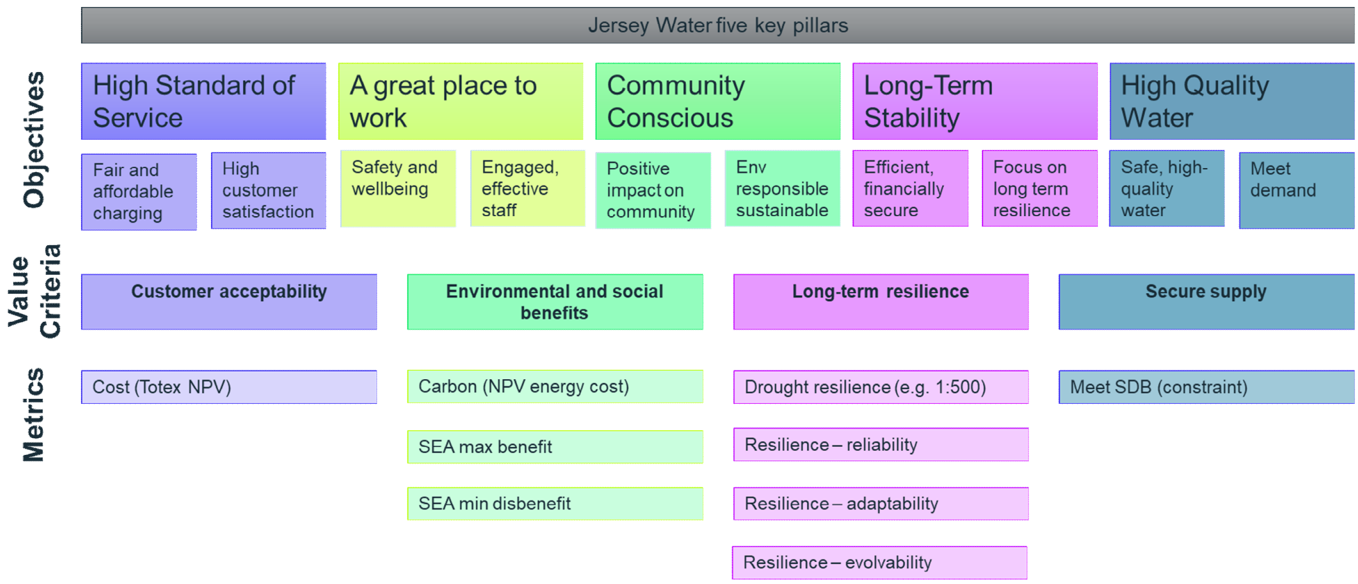


Figure 9-3 - Value criteria and metrics aligned to Jersey Water's strategic objectives

9.2.1 Measuring resilience

One aspect of our resilience is our drought resilience which we have determined and addressed as part of the level of service and planning scenarios within the investment model. In addition to this we have developed a set of sub-metrics that fall under one of three resilience metrics – Reliability, Adaptability and Evolvability. These have been formulated to test our plan and mix of selected options for resilience to future shocks and stresses, both foreseen and unforeseen. Further detail on each of the sub-metrics and how they were calculated is given in Section 2 of Appendix H.

9.2.2 Measuring Environmental and Social benefits

Although we are not required to comply with the Strategic Environmental Assessment (SEA) legislation that covers England and Wales, we seek to maintain a strong environmental and social performance and have carried out an SEA of the feasible options identified during Options Appraisal. The SEA considers numerous environmental and social factors and provides a residual impact assessment (either significant or insignificant) in terms of the residual positive and residual negative impacts for each option associated with construction and operation.

Impacts are intended to be considered individually in terms of the value and significance of each factor. However, in practice a pragmatic approach to allow these assessments to contribute towards the modelled decision-making approaches involves converting the impacts to numerical scores and combining. Appendix H details how we have done this.

9.2.3 Best-value optimisation

To determine the best value plan, we have used a multi-stage approach as follows:

- A traditional least cost plan is produced for each future scenario
- The modelling optimisation objective is then changed from minimising cost to maximising benefit, defined either as maximising the resilience score or the SEA score.
- To achieve a balance between the cost and benefit objectives, a cost constraint is put on the “maximising benefit” runs to remain within either 10% or 20% of the least cost strategy.

9.3 Sensitivity testing

To ensure a robust final plan we have identified and tested the plan to specific policies, stresses and uncertainties that are relevant to our decision making. Table 9-1 details the sensitivities, or 'what-if' sensitivity tests, that have been carried out.

