Department of Climate Change, Energy, the Environment and Water

Water availability and access pathways

Central West Orana Renewable Energy Zone

May 2025

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

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Contents

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1 Executive summary

1.1 Context

This document is a deliverable in the Electricity Infrastructure Roadmap (the Roadmap) Implementation Plan as part of the whole-of-government approach to Roadmap delivery (item B.1.2.1). The NSW Government is establishing Renewable Energy Zones (REZs), which combine renewable energy infrastructure, storage and high-voltage transmission to deliver cheap, clean and reliable electricity for homes and businesses in NSW.

DCCEEW Water is responsible for collaborating with its partners and stakeholders to identify water-related challenges and solutions to support delivery of the Roadmap implementation plan within the water management framework.

This document supports delivery of the Roadmap by providing advice on:

- water availability and water and wastewater servicing capacity within the REZ and region
- cumulative demands for water and wastewater servicing
- pathways to address risks, enabling the transition to renewable energy while ensuring sustainable water resources in NSW.

This summary outlines the possible next steps based on findings in the report and explains how the advice was developed.

1.2 Possible next steps

Possible next steps are presented in Table 1 along with key findings. Actions to address the key findings will be developed and included in the whole-of-government implementation plan, including timeframes and agreed responsibilities.

Table 1 Possible next steps in this report.

No.	Findings	Possible next steps
1	The department's analysis has identified that: • most local water utilities currently have limited capacity to provide additional potable water or wastewater treatment to REZ projects • upgrades to existing infrastructure could help to meet demands where justified by longer-term servicing needs, noting that timeframes for approval and construction are challenging • alternatives are needed for potable water access and wastewater treatment where local water utilities cannot meet additional demands and loads, including on-site treatment during construction and operations • proponents may need to source raw water on the open market, subject to licensing and approval conditions. Government will have an important role in supporting proponents with the information they need to manage their responsibilities regarding water and wastewater management.	**Communicate early with proponents** the available pathways for water access and wastewater management. This should focus on informing proponents that: 1. if they are seeking to access town water supplies or wastewater treatment, they need to engage early with councils to discuss their needs and secure agreement 2. alternatives will be needed where local water utilities cannot meet expected demands and loads and this may include on-site treatment 3. they are responsible for securing raw water for construction use and as source water for treatment via the water market and need to consider the licensing and approval requirements for that take 4. they are responsible for understanding the level of risk associated with each water source and licence type and planning for potential interruptions to supply, including due to drought 5. they are responsible for managing human health and environmental risks associated with on-site water and wastewater treatment.

No.	Findings	Possible next steps
2	Factors constraining the capacity of water and sewage treatment plants to support the short-term water and wastewater needs of REZ projects vary between local water utilities. Specific actions to address constraints should be targeted to the causes of constraints in each LGA, where they pose risk to the delivery of REZ projects or where the impacts of increased demand are unacceptable.	**Work with councils** within the Central-West Orana REZ to identify opportunities to address capacity constraints, including: 1. where investment in long-term infrastructure is supported by long-term population projections, to identify infrastructure needs and potential sources of funding, noting that no existing sources of funding have been identified. 2. where water entitlement is a limiting factor, reviewing the volume local water utilities need to service projected population increases and assess options 3. initiatives to address critical skill or workforce shortages, particularly for plant operators.
3	The volume of water entitlement in the relevant groundwater and surface water sources exceeds estimated project demands. However, access to that water requires willing sellers in the open market. There is a risk that the market will not function as expected and proponents will not be able to trade, either due to low market activity/maturity or entitlement holders choosing not to trade. If drought occurred during construction, it would reduce the water able to be allocated to licence holders.	**Prepare for situations where projects cannot access water on the market to meet demands** by considering potential actions and forming positions as required.
4	Increased demand for raw water and changing timing for peak demands could have impacts on planning and delivery of environmental water. Engagement is needed across NSW agencies to understand these risks and address them as needed.	DCCEEW Water to **engage with partner agencies** to understand impacts of increased raw water demand on environmental needs, in addition to town water and commercial extraction.

No.	Findings	Possible next steps
5	This report contains the best available information as of March 2025 and changes to project timings or scope may require new actions or changes to agreed actions. All agencies need timely access to current information from a consistent source.	**Coordinate sharing of information about changes in proposed projects**, including start/finish times, worker populations and water/wastewater requirements, and identify additional actions as needed to manage risks.

1.3 Approach to developing advice

This advice is a strategic-level water security assessment, aimed at understanding the cumulative impacts of development, and the risks and opportunities related to water and wastewater management across the Central-West Orana REZ and surrounding region.

The advice is based on themes, applied to 7 clusters of projects grouped around existing water infrastructure and water resources. Themes covered in this advice are:

- Potable water
- Raw water
- Wastewater
- Recycled water.

Data were sourced from Environmental Impact Statements (EISs) prepared by energy project proponents where available, noting that projects are at different stages of planning approval. Where needed, EIS data were supplemented with transparent assumptions based on key factors such as workforce size, project timelines, project type (e.g., wind, solar) and project size (in MW of generation). This approach uses the best available information at the time and recognises that findings may require revision as more information becomes available.

Consultation with key stakeholders informed development of this advice. This includes seeking input from local councils within the REZ, NSW Government agencies and internal subject matter experts.

2 Introduction

2.1 Context

The NSW Government has designated the successful delivery of the Roadmap as a strategic priority of Government. One element of the Roadmap is creation of REZs, which are modern-day power station equivalents. They combine new renewable energy infrastructure, storage and high-voltage transmission to deliver cheap, clean and reliable electricity for homes and businesses in NSW.

There are 5 REZs planned for NSW (Figure 1)

