Technical Paper 7

Demand for services

September 2025

Central Coast Council | Water and Sewer

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1 Key points

- The current population of the Central Coast Local Government Area (LGA) is 354,463.
- By 2030-31, the forecasted population of the Central Coast LGA is estimated to be 369,921.
- Water sales forecast completed using Integrated Supply Demand Planning (iSDP 2.0).
- Annual water consumption for the determination period in line with forecasts set in 2022. There is no revenue adjustment required using the Demand Volatility Adjustment Mechanism (DVAM).
- Forecast water sales estimated to increase to 29,084 ML by 2030-31
- Deemed sewage discharge factors to remain at 125kL for standalone residential properties and 80kL for residential properties within multiple or mixed multiple premises.
- By 2031, forecast billable connections for water is projected to increase from 145,935 in 2025-26 to 150,923 and sewer a projected increase from 142,336 in 2025-26 to 147,223.

2 Introduction

Central Coast Council (Council) provides water and sewer services to households, businesses, and industry across the Central Coast Local Government Area (LGA).

To calculate prices required to recover target revenues, Council has forecast water demand and sewage disposal volumes, together with the number of water and sewerage connections and population forecasts.

Forecasts proposed by Council and adopted by IPART are required to be as accurate as possible. If the forecasts are markedly different from actual outcomes, Council's revenue could vary significantly from target revenue.

Water sales of a utility can be impacted by factors including population growth, dry/wet years, climate change and water restrictions. Water sales forecasting can be limited by the available data associated with these factors.

Council used Integrated Supply Demand Model (iSDP) in its previous two submissions (2018 and 2022). The iSDP model was built by Council in 2017 and was maintained with support from the Institute for Sustainable Futures (ISF) at the University of Technology Sydney (UTS). ISF stopped supporting the iSDP but continued to develop its demand forecast modelling tools and thinking around end-use modelling with several projects with the Commonwealth Water Efficiency Labelling Scheme (WELS) group and Victoria's Department of Energy, Environment and Climate Action (DEECA). A 2024 UTS internal grant to consolidate these in-house bespoke models into a usable tool for Australian utilities has led to Council engaging ISF to review the latest Council data and provide a new end-use forecasting model, based on a revised and renewed model infrastructure. The new model is called iSDP2.0.

Council provides sewer services to approximately 98 percent of its residential water customers. The proportion of non-residential water customers provided with sewer services varies with the water meter size of the customers. Sewage disposal volumes are forecast from water usage statistics. Sewage discharge factors are applied to the estimated portion of metered water usage discharged into the sewerage system.

This Technical Paper sets out Council's proposed demand and billable connection forecasts, with explanation of forecast methodology and underlying assumptions.

3 Customer growth

3.1 Population serviced

The Central Coast LGA has a current population of approximately 354,463 people based on Council's consultant (.id- Informed Decisions) population forecasts (as at June 2024). However, not all the population living in the Central Council LGA is serviced for water and sewerage.

3.2 Water supply servicing area

Figure 1 shows the water supply servicing area for Council's supply scheme. Generally, residents on the western side of the M1 Motorway (Mangrove Mountain, Kulnura, etc) are not serviced by the Council supply scheme. Some rural and peri-urban properties on the eastern side of the M1 are not connected to the supply scheme, reducing the total residential population for forecast of water sales. Table 1 provides the actual and forecast population figures used for water sales forecasting.

Figure 1: Central Coast region: water and sewer serviced area

Table 1: Central Coast serviced population

Financial Year	Annual Movement %	Estimated Resident Population in Private Dwellings ^	Estimated Resident Population in Private Dwellings serviced with water #
2023-24	1.0%	351,510	344,526
2024-25	0.8%	354,463	347,424
2025-26	0.8%	357,412	350,315
2026-27	0.8%	360,176	353,027
2027-28	0.7%	362,656	355,459
2028-29	0.6%	364,888	357,637
2029-30	0.7%	367,415	360,109
2030-31	0.7%	369,921	362,561

^ Estimated Resident Population in Private Dwellings includes dwellings in areas that are not serviced by the water network. The source of this information is the Council Consultant, .id- informed decisions' website updated in June 2024.
# Estimated Resident Population in Private Dwellings serviced with water is calculated by population information for suburbs not serviced by water, and GIS mapping of Council's water network.

3.3 Forecast population and dwellings

The demand for residential water supply is largely driven by the demographics of the region. The population, dwelling type, and occupancy (persons per dwelling) are key elements for water demand modelling. These demographics and growth forecasts are informed by the previous analysis by Council's consultant (.id).

The Central Coast has a mix of dwelling types including residential single houses, units and flats. Council used Australian Bureau of Statistics (ABS) data (Census) to determine the future population in single and multi-dwellings, and .id estimated the resident population in private dwellings and the average occupancy rate. This data is combined to provide the total number of occupied dwellings, subdivided into standalone houses and units/flats. The ratio of single dwellings to total dwellings has steadily been decreasing. It has dropped from 82% in 2016 to 81.1% in 2021 and downward trend is forecasted to continue and reach 79.5% by 2031.

Table 2 shows existing and forecast dwellings used for water demand/sales forecasting.

Table 2: Forecast growth in residential dwellings

Year	Estimated Single Dwellings	Estimated Multi Dwellings
2023-24	122,847	30,162
2024-25	123,594	30,676
2025-26	124,400	31,169
2026-27	125,223	31,633

2027-28	126,094	32,077
2028-29	127,011	32,448
2029-30	127,962	32,830
2030-31	128,931	33,205

The Central Coast is divided into two regions, North (former Wyong Shire Council) and South (former Gosford City Council) for the purpose of demand forecasting. Both regions have different growth rates and patterns of development. Due to availability of land, most of the green field development on the Central Coast is happening in the North region, whereas development in the South region is in-fill and redevelopment. Figure 2 shows the forecasted serviced population of both regions.

