Department of Planning and Environment

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Guidance on strategic planning outcome - Understanding service needs

Regulatory and assurance framework for local water utilities

November 2022

Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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Contents

1 Introduction

Local water utilities can best meet the needs of their customers, and manage key risks, when their decisions and activities are based on effective, evidence-based strategic planning.

The NSW Department of Planning and Environment is committed that all local water utilities should have in place effective, evidence-based strategic planning. This will ensure utilities deliver safe, secure, accessible, and affordable water supply and sewerage services to customers. It will also ensure they can manage keys risks now and into the future, and in the event of significant shocks. Local water utilities remain responsible for conducting strategic planning.

The department gives assurance of effective, evidence-based strategic planning. Local water utilities not making dividend payments[1] are encouraged, but not compelled, to use the department's assurance framework, experience and capacity to support effective strategic planning.

Through the department's assurance role under section 3 of the Regulatory and assurance framework for local water utilities (PDF, 1613.11 KB) - Regulatory and Assurance Framework - we establish what outcomes we expect effective, evidence-based strategic planning to achieve (see section 3.2 of the Regulatory and Assurance Framework) and assess if a utility's strategic planning achieves these outcomes to a reasonable standard (see sections 3.3 and 3.4 of the Regulatory and Assurance Framework).

We give separate, optional guidance in the department's guidance Using the Integrated Planning and Reporting framework for local water utility strategic planning (PDF, 573.33 KB) to explain how utilities can achieve the strategic planning outcomes to a reasonable standard using the *Integrated Planning and Reporting Framework* for councils under the *Local Government Act 1993*.

1.1 Purpose of this document

This document supplements the Regulatory and Assurance Framework and gives guidance on achieving the outcome of understanding service needs to a reasonable standard.

This guidance is consistent with the objectives and principles established under the Regulatory and Assurance Framework, including being outcomes focused and risk-based.

This document sets out good practice for **all local water utilities** to apply when doing strategic planning to achieve the outcome of understanding service needs.

[1] Sections 3 and 4 of the Regulatory and Assurance Framework, are also the Guidelines for council dividend payments for water supply or sewerage services, under section 409(6) of the *Local Government Act 1993.* Before taking a dividend payment from a surplus of the council's water supply and/or sewerage business, a council must have in place effective, evidence-based strategic planning in accordance with section 3 of the Regulatory and Assurance Framework.

1.2 Structure of this document

This guidance is structured providing:

- the expectations for achieving this outcome to a reasonable standard
- an appendix with optional 'how to' guidance that helps utilities achieve assurance expectations
- an appendix providing templates, case studies and tools useful for utilities to achieve assurance expectations.

1.3 Review of this guidance

As part of our commitment to continuous improvement, we will review the performance of the Regulatory and Assurance Framework within 2 years from finalisation. There will also be periodic reviews of the full suite of relevant regulatory and assurance documents, which will happen at least every 5 years.

We welcome feedback on this guidance and will update it when needed based on feedback or a 'lessons learned' review following our assessment of strategic planning by local water utilities.

2 Oversight of local water utility strategic planning

Under section 3 of the Regulatory and assurance framework for local water utilities (PDF, 1613.11 KB), the department establishes what outcomes it expects effective, evidence-based strategic planning to achieve (see section 3.2) and assesses whether a local water utility's strategic planning achieves these outcomes to a reasonable standard (see sections 3.3 and 3.4).

Councils making a dividend payment from a surplus of their water and/or sewerage business must meet the expectations set out in section 3 and section 4 of the Regulatory and Assurance Framework.[2] Local water utilities not making dividend payments are encouraged, but not compelled, to utilise the department's assurance framework, experience and capacity to support effective strategic planning.

For effective, evidence-based strategic planning to occur, the department expects strategic planning to achieve the following outcomes to a reasonable standard:

- Understanding service needs **(this guidance)**
- Understanding water security
- Understanding water quality
- Understanding environmental impacts
- Understanding system capacity, capability and efficiency
- Understanding other key risks and challenges
- Understanding solutions to deliver services
- Understanding resourcing needs
- Understanding revenue sources
- Make and implement sound strategic decisions
- Implement sound pricing and prudent financial management
- Promote integrated water cycle management

A **reasonable standard** is met if the utility considers and addresses an outcome in a way that is:

- **sufficient:** underpinned by evidence-based analysis that supports the conclusions reached
- **appropriate:** underpinned by relevant departmental guidance and industry standard approaches to conduct planning and reach conclusions
- **robust:** underpinned by evidence that draws on appropriate sources and recognises and rebuts potential alternative interpretations.

[2] Sections 3 and 4 of the Regulatory and Assurance Framework, are also the Guidelines for council dividend payments for water supply or sewerage services, under section 409(6) of the *Local Government Act 1993.* Before taking a dividend payment from a surplus of the council's water supply and/or sewerage business, a council must have in place effective, evidence-based strategic planning in accordance with section 3 of the Regulatory and Assurance Framework.

The assessment considerations the department will apply and how these may be addressed are set out in more detail in the Regulatory and Assurance Framework.

3 Guidance on understanding service needs

Under section 3.2 of the Regulatory and Assurance Framework, the department expects utilities to achieve the strategic planning outcome **understanding service needs** to a reasonable standard. This includes considering:

- What are customers' needs, values, and preferences?
- What current and future demands are placed on water supply and sewerage systems?
- How will the local water utility consider and address objectives, priorities and evidence of other relevant state or regional strategic planning, including the NSW Water Strategy and regional water strategies?

3.1 Understanding service needs

Meeting service needs should be a key objective of a water utility. Service needs determine the requirements for operation, maintenance and capital works. This, in turn, drives key elements of strategic planning, including service levels, assets and workforce and financial (expenditure and revenue) planning.

In general, the department's expectations are that a local water utility understands its service needs, including:

- requirements and expectations of regulators, which often determine minimum service levels or outcomes
- needs, values and preferences of customers revealed through consultation with customers, which can determine service levels or outcomes where the regulatory framework allows discretion, for example where:
  - service levels or outcomes are not mandated by regulation

    or
  - customers are willing to pay for service levels/outcomes above minimum levels mandated by regulation
- demand for water and sewerage services in a changing and varying climate and evolving customer expectations, and how to analyse and forecast demand
- objectives and priorities of other relevant state or regional strategic planning, including the NSW Water Strategy and regional water strategies.

Understanding current and future demand placed on water supply and sewerage services by customers is fundamental to effective strategic planning.

A local water utility's understanding of demand (analysis and forecasting) should:

- be based on the utility's understanding of its customers' service needs (as set out in the guidance on the outcome of understanding service needs)
- be developed from a consistent set of assumptions around residential population and dwelling growth and non-residential growth that are consistent with those used across all forecasts of the demand for water and sewerage services and associated local government planning functions
- be at a spatial resolution to support the strategic analysis and planning being undertaken
- use a forecasting time frame that supports the strategic analysis and planning being undertaken
- apply consistent assumptions around the impacts of non-climate driven peaks in demand and load such as tourism or industry driven increases
- demonstrate consistency in terms of end use assumptions that link water demands and dry weather sewer loads
- share a common basis with that used by the relevant local government authority's land planning and environment teams in a local water utility's service area
- be subject to periodic review, typically every 5 years, depending on the likelihood of changes in circumstances and/or drivers.

In the following sections we set out **what** the department's expectations are for **understanding service needs** to a reasonable standard. In Appendix A and Appendix B, we provide optional guidance and case-studies and tools on **how** some of these expectations could be met.

3.2 What are customers' needs, values and preferences?

Understanding customers' needs, values and preferences is key to understanding service needs for effective the strategic planning. A utility's understanding of service needs, and how they are driven by customers' needs, value and preference, should reflect that:

- there are certain non-discretionary service levels and outcomes that should be met by water utilities, such as complying with minimum water quality and environmental requirements
- beyond regulatory requirements, service levels and outcomes should be determined by an understanding of customers' needs, values and preference, considering their ability and willingness to pay for services.

A local water utility should understand, and deliver its services consistent with, the requirements and expectations of its regulators

To meet the needs of customers and the community, a utility should have sound understanding of, and deliver its services consistent with, the requirements and expectations of its regulators as reflected in legislation, regulation, regulatory instruments (such as licences) and guidance material.

This includes (but is not limited to) regulatory requirements covering:

- water quality standards – as determined by NSW Health

- environmental standards (including in relation wastewater discharges to the environment) – as determined in environmental legislation/regulation and by the NSW Environment Protection Authority (EPA)
- any expected service levels or standards specified by the department or other regulators, for example about:
  - water security (for example, in relation to the expected frequency, duration and severity of water restrictions)
  - supply failures or interruptions
  - response times to supply failures/system faults
  - water pressure
  - customer complaints and inquiries
  - services to special customers, such as those with critical health needs
  - impact of sewage treatment works on surrounding residents
  - effluent and biosolids management.

In addition, the department gives guidance on other, related outcomes addressing services and service levels under the Regulatory and Assurance Framework, including:

- Understanding water security – how will the local water utility address current and future risks around continuity and reliability of access to water supply sources?
- Understanding water quality – how will the local water utility meet relevant regulatory standards, such as on drinking water quality management?
- Understanding environmental impacts – how will the local water utility meet relevant regulatory standards, such as licence requirements set by the environmental regulator?
- Understanding other key risks and challenges – how will the local water utility meet relevant regulatory standards (for example, such as on dam safety)?

A local water utility should understand the key characteristics of its customer base

A local water utility should have a sound understanding of the key characteristics of its customer base. This will help ensure that its customer engagement activities cover a representative sample and adequate cross-section of its customer base and allow it to accurately and comprehensively determine customer preferences, wants and needs. It will also allow the utility to understand its customers' capacity to pay for services.

A local water utility should have an ongoing understanding of its customers' needs, values and preferences

A utility should have systems and processes in place to allow it to understand its customers' needs, values and preferences.

The system should allow:

- customers to provide ongoing feedback, such as via:

  - a website and phone number advertised on bills
  - annual customer surveys
  - regular meetings with a customer advisory committee or other customer groups
- the collection, review and reporting of complaints and issues raised by customers over time.

A local water utility's service levels should be informed by a strong understanding of its customers' needs, values and preferences, including their willingness to pay for service levels and outcomes, obtained through periodic customer engagement

A utility should periodically conduct an extensive customer engagement process when reviewing and/or developing service levels and at least once every 4 years.[3]

Local council water utilities should be well placed to do this as the community strategic planning process under the Integrated Planning and Reporting (IP&R) framework requires significant community consultation, including commonly setting aspirational goals for water resources, water services and environmental management.

The purpose of this engagement is for the utility to understand the priorities of its customers, including the nature of services customers want and need. This will allow the utility to deliver the outcomes that matter most to its customers.

When undertaking its customer engagement, a utility should seek to understand what is important to its customers, while considering all key aspects of water and sewerage services, including:

- availability and reliability of services/supply
- response to system faults or supply interruptions
- water pressure
- customer complaints
- the needs of customers that are vulnerable or have special needs
- water quality (regulatory requirements must be met, but customers' may be willing to pay for the utility to achieve outcomes above and beyond those mandated by regulation)
- environmental performance/impact (regulatory requirements must be met, but customers' may be willing to pay for the utility to achieve outcomes above and beyond those mandated by regulation).

Utilities should also seek to understand their customers' preferences for service/cost trade-offs, including their customers' willingness to pay for various service levels where the regulatory framework allows discretion (such as where service levels are not mandated by regulatory requirements and/or where customers may be willing to pay to achieve service levels and outcomes above minimum standards). The guidance on the outcome of understanding revenue sources includes information and guidance about customers' willingness to pay.

[3] This is broadly consistent with previous guidance. For instance, the NSW Office of Water's *NSW Water and Sewerage Strategic Planning Guidelines*, 2011 (p 47), suggest a customer attitude survey at least once every 2 to 4 years. It is also consistent with timeframes in the IP&R process, for example to review Community Strategic Plans and Community Engagement Strategies about once every 4 years.

There is no one right way to undertake customer engagement. Water utilities are best placed to design and undertake engagement to suit their circumstances and those of their customers and there are numerous publicly available examples of how to do this.

A local water utility's customer engagement should start early and be broad and deep

Good customer engagement will generally start early and be broad and deep (see Figure 1). For example, in developing and reviewing service levels, utilities should:

- engage with customers early in the planning and decision-making process and continue to test proposals with customers throughout the process as options/proposals are further developed and refined
- be as open and broad as possible, at least in the early stages of consultation, to identify those aspects of the utility's services that are of most interest or concern to customers
- at least 'involve' and ideally 'collaborate' with customers, including establishing structures for ongoing engagement (such as customer advisory committees)[4] – this form engagement has been developed by the International Association for Public Participation (IAP2) and is explained further in Figure 2.

Form: deeper engagement →				
Inform	Consult	Involve	Collaborate	Empower
Timing: earlier engagement →				
Position formed	Position developing	Planning underway	Pre-planning	Ongoing
Content: broader engagement →				
Discrete projects or service standards	More service standards	Price and service trade-offs	Other elements of strategic planning	All services/ elements of strategic planning

Figure 1. Good engagement will be broad, deep and start early. Adapted from Essential Services Commission, Water Pricing Framework and Approach, Implementing PREMO from 2018, October 2016, p 17.