1. Central-West Orana
2. New England
3. South West
4. Hunter-Central Coast
5. Illawarra.

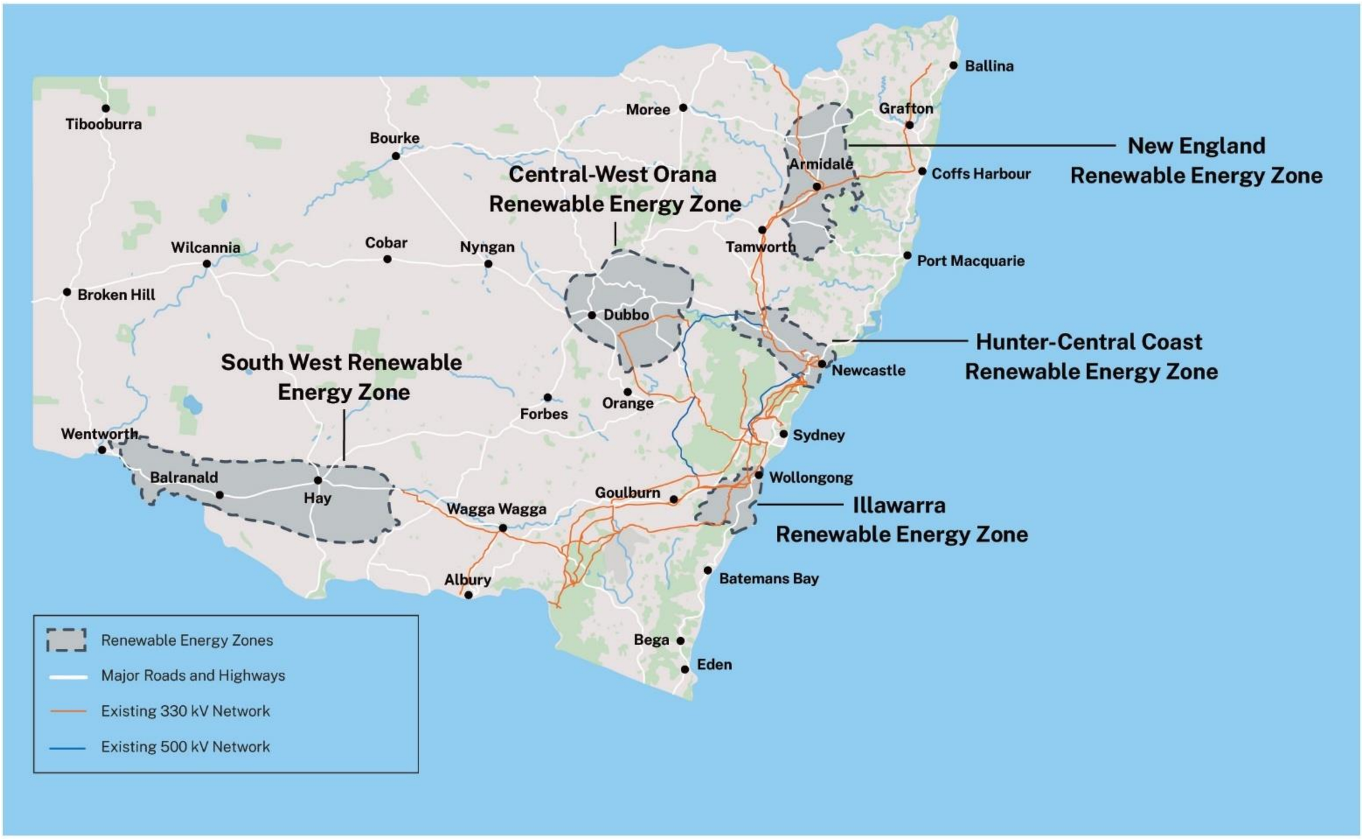


Figure 1 Map of renewable energy zones in NSW. Source: EnergyCo.

The Energy Corporation of NSW (EnergyCo) is the agency responsible for overseeing the REZ program with a whole-of-government approach. This includes coordinating investment in REZs, strategic planning, technical and regulatory design, communications and stakeholder engagement.

DCCEEW Water is responsible for collaborating with its partners and stakeholders to identify water-related challenges and solutions to support delivery of the Roadmap implementation plan within the water management framework. This is supported by the Water Group's 2024-2029 Business Plan (Priority 5.1 is 'coordinating whole of government implementation plan actions for provision of water and wastewater in Renewable Energy Zones, and as part of the broader Electricity Roadmap').

DCCEEW Water's work builds on cumulative impacts studies prepared by the Department of Planning, Housing and Infrastructure (DPHI), including for population, workforce, housing and population.

2.2 Central-West Orana Renewable Energy Zone

The Central-West Orana REZ is approximately 20,000 square kilometres centred by Dubbo and Dunedoo, on the land of the Wiradjuri, Wailwan and Kamilaroi people (Figure 2).

Figure 2 Map of Central-West Orana REZ. Source: EnergyCo.

The successful operation of the Central-West Orana REZ is reliant on new transmission network infrastructure, including transmission lines and energy hubs. This new infrastructure will facilitate the transfer of power generated by solar and wind farms to consumers throughout the state. The REZ is expected to have a 4.5 gigawatt network capacity by the late-2020s with an ultimate capacity of 7.7 GW.

The network operator, ACEREZ, has been assigned to design, build, finance, operate and maintain the transmission network. Other proponents are seeking access rights to the energy network to construct generation projects within the Central-West Orana REZ and export electricity to the broader electricity network.

In addition to new transmission infrastructure, the REZ will see development of wind farms, solar farms, battery energy storage systems (BESS) and pumped hydro. Construction for some projects has already started and the earliest could be operational by 2030, pending necessary approvals.

2.3 Purpose of this document

The purpose of this document is to support delivery of the NSW Government's Electricity Infrastructure Roadmap (the Roadmap) by providing advice on:

- water availability and water and wastewater servicing capacity within the REZ and region
- cumulative demands for water and wastewater servicing
- pathways to address risks, enabling the transition to renewable energy while ensuring sustainable water resources in NSW.

This document is a deliverable in the Roadmap Implementation Plan as part of the whole-of-government approach to Roadmap delivery (Reference B.1.2.1).

2.4 Our approach

This advice is a strategic-level water security assessment, aimed at understanding the cumulative impacts of development, and the risks and opportunities related to water and wastewater management across the Central-West Orana REZ and surrounding region. The approach has been designed to produce findings and possible next steps to inform decision-making by DCCEEW Water and its partners in NSW Government and local councils.

2.4.1 Theme-based approach

A theme-based approach has been developed, targeting the most prominent sources of water and methods of treatment:

- potable water (focusing on local water utilities)
- raw water (surface water and groundwater resources and water licensing)
- wastewater (focusing on wastewater treatment facilities)
- recycled water (as a resource for re-use).

Themes provide the structure for this document and focus analysis of issues, opportunities and pathways to address issues.

2.4.2 Principles for identifying pathways

Pathways are the options to support meeting water and wastewater management needs. For the purposes of developing this advice, DCCEEW Water has identified principles to support the identification of pathways.

Water availability pathways:

- must ensure there is **no net decrease in water security** for local communities

- must **avoid or minimise negative impacts** on the environment, other water users, communities and industries
- must be **consistent with regulations and policy**, including legislated priorities for water sharing
- should provide for an **enduring positive legacy** where possible
- should **consider views of key stakeholders** and reflect engagement.

2.4.3 Role of DCCEEW Water and NSW Government

DCCEEW Water is responsible for sustainable management of water resources in NSW in collaboration with its partner agencies, including Local Government. DCCEEW Water has a key role as a regulator of water licensing and approvals, water allocations and local water utilities among other aspects of water management. DCCEEW Water balances its role as a regulator alongside its functions providing support and information to water users and partners to help them understand and comply with legislation and regulations.

Principles related to the role of NSW Government, local government, and renewable energy development proponents include that:

- the level of service provided by NSW Government to proponents should be consistent with that provided to other water customers while reflective of the fact that the renewable energy transition is a government priority
- local councils are responsible for undertaking strategic planning, infrastructure delivery and managing risks associated with supplying water and wastewater services including in the context of extreme events, with support from NSW Government
- proponents are responsible for securing access to the water and wastewater solutions they need and demonstrating this before commencing activities.

2.4.4 Project clusters

Seven project clusters have been used to assess water and wastewater resource needs and availability at a meaningful and manageable scale. Assignment of clusters considered:

- proximity to a common town
- proximity to a common water and/or wastewater treatment plant
- likelihood of projects drawing from same or adjacent raw water sources (surface water and groundwater).

The cluster approach varies from the Central-West Orana REZ Cumulative Impact Assessment - Population, Workforce and Housing and Accommodation Cumulative Impacts (DPHI, 2024), which focused on Local Government Areas (LGAs) and accommodation catchments around towns. The cluster-based approach is better suited for water resource analysis.

Discussion of risks and issues in this document is organised by theme and cluster to facilitate possible next steps for actions that are meaningful for water management frameworks. Figure 3 shows the 7 clusters and projects included within and Table 2 identifies the nearest local water utilities and potential raw water resources for each cluster. See Section 11.9 for maps including water sources.