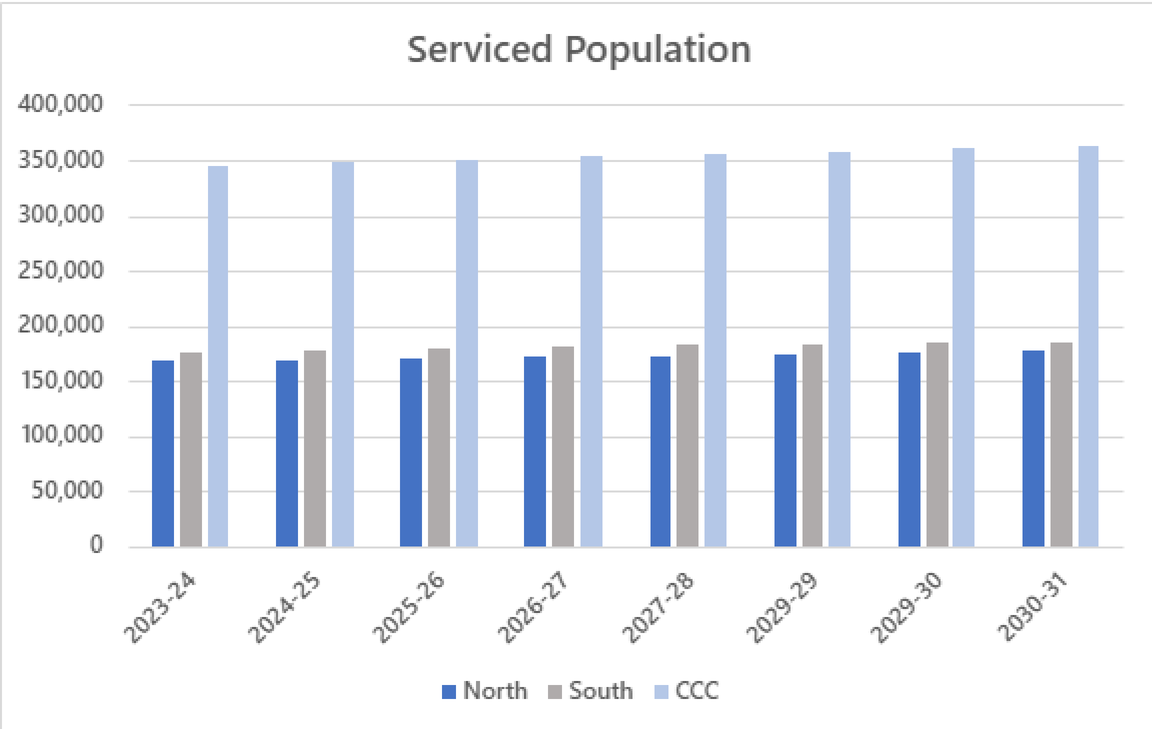


Figure 2: Central Coast serviced population

In the model, the estimated residential population in occupied private dwellings is used to forecast water sales for residential houses, units and flats separately. Figure 3 shows the distribution of dwellings in single and multi-dwellings (units and flats).

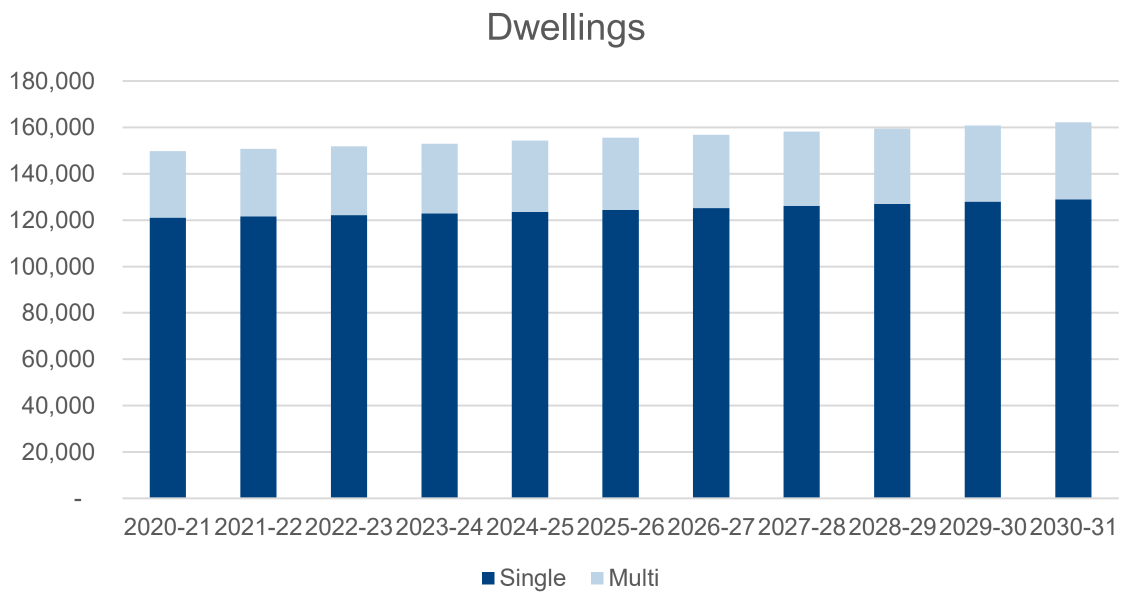


Figure 3: Central Coast dwelling forecast

The non-residential customers are segregated into various categories; commercial, industrial, education, recreation, government, health, aged care etc. In each segment, the top 5 high water users are picked up and their demand is forecasted individually based on mean of last 6 years of actual consumptions from 2018-23. For the balance, low water users in each category, their count is pegged to the growth of population respectively for North and South population forecast growth. The demand is forecasted using average consumption for each of these categories. Billable customer numbers used in tariff modelling are sourced separately from Council's billing system.