Table 9-1 – Summary of sensitivity tests

Sensitivity Description	Rationale
Alternative PFAS regulation situations. PFAS treatment enhancement (S-B2) brought in by 2030 in all futures.	Level of PFAS regulation is a key short-term uncertainty for our plan. This tests the impact on our estimated costs and strategy under alternative higher regulation outcomes.
La Rosière desalination extension not available	The La Rosière desalination extension option is a core part of our preferred strategy. This sensitivity tests the impact on our plan if this is not available for whatever reason.
Bellozanne reuse not available	Understand how sensitive the preferred plan is to changes in Bellozanne reuse availability and/or cost.
Bellozanne reuse is 10% more expensive	
Bellozanne reuse is 10% cheaper	
Both La Rosière desalination extension and Bellozanne reuse options are not available	To inform what the best alternative large resources would need to be
Force in Trinity reservoir	This option has other benefits aside from purely a water resource benefit and this test seeks to understand the impact on our preferred plan if the option was progressed due to other drivers outside the WRDMP.
Explore plan sensitivity to cost of Trinity reservoir (e.g. 10% to 60% cheaper)	
Impact of no Grands Vaux or Vallee de Vaux on the strategy	If a possible flood attenuation scheme were to go ahead at this location, then the water resource benefit from Grands Vaux and Vallee de Vaux would be lost. This tests the impact this could have on our system, and our strategy.
Impact of meeting a low per capita consumption (PCC) of water target (of 110 litres/person) by 2035	We already have comparatively low PCC levels on Jersey compared to the UK as a whole, and this tests the potential benefit to our strategy on seeking to achieve further ambitious PCC reductions to the current level of water consumption.
Include draft values for La Gigoulande Quarry	This option was originally screened out during the options appraisal process (on the grounds of asset ownership uncertainty), however using draft savings and cost values this test seeks to understand if it could be part of the plan if it were available to us.

9.4 Selecting the preferred plan

To determine our preferred plan, we have reviewed the outputs from each of the five scenarios used in the least cost modelling and the maximised benefits best value planning runs to identify which options are selected and when. We have then split these portfolios of options into three time-based categories:

- **Immediate no regrets options** – these are implemented immediately and, in all (or most) futures, (i.e. they are options that should be implemented regardless of what the future looks like – they are least regrets options)
- **High chance short/medium term options** – these are options that are often selected in the short to medium term in the Mid-Range, Plausible Adverse and Reasonable Worst futures. We suggest that where necessary further investigations are started to facilitate timely implementation of these options if required in future.
- **Potential long-term solutions** – these are options which are only selected towards the end of the plan and only in the two most adverse futures, and hence there should be sufficient time to implement them in future should they be required.

10. Programme appraisal

We have carried out extensive investment modelling and testing to develop a best-value and adaptive strategy that is robust and resilient to future uncertainties. The details of the programme appraisal analysis are described and presented in detail in Appendix I.

We have looked at a range of different planning conditions – which represent different levels of resilience to drought events, from a normal year (1 in 2-years) to extreme drought of 1 in 500-years return period. We have also tested our plan under a range of plausible future scenarios. These concepts are both discussed in detail Section 7.1. Our futures scenarios are characterised as follows:

- **Very Benign** – this represents a very low population growth future (<= nil migration) and low climate change impacts
- **Benign** – this represents a future with low population (limited net migration) and low to medium climate change impacts
- **Mid-Range** – the mid-range future spans a range of possible combinations that could include high climate change impacts but low population growth, low climate change impacts but high population growth or medium population and climate change impacts
- **Plausible Adverse** – this represents a future with likely high population growth (>= +325 net migration) and medium to high climate change
- **Reasonable Worst** – this represents a future with high population growth (>= +700 net migration) and high climate change impacts

Together the Plausible Adverse and Reasonable Worst futures are sometimes referred to as the “more adverse futures” in subsequent sections of this document.

10.1 Outcomes of least cost modelling

Figure 10-1 summarises our least cost plan in terms of the options that are selected in all futures and should be started immediately as well as the schemes that are dependent on the future scenario. This shows that our core least regrets options include the La Rosière desalination extension and our base leakage reduction strategy. The two schemes are sufficient in the Very Benign and Benign futures, however in all other futures additional options are required to maintain our supply.