[4] This is consistent with advice previously provided to local councils as part of the Integrated Planning and Reporting (IP&R) process (for example, see: Premier & Cabinet Division of Local Government, Integrated Planning and Reporting Manual for Local Government in NSW, 2013, p 39).

Increasing customer impact on decisions

	Inform	Consult	Involve	Collaborate	Empower
Customer engagement goal	To provide customers with balanced and objective information to assist them in understanding the problem or objective, alternatives, opportunities and/or solutions	To obtain customer feedback on analysis, alternatives and/or decisions	To work directly with customers throughout the process to ensure that customer concerns and aspirations are consistently understood and considered	To partner with customers in each aspect of the decision including the development of alternatives and the identification of the preferred solution	To place final decision making in the hands of customers

Figure 2. IAP2's Spectrum of Public Participation. Source: IAP2 Spectrum of Public Participation (PDF 754 KB)

A local water utility's customer engagement should also be consistent with the following principles

In reviewing and developing service levels, a utility's customer engagement should be:

- **objective** and not biased towards a particular outcome.
- **representative** and use a good sample of customers potentially affected by decisions, including Aboriginal people and people experiencing vulnerability
- **proportionate** to the potential impact on service and/or price levels, not place an undue burden on participants and give priority to the matters that have a potentially significant impact on the services provided and prices charged by the utility
- **meaningful** and focused on areas where customers can have a real say – for example, there is likely to be little value in engaging on service standards mandated by legislation or regulatory instruments, although engagement could occur on the question of whether customers are willing to pay for receive service levels above those mandated by regulation
- **clearly communicated and accurate** – the utility should clearly explain to customers the purpose of the engagement, how the utility may use the results, relevant context and potential impacts on services and prices of options being considered (including potential price/service level trade-offs) and how the results of the customer engagement have informed the utilities' position.[5]

A local water utility should report on the process and outcomes of its customer engagement

A utility should report on the process and outcomes of its customer engagement to its customers. This report should be made available on the utility's website and brought to customers' attention (such as through a note or reference on customers' bills). The report should include a description and explanation of:

[5] These principles are sourced from: IPART, *Guidelines for Water Agency Pricing Submissions,* November 2020, pp 32-33; the Essential Services Commission (ESC), *2023 Water Price Review: Guidance Paper*, October 2021, p 20; and IAP2 Core Values

- the engagement process and how it was consistent with the above-mentioned approach and principles
- the matters covered by the engagement processes and the key issues raised by customers
- how feedback was considered by the utility in making its service and strategic planning decisions
- its response to any expectations that will not or cannot be met.

Good customer engagement does not necessarily mean a water business must simply adopt whatever their customers want. Rather, the engagement process is to inform good decision-making within the capabilities and constraints of the utility's operation. The water utilities should always be held accountable for their performance. Accordingly, where a utility proposes not to deliver outcomes consistent with the engagement findings, it should communicate the reasoning behind this to its customers.

3.3 What current and future demands are placed on water supply and sewerage systems?

A local water utility should analyse and forecast demand for services based on credible and consistent forecasts and assumptions on population and connected properties and sound knowledge of its customer characterisation and profile

Forecasts of population and connected residential and non-residential property are a core foundation for understanding service demand and informing effective, evidence-based strategic planning. The implications of a change in population and connected properties flow through to almost every aspect of water and sewerage strategic planning.

Customer characterisation and profiling should consider permanent and visitor populations and connected residential and non-residential properties. The number of customers and the types and spatial distribution of those customers, each with unique servicing needs, drives the requirements for services and infrastructure provision. Further detail is given in Section 3.2.

The utility's analysis and forecasts of current and future population, connected properties and customer characterisation should:

- use the Australian Bureau of Statistics (ABS) or council's rates database or other credible source or evidence-based approach for determining the historical permanent and visitor populations and dwelling type information for each water supply and sewer scheme
- use the NSW Department of Planning and Environment population projections[6] or another credible source or evidence-based approach
- align with the NSW Common Planning Assumptions unless evidence-based alternatives are available and are more relevant to the utility's area of operations

[6] https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections/Projections

- account for individual major developments or special activation projects that are anticipated to generate growth, including expected changes associated with customers that use significant water and those that discharge significant liquid trade waste
- exhibit a continuity between historical and future rates of growth or decline or articulate why the projections are not consistent with historic trends.
- account for the number and type of current customers in each customer category in each water supply and sewer scheme using rates databases or another credible source or evidence-based approach
- be at a spatial resolution and time scale to support the analysis and planning work being undertaken for the individual system/scheme
- be broadly categorised to support an understanding of the different need for services of different types of customers (including different residential lot sizes) and the impact of changes in the customer mix on both average and peak demands and flows and peaking factors
- provide differentiation between small-scale infill development and broad-hectare brownfield and greenfield development to both support infrastructure sizing and revenue calculations
- exhibit consistency with peak documents prepared by the relevant land use planning authorities
- where relevant, take account of trends in household size and dwelling type in the residential sector.

A local water utility should understand its current and future water demands and sewerage system loads, including taking account of key influencing factors on demands/loads and peak behaviour

There are various strategic needs for forecasts of future water supply and sewerage service demands. These include the need for analysis and forecasts of water demands, sewerage system loads and pollutant loads for current and future connected and non-connected properties in changing and varying climatic conditions, economic and regulatory environments and customer needs and expectations.

These forecasts play an important role in:

- understanding servicing and infrastructure needs – the provision and sizing of infrastructure and the setting of service standards – under peak and average period demands and flows
- environmental impacts and natural resource management – understanding water utility impacts in the local and regional environmental resource management context
- water security and drought management, including setting standards for levels of service for water security and understanding the impact of water restrictions
- water utility financing – forecasting revenue and revenue requirements and setting water services pricing structures to support sound pricing and prudent financial management.

Based on the analysis of current and future customers and their service needs, the utility should understand baseline and forecasts of water demands and sewerage system loads over the long term (such as for a period of 30-years) and at appropriate medium-term intervals (such as 5-years) and at spatial resolution appropriate for the specific strategic planning needs. This should include:

- unrestricted dry-year water demands for headworks planning and volumetric water access licencing
- average-year water demands for revenue requirements and pricing structure planning
- peak-day water demands and associated persistence patterns
- daily demand target for each level of water restriction
- average dry weather sewer flows
- peak dry weather sewer flows
- peak wet weather sewer flows based on the adopted performance standard
- annual effluent volume
- daily and annual pollutant loads in sewage.

Influences on water demand and sewerage system loads

The demands or loads of each system are unique and influenced by factors such as weather and climatic conditions, economic activity, annual events, socio-economic profile, end users and their operating practices, system efficiency and water pricing. It is important to understand these factors and their influence when establishing the baseline and forecast demands/loads.

Influencing factors should be analysed using a known period of available supply (also referred to as production) and consumption data to identify the significant demand-influencing factors at the scheme level and for each customer category and at appropriate spatial resolution.

Weather, climate and climate change

Across regional NSW, many operational aspects of water and sewerage systems are influenced by weather. This includes water demands, where hot and dry conditions increase demands and sewerage system flows and wet weather tends to increase flows. As the reference point for demands and flows is average conditions, it can be important to correct for weather influences (for example historical weather events such as drought or wet year events) when preparing forecasts or benchmarking performance from one year to the next.

When preparing forecasts of water demand, historical water consumption[7] per capita or per connected property should be adjusted for the impact of weather. The starting point for projections should be ‘climate-normalised’.

Climate normalisation of demand generally involves developing an analytical model that correlates the historic demand for water with population and connected property data, seasonal and major event influences and climatic factors such as temperature, rainfall and evaporation rates. The climate correlation model is then used to project future demand, factoring in account and population growth.

Changes in current and future climate relative to longer-term historical norms are predicted to be caused by anthropogenic emissions of greenhouse gases. These effects include increases in

[7] Water consumption is the volume of water consumed by a customer or group of customers as measured by customer meters

maximum temperatures, the intensity and frequency of rainfall events and rising sea levels, all of which can impact on the design and operation of water and sewerage systems.

While there remains significant uncertainty about the magnitude of the changes, particularly associated with precipitation, it is still reasonable to include climate change impacts in forecasts for future planning. Due to the uncertainty of the climate change impacts, approaches such as sensitivity testing are likely to aid in understanding the risks that climate change presents and can be used to inform a utility's strategic planning to manage those risks.

To account for future climate change, the utility should:

- assess the impact of future climate change on water demands in both the simulation of water security and in annual demand forecasts
- address the impacts of future climate change on peak period demands, where those forecasts inform decisions on infrastructure capacity and delivery
- consider the impacts of future climate change on sewerage system infiltration and inflow where those forecasts inform decisions on infrastructure capacity and delivery.

Peak demand/load behaviour

Significant parts of water supply and sewerage systems are designed to service customers on peak days or during sustained periods of high demand and flows. This is a challenge for 2 reasons: peak water demands are driven by prevailing hot and dry weather conditions that may not necessarily occur every year and average demand can vary significantly from year to year depending on the weather.

These issues can be managed by 'weather-normalising' the average demand and examining peaking behaviour over several years.

To establish the starting peak-day demand, significant anomalies in the daily supply data should be reviewed and rectified. Periods with high demand persistence should be selected to derive ratios such as peak day to average day or peak week/fortnight to assist in estimating the starting peak-day demand for the scheme and the associated unit demands.

Similarly, to establish the starting average dry weather sewer flows for a scheme, significant anomalies in the daily data should be reviewed and rectified (including any inflow and infiltration influence) to help estimate the starting average dry weather flows for each scheme and the associated unit demands.

Sewerage system capacities and design are driven by peak wet weather flows. Both water and sewerage demands can also be influenced by fluctuations in the service population driven by holiday periods or events.

In both water reticulation and sewerage systems, peak demands and flows are also driven by diurnal variations and instantaneous flows. These can be different during winter and summer periods.

When analysing peak demand/load, the utility should consider:

- assessing how weather, holiday periods and special events drive peaking behaviour
- weather-normalising the average demand when calculating the peak day or peak period to average water demand ratio

- taking account of factors such as changing lots sizes and dwelling types in forecasts of peaking behaviour where their impact is likely to be significant
- basing diurnal demand and flow variations on observed data – where this data is not available or not reliable, use publicised industry knowledge including the available curves in proprietary water reticulation and sewerage system modelling packages
- accounting for firefighting needs and requirements from the water supply system for the properties within the nominated serviced areas.

Non-revenue water

Non-revenue water[8] in water supply systems is an important part of the overall water balance. It is useful to forecast this separately, particularly when there are plans and programs in place to reduce the level of non-revenue water during the forecasting period. Non-revenue water also presents a major source of inefficiency as it is water that is produced by a water utility that does not result in revenue.

The utility should quantify and forecast non-revenue water as a separate item when preparing water demand forecasts, with a separate forecast for each water system.

The level of non-revenue water is typically expressed as a percentage of total bulk production. This metric is not as useful as a benchmarking tool as it may first appear because of the significant differences in both the level of water consumption and the length of water mains required to deliver water to customers.

A more useful metric is the infrastructure leakage index (ILI), which is the ratio of current annual real losses to unavoidable annual real losses calculated using standard water balance approaches.[9] An ILI of greater than 1.0 suggests that additional resources should be committed to reducing water system losses, although many water utilities are able to achieve ILI's significantly lower than 1.0.

Where the analysis of options or experience in other jurisdictions indicate that non-revenue water reduction measures will be cost-effective and save significant volumes of water, this work should be planned and implemented. This will be particularly beneficial if there is any planned supply-side capital investment where non-revenue water reduction options could delay or remove the need for that investment.

Unit demands/loads

Unit demands or loads for water and sewerage systems are used to assess existing capacity and plan for future capacity. These demands or loads can be the volumes of water consumed or the volumes of sewage generated, but also include the pollutant loads placed on sewage treatment systems.

Forecasts of unit demands or loads should:

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[8] Non-revenue water is the volume of water that is produced by a water utility and fed into water distribution and reticulation systems for consumption by customers but is not recorded as consumption by customers for the purpose of collecting revenue. The primary contributor to non-revenue water is leakage (real losses). Non-revenue water can be grouped into real losses, apparent losses and unbilled authorised consumption in line with the International Water Association water balance framework (IWA framework).

[9] See Water Services Association of Australia, (2001), Benchmarking of Water Losses in Australia; Lambert, A., & Hirner, W. (2000), Losses from Water Supply Systems: Standard Terminology and Recommended Performance Measures; Alegre, H., Hirner, W., Baptista, J., & Parena, R, (2000), Performance Indicators for Water Supply Services. IWA Manual of Best Practice

- be set on a common basis such as per capita, per connected residential property or per connected residential assessment
- be analysed separately for each water supply and sewerage system
- take account of trends over a period (preferably at least 5 years) and should not be based on short time spans such as one or 2 years
- in the case of sewerage system pollutant loads, take account of changes in industry mix and trade waste discharges, including from major dischargers
- in the case of water demands, use climate-normalised data
- consider known future impacts such as changes in the water efficiency of fixtures and appliances on water demands and sewerage system loads
- use estimates of peak to average flows based on similar or adjacent catchment information where a calibrated sewerage hydrological inflow model is not being used.

The common basis typically used in planning systems and pricing structure is to convert all customers to an equivalent connected residential property.