4 Forecasting water sales

4.1 Modelling approach

Council has used the newly built Integrated Supply Demand Planning (iSDP2.0) model to forecast the water sales forecast. The updated model is a hybrid approach which combines ground-up estimation of residential water demand through individual end uses (e.g. shower, toilet), and top-down estimations of non-residential water demand for each sector. The main advantage of this method is that it accounts for known changes in residential water efficiency in the near to mid-term. Figure 4 shows end-use modelling logic.

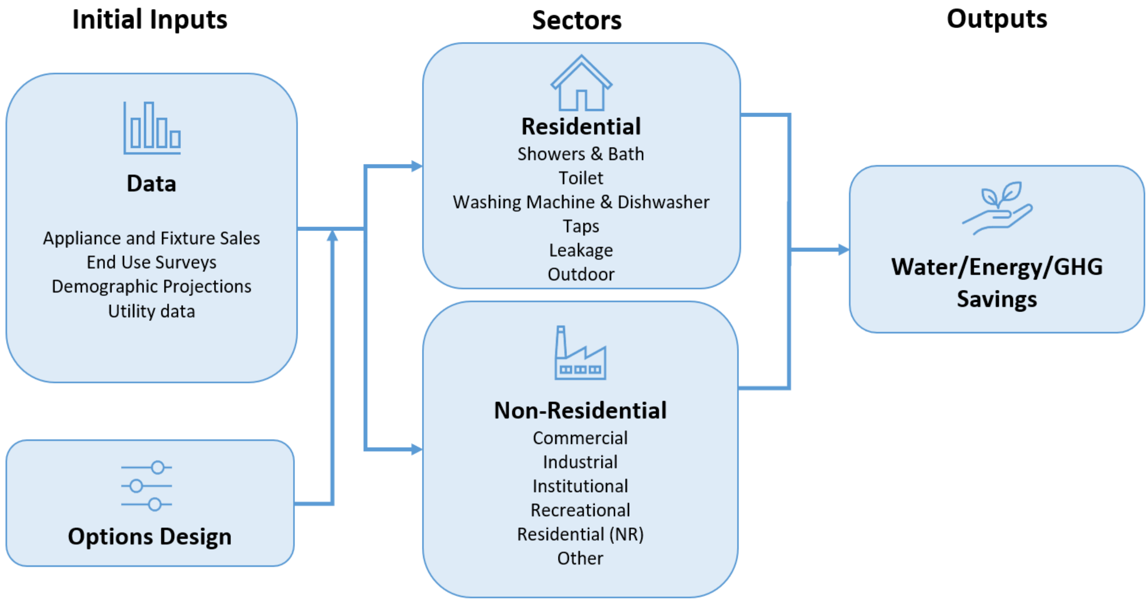


Figure 4: End-use modelling logic

The following sections detail how the hybrid ground-up and top-down approach is utilised for water demand forecasting. It is important to note that for the historical consistency, Council is interested to continue to keep the two main areas, North and South which are former Wyong Shire and Gosford City Council areas respectively. Data is kept separate for each area, including modelling residential and non-residential components before aggregation for a total forecast.

4.2 Residential water sales

Residential water demand is modelled through ground-up estimation of six main indoor end uses; shower, toilet, washing machine, dishwasher, taps and bath. For each component, the modelling considers the fundamental drivers of usage, for example, per person shower demand can be estimated as the multiplication of mean flowrate, duration, and frequency. Table 3 outlines the generic assumptions, their source and how they are forecasted. A full list of assumptions can be found in Appendix A of the Final Report of Central Coast Water Demand Forecast.

Table 3: Summary of data for residential modelling

Data	Source	Forecast
Behaviour	Literature Review	Constant (distribution)
Flow Rate	WELS Standard	Constant (distribution)
Appliance/Fixture Sales	Privately Licensed Data, Modelling based on WELS database	Modelling continued trends
Appliance/Fixture Lifetimes	Literature Review	Constant (distribution)
Stock	-	Calculated based on Sales and Lifetime

Literature based behavioural assumptions are based on results from Australian sources, typically end-use surveys. These surveys were completed frequently in Victoria during the 2000's and early 2010's (Roberts, 2003; Roberts 2004; Athuraliya et al 2008; Roberts 2012; Ghobadi et al, 2013; Redhead et al 2013, Roberts 2017) and other Australian States less frequently (QLD: Beal & Stewart, 2011; WA: Water Corporation, 2010). See F. Mazzoni et al (2023) for a worldwide review of these studies among others.

To consider the uncertainty of variables, particularly literature or assumed values, constants are treated as Log-Normal distributions with an error variance. Using properties of this distribution, both summation and multiplication can be evaluated mathematically to give a final water estimation as another Log-Normal distribution. This update to previous models allows for robust sensitivity calculations in the short-medium term forecast without the need for Monte-Carlo simulation. The model does not currently consider uncertainty in time, specifically around long-term sales, which results in smaller error estimates over the long-term horizon (20+ years).

4.3 Sales modelling

Data for the sales and stock component can be difficult to find as commercial interests are protective of sales data and regional specific stock surveys can be expensive to run. Demand for each water end use was calculated based on methodology from Fane et al 2024. The installed stock of different fixtures/appliance was determined based on sales estimations and their expected probabilistic lifetime. The mean flow rate of the region is then the multiplication of the installed stock proportions and the WELS rated flowrate for each technology. An example of sales can be seen in Figure 5.