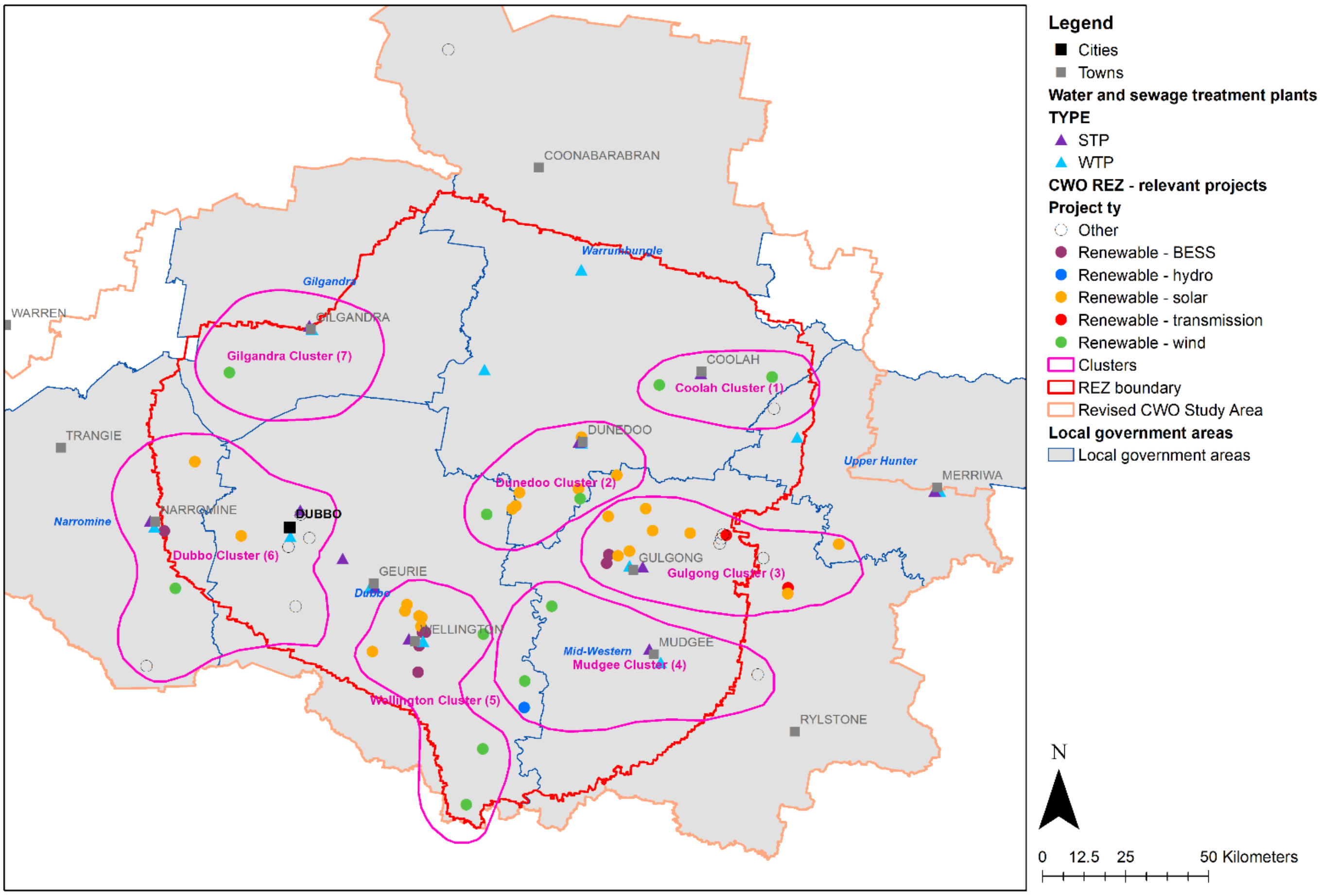


Figure 3 Clusters of projects in relation to towns and Local Government Areas.

Table 2 Nearest local water utilities and potential raw water resources for each cluster.

Cluster	Nearest local water utilities	Potential raw water resources
1 – Coolah	Coolah WTP/STP	Talbragar Alluvial, Lachlan Fold Belt MDB, Oxley Basin Coast, Sydney Basin North Coast groundwater sources
2 – Dunedoo	Dunedoo WTP/STP	Talbragar Alluvial, Lachlan Fold Belt MDB, Gunnedah Oxley Basin MDB, Southern Recharge groundwater sources, Lower & Upper Talbragar Rivers unregulated water source
3 – Gulgong	Gulgong WTP/STP	Lachlan Fold Belt MDB, Gunnedah Oxley Basin MDB, Sydney Basin MDB groundwater sources, Cudgegong River regulated water source
4 – Mudgee	Mudgee WTP/STP	Lachlan Fold Belt MDB, Cudgegong River regulated water source
5 – Wellington	Wellington WTP/STP	Lachlan Fold Belt MDB, Macquarie River regulated water source

Cluster	Nearest local water utilities	Potential raw water resources
6 – Dubbo	Dubbo WTP/STP	Lachlan Fold Belt MDB, Gunnedah Oxley Basin MDB, Southern Recharge groundwater sources, Macquarie River regulated water source Macquarie River regulated water source
7 – Gilgandra	Gilgandra WTP/STP	Southern Recharge, Lachlan Fold Belt MDB, Gunnedah Oxley Basin MDB groundwater source,

Three projects were identified that did not logically fit within clusters:

- Narromine to Narrabri Inland Rail
- Nevertire Solar Farm Mod 4
- Cadia East Gold Mod 14.

These projects were predominantly non energy-related and geographically isolated from the clusters. They are discussed separately in this document, following the cluster-based analysis. See Section 0 for more information.

2.4.5 Projects in scope

This report considers the cumulative impacts of water demand and wastewater loads from major projects across the REZ. While the focus is on renewable energy projects, the analysis includes all State Significant Developments (SSDs) covered by the Central-West Orana REZ cumulative impacts studies, including extractive projects (see Section 11.7 for a full list of projects).

There are several SSDs within the Central-West Orana REZ area that are not related to renewable energy generation but should be considered when discussing cumulative impacts of development. Assessments of water demand and availability within each cluster have been undertaken both with and without these other projects but the focus in this assessment has been on the renewable energy projects.

SSDs related to existing projects requesting modifications are included in scope, but only additional water demands or changes to existing water allocations have been considered (i.e., if their current usage is unchanged, their water requirements are not in scope).

2.4.6 Internal and external consultation

Extensive internal and external consultation has underpinned this advice, drawing primarily on internal and whole-of-government governance arrangements. This includes engagement with local councils within the REZ. See Section 11.6 for more information.

2.4.7 Analysis reflects a point in time

Assessment of water demands and wastewater loads is underpinned by available information at a point in time and assumptions based on key project details such as start and finish times, workforce population and size of development. These key project details are subject to change throughout the planning process and post-approval, and these changes could have impact the estimated peak demands and loads. It may be necessary for DCCEEW Water to revisit aspects of the analysis in this document as new information becomes available, or to adjust planned actions, as part of an adaptive approach to implementation.

2.4.8 Standard assumptions

DCCEEW Water has adopted a range of standard assumptions to enable delivery of robust advice where data availability is limited and to ensure consistency with approaches used by others, including DPHI's cumulative impacts studies on population and housing. These assumptions are outlined below.

Many EISs did not provide sufficient information about water and wastewater needs to directly inform this analysis. Review of EISs found 16 Central-West Orana REZ projects had sufficient information, and assumptions to fill gaps in the remaining projects were established based on these. This approach is limited by the quality of those EIS inputs and the methods used by proponents to produce them.

2.4.8.1 All temporary construction workforce housed in temporary accommodation

Based on DPHI's cumulative impacts study, local towns lack sufficient accommodation capacity to house the temporary construction workforce. Therefore, each project is anticipated to establish its own temporary workforce accommodation (TWA) capable of providing accommodation for the peak workforce. Although some projects may share or repurpose accommodation facilities, specific arrangements are yet to be verified so it is assumed that each project has its own temporary accommodation camp.

2.4.8.2 Temporary construction workforce number and profiling

EISs typically contained peak workforce estimates but no or little indication of how the workforce would change over time. This was addressed by scaling the peak workforce numbers according to a percentage of peak workforce per quarter as in Figure 4.