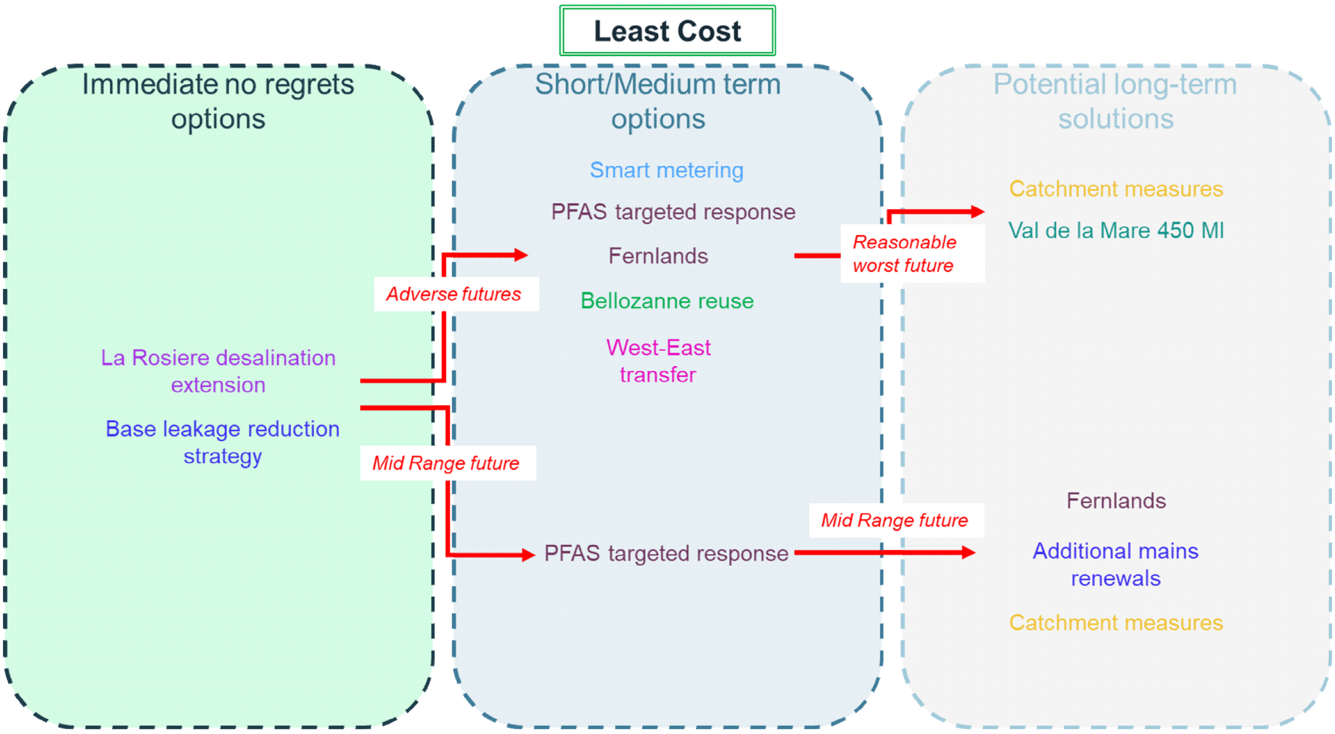


Figure 10-1 – Least cost strategy across scenario futures

10.1.1 Our level of service

Figure 10-2 shows our initial supply demand balance across each of the five future scenarios in a 1 in 100 (orange), 1 in 200 (pink) and 1 in 500 (red) type of drought event. This shows that in all futures and planning conditions we begin our plan with a risk of deficit. All options take time to implement before they can realise a benefit, therefore we have accepted a risk of deficit across these planning conditions and scenarios up until 2030.

To meet a 1 in 500 year level of drought resilience further time is required to fully resolve the potential deficit in all futures. We are committed to providing the highest level of service to our customers and a 1 in 500-year level of drought resilience is in line with the current UK Water Resources Planning Guidelines. However, to ensure we are also proposing a reasonable and affordable plan we carried out an additional run to assess the least cost plan to meet a 1 in 200-year level of service as the highest level of drought rather than the 1 in 500. This indicated that in the Mid Range or Benign futures there is little impact on the overall plan or cost. In the Plausible Adverse and Reasonable Worst futures, where a second large scheme is required in our base least cost strategy, the second large scale scheme is still required to meet a 1 in 200 year level of service but some savings can be achieved through delaying the need for implementation. Given these findings we are committed to aiming for the best level of service we can and aligning with best practice by targeting a 1 in 500 year level of service by 2035.

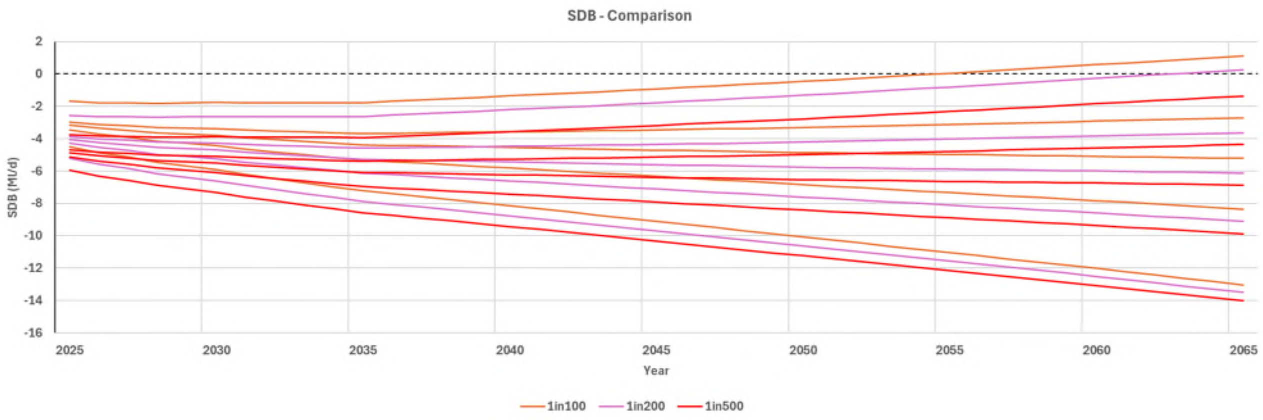


Figure 10-2 – Projected SDB across all 5 future scenarios for the 1 in 100 (orange), 1 in 200 (pink) and 1 in 500 (red) planning conditions.

10.2 Conclusions of best-value planning

A best-value plan should represent options that will increase the overall benefit to customers, the wider environment and society. While this should include consideration of cost it is not the only objective. We have carried out several investment model optimisations to explore what best-value looks like for our plan. To do this we have set the optimisation objective function to maximise benefits rather than minimise costs but applied a cost constraint on the total expected Net Present Cost (NPC) (across all futures) to constrain the strategy to within 10% or 20% of the total expected least cost NPC. As the resilience and SEA metrics are in different scales, we have carried out separate optimisations to explore the differing impacts of maximising resilience and maximising the environmental and social aims.

10.2.1 Maximising resilience

Figure 10-3 summarises the optimised strategy when seeking to maximise resilience within a percentage of the total expected least cost. This shows results are largely consistent with the least cost strategy, although with some changes specifically as relates to our immediate least regrets actions. Under the maximised resilience plan this includes bringing our PFAS response into the core least regrets actions as well as the Fernlands abstraction scheme. The decision on PFAS (source specific treatment) depends on the regulatory review of PFAS concentrations and the results of a desalination blending study.