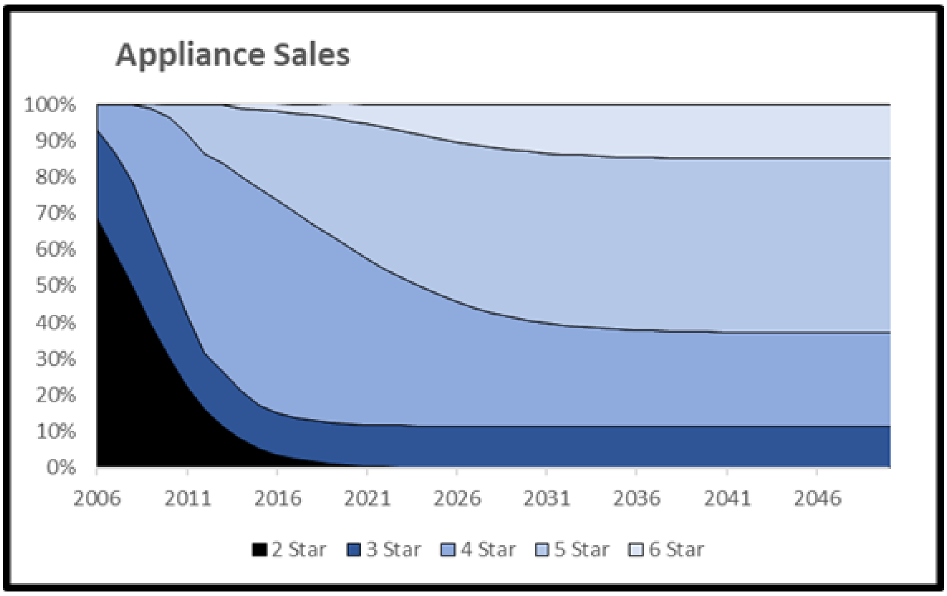


Figure 5: Modelled sales of dishwashers

Under a base case scenario, we expect the behaviour and flow rate to remain constant, which results in the standardised usage for end use changing over time based only on trends of sales (refer to Figure 6).

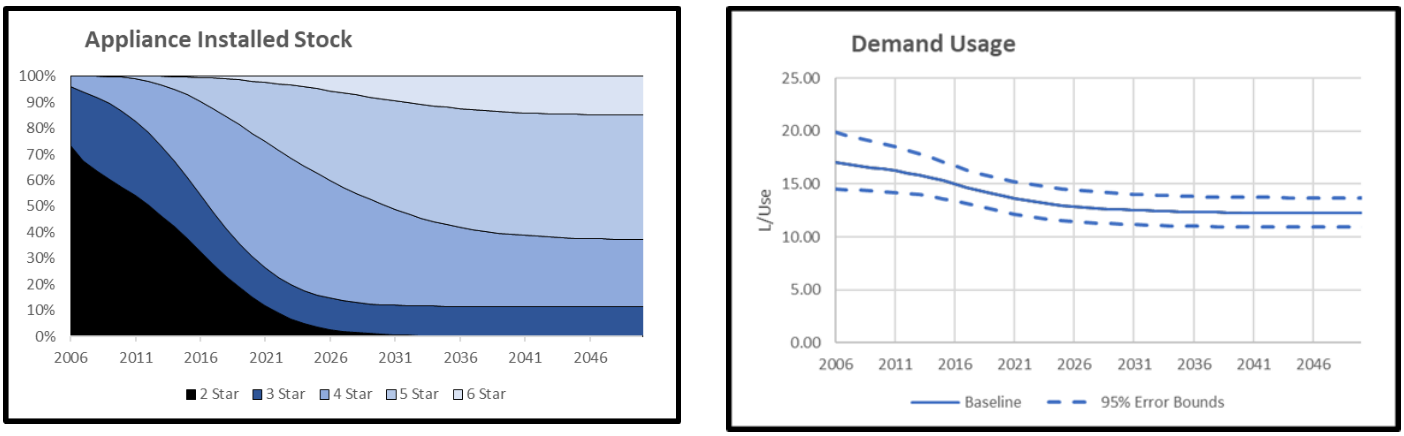
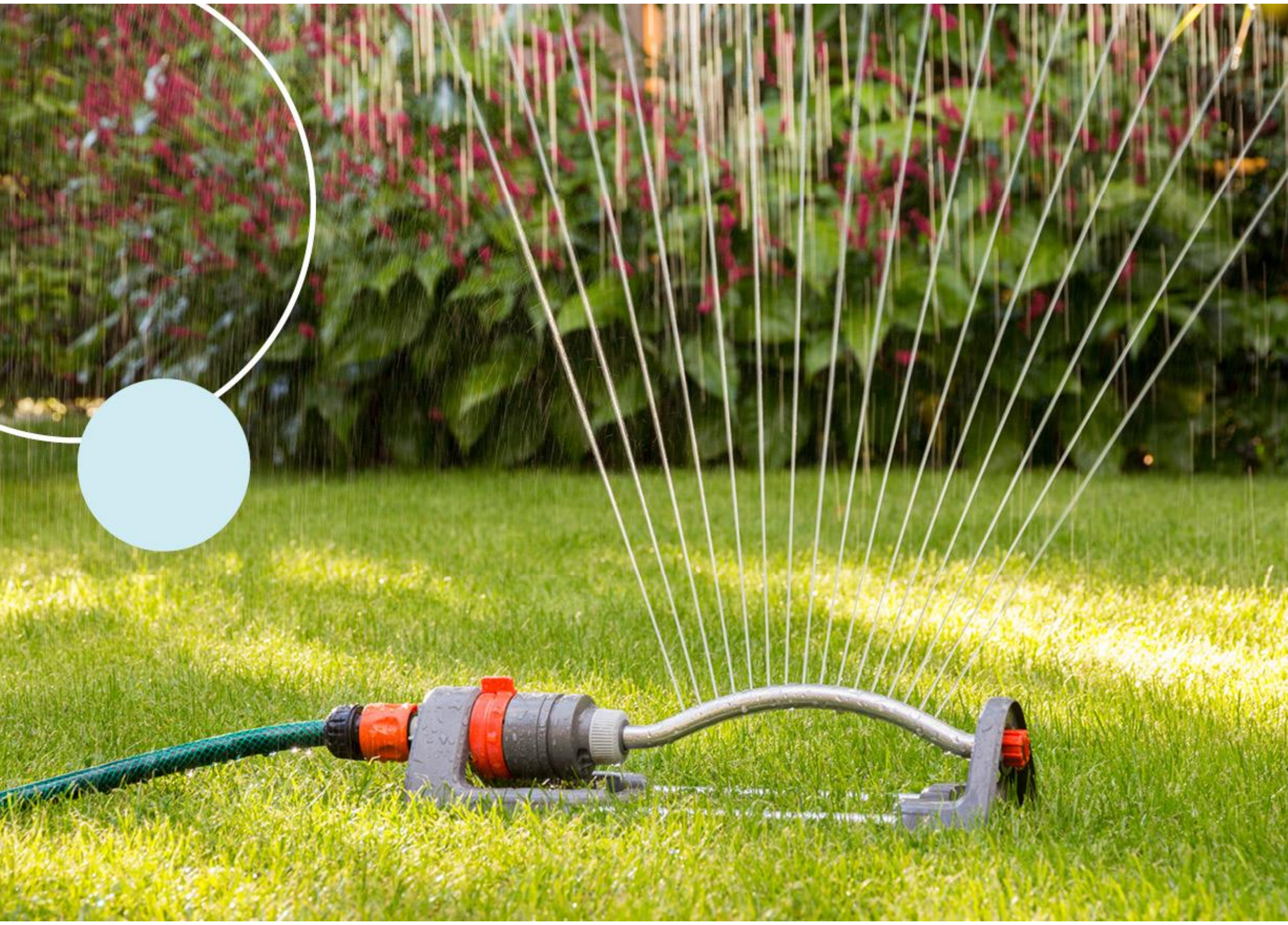