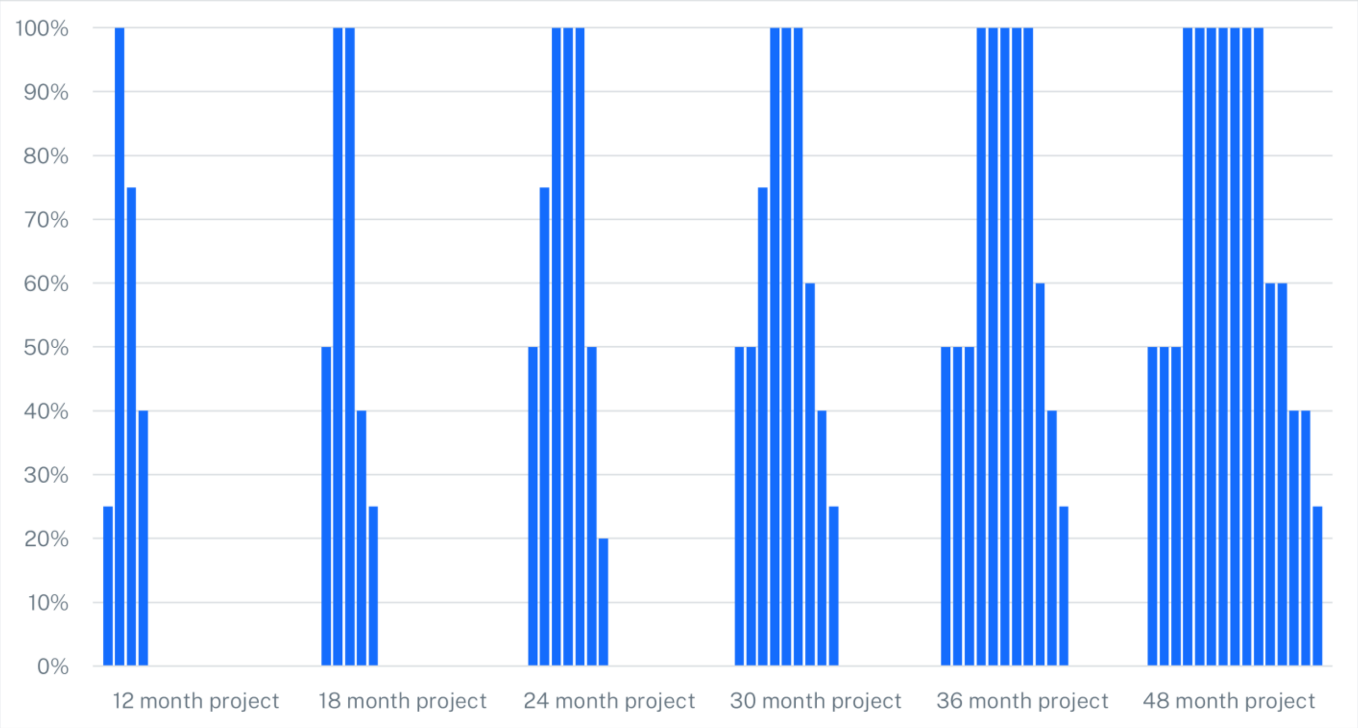


Figure 4 Workforce population scaling over assumed project timeline. Each column represents one quarter.

Application of this scaling to the entire Central-West Orana REZ results in a peak construction workforce of approximately 5,000 to 8,000 workers throughout 2027-2030 (Figure 5). These results for each LGA were compared against the population projections in the population and accommodation cumulative impacts study and found to be consistent. Note that LGA-based results were produced for comparison with the cumulative impacts study only and analysis in this document focuses on the clusters described in 2.4.4.

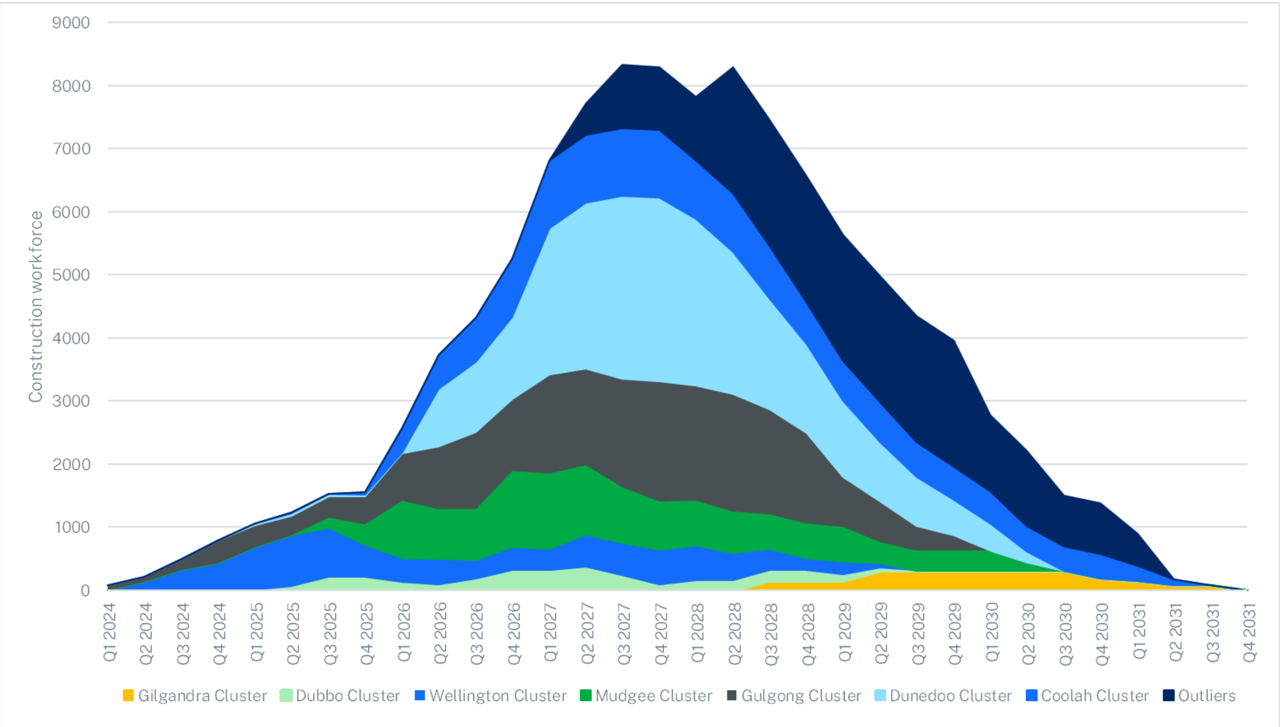


Figure 5 Construction workforce within each project cluster. Information sourced from proponent EISs and standard assumptions.

2.4.8.3 Operational workforce

The Central-West Orana transmission project is scheduled for completion in 2030 and EISs for projects reviewed in this analysis suggest most projects will be completed by 2030-2031. The operational phase for projects is assumed to commence after a period of 6 months for commissioning and operational workforce numbers are assumed to be consistent from this time and throughout the project lifespan (to 2050). Adoption of these assumptions results in a total operational workforce of approximately 1437 workers from 2031 onwards.

2.4.8.4 Start and finish times of projects

DPHI's standard assumptions were used to estimate construction start and end dates for projects where the EIS did not specify this. Solar and BESS projects were assumed to start 24 months after approval of the Secretary's Environmental Assessment Requirements (SEARs), while wind farms were assumed to start 36 months after SEARs approval, aligning with typical lag times observed in previous DPHI assessments.

2.4.8.5 Potable water use within temporary worker accommodation and construction sites

Due to the inconsistent values of potable demand in proponents planning documents (e.g., EISs), assumptions have been adopted based on those used by EnergyCo to plan construction of their REZ projects. This supports a consistent approach across government. This analysis assumes 185 L/p/day for TWA camps and 60 L/p/d for construction sites. These values are within the range of figures provided in EISs and residential water use in the REZ area, ranging from 140 L/p/d to 460 L/p/d. Water use was assumed to follow the workforce profile of each project over the life of the project.

2.4.8.6 Wastewater generated within temporary worker accommodation

Wastewater production for TWA camps was estimated by applying a wastewater usage discharge factor (WUDF) with reference to the Liquid Trade Waste Management Guidelines 2009 – Appendix G. The WUDF defines the portion of potable water that would be converted to wastewater. The average WUDF for non-residential accommodation (e.g., motels and hostels) is 90% and this has been adopted for TWA due to the temporary nature of the construction accommodation. It was assumed that that proponents would not implement grey water separation to reduce the treatable wastewater load, although this may not be true for all cases.

2.4.8.7 Wastewater generated at construction sites

Wastewater production at construction sites was estimated by applying a WUDF of 75% to potable consumption (60 L/p/d) at those sites. It was assumed that worker facilities on-site are in accordance with appropriate work, health and safety requirements, that there are no food processing or laundry facilities, and limited showers.

2.4.8.8 Equivalent Population (EP) of temporary worker accommodation and construction sites

Actual volumes of wastewater have been estimated using the WUDF described above, which is particularly important for understanding the trucking requirements and hydraulic capacity of a sewage network. However, the design capacity of wastewater treatment plants is typically rated and discussed in terms of equivalent population (EP). This analysis adopted 150 L/EP/d for TWA camps and 5 workers/EP/d at project construction sites. While some treatment plant ratings may reflect higher EP values (e.g., 180-200 L/EP/d), a conservative approach was adopted here.