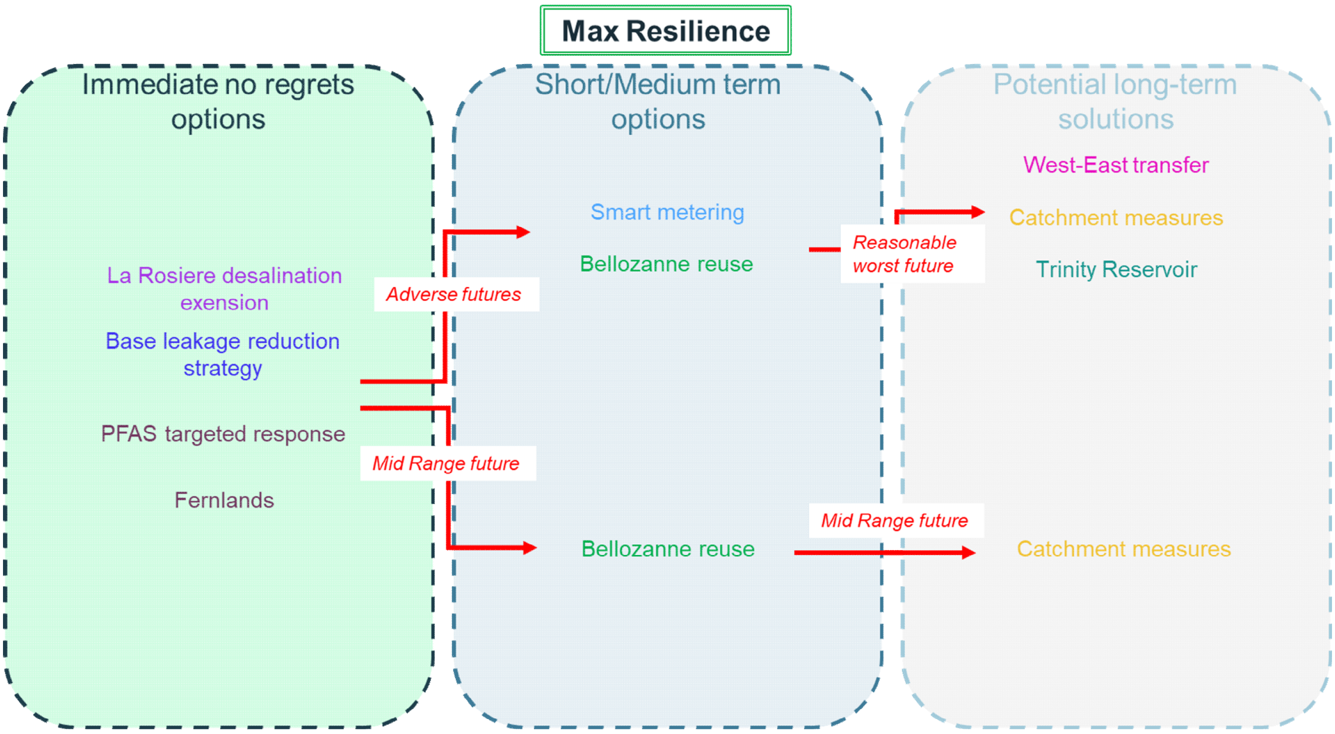


Figure 10-3 – Maximised resilience strategy across scenario futures

10.2.2 Maximising SEA benefits

Figure 10-4 summarises the optimised strategy when seeking to maximise the SEA benefit within a percentage of the total expected least cost. Again this shows results that are largely consistent with the least cost plan, but with the addition of continuing our ongoing catchment measures and proceeding with the smart metering trials and roll-out within the set of core least-regrets options.