Figure 6: (A) Timeseries of installed appliance stock showing shifting efficiencies and (B) the resulting decrease in per capita demand.

4.4 Outdoor demand

Indoor uses and leakage are all considered independently and summed together to estimate the residential water indoor demand. This modelled indoor water demand and leakage is considered to be the ”non-climate driven” water demand. The difference between this modelled value and actual Council billing data for residential customers is then considered to be outdoor or ”climate dependent demand” – which includes irrigation, pools, car washing, rain tanks etc. Council's previous model considered the modelling of these components individually based on assumptions. Combining these components improves the forecasting, with the trade-off that Council is unable to measure the effects of any outdoor efficiency programs during future options analysis.

At a monthly scale, the calculated outdoor demand is linearly regressed with temperature and rainfall data to analyse the relationship between outdoor demand and climate. Figure 7 shows the relationship between outdoor demand and climate for North region single dwellings. Figure 7 uses the climate data for the regression downloaded from Scientific Information for Landowners (SILO) for the Dog Trap Road Station (61093).



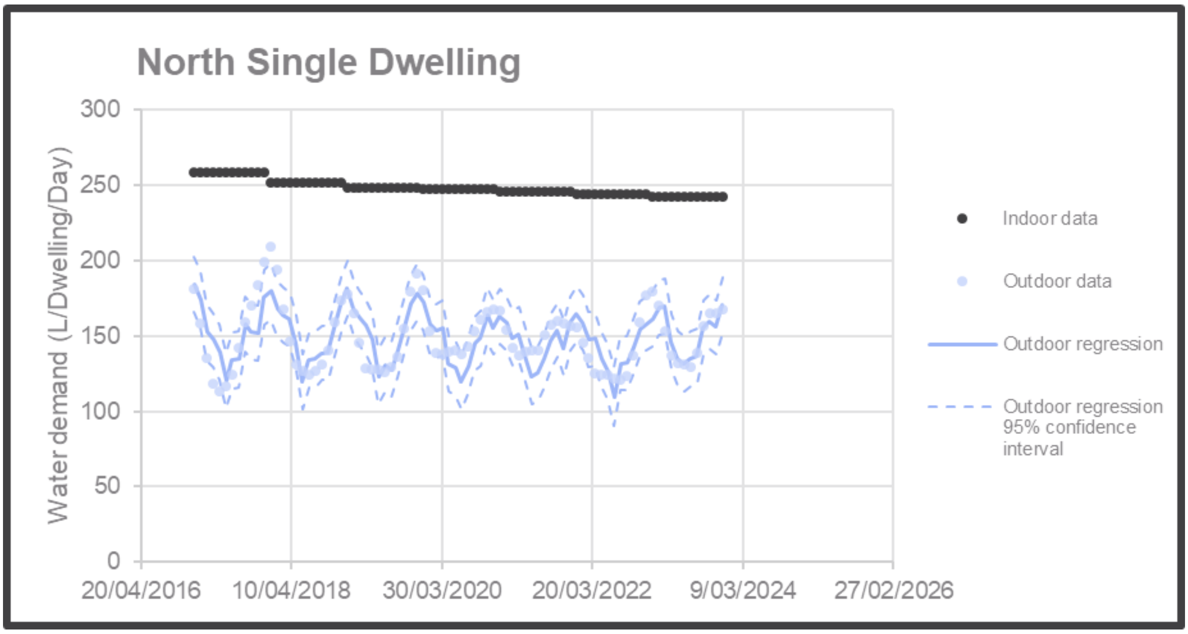


Figure 7: Example of modelled indoor and a regression trend on the outdoor component in single residential dwellings.