Two terms that are typically used are:

- equivalent tenement (ET), which represents the water demand or sewage flow placed on a system by a non-residential or attached residential dwelling customer expressed as the equivalent of a typical unattached residential dwelling[10]
- equivalent population (EP), which represents the pollutant load placed on a sewerage system by a non-residential customer as the equivalent of some multiple of persons living in a typical residential dwelling.

For water supply system design, the traditional practice was to use a series of pre-set factors to convert development characteristics such as the number of customers, students or floor areas into ETs or EPs.[11] This approach is recommended when existing consumption records or benchmarks from similar developments are not available.

For water supply and sewerage systems developer charge calculation, utilities need to estimate the existing and projected number of ETs when calculating developer charges.

Volumes for equivalent tenements should be set based on the following:

- For water supply system planning, the volume per ET should be set based on estimated end uses of water per capita multiplied by the household size.
- For sewerage system planning, the volume per EP should be estimated as the average dry weather flow based on residential end uses of water per capita that result in sewage discharge.
- For water supply developer charge calculation, the number of ET's should be estimated based on the annual metered consumption divided by the metered consumption per connected property of an unattached single residential dwelling.

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[10] Loads from non-residential customers and residential attached dwellings are typically converted to ETs.

[11] Public Works Department. N.S.W. (1986). Water Supply Investigation Manual; Water Services Association of Australia (2022), WSA 02-2014 Gravity Sewerage Code of Australia Version 3.2; Water Services Association of Australia (2022b), WSA 03-2011 Water Supply Code of Australia Version 3.2.

- For sewerage developer charge calculation, estimate the number of ETs based on the annual metered average dry weather flow into the sewage treatment works divided by the product of the estimated sewage discharged by one EP and the utility's occupancy ratio.

Water conservation and water demand management opportunities

Water conservation or water demand management can make a significant contribution to future water security. Indeed, a permanent reduction in water demand has the same effect as an increase in supply.

The decision to invest in water conservation should be made considering the financial costs against the financial, environmental and social benefits. Water demand forecasts should routinely include demand reductions associated with demand management where it demonstrates financial, environmental and social benefits.

Where the analysis of options or experience in other jurisdictions indicate that water demand management will be cost effective and save significant volumes of water, this work should be planned and implemented. This will be particularly true if there is any planned supply-side capital investment where demand management options could delay or remove the need for that investment. Further guidance on identifying and assessing options is given in the guidance on the outcome of understanding solutions to deliver services.

It is also important to recognise that water conservation opportunities at premises level are generally applicable for residential dwellings constructed prior to the implementation of the NSW Government's Building Sustainability Index (BASIX).

Inflow and infiltration management opportunities

The capacity of many parts of the sewerage system is determined by the volume of water that enters the system both in dry weather and during wet weather events through infiltration and inflow. The volume of infiltration and inflow is one of the key components impacting the demand for sewerage services. Reducing infiltration and inflow has the equivalent effect of increasing sewerage system capacity and may be more cost-effective than investing in capacity upgrades.

Forecasts of future infiltration- and inflow-based flows should include appropriately considered reductions in infiltration and inflow.

The utility should employ a credible, strategic approach to considering infiltration and inflow issues.[12] Evidence-based approaches should be used to identify catchments with high dry and wet weather exfiltration/infiltration and high wet weather inflow. At a minimum, pump station run-time analysis and a review of treatment plant inlet flows should be undertaken. Where possible, assessment of inflow and infiltration should be carried out using flow and depth monitors deployed across the sewerage system.

When considering the need for the amplification and maintenance of sewage collection and treatment systems, consider reducing infiltration and inflow in sewerage catchments with higher than benchmark levels.

[12] See: Water Services Association of Australia. (2001). Benchmarking of Water Losses in Australia

Potential water demand/sewerage system loads of non-serviced properties

Properties with an on-site water supply, such as rainwater tanks that are not serviced by the utility, can depend on the utility for potable water supply during extended dry periods and droughts. Similarly, non-serviced properties with on-site wastewater systems such as septic tanks with adsorption trenches can depend on the utility for disposal of their sullage and effluent.

Based on its adopted policy position on access for such properties to the utility's water supply and sewerage systems (including the points of access, pricing structure, metering and monitoring), the utility should establish an estimate of the average and dry annual and daily water demands and/or sewerage systems loads from non-serviced properties.

The utility should also consider using potential raw water for road construction and fighting non-urban fires.

3.4 How will the local water utility consider and address objectives, priorities and evidence of other relevant state or regional strategic planning, including the NSW Water Strategy and regional water strategies?

A local water utility should be aware of, understand and consider any objective, priority and evidence set out in relevant state and regional water strategies that may impact on their service needs now and into the future, including risks to town water security

The NSW Water Strategy takes a strategic and integrated approach to looking after the state's water. This strategy is the first 20-year water strategy for all of NSW. It seeks to improve the security, reliability, quality and resilience of our water resources over the long term and sets the priorities and outlines the implementation plan to delivering on these outcomes.

The NSW Water Strategy sets the overarching vision for 12 regional water strategies and the Greater Sydney Water Strategy (Figure 3). Together, the strategies will improve the resilience of NSW's water services and resources.

Figure 3: Greater Sydney and 12 regional water strategy areas

Regional water strategies bring together the most up-to-date information and evidence with policy, regulatory, educational, technology and infrastructure solutions in an integrated package. The strategies are based on the best evidence and aim to balance different water needs and deliver the right amount of water of the right quality for the right purpose at the right times.

The strategies look at the next 20 to 40 years to understand how much water a region will need to meet future demand, the challenges and choices involved in meeting those demands and the actions we can take to manage risks to water availability.

Through better strategic planning around water and in partnership with local government, the NSW Government aims to achieve resilient water resources for towns, communities, industry and the environment.

A local water utility should consider the specific evidence and assumptions applied in regional water strategies relevant to its analysis of service needs and risks. This includes:

- evidence on the availability of water sources and associated availability modelling and availability risks (see also guidance on the outcome of understanding water security)
- evidence of growth and economic development that may impact service demand
- land management priorities
- water quality management priorities.

A local water utility should ensure its strategic planning is informed by modelling, risk and/or options analysis that are effectively coordinated and aligned with regional water strategy analysis relating to town water supplies.

A local water utility should consider and pursue any actions in regional water strategies' implementation plans that they have committed to leading on or contributing to

The NSW Water Strategy and each regional water strategy has a separate implementation plan that prioritises actions for the life of the strategy. The implementation plans also outline responsibilities and time frames for delivery so the department can monitor progress, assess the effectiveness of the strategy and identify areas where we need to adapt.

Not all actions will start at once. Funding will be a key consideration in planning when and how the actions will be implemented. The regional water strategies will be a key tool in seeking funding as future opportunities arise.

The regional water strategy implementation plans set out priorities over the next 3 years. The implementation plans also identify key partners who will be involved in the actions:

- NSW Government agencies will lead the development and review of policies and regulatory arrangements in consultation with the community. It will deliver regional programs and take action where there is a market failure or other need for government intervention.
- Local councils will be involved in actions that influence town water supply at the local level and they will lead actions directly related to local-level strategic planning.
- State-owned corporations such as WaterNSW will be involved in actions that result in changes to the design, operation and management of major infrastructure and the way water is delivered in regulated rivers.
- Community and industry groups and research organisations will be engaged in actions and may partner with different levels of government to progress or deliver certain actions.

Where a council or local water utility is identified in a regional water strategy implementation plan, it should consider and pursue any actions they have agreed to lead or contribute to.

Appendix A: Optional how-to guidance for understanding service needs

To support utilities in achieving the strategic planning outcome **understanding service needs** to a reasonable standard, we offer the following optional how-to guidance.

The optional how-to guidance in this section covers a variety of areas that may help address one or more of the expectations set out in section 3 of this guidance document.

Understanding customers' needs, values and preference?

As outlined above, a utility should have a contemporary or ongoing understanding of its customers' needs, values and preferences. It should also undertake periodic customer engagement to review and determine service levels.

Gaining a sound understanding of the key characteristics of the customer base

To gain a sound understanding of the key characteristics of its customer base and ensure it engages with an adequate representation and cross-section of its customer base, a utility could collect, maintain and review information on the people and properties it serves including, for example, the number and proportion of:

- standalone houses and apartments
- household types, for example, single-parent, single-person, family with children at home, family without children at home
- non-English speaking households and, of these, the most common languages spoken
- Indigenous member of the community
- households in various income brackets
- households in various age brackets
- owner-occupier and rental properties
- customers working full-time, part-time or casually, not employed, or retired
- customers receiving the age pension or other form of government assistance
- customers with critical health needs that relate to the supply of water services
- customers by geographical distribution
- types and categories of non-residential customers, and their share of total demand for services.

The utility could obtain this information from its billing information, customer surveys, and/or publicly available sources such as the Australian Bureau of Statistics (ABS).

Gaining an ongoing understanding of customers' needs, values and preferences

A water utility could use social media (for example, its Facebook page), its website, and complaints and queries data, and supplement this with customer surveys and customer meetings or forums, to gain an ongoing understanding of its customers' needs, values and preferences.

A water utility could also establish or draw on a customer advisory committee to gain an understanding of customers' needs, values and preferences.

There are numerous examples of businesses, utilities and government departments using 'have your say' portals on websites to understand the views and preferences of their customers and stakeholders. Once collected, such information is categorised and regularly reviewed.

Similarly, information and data on complaints and queries is available from feedback on the utility's website, email, contact phone numbers, or direct interaction with staff. The utility can use such information with other customer feedback to gain an indication of customer views.

Periodic customer surveys and/or customer meetings and forums also add to the understanding of customers' needs, values and preferences.

Undertaking customer consultation in reviewing and developing service levels

As outlined in Section 0 above, to inform the development and review of service levels, utilities should undertake an extensive consumer engagement process at least once every 4 years. Engagement should start early and be broad and deep – including at least 'involving' customers and preferably 'collaborating' with them.

Table 1 lists examples of customer engagement tools, mapped against the various levels of engagement in the IAP2's Spectrum of Public Participation. Accompanying guidance also lists further examples on understanding revenue sources (and customers' capacity and willingness to pay). The appendix also provides further information on focus groups and various deliberative forums, which feature in the examples in Table 1.

Table 1: Examples of customer engagement tools mapped against the Spectrum of Public Participation

Inform	Consult	Involve	Collaborate	Empower
Fact sheets Websites Open houses	Public comments Focus groups Surveys Community meetings	Workshops Deliberative polling or forums Interactive websites	Customer advisory committee/panel Consensus building Participatory decision-making	Citizens' juries Ballots Delegated decisions

Source: Government of South Australia, Better Together – Principles of Engagement, p 6.

Understanding current and future demands placed on water supply and sewerage systems

Population forecasting

Population growth rates

Typically, the growth of population over time uses the simple compound growth formula:

$$P_t = P_0 \times (1 + r)^t$$

Where: P_t, P_0 = population in years *t* and *zero*

r = the rate of growth

Conversely – to assess the rate of growth that has occurred over a historical period of t years:

$$r = \left(\frac{P_t}{P_0}\right)^{\frac{1}{t}}$$

NSW Common Planning Assumptions

The NSW Common Planning Assumptions are agreed information assets (data sets, parameters and assumptions, models, and analytical tools) the NSW Government and external stakeholders use to prepare proposals, business plans, and strategies that rely on projections.[13]

These data sets provide a resource for quantifying many of the drivers of future demand for water and sewerage services. These include population, housing, land use, employment, and infrastructure. They also provide historical estimates.

Many of these projections are now available at Statistical Area Level 2 (SA2) resolution, which allows closer spatial alignment with water and sewerage service areas.

Customer characterisation/profiling and account formation and forecasting

As with population forecasts, the growth of water and sewerage accounts over a period uses the simple compound growth formula:

$$A_{x,t} = A_{x,0} \times (1 + r_x)^t$$

Where: $A_{x,t}, A_{x,0}$ = number of accounts for customer type *x* in years *t* and *zero*

r_x = the rate of growth for customer type *x*

Again, to assess the rate of growth that has occurred over a historical period of t years:

$$r_x = \left(\frac{A_{x,t}}{A_{x,0}}\right)^{\frac{1}{t}}$$

[13] NSW Treasury, (2022), NSW Common Planning Assumptions. Retrieved from NSW Treasury, https://www.treasury.nsw.gov.au/information-public-entities/nsw-common-planning-assumptions

Typically, the classification of customers will start with the customer types the water utility's billing systems use (such as residential or commercial). The utility can expand these classifications using geographical information system (GIS) data such as land use and residential lot sizes to provide added clarity on future average and peak water and sewerage system loads.

Information – modelling of demographic trends in the residential dwelling sector

There are two significant trends in the residential sector that can impact on the future demand for water and sewerage services. These are:

- increasing proportion of flat and unit-style accommodation in the total housing stock
- falling household sizes.

In developing forecasts of these changes, it becomes necessary to allocate the population into different dwelling types and numbers of customer accounts.

$$P_y = A_{SD,y} \times H_{SD,y} + A_{MD,y} \times H_{MD,y} \qquad (1)$$

Where: P_y = the population served with water or sewerage in year *y*

$A_{SD,y}$ and $A_{MD,y}$ are the number of single-dwelling and multiple-dwelling accounts in year *y*

$H_{SD,y}$ and $H_{MD,y}$ are the household sizes for single-dwelling and multiple-dwelling accounts in year *y*

Using forecasts of population, dwelling proportion and household size, it is possible to estimate the number of accounts in each category in each year.