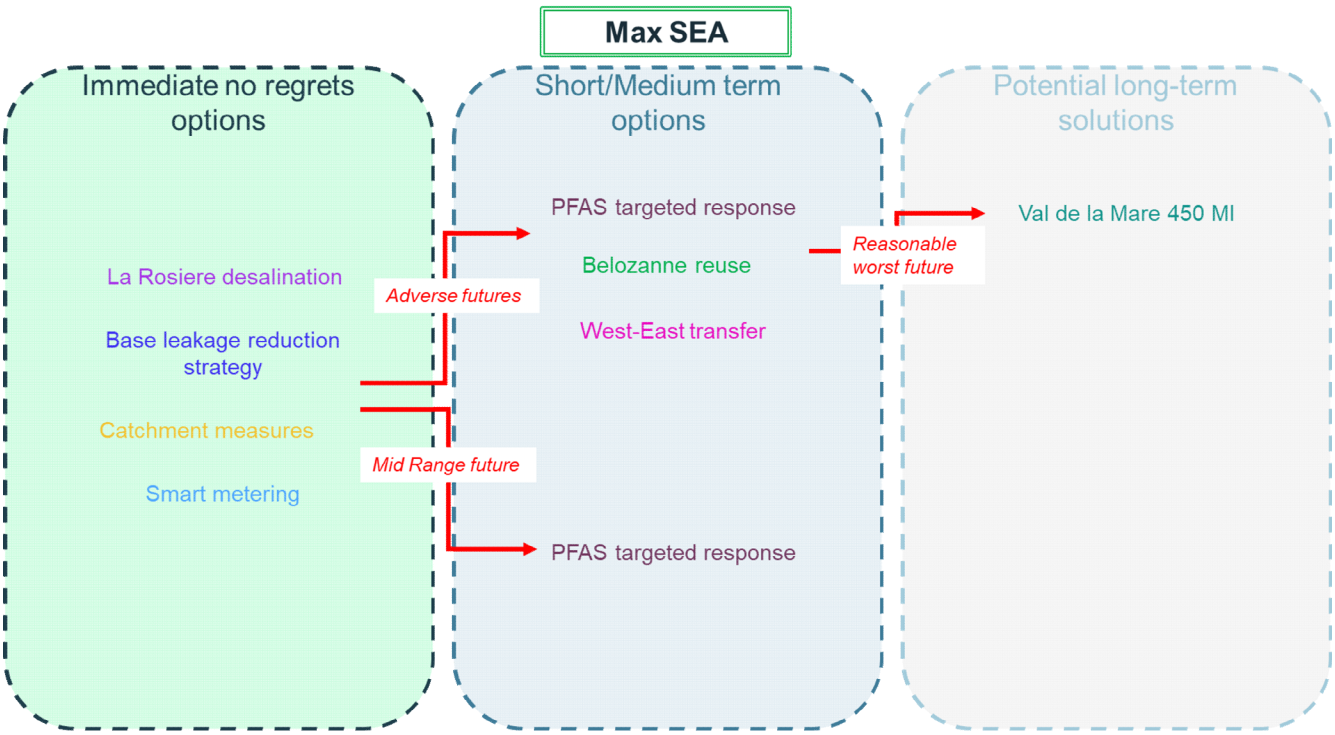


Figure 10-4 – Maximised SEA strategy across scenario futures

10.3 Our preferred plan

Across all runs and in all futures the core no regrets options include our base leakage reduction strategy and the La Rosière desalination plant. There is a significant increase in the estimated cost of our plan if the desalination plant is not available, highlighting the importance of this scheme.

The best-value runs that maximise resilience and environmental objectives are largely consistent with the least cost outputs but suggest a couple of key points:

- The Pont Marquet borehole scheme and Fernlands are cost-efficient ways of adding resilience in all futures.
- Smart metering and catchment measures have environmental and social benefits in all futures.

Based on these findings, we propose that our core short-term strategy includes:

- Base leakage reduction strategy (schedule of activities from start of plan)
- La Rosière desalination plant extension to be effective from 2030
- Continuation and enhancement of ongoing catchment measures (driven by environmental and social objectives)
- Roll-out of smart metering (driven by environmental and social objectives). We are currently undertaking a pilot study in this area and therefore will confirm the effectiveness, scale and speed of potential roll-out depending on the findings of this study.
- Implementation of the Fernlands stream abstraction scheme (driven by resilience objectives)
- A PFAS targeted solution by 2030, exact solution dependent on resolving uncertainty around PFAS regulation. This will improve overall resilience as well as responding to the outstanding uncertainty over the level of PFAS regulation we will be held to.

As part of this we have accepted that there may be a risk of deficits in an extreme 1 in 500-year type event for the first 10 years (up to 2035) and a severe 1 in 100 type of drought event for the first 5 years (up to 2030).