The resulting regression equations for the historical climate data and outdoor water demand are used with NARCliM2.0 climate projections for the Central Coast (Department of Climate Change, 2024) to forecast outdoor demand. The NARCliM2.0 ensemble average for the low and high emissions scenarios for rainfall and temperature was used for the forecasting. This time series was drawn from the Central Coast: Climate Change Snapshot (*ibid*) This is a departure from previous modelling which would only consider calibration on standard years and projected forward an average without the climate change signal.

The update allows the model, to consider the effects of climate change, in the longer term, on residential water demand, a key interest to Council to improve their forecasting methods. The high emission projections were used for the current short-term forecast; however, the choice of projection has no impact in the 5-year forecast. Beyond the medium term, the high emissions scenario had some impact on total demand while the low emission projections had little impact on total demand even in the long term, NARCliM2.0 data for high and low emission scenarios was only released in November 2024 and projections for the middle of the road emission scenario are yet to be released. Hence these were not used for the outdoor demand projections at this time. At present, the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) is working on building a consensus around how NARCliM2.0 data might best be used in a range of application including the range of climate models included and the three emissions scenarios.

4.5 Non-residential demand

Non-residential demand is considered on a sectoral basis using Council billing data. These are commercial, industrial, institutional (education, Government health), residential, recreation and other. The modelling in these sectors was a recommendation in a previous model review (Fane and Falletta, 2018).

For each sector, in each area (North and South), non-residential users are divided into intensive, high, and low which are each modelled differently:

- **Intensive users** - The model takes the top 5 users in each sector to be considered on an individual basis. By default, the average of input data is forecasted forward, however, if historically the demand is not consistent then further modelling should be done. On an individual basis, the demand of these intensive users has been regressed with population, climate or forecasted with the mean. In the future, to improve the forecast, Council could work with these top users to understand what drives their demand. Smart meter data of these customers can also be used to better understand their demand through statistical analysis.
- **High users** - In most sectors, the high users are chosen as the top 25 (30 taking into account the intensive users). This typically represents approximately 20% of the meters. For bigger sectors, this number is larger (195 for commercial and 45 for industrial). The count of meters (e.g. 25) is fixed in time and the forecast for high users is projected with the mean of this group.
- **Low users** - After removing properties which are considered as intensive and high usage, the remaining number of properties are regressed with the population. This adds a natural increase to the sectors as the Central Coast grows. As the demand of low users is consistent at a per property level, the mean is assumed forecast into the future.

Council has recently engaged AECOM to re-categorise their non-residential billing database and align it with ANZSIC code (AECOM, 2024). This is a good future step for Council to improve its analytics, however, due to the complications of non-residential modelling (e.g. non-homogenous usage, commercial in confidence etc.), these codes were aggregated and modelled at the broader sectoral categorisation above. While not relevant for this 5-year forecast, Council and ISF have discussed the potential for further research projects in

2025-26 to explore potentially more efficient ways to model the demand of individual sectors and make more extensive use of its updated database, particularly the use of .id data in terms of employment and economic output.

5 Actual and forecast water consumption

Growth in population and housing are the key drivers for water consumption and new connections across the Central Coast region, with dry and wet climatic conditions impacting the outcomes within any pricing period.

5.1 Current regulatory period

In 2022, IPART determined the Central Coast water forecast sales for the period 2022 to 2026 as provided in Table 4. The actual sales are within 2% less or more than the IPART determined figures for years from 2022-23 and 2024-25.

Table 4: Current pricing period forecast vs actual water sales

Category	2022-23	2023-24	2024-25	2025-26
Residential	20,867	20,966	21,076	21,190
Non-Residential	6,459	6,489	6,521	6,552
Total IPART Determined sales	27,326	27,456	27,596	27,742
Actual water sales	27,120	27,953	27,687	Not available till end of FY26

5.2 Next regulatory period

Using the methodology as explained in Section 4 - Modelling Approach – the forecast water sales are carried out for residential (indoor/outdoor) and non-residential sectors.

Forecasts are built up from projected changes in demographics over time as well as functions that reflect the shifts in the total stock of the plumbing products and appliances over time as well as the water efficiency of that stock for residential sector.

The outdoor end-use is the only residential category that is commonly determined using a top-down approach. Outdoor use is the difference between bottom-up modelling results for other end-uses and the historical metered consumption for residential customers. The climate change impacts are integrated for future forecast of outdoor demand.

The non-residential sector is divided into various segments; commercial, industrial, education etc. based on the recent customer classification of non-residential customers as per ANZSIC. For the purpose of forecasting water demand, all non-residential customer segments have been grouped into intensive (top 5), high (next 25) and low(remaining) customers. For intensive and high usage customers, their historical mean is used for future forecast. The count of low usage customers is forecast proportional to the population growth in both regions. The average usage of the low usage is used for forecasting water usage.

Table 5 and Figure 8 provide the forecast water sales for residential and non-residential sectors in megalitres/year for the pricing period. The forecast figures also include exempt customers usage.