2.4.8.9 Temporal profiling of non-potable water use during construction

Estimates for raw water demand over the life of a project assume that the increase to peak non-potable demand takes place over 2-3 quarters, aligning with the expected timing of construction activities that require non-potable water such as dust suppression, earthworks compaction, and concrete batching. The peak demand is maintained for 60% of the project construction period and falls quickly to a maintenance level of 20% of peak demand, reflecting the greater need for water for dust suppression and landscaping toward the beginning of construction.

3 Overview of project types

At time of writing, the Central-West Orana REZ area is proposed to include approximately 27 solar farms, 11 wind farms, 6 battery storage systems, 5 energy hubs, various transmission upgrades and 1 pumped hydro project. All projects will have a construction workforce, expected to be housed in temporary worker accommodation.

This section provides high-level information about the specific water-related issues associated with each type of development within the REZ. Note that temporary worker accommodation is discussed separately and not for each development type. Other non-renewable energy projects within and adjacent to the REZ area are also included in this report but are not discussed in this section. See Section 11.7.

3.1 Shared water and wastewater needs in renewable projects

While each renewable energy project has unique water and wastewater management needs, several common requirements exist, including:

- site office needs, including kitchens, washbasins, and bathroom amenities
- machinery and vehicle washdown areas
- fire protection.

3.2 Solar farms

The major uses of water in solar farm construction are for:

- dust suppression along internal unsealed access roads, and cleared areas for sub-stations, site offices, power conversion and battery skids until equipment is fitted
- earthworks compaction where fill needs to be stabilised to support heavy equipment
- concrete batching during construction for equipment plinths and transmission tower foundations
- cleaning panels in the operational phase (very minor water use requirement).

Water used is generally non-potable unless quality of the source water does not meet specification requirements (e.g., for concrete batching).

3.3 Wind farms

The major uses of water in wind farm construction are for:

- dust suppression along internal unsealed access roads, hardstand laydown areas adjacent to wind turbine generators (WTG), and cleared areas for sub-stations, site offices, power conversion and battery skids until equipment is fitted

- earthworks compaction where fill needs to be stabilised to support heavy equipment; this tends to be greater for wind farms as significant earthworks is usually necessary in hilly terrain
- concrete batching during construction for WTG foundations, equipment plinths and transmission tower foundations.

Water used is generally non-potable unless quality of the source water does not meet specification requirements, particularly in relation to the structural requirements for WTG foundations. Operational water needs are minor.

3.4 Battery energy storage systems

The major uses of water in battery energy storage systems (BESS) construction are for:

- dust suppression along internal unsealed access roads, and cleared areas for sub-stations, site offices, power conversion and battery skids until equipment is fitted
- earthworks compaction where fill needs to be stabilised to support surface equipment loads
- concrete batching during construction for equipment plinths and transmission tower foundations.

BESS developments have a much smaller footprint than either solar or wind farm developments. Accordingly, their construction water requirements are much less. Ongoing water needs for the operational phase are minor.

3.5 Energy hubs and transmission lines

The major uses of water in energy hub and transmission line construction are for:

- dust suppression along internal unsealed access roads (to and between towers), hardstand laydown areas transmission towers, and cleared areas for energy hub sub-stations, and site offices (until transformers and other equipment have been installed)
- earthworks compaction where fill needs to be stabilised to support heavy equipment; this tends to be greater if transmission lines and associated access roads traverse hilly terrain
- concrete batching during construction for transmission tower foundations and equipment plinths.

Water used is generally non-potable unless quality of the source water does not meet specification requirements, particularly in relation to the structural requirements for tower foundations. Operational water needs are minor.

3.6 Pumped hydro

The major uses of water in pumped hydro construction are for:

- dust suppression along internal unsealed access roads and site offices
- earthworks compaction where fill needs to be stabilised to support heave equipment
- concrete batching, depending on the arrangement and size of reservoirs

- dewatering as required for tunnels.

Water licensing considerations for initial fill and operation of pumped hydro projects can be complex and are best considered on a case-by-case basis.

3.7 Temporary worker accommodation

Temporary worker accommodation requires water and wastewater management, scaled according to the number of people accommodated. Water and wastewater management needs include:

- potable water for workers' domestic needs
- wastewater treatment and disposal for sewage
- liquid trade waste treatment and disposal (e.g., grease arrestors for kitchens)
- dust suppression and concrete batching during construction of accommodation.

4 Overarching issues and risks

In addition to the theme-specific challenges and opportunities outlined below, this section identifies overarching issues and risks at a whole-of-REZ scale. The specific implications of these overarching risks and issues for the themes are identified in those sections where appropriate.

4.1 Drought and extreme water quality events

If extreme events occur during the construction phase, there is a high likelihood that construction activity in the REZ would need to be scaled back or suspended, risking delivery of the Roadmap. Proponents must understand and plan for these corporate risks. This means understanding the risks associated with each water licence type and planning for contingencies by diversifying water supplies and knowing what steps will be taken if water supplies fail.

During extreme drought, water allocations may be reduced in line with the NSW Extreme Events Policy and local water utilities will impose water restrictions to conserve supplies. Depending on the water access licence types held by proponents, raw water may not be available for construction activities and temporary worker accommodation may not have sufficient water to remain open.

Extreme water quality events can be caused by flooding, drought or other conditions. Poor water quality may render the resource unsuitable for treatment to required standards or may require additional processing time to treat. Surface water sources are particularly susceptible. Local water utilities will likely reduce their production of potable water if source water quality is significantly impacted and on-site water treatment systems operated by REZ project proponents may need to do the same.

4.2 Coordination and scheduling

Key project details are subject to change throughout the planning process and post-approval, and these changes could have a significant impact on the estimated peak demands and loads. There is a risk that either agencies have different levels of awareness of changes or that changes may be missed altogether. There is an opportunity through the whole of government approach to Roadmap delivery to coordinate the sharing of this information to ensure that decisions are based on the best available information at the time and that all agencies are working from a shared understanding of demands for resources and infrastructure.

4.3 Availability of key services and human resources

Access to suitable water resources and wastewater management is dependent on availability of suitably trained water and sewage treatment operators, water carters to transport water and wastewater, and portable water and wastewater treatment solutions.

There is currently a shortage of trained water and sewage treatment operators in regional NSW. This means that some plants cannot operate at their potential capacity or are at risk of needing to scale back or suspend activities. While there are actions underway in NSW Government to increase the workforce, these measures may not be in place in time to provide the support needed in the REZ.

Water carters are required to transport potable and raw water from the source to the point of use, and to transport wastewater or septage residuals to treatment plants. Due to health risks, water carters are licenced and their tankers can only be used for a single purpose (e.g., raw water cannot be transported in a potable water tanker and wastewater cannot be transported in any water tanker). The number of tanker loads required to transport water and wastewater in the REZ may exceed the number of carters available in the region, depending on the extent to which water and wastewater needs are managed on site.

Increased demand for portable 'package' water and wastewater treatment plants could exceed the supply of these products in the region or more broadly. The industry providing these solutions has not been engaged for this report and the analysis assumes that the solutions are available. Shortages could mean that construction would be delayed for some projects due to lack of drinking water and sanitation.

4.4 Distribution of risks to private enterprises

Proponents will in most cases be responsible for managing their own water and wastewater requirements, including treatment of raw water for domestic use. This requires that proponents understand their responsibilities with regards to operation of infrastructure. There is a risk that proponents will not meet regulated guidelines for water treatment or that infrastructure failure or lack of redundancy will result in risks to human health. The distribution of this risk to private enterprises could either increase this risk due to oversight challenges or decrease the risk by decentralising infrastructure.

5 Potable water

Potable water is water treated to a standard suitable for domestic consumption. It is produced by a water treatment plant, either operated by a local water utility or commercially.