The total number of accounts is the sum of single and multiple-dwelling accounts:

$$A_{TOT,y} = A_{SD,y} + A_{MD,y} \qquad (2)$$

We can also estimate the total number of accounts based on the number of single-dwelling accounts plus the forecast proportion of single-dwelling accounts

$$A_{TOT,y} = \frac{A_{SD,Y}}{\%_{SD,Y}} \qquad (3)$$

Substituting (3) into (2) and re-arranging we get:

$$A_{MD,y} = A_{SD,y} \times \left(\frac{1}{\%_{SD,Y}} - 1\right) \qquad (4)$$

Substituting (4) into (1) and making $A_{SD,y}$ the subject of the formula we get:

$$A_{SD,y} = \frac{P_Y}{\left(H_{SD,Y} + \frac{1}{\%_{SD,Y}}\right) \times H_{MD,Y}}$$

These equations allow water utilities to better account for demographic trends in their demand forecasts.

Weather correlation and normalising

Understanding weather influences on water demand and sewage flows can be important for the sizing of infrastructure. Examples follow.

- In the case of water demands, regular cycles of hot-dry and cool-wet weather can give the misleading impression of upward and downward trends (Figure 4 and Figure 5). We do not recommend using the most recent year's demand as the starting point for projections of future water demand.

- Weather cycles influence on the level of wet weather infiltration and inflow into the sewerage system and the frequency of sewage flows.
- When estimating peaking factors, a weather-influenced average demand in any single year can bias the peaking factor estimated in that year.
- Understanding how weather drives water demands is an important input to system simulation when assessing the security of water supply systems. The use of constant annual demands with a fixed seasonal pattern will lead to higher estimates of water system yield.

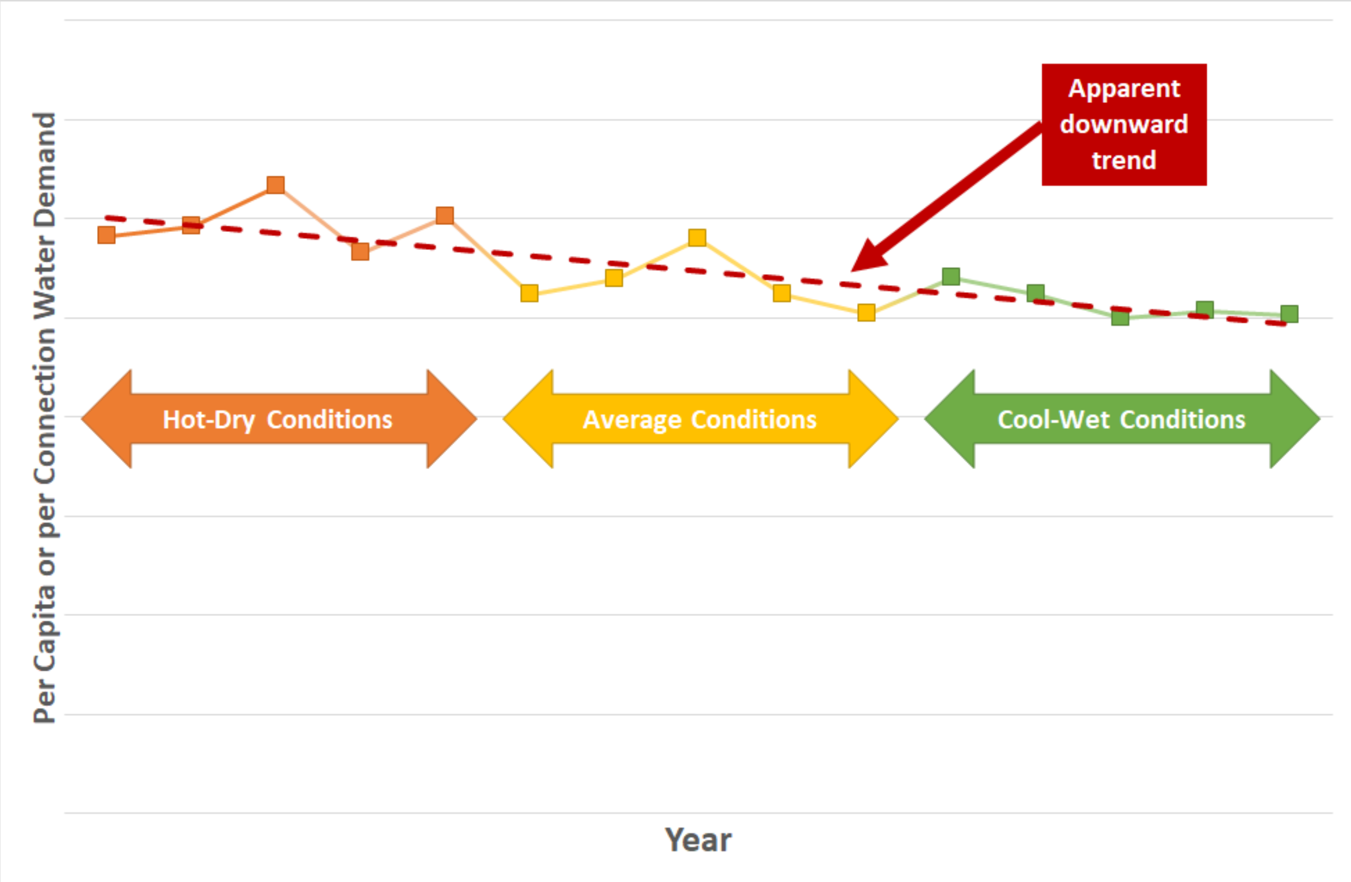

Figure 4. Weather cycles giving the appearance of a downward water demand trend

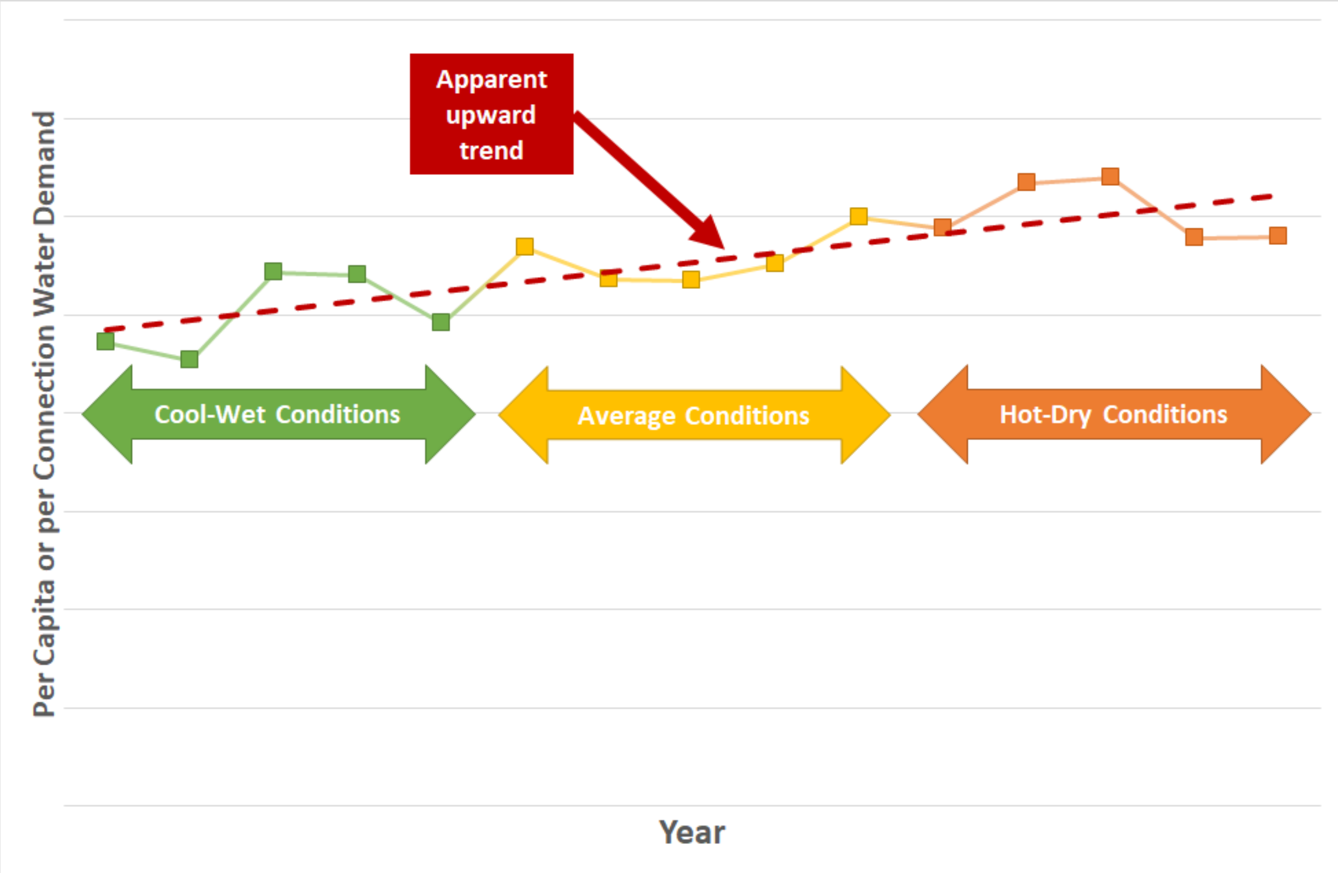

Figure 5. Weather cycles giving the appearance of an upward water demand trend

Climate normalisation

Climate normalisation of demand generally involves developing a model that correlates the historic demand for water with population and account data, seasonal and major event influences, and climatic factors such as temperature, rainfall, and evaporation rates. The climate correlation model is then used to project future demand, factoring in growth in population and connected properties. Climate normalisation can be a relatively simple exercise using MS Excel functions and publicly available climate data contained in the Queensland government SILO database.

Understanding weather influences

Understanding weather influences on water demands is typically accomplished with the use of a multi-variable regression analysis. In this type of analysis, an equation of the following form explains the water demand on a daily or monthly time step:

$$D_t = \beta_0 + \beta_1 \times S_t + \beta_2 \times T_t + \beta_3 \times R_t + \beta_4 \times E_t + \varepsilon_t$$

Where: D_t is the per capita or per connection water demand at time step *t*

β_0 to β_4 are regression coefficients

S_t, T_t, R_t and E_t are indicators or soil moisture, temperature, rainfall and evaporation at time step *t*

ε_t is the error term or difference between the observed and predicted demand at time step *t*

Time steps can vary from daily and monthly where examining bulk water demands, or quarterly when examining customer consumption records. Smart metering technology can examine daily customer consumption records.

It is possible to custom-derive soil moisture variables using semi-deterministic soil water balance models, or extract them from the AWRA-L Australian Landscape Water Balance model available from the Bureau of Meteorology.[14] A number of software packages, including MS Excel, offer multi-variable regression analysis.

Technical note – the use of dummy variables in regression equations to estimate the impact of holiday influxes

In many areas of NSW, particularly in coastal regions, holiday periods have a significant impact on water demands as the influx of visitors to holiday homes, and caravan and camping facilities produce significant population increases. With some of these holiday influxes coinciding with the hotter, drier months of the year, it can be difficult to separate the difference between the two. Fortunately, adding some dummy variables to the multi-variable regression equations outlined above, makes it possible to estimate the impacts.

$$D_t = \beta_0 + \beta_1 \times S_t + \beta_2 \times T_t + \beta_3 \times R_t + \beta_4 \times E_t + \beta_5 \times H_1 + \beta_6 \times H_2 + \cdots . + \varepsilon_t$$

Where: H_1 and H_2 are dummy variables associated with holiday periods 1 and 2. These variables are equal to 1.0 if the date is in a holiday period and zero otherwise

β_5 to β_6 are regression coefficients relating to dummy variables H_1 and H_2

Establishing unit loads per capita or per account

Where it is possible to monitor and forecast unit loads per capita and per account, it is important to observe the following principles, as the example in Figure 6 demonstrates.

- Where the unit load is subject to weather fluctuations, the historical data should be weather-normalised.
- There should be a demonstrated continuity in the forecast between the historical and forecast unit loads.
- Forecasting future trends in unit load requires a robust understanding of the drivers of that trend and, if relevant, confirmation in the historical data.
- In the case of sewerage system:
  - establish dry weather loads during dry periods and outside of periods influenced by tourism or other peak loadings
  - make evidence-based assumptions around ground water infiltration during dry periods and exclude these assumed volumes from the unit loading rate calculation.
- There should be a defined link between per unit water demand and sewerage load.