Table 5: Water sales forecast (ML)

Category	2026-27	2027-28	2028-29	2029-30	2030-31
Residential	20,826	20,993	21,090	21,086	21,330
Non-residential	7,623	7,666	7,688	7,709	7,754
Total	28,449	28,659	28,778	28,795	29,084

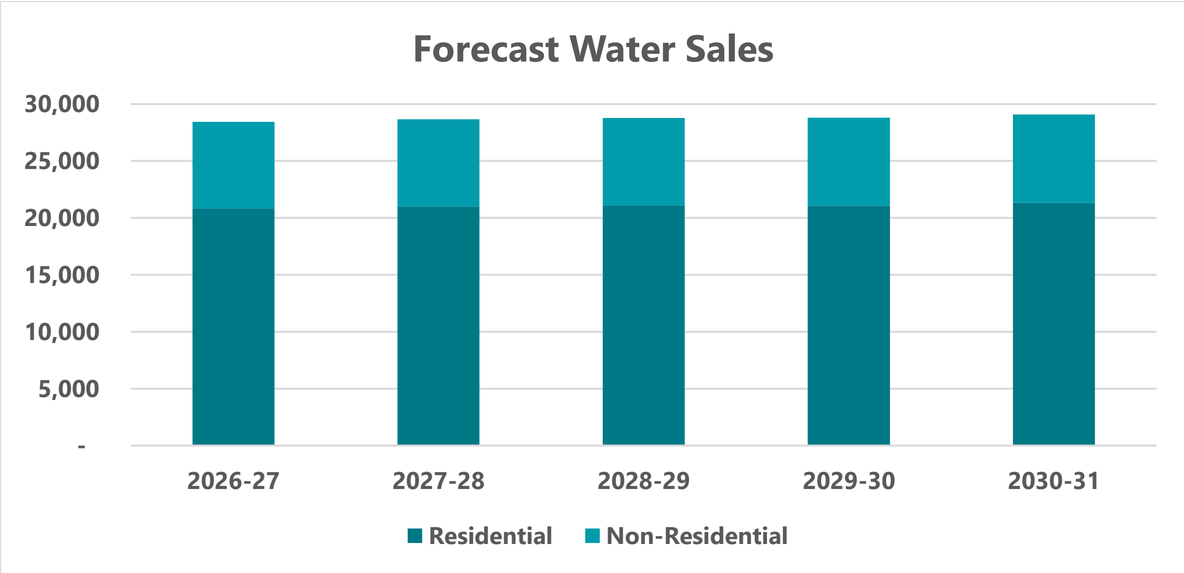


Figure 8: Forecast water sales

The forecasted water sales can be impacted by prevailing climate variability (dry and wet cycles), water restrictions, demand management measures and any variance in forecasted population growth. This can impact the revenue from water sales.

Council has used the 'Daily Tracking' model to inform the impact of climate. The cumulative frequency of five yearly (pricing period) demand factors on consumption in Figure 9 show low sensitivity (median value of 0.999) to prevailing climate conditions. It is shown that with prevailing conditions, there is low likelihood of future water demand varying by more than 2% because of climate variability. The resulting demand factors for selected percentiles are shown in Table 6.

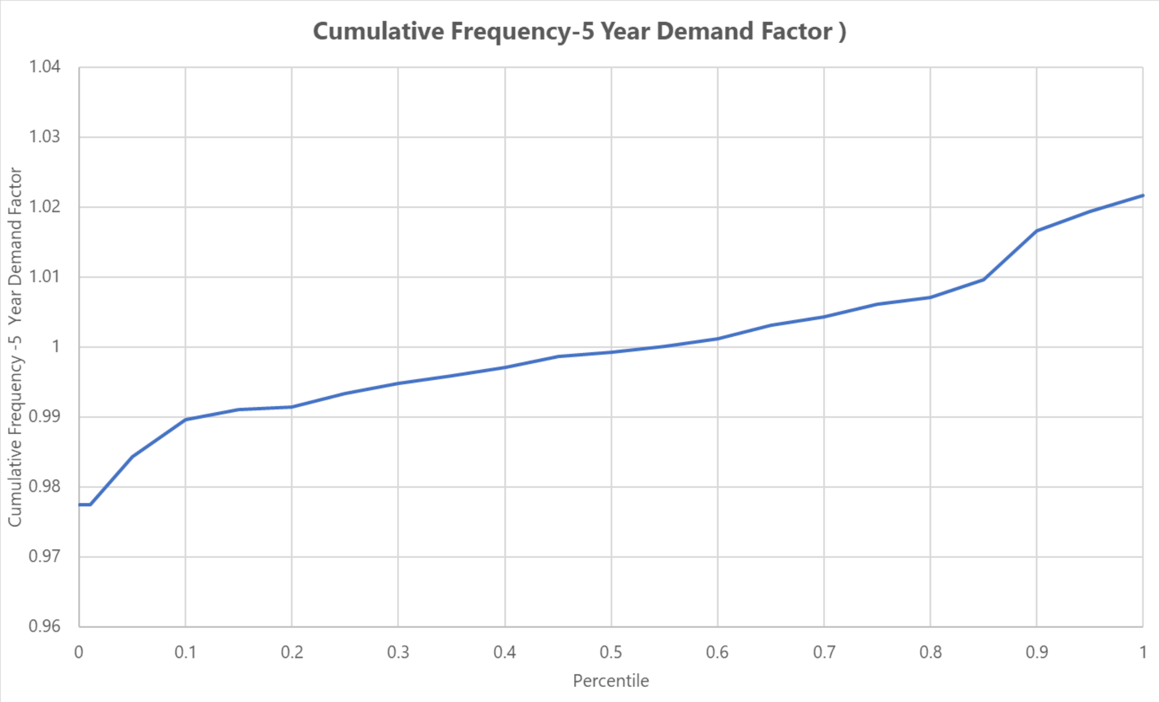


Figure 9: Cumulative frequency 5 year demand factors

Table 6: Demand outcomes for selected frequencies

Percentile	Demand Output
0.05	98.4%
0.25	99.3%
0.5	99.9%
0.75	100.6%
0.95	101.9%

In Council's next long-term water resources plan, Central Coast Water Security Plan, water conservation has been identified as a focus area which has potential to reduce water sales over the pricing path.
Council's main storage, Mangrove Creek Dam was 100% full in 2022, the first time since it was built in the 1980s. This was on the back of removing the cap on filling Mangrove Creek Dam above 80% its full capacity. The revised dam safety guidelines for risk-based assessment of the dam safety enabled the dam filling cap to be lifted. Mangrove Creek Dam is currently above 85% full. It is unlikely that water restrictions will be required in this pricing period.