5.1 Key findings

5.1.1 Challenges

The following key challenges have been identified as limitations to meeting potable water requirements in the Central-West Orana REZ:

- Capacity constraints: Most existing water treatment plants (WTPs) are operating at or near their design capacity and water filling stations are unlikely to meet additional potable water demand without augmentation. WTPs also experience seasonal and tourism-related fluctuations in water demand which may affect their ability to meet additional supply requirements from proponents in peak seasons.
- Skills shortages: Regional areas face challenges in attracting and retaining skilled water treatment personnel. Staff losses could significantly impact a local water utility's ability to service an increased demand.
- Raw water quality: Poor raw water quality can restrict treatment volumes, regardless of a WTP's design capacity. Drought and flood can further limit available source water for treatment.
- Water entitlement: Some councils have reported insufficient water entitlement to treat additional water (see Section 11.5).
- Impacts to existing service levels: A significant increase in demand is likely to impact current service levels (i.e., reduced water pressure, and shortages during dry periods).
- Timelines for upgrades: Any major upgrades to existing facilities will require planning, funding, approval, contracting, delivery and commissioning. This process takes time and risks missing the forecast peak demand from REZ construction (end 2027 to end 2030).
- Water carting: Most TWA camps are expected to be co-located with project sites rather than in proximity to existing water infrastructure. If existing WTPs were able to provide water to service all potable water needs, this could result in 85 tanker movements per day for temporary worker accommodation and 11 for construction sites. There may not be enough licenced tankers or filling stations available to meet this demand.

More detailed information about the capacity of water treatment plants and specific challenges in contained in Section 11.1.

5.1.2 Opportunities

Despite the challenges listed above, the following opportunities will support meeting the potable water requirements:

- Raw water availability: There is likely to be enough volumes of raw water available to trade for proponents to access source water for on-site treatment. Availability is subject to licensing and trade considerations and the market functioning as expected (see Section 6 for more information).
- Adoption of temporary accommodation camps: Many proponents have indicated in EISs that they intend to construct temporary accommodation camps and this report assumes that all accommodation will be temporary. While this presents some challenges, careful planning of on-site water treatment will enable construction of the REZ projects to proceed without impacting significantly on local water utilities and existing customers.
- Strong baseline population projections: Where there is strong projected population growth beyond the REZ construction period, a case can be made to invest in permanent water infrastructure upgrades to meet construction demands while also providing a long-term community benefit. However, this requires detailed investigation, and assessment of if it is achievable in time to meet peak construction demand.

5.1.3 Pathways to address potable water requirements

The following pathways have been identified to address potable water requirements:

- Onsite treatment: Most TWA camps and construction sites will need to treat raw water on site to a standard suitable for domestic use. Most local water utilities do not have sufficient capacity or capability to provide additional water whether accessed via the reticulation system or water carting. Proponents will need to source raw surface or groundwater and install and operate suitable treatment infrastructure. See Section 6 for more information about raw water.
- Augmentation of water treatment plants: Augmentation of existing water treatment plants by investing in permanent upgrades is an option where long-term population projections support the investment. Temporary augmentation (e.g., via installation of a package plant) may be suitable where longer-term population growth can be accommodated within current capacity and/or where additional capacity is required while constructing a more permanent solution. Other infrastructure to support access to potable water could include water fill stations. More detailed discussion with local water utilities is required in each case to avoid the risk of investing in infrastructure that cannot be maintained or operated efficiently beyond the period of REZ construction.

5.2 Analysis of potable water demand

Potable water in construction is used to support the needs of the construction workforce in accommodation and at construction sites. It is assumed that:

- construction activities such as concrete batching would not require potable quality water (although raw water may need to be treated to satisfy chemistry requirements, treatment to a potable standard is not usually required)

- most construction workers will be housed in TWA camps and operational workers will be housed in towns.

Demand for potable water was estimated based on per-person domestic water requirements for workers obtained from EISs and using standard assumptions regarding construction workforce profiling over time. The core metrics used are:

- 185 L/p/d for TWA camps
- 60 L/p/d for construction sites.

5.2.1 Potable water requirements during the construction phase

Table 3 shows the potable water requirements for each cluster, excluding major non-REZ projects, and Table 4 shows the potable water requirements for these clusters with the non-REZ projects included. The non-REZ projects substantially increase potable water requirements in the Wellington and Dubbo clusters but have minimal impact elsewhere due to no change in FTEs.

Table 3 Potable water requirements for construction.

Cluster	Peak construction workforce	Est. peak date	Peak potable water demand at TWA camps (kL/d)	Peak potable water demand at construction sites (kL/d)
1 - Coolah	1070	Q1 2027	198	64
2 - Dunedoo	2905	Q4 2027	537	174
3 – Gulgong	1845	Q4 2027	341	111
4 – Mudgee	1200	Q4 2026	222	72
5 - Wellington	825	Q2 2025	153	50
6 – Dubbo	355	Q2 2027	66	21
7 - Gilgandra	300	Q2 2029	56	18

Table 4 Potable water requirements for clusters containing non-renewable projects.

Cluster	Peak construction workforce	Est. peak date	Peak potable water demand at TWA camps (kL/d)	Peak potable water demand at construction sites (kL/d)
1 – Coolah	1076	Q1 2027	199	65

Cluster	Peak construction workforce	Est. peak date	Peak potable water demand at TWA camps (kL/d)	Peak potable water demand at construction sites (kL/d)
2 – Dunedoo[1]	2905	Q4 2027	537	174
3 - Gulgong[2]	1905	Q4 2027	352	114
4 - Mudgee	1200	Q4 2026	222	72
6 – Dubbo	1493	Q3 2025	276	90

5.2.2 Potable water requirements during the operational phase

The workforce required to sustain operations and maintenance at wind, solar and BESS sites is minimal compared with construction workforce resource requirements. It is assumed that operational workers will reside in local communities in proximity to the project sites. Accordingly, operational workers' potable water needs are assumed to be met by existing potable supplies with each town. Operational workplace needs can be adequately met by potable water tanks on-site, periodically replenished by licensed water carters and by capturing rainwater. This assumption is supported by EIS documents.

5.2.3 Water tanker movements

TWA camps and construction sites will need to transport potable water (or non-potable water in the case of on-site water treatment) if they are not adjacent to an appropriate water source. Table 5 shows the approximate number of tanker movements needed to meet potable water demands in each cluster, both for TWA camps and construction sites. Note that this is for the construction period only and assumes the availability of tankers to transport this water. Estimated truck movements are aggregated at the cluster level and additional movements may be required to deliver to individual projects. This analysis assumes one tanker carries 30 kL.

Water carting is a practical solution for providing water to locations outside of the reticulation network, but has limitations, including:

- availability of licenced tankers to service the cumulative demand
- capacity of WTPs to fill tankers quickly enough without impacting existing customers
- increased traffic on local roads.

[1] No increase to existing workforce of the Moolarben OC3 extension project.

[2] No increase to existing workforce of the Ulan Coal Mine Mod 6.

Table 5 Potential potable water tanker movements (based on 30 kL per tanker).

Cluster	Tankers per day (TWA camps)	Tankers per day (construction sites)
1 - Coolah	7	2
2 - Dunedoo	18	6
3 – Gulgong	11	4
4 – Mudgee	8	3
5 - Wellington	5	2
6 – Dubbo	2	1
7 - Gilgandra	2	1
Total	53	19

5.3 Options for potable water supply

Options for potable water supply for each cluster are provided in Table 6, based on assessment of expected demands and capacities of WTPs. Note that since this analysis was undertaken, upgrades to Coolah and Dunedoo water supply schemes have been funded under the Community Employment and Benefits Program. However, the upgrades as scoped at time of writing are intended to improve processing and water quality rather than increasing supply and are not expected to affect these results.

Table 6 Options for potable water supply per cluster.

Cluster	Options for potable water supply
Coolah	Projects will likely need to treat raw water on-site for domestic use at TWA camps and construction sites. The closest water treatment plant is at Coolah and does not have capacity to provide additional potable water. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and points of use.
Dunedoo	Projects will likely need to treat raw water on-site for domestic use at TWA camps and construction sites. The closest water treatment plant is at Dunedoo and does not have capacity to provide additional potable water. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and points of use.