[14] Bureau of Meteorology. (2022). Australian Landscape Water Balance. Retrieved from Water Information: http://www.bom.gov.au/water/landscape/#/sm/Actual/day/-28.34/130.43/3/Point////2022/5/31/

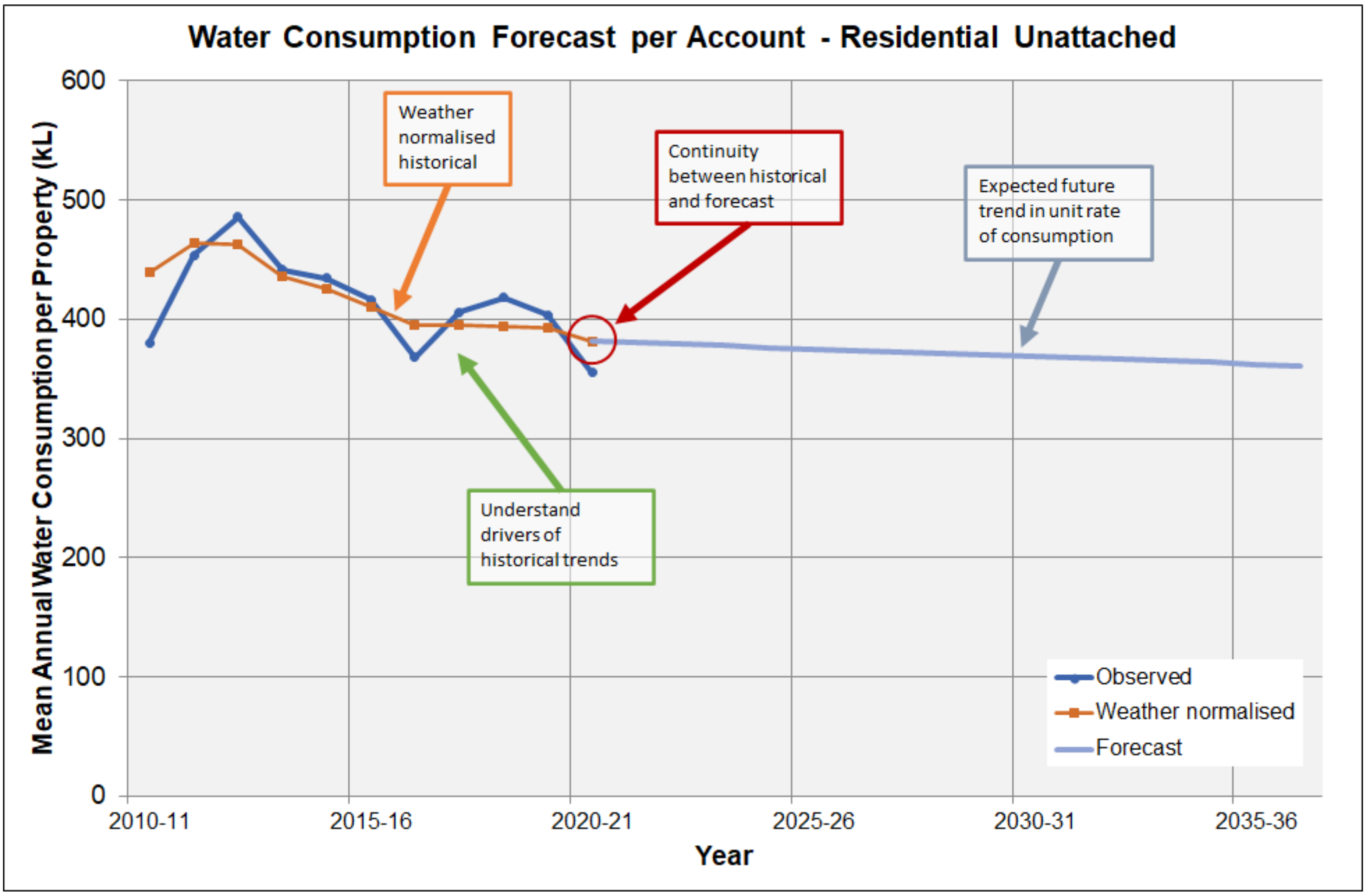

Figure 6. Analysing and forecasting unit rates of demand

Equivalent tenement and equivalent population estimation

Water supply equivalent tenements

Equivalent tenements (ETs) for water supply can be calculated on the basis of the average annual water supplied for a detached residential dwelling. That is defined as the demand for an ET for that utility. The demand for an ET should be determined using a robust evidence-based approach. Local water utilities that have in place a strategic demand management with evidence-based demand analyses and forecasting, can use the outcomes from those analyses. Alternatively, utilities can use an approach that:

- analyses the metered consumption per connected property to estimate the average annual consumption of an unattached single residential dwelling
- factors in weather impacts on residential demand
- considers the levels of non-revenue water
- considers any planned water efficiencies due to the utility's proposed pricing and demand management measures.

In addition, where circumstances warrant, the utility should allow for other relevant considerations when determining the number of ETs for new development. This should be fully documented.

$$ET_{W,AV} = \frac{C_n}{C_{R,AV}}$$

Where: $ET_{W,AV,n}$ = the estimated number of water supply equivalent tenements *n*

C_n = the recorded or estimated total consumption in a year, that is, residential and non-residential consumption, excluding non-revenue water *n*

$C_{R,AV}$ = the average single residential dwelling consumption in kL/property/year

Sewerage equivalent tenements

ETs for sewerage can be calculated on the basis of the average dry weather flow (ADWF) per equivalent person (EP) from a residential dwelling. Alternatively, a utility can use the sewage treatment works ADWF design capacity to determine the volume per sewerage ET in its developer charges calculation. To determine the number of ETs a sewage treatment works serves, divide the metered ADWF received into the treatment works by the product of the sewage discharged by 1 ET and the utility's occupancy ratio.

$$ET_{S,n} = \frac{ADWF_n}{ADWF_{DC} * OR}$$

Where: $ET_{S,n}$ = the estimated number of sewerage equivalent tenements for customer/s *n*

$ADWF_n$ = average dry weather flow, total daily inflow for customer/s *n*

$ADWF_{DC}$ = average dry weather flow design capacity or sewage discharged by 1 EP

OR = Occupancy ratio as published in the ABS Census, people per household

For other developments, for instance new industrial developments, the number of sewerage ETs is determined as the estimated ADWF for the development divided by the sewage discharge for 1 ET. Estimate the ADWF using the sewer discharge factors from various developments as suggested in Appendix G of the department's Liquid Trade Waste Management Guidelines.[15]

Average dry weather flow estimation

Current developer charges guidelines recommend an ADWF of 200 L/EP/d as the basis for sewage flows. Further detail on developer charges is given in the guidance on the outcome of implement sound pricing and prudent financial management. Some recent water end use studies across Australia suggest this number is high as shown in Error! Reference source not found.. Of those studies, it appears that one (Melbourne 2011-2013) may be anomalous – the average of the remaining studies is 136 L/EP/d.

15 NSW Department of Planning, Industry and Environment. (2021). Liquid Trade Waste Management Guidelines. NSW.

Table 2. Internal residential end uses of water per capita (L/d)

End use	Adelaide[16] 2013 L/d	Melbourne[17] 2011-13 L/d	South East Qld[18] 2010 L/d	South East QldError! Bookmark not defined. 2011 L/d	City West Water (Melbourne)[19] 2017-18
Toilet	27.8	20	23.9	24.4	32.4
Bath	3	3	1.8	1.9	9.7
Tap	28.8	19	27.5	25.1	20.6
Dishwasher	1.7	1	2.5	2.2	0.3
Shower	48.3	36	42.7	49.9	42.9
Washing Machine	24.8	21	30.9	31.8	11.1
Leakage	10.5	7	9	3.1	5.2
Total internal	**144.9**	**107.0**	**138.3**	**138.4**	**122.2**

The use of discharge factors

Metering provides water utilities with extensive records of customer consumption. This information generates an understanding of the contribution of different customer groups to the overall demand for water and sewerage services.

Given that we have reasonable information on the level of internal water use in the residential sector, one method of generating a range of estimates of EPs and ETs is to use an ADWF per ET/EP water consumption in combination with discharge factors. These discharge factors can be set at the customer category level or for individual customers if information is available. In many areas, the variation in billing data between summer and winter periods can provide an indication of the proportion of sewerage discharge in the total water consumption for non-residential customer types.

Calculate sewerage ETs using the following formula:

$$ET_{WW,n} = \frac{C_n \times DF_n}{C_{R,AV} \times DF_R}$$

Where: $ET_{WW,n}$ = the number of equivalent tenements for sewage discharge for customer/s *n*

C_n = the recorded or estimated consumption for customer/s *n*

$C_{R,AV}$ = the average residential single dwelling consumption

[16] Arbon, N., Thyer, M., Hatton Macdonald, D., Beverley, K., & Lambert, M, (2014), Understanding and Predicting Household Water Use for Adelaide. Goyder Institute for Water Research

[17] Smart Water Fund. (2013), Melbourne Residential Water End Uses – Winter 2010/Summer 2012

[18] Beal, C., & Stewart, R, (2011), South-East Queensland Residential End Use Study: Final Report

[19] City West Water. (2019) CWW Residential End Use Measurement Study (REUMS)

DF_n= the estimated discharge factor for customer/s n

DF_R = the estimated discharge factor for single residential dwellings

Sewerage EP's can be calculated using a similar formula:

$$EP_{WW,n} = \frac{C_n \times DF_n}{C_{R,AV} \times DF_R} \times H_R$$

Where: $EP_{WW,n}$ = the number of equivalent persons for sewage discharge for customer/s *n*

H_R = the household size for the average residential single dwelling

Peaking factor assessment

Availability of data

Assessing historical peaking factors is an important step in appraising system capacities and planning for future capacity. Water utilities routinely collect information on peak demands. The most commonly available data is bulk production, at either the inlet or outlet of water filtration facilities. The problem with this data is that service reservoir storage distorts the actual demands on any one day, which provides a buffer between consumers and the treated water source.

Utilities can use data collected on the fluctuations in service storage to adjust the record. Estimating diurnal demand fluctuations requires data collected at the outlet of service storage. Another emerging source of data is smart meters. This data can provide a detailed mapping or diurnal demand factors from the coolest, wettest days of the year to the hottest and driest. Figure 4 shows an example of this type of analysis.

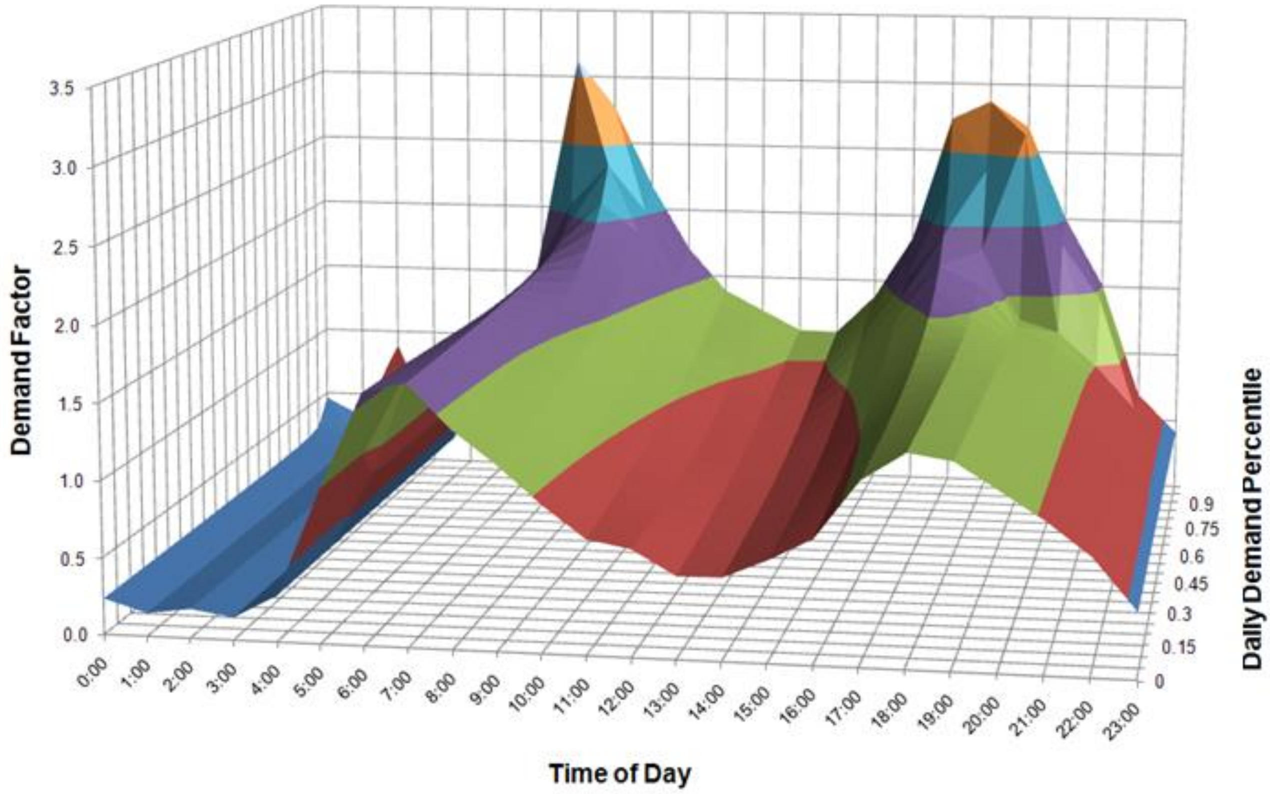

Figure 4. Example of the characterisation of a residential diurnal demand curve

Technical note – the use of demand-duration curves to estimate daily peaking factors

Peak to average ratios for water demands are typically set using demand-duration curves. Figure 5 provides an example using the observed average demand. Figure 6 shows a second example using the weather normalised average demand. These results show that:

- the peaking factor can vary significantly from year to year, so it is important to consider multiple years
- climate normalisation can be important. In this instance – the highest peak demand occurred in a hotter/drier year overall, with the higher average in that year placing a downward bias on the peak to average ratio.