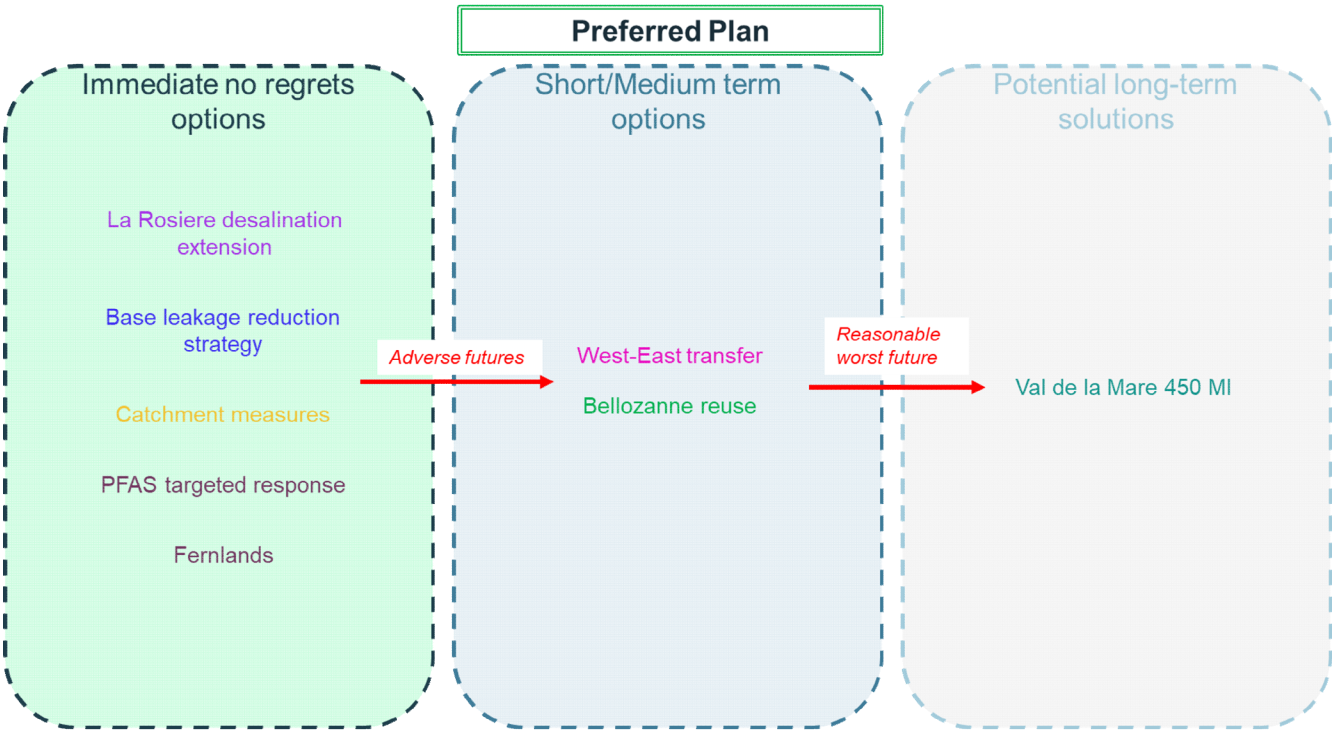


Figure 10-5 – Summary of components of preferred plan

10.3.1 Leakage reduction strategy

Our base leakage reduction strategy forms part of our immediate least regrets options within our preferred plan. This comprises a set of leakage reduction activities aimed at reducing the risk of a rise in leakage (due to deterioration of the network without further interventions). Estimating leakage levels and savings from leakage reduction activities involves a high level of uncertainty and our planned set of activities balances minimising the risk of a rise in leakage with an achievable set of options at an acceptable cost. Figure 10-6 illustrates the cumulative estimated impact of our leakage reduction activities.

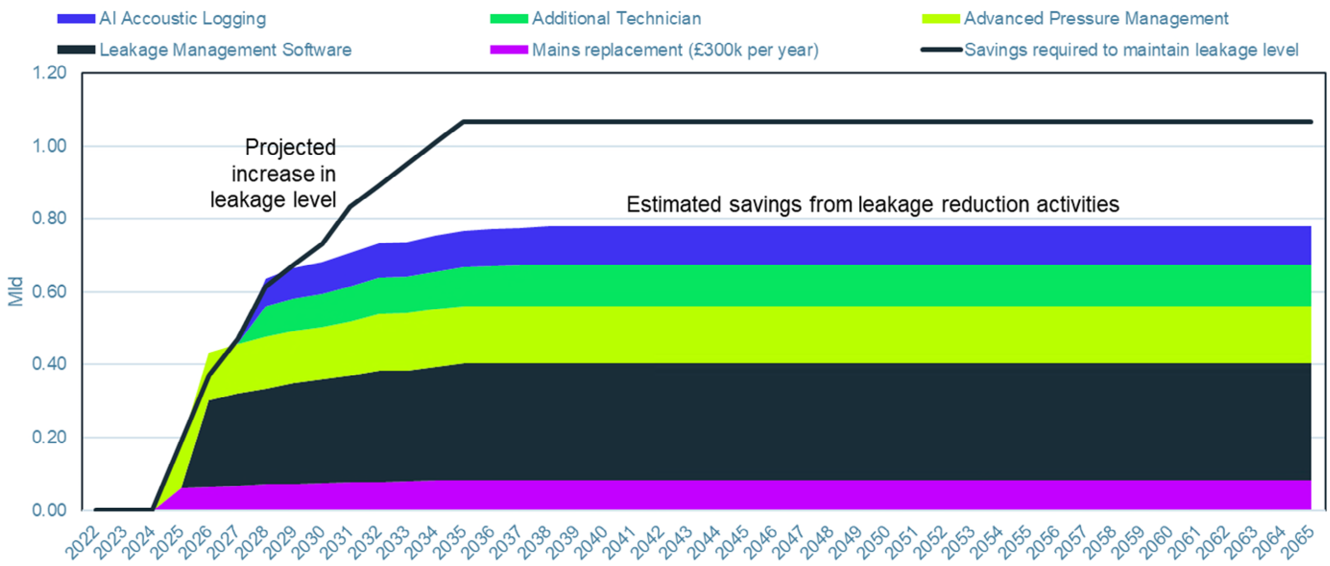


Figure 10-6 – Illustration of base leakage reduction strategy aimed at minimising the risk of leakage increase.

10.4 Sensitivity testing

These sensitivities have been applied to the least cost strategy to understand the impact on, and to test the robustness of, our strategy. Table 10-1 summarises the findings of sensitivity testing. More detail is given on each of these sensitivity tests in Appendix I.