The population forecast used for water demand forecasting is based on the latest ABS Census completed 2021. Any population trend changes that will be informed by the next Census in 2026 has the potential to impact demand in either way.

6 Actual and forecast sewage discharge volumes

Sewer usage for residential customers is based on property type and levied at a fixed charge to reflect the deemed usage. The deemed sewer usage is as follows:

- 125kL for standalone residential properties.
- 80kL for residential properties within multiple or mixed multiple premises.

Non-residential customers within mixed multiple premises have a deemed sewer usage of 125kL and are charged a fixed rate to reflect this. All other non-residential customers are liable for a volumetric sewer usage charge.

Sewage discharge volumes are a function of water sales. A sewage discharge factor is applied to water sales to reflect the estimated portion of metered water usage discharged into the sewerage system.

Only three of Council's non-residential customers are separately metered for sewage discharge. For other non-residential customers, a customer-specific discharge factor is applied based on the nature of the customer's business. See Technical Paper 8 for more detail on the deemed sewage discharge allowance and sewage discharge factors.

Variances between forecast and actual sewage discharge volumes reflect variances in overall non-residential water demand, as well as the mix of non-residential customers with different discharge factors (refer to Table 7).

Table 7: Sewage volume for non-residential customers

(ML/year)	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
IPART 2021 Determination		4,023	4,043	4,064				
Actual (including wastewater usage from customers with a sewer meter)	3,964	4,147						
Forecast based on ratio of actual sewage and water usage charges			4,085	4,163	4,186	4,198	4,210	4,234

To forecast the overall volume of sewage discharged into the sewerage system by non-residential customers, previous year's non-residential sewage discharge as a proportion of non-residential water sales was applied.

7 Actual and forecast billable connections

Council's billable connections are used to calculate the level of fixed (service) charges. This is required to forecast the number of connections (up to 2031) so the spread of the revenue across all connections can be done accurately based on IPART's price modelling methodology.

This section outlines Council's water and sewer actual and forecast billable connections based on actual billable connections as at December 2024.

7.1 Water connections

Connection forecasts is based on the rate of historical connections, population, and dwellings growth and divided into three different categories:

- Residential (includes exempt)
- Non-residential (excluding exempt)
- Non-residential exempt

The growth of billable entities is forecasted to grow with the growth of serviced population. The actual relative growth of billable entities from the previous two years, 2022-23 and 2023-24, is taken as baseline for the forecast for residential customers. The annual growth in total connections is distributed in various meter sizes proportionally to the annual average change in 2022-23 and 2023-24.

The annual growth forecast of non-residential (excluding exempt) and non-residential (exempt) billable entities is based on the average annual growth rate for previous three years from 2021 to 2024. Table 8 provides the forecast of water billing connections for various categories.

Table 8: Forecast water billing connections for determination period.

Water Service Customer Type	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Residential (includes Exempt)	139,392	140,553	141,640	142,616	143,489	144,481	145,466
Non-residential (excluding Exempt)	3,938	3,949	3,960	3,971	3,982	3,993	4,004
Non-residential Exempt	1429	1433	1437	1441	1445	1449	1453
Total	**144,759**	**145,935**	**147,037**	**148,028**	**148,916**	**149,923**	**150,923**

7.2 Sewer connections

Historically, the residential sewer connections are close to 98% of the residential water connections. This knowledge is used to forecast the future residential sewer connection. The growth of billable connections for each residential sewer meter size category is forecast in proportion to the growth of water connections of corresponding water meter size using the above factor. For non-residential category the growth is assumed to be same as in water connection for non-residential categories. Table 9 below provides the forecast of sewer billing connections for various categories.

Table 9: Forecast sewer billing connections for determination period

Sewer Service Customer Type	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
Residential (includes Exempt)	136,559	137,695	138,761	139,717	140,573	141,544	142,509
Non-residential (excluding Exempt)	3,689	3,700	3,711	3,722	3,733	3,744	3,755
Non-residential Exempts	977	981	985	989	993	997	1001
Total	**141,185**	**142,336**	**143,416**	**144,387**	**145,258**	**146,244**	**147,223**

Abbreviations

ABS	Australian Bureau of Statistics
ANZSIC	Australian and New Zealand Standard Industrial Classification
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DEECA	Victoria's Department of Energy, Environment and Climate Action
DVAM	Demand Volatility Adjustment Mechanism
GIS	Geographic Information System (mapping)
IPART	Independent Pricing and Regulatory Tribunal
iSDP	Integrated Supply Demand Planning
ISF	Institute of Sustainable Futures (UTS)
LGA	Local Government Area
SILO	Scientific Information for Landowners
UTS	University of Technology Sydney
WELS	Water Efficiency Labelling Scheme

References

- .id Informed Decisions, Central Coast population forecasts (as at June 2024).
- Institute for Sustainable Futures (UTS), Central Coast Water Sales Forecast for IPART pricing submission 2027-31, June 2025

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