When considering records, it is important to remove anomalous data. Anomalous records can result from:

- data errors
- bushfire events where firefighting uses the urban water supply
- operational changes and/or equipment or power failure.

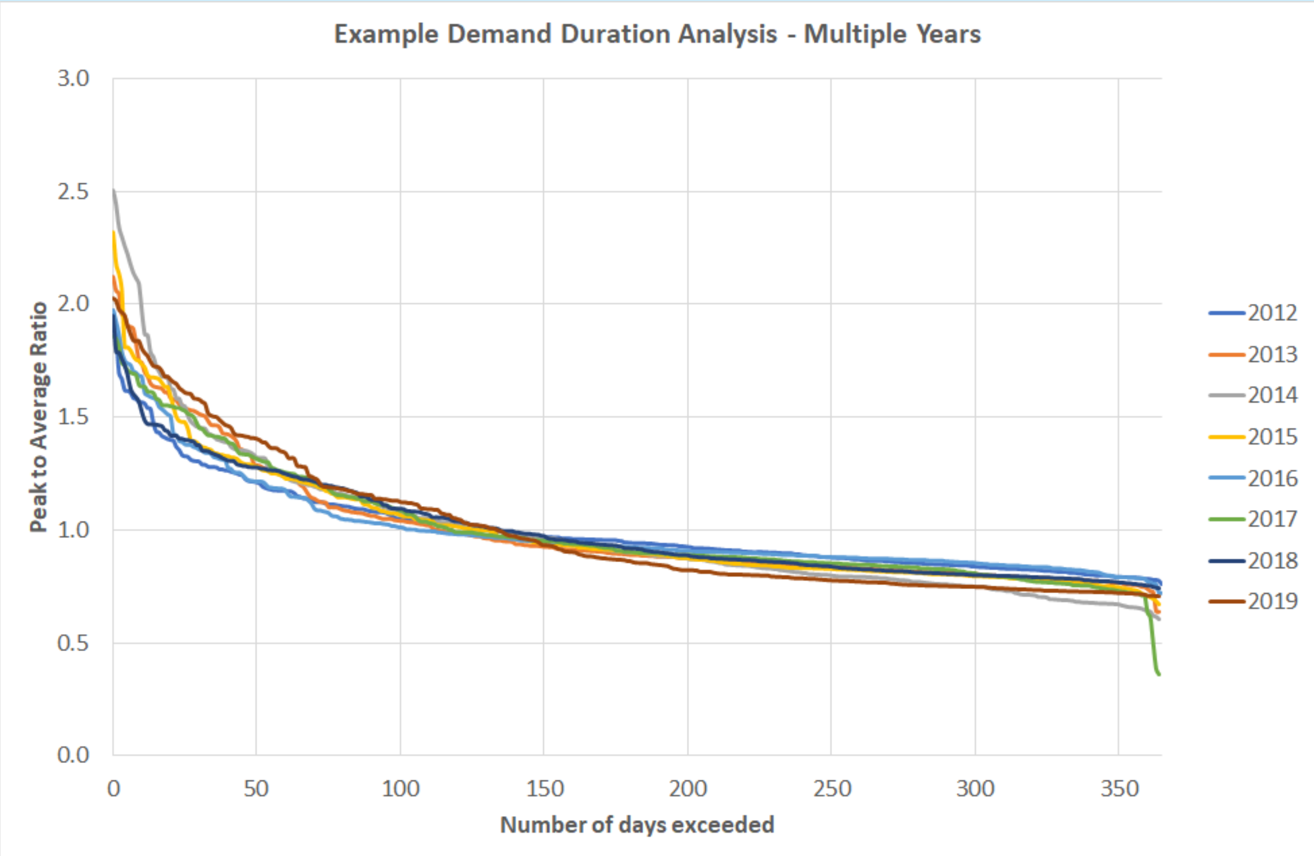

Figure 5. Example demand duration analysis

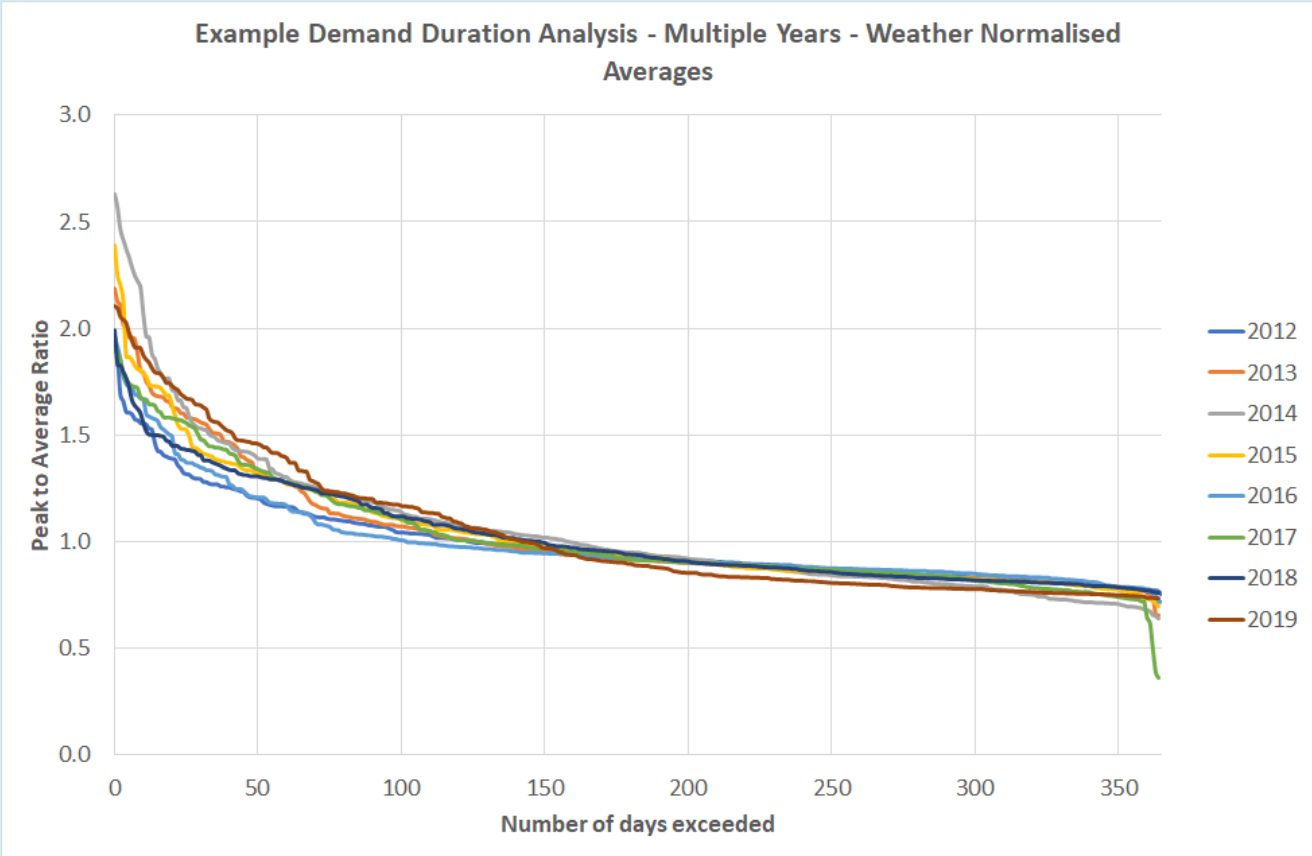

Figure 6. Example demand duration analysis – with weather-normalised averages

Peaking factors for different customer types

Applying discharge and peaking factors can generate separate estimates of water ETs for peak demand periods. In areas with significant holiday influxes and for major facilities such as caravan parks, it can be useful to conduct daily meter readings or monitor sewage pump station run times during peak holiday periods (Easter and summer holidays) to assess the impact on water consumption relative to averages. The availability of smart metering data enables utilities to conduct much more detailed analysis.

The following formula can estimate peak demand equivalent tenements:

$$ET_{W,PD,n} = \frac{C_n \times P_n}{C_{R,AV} \times P_R}$$

Where: $ET_{W,PD,n}$ = the number of peak demand equivalent tenements for average water consumption for customer/s *n*

C_n = the recorded or estimated consumption for customer/s *n*

$C_{R,AV}$ = the average residential single dwelling consumption

P_n = the peaking factor for customer/s *n*

P_R = the peaking factor for residential single dwelling customers

Utilities can calculate peaking factors for individual customers and groups based on discharge factors and peaking factors for indoor[20] and outdoor[21] use:

$$P_n = DF_n \times P_{i,n} + (1 - DF_n) \times P_{o,n}$$

Where: P_n = the peaking factor for customer/s *n*

DF_n = the estimated discharge factor for customer/s *n*

$P_{i,n}$ = the peaking factor for indoor use for customer/s n

$P_{o,n}$ = the peaking factor for outdoor use for customer/s n

Example– use of peak demand factors to generate estimates of equivalent tenements and equivalent population

The following example uses the total consumption breakdown and assumption about the levels of indoor use for different types of customers to generate peak water demand and sewage flow ET/EP factors. It is possible to estimate the peaking factors for each customer type if the peaking factor for all outdoor use by all customer types is assumed to be equal, and reasonable assumptions can be made on the levels of indoor and outdoor use.

Table 3. Example calculation – the use of peaking and discharge factors to calculate ET and EP factors

Customer type	% of total bulk demand	Annual consumption (ML)	Discharge factor	Peaking factor - indoor use	Peaking factor - outdoor use	Overall peaking factor
Residential	50.0%	1,250	0.61	1.0	3.5	1.98
Commercial	15.0%	375	0.85	1.0	3.5	1.38
Industrial	7.0%	175	0.90	1.0	3.5	1.25
Schools	3.0%	75	0.80	1.0	3.5	1.50
Parks and ovals	5.0%	125	0.10	1.0	3.5	3.25
Tourist facilities	5.0%	125	0.95	4.5	3.5	4.45
Non-revenue water	15.0%	375	N/A	N/A	N/A	1.00
Total bulk demand	100.0%	2,500				1.86

Based on metered water consumption
Reasonable estimate based on observation or measurement
Value set to match target bulk demand peaking factor
Target bulk demand peaking factor

Non-revenue water assessment and benchmarking

There are a range of approaches for quantifying the volume of non-revenue water. These include:

- calculating the difference between bulk water production and customer billing data (see example below)
- measuring night flows within service reservoir zones through either reservoir outlet metering, district metering, or service reservoir drop tests.

[20] Indoor water usage is water consumed by customers generally (but not exclusively) inside premises that results in discharge to the sewerage system

[21] Outdoor water usage is water consumed by customers generally (but not exclusively) outside premises that does not result in discharge to the sewerage system

When making any measurement of night flows, it is important to take concurrent night-time meter readings for major water users in the area being studied.

Case study – assessment of non-revenue water using quarterly billing data

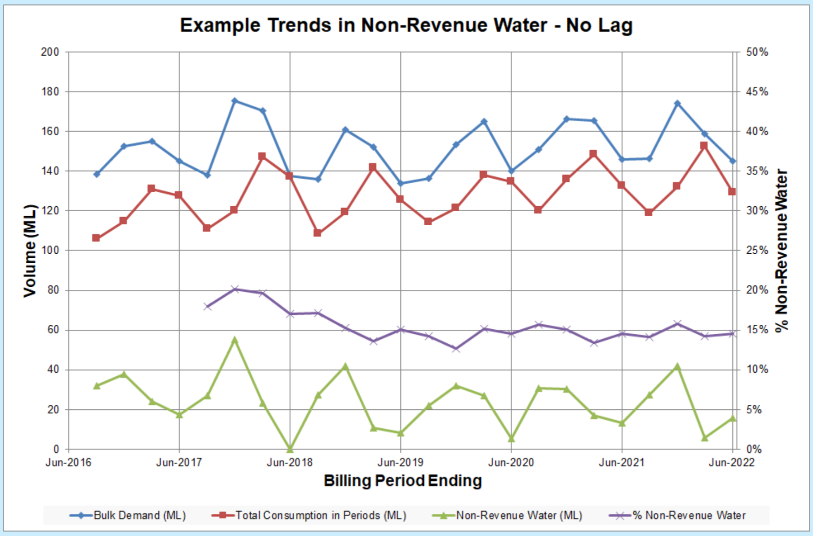

Figure 7. Assessment of trends in non-revenue water – no lag between bulk demand and customer consumption

Trends in the level of non-revenue water can generally be tracked by comparing annual bulk demand with the total of customer consumption in each supply system. Due to the staged nature of meter reading during each billing period, there will be a lag between the average date of each meter read and the calendar quarter. The result is an obvious mismatch between the consumption and bulk demand totals with an artificially strong seasonal pattern in the estimates of non-revenue water as shown in Figure .

This may not necessarily be a problem if estimates of non-revenue water derive from annual figures, which reduces the impacts of this mismatch

If a lag is introduced in the bulk production data, the mismatch between bulk demand and customer consumption data largely disappears, as shown in Figure 8.