Cluster	Options for potable water supply
Gulgong	Potable water could potentially be sourced from the Gulgong WTP; however, there are capacity limitations in terms of the number of filling stations and availability of source water for treatment. Discussion with Mid-Western Regional Council would be essential to determine if water can be supplied. Alternatively, projects would need to treat raw water on-site for domestic use at TWA camps and construction sites.
Mudgee	Potable water could potentially be sourced from the Mudgee WTP; however, there are capacity limitations in terms of the number of filling stations and availability of source water for treatment. Discussion with Mid-Western Regional Council would be essential to determine if water can be supplied. Alternatively, projects would need to treat raw water on-site for domestic use at TWA camps and construction sites.
Wellington	Projects in the Wellington cluster are likely to be able to access potable water from Wellington WTP for temporary worker accommodation and construction sites, subject to agreement from Dubbo Regional Council. It may be possible to connect directly to the reticulated supply network, or it may be necessary to tanker water.
Dubbo	Projects in the Dubbo cluster are likely to be able to access potable water from Dubbo WTP for temporary worker accommodation and construction sites, subject to agreement from Dubbo Regional Council. It may be possible to connect directly to the reticulated supply network, or it may be necessary to tanker water.
Gilgandra	Projects will likely need to treat raw water on-site for domestic use at TWA camps and construction sites. The closest water treatment plant is at Gilgandra and does not have capacity to provide additional potable water. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and points of use.

5.4 Limitations of analysis

Establishing potable water use profiles for temporary workforces is challenging due to the absence of standard estimates or industry standards. This analysis, therefore, faces two main limitations, including:

- **Data availability regarding project water requirements:** There is variability of construction timeframes, worker and water data provided in EIS documentation. Gaps and inconsistent data results in lower confidence around demand estimates.
- **Data availability regarding local water utilities:** Detailed information on surplus capacity and peak demands at council water treatment facilities was often not available. Typically, only average figures could be used to assess likelihood of accommodating additional demand.

6 Raw water

Raw water is untreated water sourced from surface water or groundwater sources, e.g., by pumping from a river or aquifer. It can either be used for non-consumptive purposes or used as source water for treatment to a standard suitable for domestic use (potable water).

6.1 Key findings

6.1.1 Challenges

The following key challenges have been identified to meeting raw water requirements in the REZ:

- Fully allocated system: All entitlement in surface water sources (unregulated and regulated rivers) is allocated to water licence holders, which means proponents will only be able to access raw water with a water access licence by temporary or permanent trade.
- Timeframes for assessments: There is a risk of delays to projects resulting from low level of knowledge about the licensing framework. Applications for new groundwater bores have long timeframes for assessment due to the need for detailed investigation.
- Market behaviour: There is a risk that the water market will not function as expected, limiting the ability of proponents to access water via permanent or temporary trade. This may result in calls for Government intervention in the market, which carries additional risks.
- Variable yields: Several projects are located over fractured rock groundwater sources, which have highly variable water availability and are typically lower yielding than the alluvial groundwater sources. However, the alluvial groundwater sources typically have a higher rate of utilisation, and there may not be water available on the market to trade. There are also limitations for specific groundwater sources in terms of the information available about water quantity and quality.
- Truck movements: Proponents may need to cart raw water to the point of treatment and/or use. Numerous truck movements may impact local roads and road users, and there may not be enough tankers in the region to accommodate the need.
- Environmental considerations: An increase of water take from surface water and groundwater sources may have impacts on the local environment including planning and delivery of environmental water.

6.1.2 Opportunities

Despite the challenges listed above, opportunities have been identified, which will support meeting the raw water requirements:

- Raw water availability: It is likely that the water needs of most or all projects can be met by the raw water sources within or near those projects, assuming the market functions as expected. Proponents will need to identify the best pathway to accessing water for their needs.

- **Trade opportunities:** Increased demand for raw water provides an opportunity for willing sellers to trade their water entitlement for an additional source of income. Analysis shows that there is an active water market likely to be capable of supporting trade.
- **Controlled allocations:** Controlled allocation orders may be made for groundwater sources, providing proponents an opportunity to purchase entitlement. However, orders are subject to the Minister's decision and there is no guarantee of these being issued in any given year or water source.

6.1.3 Pathways to address raw water requirements

The following pathways have been identified to address raw water requirements:

- **Temporary and permanent trades on the water market:** Proponents may source raw water on the open market via a water dealing (trade). These can be either for temporary trade of allocation or permanent trade on entitlement. Proponents will need a water access licence to trade and an approved water supply work (e.g., bore or pump) to take the water. Proponents also need to understand the level of security associated with their entitlement and ensure it is suitable for the intended use. For example, reliance on general security surface water for essential services would increase the risk of shortfall if drought conditions occur during construction.
- **Taking water using an existing approved work:** Given timeframes for approval of a new water supply work, proponents should investigate options to take water for which they have secured entitlement using an existing water supply work rather than seeking to construct a new one. This may be possible through negotiation with nearby landholders or using works associated with property purchased or leased for construction. If a new water supply work is required, this needs to be approved as part of the state significant development/infrastructure assessment or a separate application submitted to WaterNSW.
- **Infrastructure supporting access to raw water:** Raw water fill points could be installed as needed to enable access to raw water. These could be located in regulated or groundwater sources and enable proponents who have secured water entitlement in that water source to fill water tankers for use at construction sites. This should only be considered where there is a significant need for water where projects are located far from suitable access points.

6.2 Analysis of raw water demand

Raw water demand was estimated based on average figures reported in EISs, categorised by project type and size (in MW of generation). The following averages were adopted:

- Battery storage: 0.015 ML/MW/year
- Solar: 0.227 ML/MW/year
- Wind: 0.177 ML/MW/year.

Raw water demand builds to peak earlier in the construction phase than potable water. The demand profile begins with early activities of soil compaction and dust suppression. Demand peaks (particularly for wind farms) with concrete production for foundations and electrical substations, and then drops to much lower levels, predominantly for dust suppression and landscape establishment during the mechanical/electrical fit out and commissioning phases.

Raw water demands do not include requirements for source water to be treated for domestic use as those demands are include in the 'potable water' section of this document (Section 5). Those values should be included in the raw water demands once it is confirmed that proponents will treat water to potable standards on site. The two categories of use have been separated to avoid double counting.

6.2.1 Raw water needs during the construction phase

Peak raw water demands in Table 7 exclude major extractive projects in the clusters. These projects have raw water needs significantly greater than the other REZ projects but have provided in EISs detailed water management plans and water balances (including source water). Table 8 includes their demands along with the REZ projects.

Excluding the extractive industry projects, the largest peak demand is in the Mudgee cluster (8,247 ML/year) due to the Yarrabin (Phoenix) Pumped Hydro Project. The Dunedoo cluster has the second highest demand (660 ML/year). This is largely driven by proposed concurrent construction of 2 wind farms and 6 solar farms representing 3.8 GW of generating capacity. Changes to the timings of these projects would modify this peak.

Table 7 Peak raw water demand and timing.

Cluster	Peak annual water demand (ML/y)	Year	Peak daily water demand (ML/d)	Est. peak demand date
1 - Coolah	300	2027	0.9	Q3 2026
2 - Dunedoo	660	2027	2.1	Q4 2027
3 – Gulgong	245	2027	0.7	Q2 2027
4 – Mudgee	8,247	2028	22.9	Q4 2027
5 - Wellington	111	2027	0.3	Q2 2027
6 – Dubbo	48	2027	0.2	Q2 2027
7 - Gilgandra	142	2029	0.4	Q3 2028

Table 8 Peak raw water demand for clusters containing non-renewable projects.

Cluster	Peak annual water demand (ML/y)	Year	Peak daily water demand (ML/d)	Est. peak demand date
1 - Coolah	315	2027	0.9	Q3 2026
2 - Dunedoo[3]	660	2027	2.1	Q4 2027

[3] No increase to raw water demand for extractive projects in the Dunedoo cluster

Cluster	Peak annual water demand (ML/y)	Year	Peak daily water demand (ML/d)	Est. peak demand date
3 – Gulgong[4]	245	2027	0.7	Q2 2027
4 – Mudgee	9,340	2028	25.9	Q4 2027
6 – Dubbo	4,025	2025	11.1	Q3 2025

Peak annual demand represents the greatest annual requirement for raw water from surface or groundwater sources across the cluster. Peak daily demand is also included to indicate maximum rate of raw water demand as relevant for estimating truck movements and filling. While an individual project's peak daily demand usually aligns with its peak annual demand, this is not always the case for project clusters. Differing water usage profiles (timing of projects), and activities requiring the highest water usage, can lead to a concentrated period of high demand, resulting in a cluster-wide daily peak demand that exceeds the peak of a single project.