Table 10-1 – Headline findings from sensitivity tests

Sensitivity Description	Headline impact on least cost strategy
Alternative PFAS regulation situations. PFAS treatment enhancement (S-B2) brought in by 2030 in all futures.	In Mid-Range and Adverse futures Fernlands implemented earlier as well as PFAS treatment. No change to Benign futures except a slightly increased surplus. Main impact is on estimated total NPC which is up to £25m higher under strictest PFAS regulation scenario where additional treatment is required at both of our treatment works.
La Rosière desalination extension not available	An alternative large resource is needed in all futures immediately (Bellozanne water reuse). Additional resource is also required from additional mains renewals and the reservoir options, although unable to resolve the risk of deficit in the 1 in 500 in the Reasonable Worst future.
Bellozanne reuse not available	The two more adverse futures require additional resource from a new reservoir scheme or expansion of Val de la Mare reservoir but there remains an unresolved risk of deficit in the 1 in 500 in the Reasonable Worst future.
Bellozanne reuse is 10% more expensive	No change.
Bellozanne reuse is 10% cheaper	In the Plausible Adverse future Bellozanne reuse is implemented immediately without deferring this by using other schemes (e.g. Pont Marquet, Fernlands, West-East transfer).
Both La Rosière desalination extension and Bellozanne reuse options are not available	Trinity and Val de la Mare 1200 Ml reservoirs implemented in all futures except the Very Benign. However, these are unable to fully resolve the risk of deficit in the Mid-Range to Reasonable Worst futures in a 1 in 500 type event and in both the more adverse futures in a 1 in 100 type event.
Force in Trinity reservoir	Defers need for Bellozanne water reuse in the Plausible Adverse future but water reuse is still required at the same time in the Reasonable Worst futures.
Explore plan sensitivity to cost of Trinity reservoir (e.g. 10% to 60% cheaper)	Trinity Reservoir only selected when costs reduced by >50% (against the variant where costs are already shared) and then only in Reasonable Worst future. Second large resource option (e.g. Bellozanne water reuse) is still selected.
Impact of no Grands Vaux or Vallee de Vaux on the strategy	No change to Very Benign future. Pont Marquet required in addition to desalination and leakage reduction in Benign future. In Mid-Range future West-East transfer, smart metering, additional mains renewals and Trinity Reservoir are implemented. In adverse futures water reuse implemented earlier and larger reservoir schemes required in Reasonable Worst future.

Sensitivity Description	Headline impact on least cost strategy
Impact of meeting a target of 110litres/person PCC level by 2035	This was tested on the Mid-Range future only. The core no regrets options were the only ones required (e.g. leakage reduction strategy and desalination).
Include draft values for La Gigoulande Quarry	Selected in place of Val de la Mare in Reasonable Worst future and selected to delay need for Bellozanne reuse in Plausible Adverse future.

10.5 Our adaptive strategy

An adaptive plan is a framework which allows you to consider multiple preferred programmes or options dependent on future uncertainties and outcomes. We have developed our scenario framework consisting of 5 plausible futures that will have differing impacts on the water resources situation in Jersey. Our preferred plan presented in Figure 10-5 is adaptive dependent on the future we end up in.

Figure 10-7 also illustrates our preferred adaptive strategy based on the conclusions of our least cost and best value planning, and from the sensitivity tests on our preferred plan. This shows that under this strategy our immediate actions are enough to provide a robust and resilient service in the Mid-Range and Benign futures. However, if we are in a more adverse future (Plausible Adverse or Reasonable Worst), then further options may be needed including a second large resource option such as the Bellozanne water reuse plant or a 2nd desalination scheme. The West-East transfer scheme may be utilised to slightly delay the need for this, however in a more adverse future delaying the decision on a second large resource may increase the risk of future deficits during a drought. This suggests the prudence of undertaking feasibility studies and investigations in the short term to reduce lead-in times for such a scheme if we are in a more adverse future.