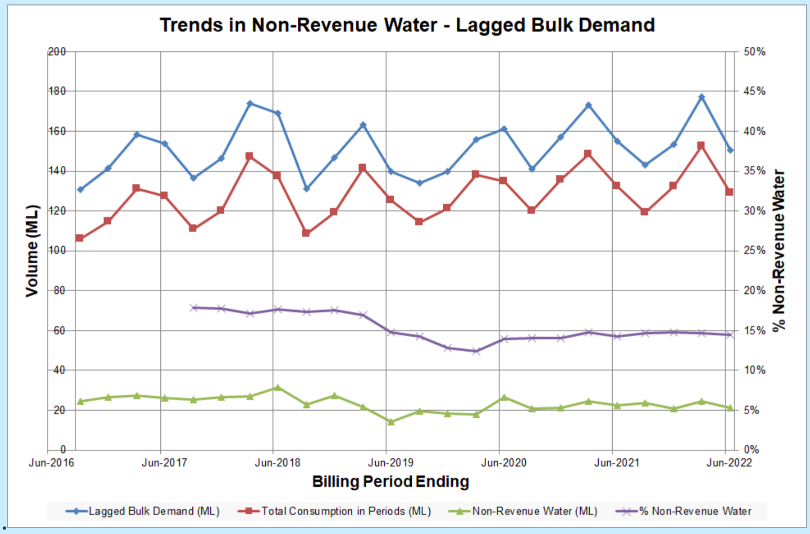

Figure 8. Assessment of trends in non-revenue water - with lag in bulk demand

Water demand management opportunities

The assessment of demand management opportunities can be a significant undertaking. Not all local water utilities will have the resources to undertake a full cost-benefit analysis and a detailed assessment of a wide range of options. Smaller water utilities could undertake a lower-cost assessment based on effective efforts in other jurisdictions. This effort should be proportional to the scale of operations of a water utility and the importance of the urban water extraction in the overall regional water management context. Suggested scale-appropriate actions are set out in Table 4.

Table 4. Scale-appropriate approaches to water demand management

Utility size	Overall strategy	Water pricing and metering	Retrofit and rebate	Regulations and codes	Education	Alternative water sources	System water loss
<5,000 customers	There may not be resources to devote to the development of a full demand management strategy. Should instead introduce options that are likely to be cost-effective at the same time sending a message to the community about the importance of saving water.	All customers should have metered use. Water tariff should be set to recover at least 50% of revenue from water consumption charges –75% is preferable.	Can consider a small program to distribute low flow showerheads from water utility offices.	BASIX is a comprehensive regulation that encourages the use of water efficiency through low flow taps, showers, toilets, and urinals in all new residential buildings.[22] Permanent water savings rules governing irrigation, car washing should be in place.	Provide water efficiency information on water bill flyers. Use opportunities such as festivals and fairs to promote water efficiency messages. Topics to be covered include: • garden watering • water efficient garden design • buying a water efficient washing machine or dishwasher.	BASIX provides incentive to include rainwater harvesting systems in high rainfall areas. Information can also be provided to help residents install rainwater tanks.	Should at least carry out an annual comparison of customer water meters and bulk input to the system. This difference will provide an indication of the volume lost to leakage and individual water systems that may require attention.

[22] In a number of states and territories in Australia there are mandates in place that specify the water efficiency of water using taps and sinks for new housing and other development. This would negate the need to implement this type of scheme at a water utility level.

Utility size	Overall strategy	Water pricing and metering	Retrofit and rebate	Regulations and codes	Education	Alternative water sources	System water loss
5,000 to 10,000 customers	Should undertake a demand management strategy exercise every 5 – 10 years that considers various demand management options, the water savings and the costs and benefits of options. Benefits to include the downsizing and/or deferral of capital expenditure, plus reductions on treatment and transfer costs.	All customers should have metered use. Water tariff should be set to recover at least 75% of revenue from water consumption charges. Consideration should be given to linking sewerage charges to water consumption via a discharge factor.	As determined by the demand management strategy. Options to consider: • residential retrofit program • large water users audit program • home tune-up kits – toilet leak detection tablets, low flow showerheads and flow regulators for taps.	As above. Other options as determined by the demand management strategy. Should include consideration of 5 yearly water efficiency benchmarking and reporting for large water users.	Should be at least a part-time commitment to coordination of water conservation efforts. These could include school visitation, production of educations materials, and media information.	The demand management strategy should consider the impacts of BASIX regulations on the uptake of alternative water systems. Consider the use of recycled water for large water users.	Annual reporting should include the calculation of the infrastructure leakage index (ILI) using the methodology and approach adapted for Australian conditions by the Water Services Association of Australia (WSAA). Comparison of bulk water input and customer consumption should be conducted on a supply zone basis. This exercise will provide information on supply zones consideration for leakage investigations.

Utility size	Overall strategy	Water pricing and metering	Retrofit and rebate	Regulations and codes	Education	Alternative water sources	System water loss
>10,000 customers	Should undertake a demand management strategy exercise every 5 years as described above. Should consider all options – including the wider use of recycled water, stormwater harvesting and rainwater harvesting systems modelling in a whole of system context.	As above. Should have implemented a trial of smart water metering technology for a sample of residential and non-residential customers.	As above. Should implement a program that provides free installation of water efficient showers. This program should only be terminated where there is clear evidence that it has reached market saturation. Follow-up surveys of participating customers to verify medium and long-term retention.	As above.	At least one fulltime person dedicated to the coordination of water conservation-based education for customers and the community. Water efficiency benchmarking information should be widely available for customers.	As above. The demand management strategy should also consider the costs and benefits of the use of recycled water systems beyond the largest users – especially in inland areas. Stormwater and rainwater harvesting systems should also be considered.	As above. Consider the establishment of district metering areas. There should be permanent teams dedicated to the detection and repair of water system leaks. Should be trialling automated water system monitoring technology.

Infiltration and inflow management opportunities

The identification of infiltration and inflow management opportunities should employ an evidence and risk-based approach. This should include an assessment of current levels of infiltration and inflow within the sewerage catchment. Criteria could include:

- indices of rainfall-impacted flow rates against dry weather flow rates and historical wet weather overflow rates
- comparison of rainfall intensity linked and sewage overflows, treatment bypasses, and indicators for saline water intrusion.

Where seeking a deeper understanding of infiltration and inflow issues within a catchment, consider using temporary or permanent flow gauging.

Within each catchment, couple I&I volumetric assessment with an assessment of public health and environmental impacts of infiltration and inflow.

Climate change impacts

To assess climate change impacts on a range of services, extrapolate correlations with existing weather and water demands and sewerage system flows. These include correlations between water demand and weather previously outlined in Section 0.

Chapter 6 of Book 1 of Australian Rainfall and Runoff (AR&R)[23] lists five aspects of design flood estimation that climate change is likely to affect. These are:

- rainfall intensity frequency duration (IFD) relationships
- rainfall temporal patterns
- continuous rainfall sequences
- antecedent conditions and baseflow regimes
- compound extremes (for example, riverine flooding combined with storm surge inundation).

These design flood impacts are also likely to affect sewerage system design. The information in AR&R Chapter 6 is also applicable where sewerage system design is based on correlations or modelled relationships with rainfall events.

[23] Ball, J., Babister, M., Nathan, R., Weeks, W., Weinmann, E., Retallick, M., & Testoni, I, (2019), A Guide to Flood Estimation. Geosciences Australia. Retrieved from https://arr.ga.gov.au/arr-guideline

Technical note – the impact of climate change on diurnal demand variations

Water distribution system design uses demand factors to understand the dynamic operation of water supply systems. Figure 9 shows typical curves. These curves are normally non-dimensional – and are applied to the daily demands to simulate diurnal operation. In planning for future climate change, the summer curve will be the most impacted. The wintertime diurnal curve essentially represents internal water use. There will be very little outdoor water use on the coldest, wettest days of the year, barring some use of water to wash mud off boots and ice off vehicle windscreens. It may also be necessary to account for the phase shift in the diurnal curve due to daylight saving.

To adjust the curve for the future impacts of climate change, it is convenient to assume that any increase in demand will occur with external use. This can be assumed to be the difference between the winter and summer curves (Figure 9). This external water use can be then adjusted for the influence of climate change, resulting in a modified summer curve (Figure 10). The adjustment to the level of summer use will need to be higher than the adjustment to the total uses:

$$\begin{matrix} External\ use \\ adjustment \end{matrix}(\%) = \begin{matrix} Total\ use \\ adjustment \end{matrix}(\%)\frac{Total\ use\ (volume)}{External\ use\ (volume)}$$

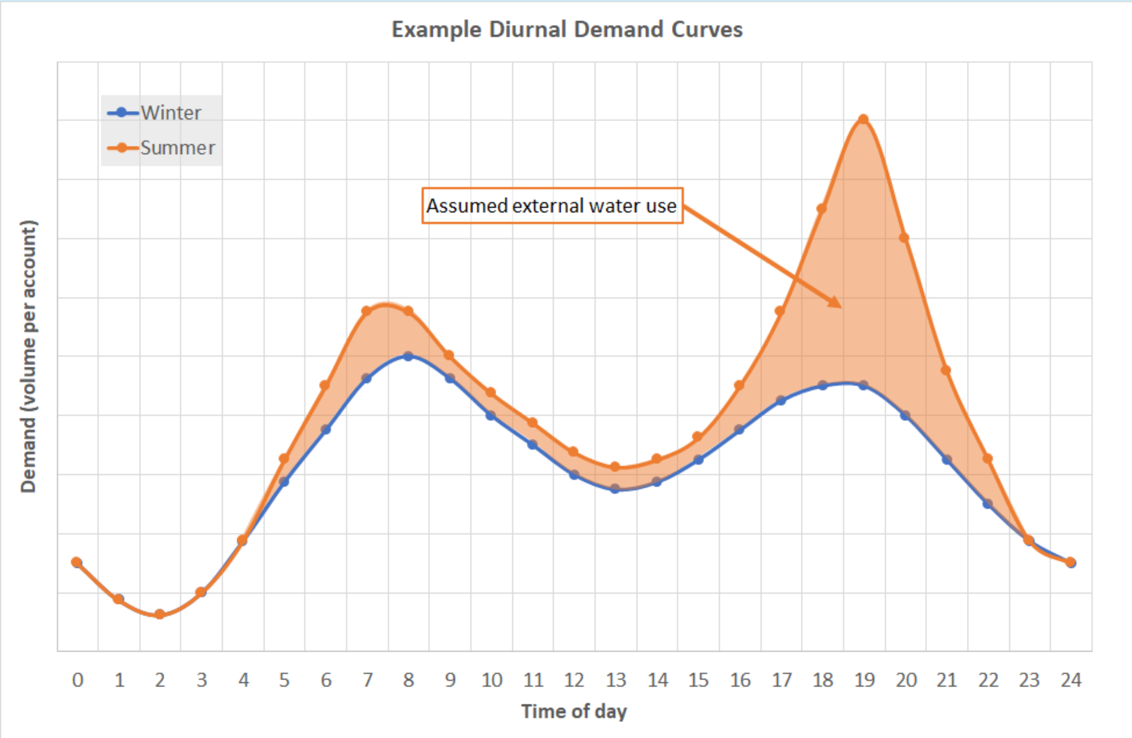

Figure 9. Example diurnal demand curve – typical historical

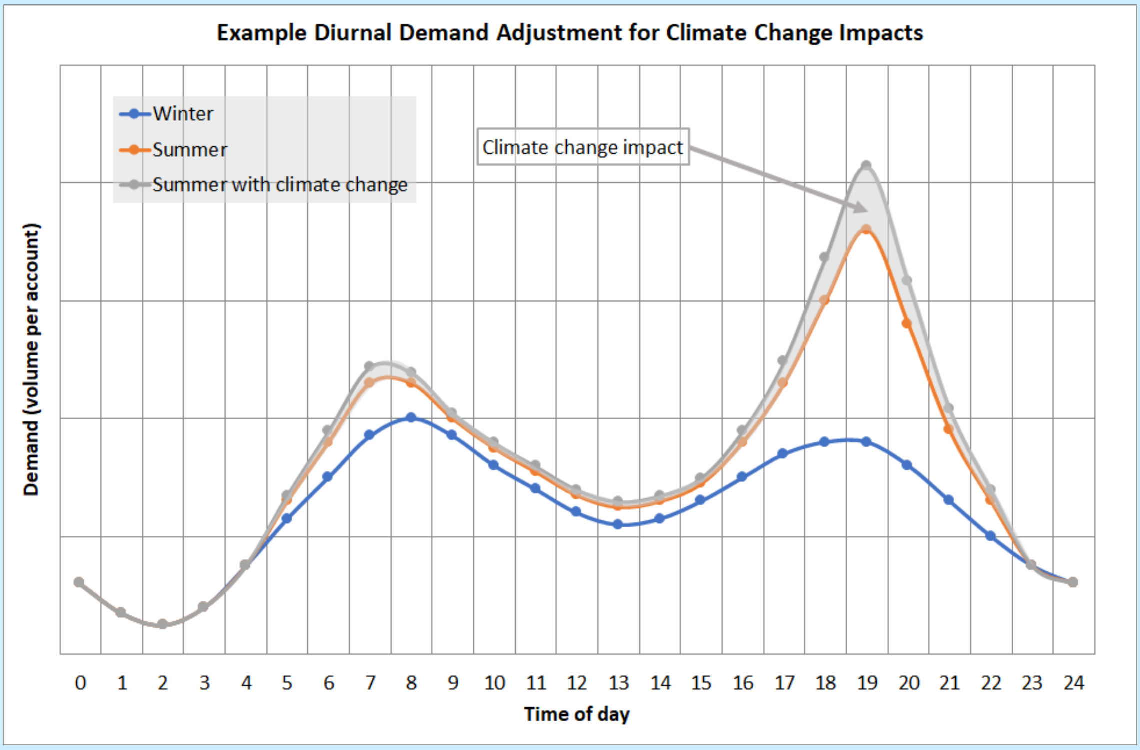

Figure 10. Example diurnal demand curve – impacts of climate change illustrated

Appendix B: Templates, case studies and tools

To support utilities in achieving the strategic planning outcome of **understanding service needs** to a reasonable standard, we give the following optional templates, case studies and tools.