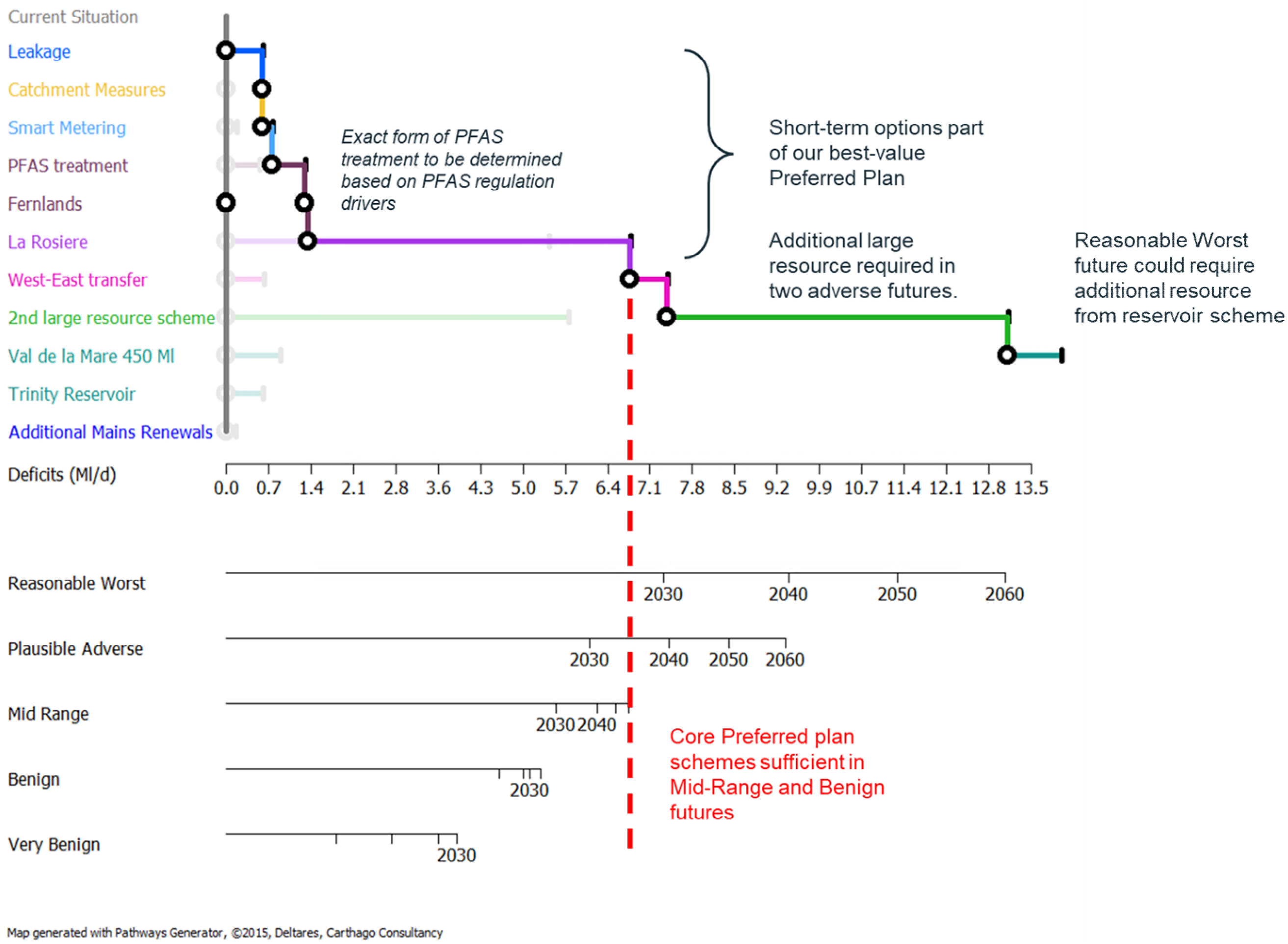


Figure 10-7 – Illustration of our adaptive preferred plan. This shows that our short-term core plan schemes are resilient to all but an Adverse future.

10.5.1 Monitoring the current situation

Another key element of producing an adaptive strategy is monitoring where we believe we are in the present to understand which future we are most likely to be on. The key elements of our scenario framework include population growth and climate change impacts. We therefore propose two key approaches which are outlined in greater detail in Appendix I.

Monitoring population growth

The population forecasts are developed and released by the Jersey Statistics Unit. These are updated roughly every 10 years which will provide an opportunity to assess the driving inputs to our demand forecast model. Additionally, we will compare our actual annual demand figures against the five demand forecasts to understand which scenario we are following most closely.

Monitoring climate change impacts

This is a much harder driver to track as it is difficult to disentangle climate change impacts from natural weather variability. We therefore propose to monitor two key variables:

- Trends in annual average temperatures
- Annual total precipitation – looking at the trend in dry years

11. Conclusions

Our WRDMP meets the forecasted water needs of the island community, our on-going commitment to customer service and protection of the environment. It is consistent with planning objectives, is adaptive and provides a “no regrets” approach to investment in new infrastructure:

- Resilient and future-proof: the plan addresses the supply-demand balance for the island over the planning period to deliver enhanced supply resilience. The mix of different supply options will also help to improve overall supply resilience in ‘normal’ years as well as in drought conditions. This plan will increase the resilience of our system, allowing us to improve our level of service to a 1 in 500-year drought event (in line with England and Wales best practice) by 2035.
- Twin-track approach: we are prioritising demand management in the short term to help address the existing supply deficit before increasing the capacity of water sources. We will continue to remain at the frontier of leakage control in the British Isles while further strengthening water efficiency performance wherever possible.
- Reliable: our Plan increases supply reliability and delivers a level of service for water use restrictions comparable with water companies in southern England which act as an appropriate benchmark for Jersey. Our level of service for implementing temporary water use restrictions approximates to once in every 20 years, with restrictions on a wider range of non-essential water use being required no greater than once in every 50 years.
- Adaptable: our Plan has been tested against a range of plausible futures and can be adapted to respond to the key uncertainties surrounding the demand forecast (population growth and economic growth assumptions) and climate change effects on water sources.
- Environmental: we have undertaken a Strategic Environmental Assessment (SEA) alongside our WRDMP and assessed the environmental impacts and benefits at each stage of the planning process to ensure our plan can be delivered with net environmental benefit.
- Acceptability: we plan to balance additional freshwater supplies with additional desalination, as well as delivering demand savings at the earliest opportunity. By maximising the use of existing facilities on the island and ensuring net environmental benefit from the delivery of the supply-demand solutions, our plan should command broad acceptability. We have engaged with key stakeholders through our planning process and will continue to do so in the delivery of our plan.
- Financing and affordability: our plan will be affordable for our customers, subject to securing efficient financing. We will continue to develop the longer-term investment needs as part of our Resilience Framework and Capital Programme planning dependent on the further development of solutions identified in later phases of the plan.
- Risk management: we have produced an adaptive plan with a "no regrets" approach to infrastructure investment to ensure our plan adheres to risk management approaches. We will be regularly reassessing any significant changes that could affect the WRDMP to ensure effective risk management.
- Future proofing: our plan helps future-proof water supply resilience beyond the 2065 planning horizon, notably with the development of multiple large additional supply options. This will help address the likelihood that the supply deficit will worsen beyond 2065 due to increasing effects of climate change and potential further growth in the Jersey population.

We look forward to working with our customers, Government of Jersey and other stakeholders to deliver this Plan and secure reliable water supplies for Jersey over the next 40 years and beyond.

12. Technical appendices

The following technical appendices have been produced to provide greater detail and explanation of the analysis carried out in support of the development of the WRDMP. These are published as separate documents.

Appendix A. Problem Characterisation

Appendix B. Climate Change Assessment

Appendix C. Stochastic Data

Appendix D. Supply Forecast

Appendix E. Demand Forecast

Appendix F. Headroom uncertainty

Appendix G. Options Appraisal

Appendix H. Decision-Making Approach

Appendix I. Programme Appraisal

Appendix J. Strategic Environmental Assessment