How to understand customers' needs, values and preference?

The Essential Service Commission's (ESC's) guidance and case-study

The ESC regulates the prices and performance of water utilities in Victoria. In assessing utilities' pricing proposals under its PREMO framework, one of its key focus areas is the quality of customer engagement.[24] The ESC's guidance material and Victorian utilities' approaches to customer engagement, as outlined in their pricing proposals, provide useful tools, templates and case studies for customer engagement.

For example, the ESC's 2018 price review rated Goulburn Valley Water (GVW) as 'leading' under its PREMO framework – the highest rating the ESC assigns against the criteria of Performance, Risk, Engagement, Management and Outcomes. Key elements of GVW's approach to customer engagement are outlined below.[25]

Deep engagement

GVW used a broad range of engagement methods to inform the development of its pricing proposal, including 'inform, consult and involve'.

GVW's engagement methods included community forums, pop-up water cafes at community events, online and paper surveys, and a deliberative forum.

The deliberative forum brought together a recruited representative customer sample for five hours to evaluate the findings from the rest of the engagement and GVW's proposed responses.

Prior, 'business as usual' ongoing engagement informs program

The engagement program design and its application used business as usual customer engagement, and research and complaints data (for example, an annual customer service evaluation research survey, major customer surveys and meetings, a review of customer data in the customer relationship management system, and ombudsman complaints).

[24] The ESC assesses utilities' pricing proposals against five elements: Performance, Risk, Engagement, Management and Outcomes.

[25] This GVW case study is sourced from: FarrierSwier, *Victoria's water sector: The PREMO model for economic regulation*, 2019, Appendix F.

The timing of the engagement program (September 2016 and May 2017) was within one year of the September 2017 water pricing proposal, and as such incorporated elements of prior customer engagement.

Customers have a real say

The topics covered in the engagement program differed across the 54 towns and the range of customer groups GVW services (including the public, plumbers, builders, land developers, and major customers).

The topics included prices, on-line services, water quality in non-potable towns, the balance of fixed and variable charges, water efficiency, and emissions reduction programs.

GVW stated:

> "We wanted to identify areas where customers could have a real say in the decisions of GVW. We deliberately did not engage in questions relating to regulatory obligations, such as how much customers value safe drinking water."[26]

Clear reporting of customer engagement

GVW clearly reported the findings of its engagement and its responses – including its commitments to achieving specified outcomes in response to the key issues raised during the engagement process.

GVW's planned outcomes resulting from its customer engagement were presented in its pricing proposal, organised into four key areas:

- the best prices for customers
- a renewed focus on water quality and supply
- modern and thoughtful customer service
- meaningful environmental and recreational outcomes.

GVW presented its findings and responses to customer engagement in a way that made it easy to link the engagement feedback and its business decisions and commitments in response to this feedback.

Engaging with vulnerable customers

The ESC has also published guidance on engaging with customers experiencing vulnerability: *Sensitive and appropriate engagement with consumers experiencing vulnerability – Guidance and principles for action*, January 2021. This includes guidance, principles and checklists for engaging with vulnerable customers and ensuring inclusive engagement.

The South Australian government also provides similar guidance on its Better Together website[27] – which includes a range of handbooks and guides.

[26] GVW, Pricing submission, September 2017, p.6.

[27] https://www.bettertogether.sa.gov.au/

IAP2 (International Association for Public Participation)

IAP2 Australasia is the peak body for the community and stakeholder engagement sector. Its website includes a range of engagement templates, tools and case-studies. This includes a 'Local Government Hub' and water utilities' case studies of customer and community engagement.

Water Services Association of Australia (WSAA) case studies

WSAA has reported on 20 customer engagement case studies from the water sector.[28] Key overarching messages or observations from these case-studies follow.

- Start early and allow at least 2 years for the engagement program. Most case studies said they wished they started the process earlier.
- Allow for flexibility in the program: there will likely be additional research to be carried out or issues that need further exploration with customers.
- Be aware of bias, including how information is prepared for customers, how it is communicated and how results are presented back to customers.
- There is no 'right' process of engagement. It depends on time frame, organisational culture, and the customer base.
- Use a variety of techniques to engage.
- Ensure that a representative sample of the customer population is engaged and that efforts are made to understand the values and needs of vulnerable or often underrepresented customer groups, such as the Indigenous, disabled, young adult, and elderly.
- Close the loop with customers. It is important to report back to customers to explain the results of engagement and how this informs the utility's proposals/decisions. For example, some utilities have re-engaged customers at each stage of the planning or proposal process, to read summaries, submissions and rationales behind them and advise whether they believe it is accurate. Others have taken a more passive approach, posting and advertising their final proposal on their website and encouraging any feedback from interested customers.

Other observations.

- Utilities engaged at a variety of levels across the IAP2 spectrum, from 'inform' to 'empower' (see Table).
- Almost all utilities used the core set of techniques of surveys, focus groups and websites, albeit in different ways.
  - All utilities used one or more surveys in their engagement program. This was to primarily understand the broad areas of interest of their customers and define future themes. A smaller portion of utilities used multiple surveys, to assess themes important to customers, and to undertake willingness-to-pay studies
  - Focus groups were used in a variety of ways, for example to explore specific issues more deeply with customers, or to target customer groups (for example, business customers) that were under-represented in other phases of the engagement process. Overall, focus

[28] Water Services Association of Australia (WSAA), *Customer Engagement in the Urban Water Sector*, February 2019.

groups were a popular method to engage representative samples of people, and allowed for diverse methods of engagement.

  – Websites were an important tool used to relay insights and future directions of engagement across all businesses. They were also commonly used to 'close the loop' with customers.

- The bulk of engagement expertise is now in-house. Much of the outsourcing is moving to specialist research and analysis, and the recruitment of customers. Outsourcing the preparation of information and facilitation is also used to remove unconscious bias.

Table 2 below presents an overview of a sample of the case studies. Further information on these and other case studies is provided in WSAA's report.

Table 1: Engagement programs on the IAP2 Spectrum

Utility	Inform	Consult	Involve	Collaborate	Empower
Barwon Water	No	No	No	Yes	No
Central Highlands Water	Yes	Yes	Yes	Yes	Yes
Coliban Water	No	Yes	Yes	Yes	Yes
East Gippsland	No	No	No	No	Yes
Gippsland	Yes	Yes	Yes	Yes	Yes
Gold Coast Water	No	No	Yes	No	No
Goulburn Valley	Yes	Yes	Yes	Yes	No
Icon Water	No	Yes	No	No	No
Melbourne Water	No	No	No	Yes	Yes
North-East Water	No	No	No	Yes	No
QUU	Yes	Yes	Yes	Yes	No
SA Water	Yes	Yes	Yes	Yes	No
South-East Water	Yes	Yes	Yes	No	No
Sunwater	Yes	Yes	No	No	No
Sydney Water	Yes	Yes	No	No	No
Unitywater	No	Yes	No	No	No
Water Corporation	No	No	No	No	Yes
Wellington Water	Yes	Yes	No	No	No
Western Water	Yes	Yes	Yes	Yes	Yes

Utility	Inform	Consult	Involve	Collaborate	Empower
Yarra Valley Water	✓	✓	✓	✓	✓

Source: Water Services Association of Australia, Customer Engagement in the Urban Water Sector, February 2019.

Table 2: Case studies of customer engagement in the water sector

Utility/purpose	Approach	Learning/outcomes
Western Water (WW), to inform price proposal	Community events, email campaigns, town meetings, focus groups, deliberative forums, engaging with customers online and in-person	• Service standards were relaxed, prices remained stable, and WW made a commitment to undertake a tariff structure review • Better information about what customers pay for would help with informed engagement and ongoing communications • Customers want to be engaged but to avoid frustration they need to be provided with quality information and a clear objective • Customers don't always want improved service standards and are willing to relax them to avoid an increase in bills
Icon Water (IW), to inform price proposal	Surveys (market research and choice modelling willingness to pay studies), customer forum, media releases	• Start early – 18 months was not sufficient. IW is planning to start 3 years before their next proposal • Detailed asset data is essential to engage with customers around service levels
City of Gold Coast, to inform draft Water Strategy	Focus groups, have your say webpage, pop-up engagements, industry workshop, phone and on-line surveys	• Simplicity of language is key when engaging with the community • Customers being considered at the commencement of projects promotes a customer-involved strategy
South Australia Water, to inform price proposal	Bill inserts, workshops, willingness to pay survey, online engagement, customer working group, language group specific drop-ins	• A broad range of engagement tools allows for deeper insights and the ability to reach broader demographics • Moving engagement in-house was seen as a positive • The online engagement website benefited customers and employees • Strategic engagement facilitates meaningful inclusion of groups outside previously used engagement tools and techniques

Utility/purpose	Approach	Learning/outcomes
Goulburn Valley Water (GVW), to inform price proposal	'Water cafes', Community Reference Committee, online and in-person surveys, focus groups (ongoing engagement is now BAU)	• Ensure engagement is 'fit for purpose'– grass roots, face to face was best. • The willingness of staff to participate was critical to success • Engagement requires a commitment from all the business.
South-East Water, to inform price proposal	Online community participation, 1:1 interviews, bill simulators, surveys, focus groups, radio interview	• Breadth of engagement is important • The feedback loop is crucial to informing customers of decisions and incorporating their feedback in the plan • Simple explanations and language are best • Need to commit adequate time and resources
Yarra Valley Water (YVW), to inform price proposal	Citizen's jury, multicultural event, online engagement portal, surveys, focus groups, customer advisory group; conjoint analysis for WTP.	• Breadth and depth of engagement are important • Be open to new ways of engaging with customers • Trust that customers have something meaningful to say, don't be afraid to let them lead you.

Source: Water Services Association of Australia, Customer Engagement in the Urban Water Sector, February 2019.

Further information on focus groups and deliberative forums

Focus groups

Focus groups are a gathering of customers and stakeholders to discuss a set of open-ended questions or discussion points, allowing them to voice their opinions and attitudes. Follow-up questions are usually asked to elicit more information if required. A trained facilitator often moderates the focus group discussions, and the discussion is recorded. Data collected is verified during the meeting with participants and at the end of each focus group.

Focus groups enable a business to allow their customers to share their perspectives on the benefits and value customers receive from their services, determine what issues are relevant to them and how they perceive different aspects of quality. These insights can inform the development of quantitative research. For example, focus groups can assist in determining attributes relevant to customers and to test whether all parts of the questionnaire design make sense. Utilities can use this information to target a formal economic willingness to pay (WTP) study.

The number of participants (sample size) in a focus group varies depending on the type of research needed (along with time and budget). Use a smaller sample to achieve more in-depth research. This allows participants to speak more and explore their answers. A larger sample size allows for a larger representation of customers. Focus groups tend to include 6-8 people.

Deliberative research

Deliberative research can be viewed as a hybrid between consultation and research. While in some ways similar to qualitative research methods (such as focus groups), it provides more of an opportunity for participants to discover more about a topic, consider evidence, and discuss evidence with other participants before expressing their view. This process may occur over weeks or months.

Other quantitative and qualitative research methods capture people's 'top of mind' views given what they already know about a subject, while deliberative approaches allow for participants to respond to new information or viewpoints. 'Deliberation' sets this approach apart from other approaches, referring to a process of critically examining an issue and the weighing of reasons for and against a course of action.

There are a range of approaches that can incorporate a 'deliberative' face-to-face approach.

- Citizen's juries made up of 10 to 12 participants hear from a variety of experts, cross-examine them, deliberate about the topic, and present their findings as a report or presentation at the end of the event.
- Consensus conferences of 10 to 20 participants over 3–4 days facilitate discussions between participants and experts. The media may be invited to attend parts of the event.
- Deliberative workshops – 8 to 16 participants over the course of a few hours to several days – allow for debate between participants. This approach is similar to focus groups.

The approaches differ in terms of duration, number of participants, participant selection, presentation of information, and whether incentives are provided. Several defining features characterise deliberative research:

- Time – aims to give participants the time to engage, think, and debate the topics in depth. Depending on the approach, deliberation may take from half a day to 2 or 3 days.
- Information – can take several forms such as fact sheets, recorded content, live presentations and Q&A evidence sessions. Deliberative approaches will look to leverage a structured path to building participants' knowledge of a topic and may begin with an initial exercise to understand participants' pre-existing views and knowledge.
- Balance – often exposes participants to a full range of potential options and expert perspectives on what is achievable before exploring trade-offs, and the values and principles that participants consider should be taken into account to support a particular decision.
- Transparency of purpose – characterised by a clear task or purpose of which the participants are aware from the start. This differentiates the method from some other market research approaches.
- Representativeness – participants are often chosen to reflect the community population in terms of socio-economic characteristics, or other characteristics such as customer type. The approach can allow for over-representing some groups whose views might be of particular interest.

Importantly, the success of the deliberative research will depend on the quality of the materials provided to participants and the facilitation of discussion among participants.