6.2.1.1 Water tanker demands

Demands for raw water may not be met at the point of use and water carting may be necessary. Table 9 shows the potential water tanker movements required to service the peak raw water construction demand if all water needed to be carted. Note that it is unlikely that all raw water would need to be carted, but this estimate is included as a 'worst case' scenario.

Table 9 Potential water tanker demand for raw water transfers.

Cluster	Peak water demand (ML/d)	Number of water tankers (per day)	Peak quarter
1 - Coolah	0.7	23	Q1 2029
2 - Dunedoo	2.1	70	Q4 2027
3 – Gulgong	1.5	50	Q2 2027
4 – Mudgee[5]	0.5	17	Q2 2026
5 - Wellington	0.3	10	Q2 2027
6 – Dubbo[6]	0.2	7	Q2 2027
7 - Gilgandra	0.5	17	Q3 2029

[4] No increase to raw water demand for extractive projects in the Gulgong cluster

[5] Yarrabin (Phoenix) Pumped Hydro not included in results

[6] Non REZ projects (Dubbo Project et al) not included in results

6.2.2 Operational phase

There was insufficient data available to estimate the raw water requirements during the operational phase. However, these impacts are likely to be negligible given that construction activities (including concrete batching) would have ceased and the need for activities such as dust suppression would be reduced.

6.3 Availability and capacity of surface water sources

Surface water in the Central-West Orana REZ is managed via statutory regulated and unregulated water sharing plans, which provide the limits on the available resource, and rules for water access and trade (dealings) between users. Regulated water sources are those with a major headwater storage and unregulated water sources are those without major headwater storages. The water sharing plans covering the Central-West Orana REZ area are:

- Castlereagh Unregulated River Water Sources 2024
- Macquarie-Bogan Unregulated Rivers Water Sources 2012
- Macquarie-Cudgegong Regulated Rivers Water Source 2016.

See Section 11.9 for maps of water sharing plan areas intersecting with the REZ.

The 4 main river systems included in the REZ are the Macquarie-Wambuul River, Cudgegong River, Bogan River, and Castlereagh River. Major water infrastructure in the Macquarie-Castlereagh region includes Burrendong Dam (1,678 GL storage) and Windamere Dam (368 GL storage), both operated by WaterNSW. The major water users for the area include irrigators, local water utilities, and environmental water.

6.3.1 Regulated water sources

Although projects do not typically have river frontage enabling direct extraction from regulated water sources, proponents may be able to trade for entitlement or allocation, extract from the river and transport water to its point of use. Proponents would be responsible for negotiating access to an existing water supply work and either using water carters or a pipeline to transfer the water.

General purpose water accounting reports for regulated valleys provide information about entitlement utilisation and trade over time. This informs an understanding of availability of water in the market, which could be accessed by proponents with a water access licence. See the 2022-23 report for additional details not covered in this document.

6.3.1.1 Utilisation of entitlement

Water utilisation in the Macquarie regulated water sources for 2022-23 was 23% of total entitlement and 37% in the Cudgegong. The percentage of entitlement that was inactive in 2022-23 was also reported. This includes the entitlement associated with licences that did not take water or trade water in the water year. For the Macquarie, 21% (129,031 shares) of general security entitlement was inactive and 21% (133,498 shares) was inactive across all licence types. These figures were 42% (7,788 shares) and 30% (8,257 shares) respectively for the Cudgegong.

Note that 2022-23 was a relatively wet year and utilisation would be different in a dry year. For example, utilisation in the Macquarie was 70% in 2018-19 and 11% in 2019-20, reflecting a greater demand for water and the effect of restrictions as drought intensified. Longer-term utilisation information is shown in for the Macquarie and for the Cudgegong. See the General purpose water accounting reports for more information.

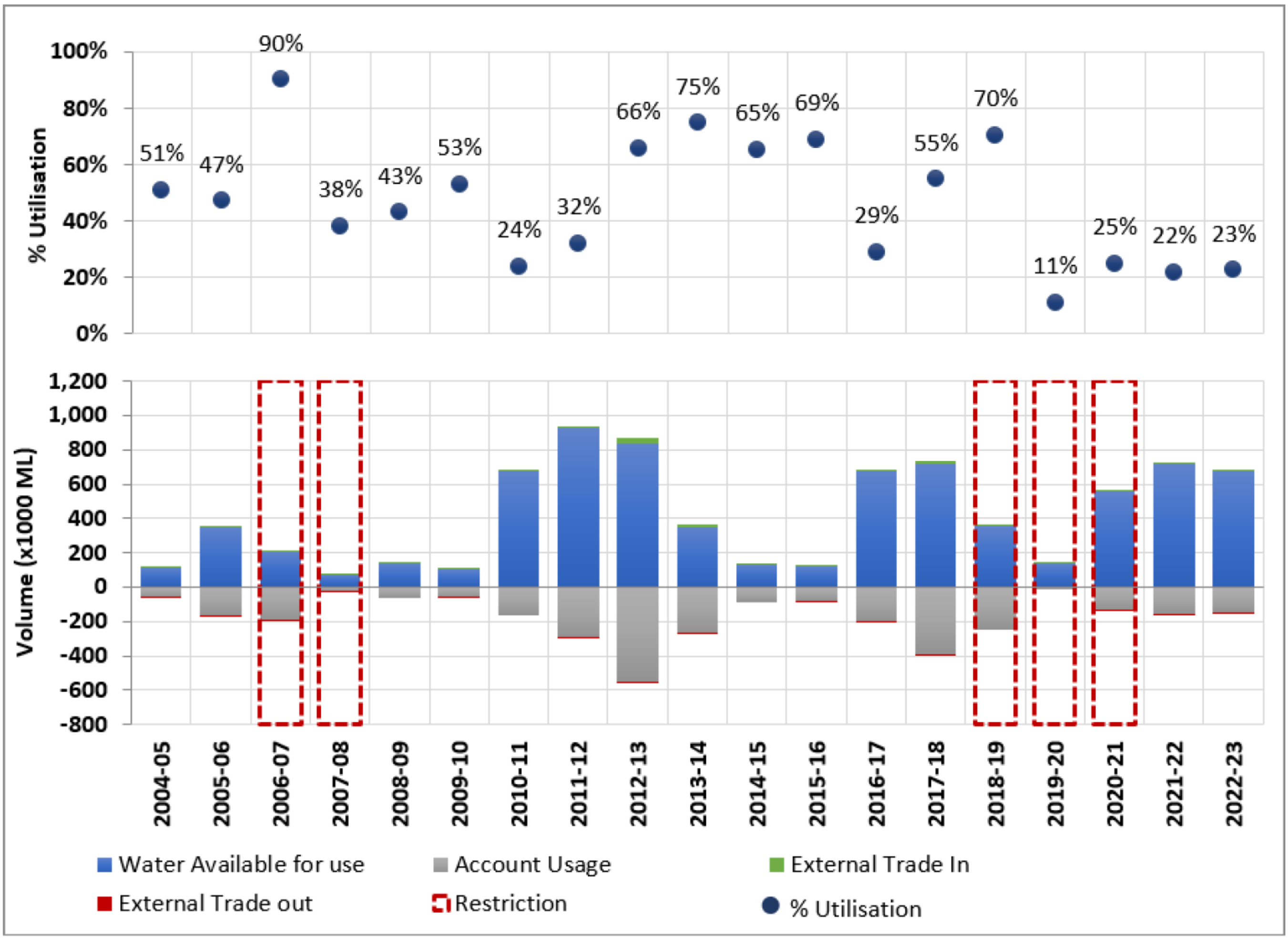


Figure 6 Percentage utilisation for the Macquarie Regulated water sources (water availability plus trade in from external water source against account usage and trade out to external water source). Source: General purpose water accounting report.

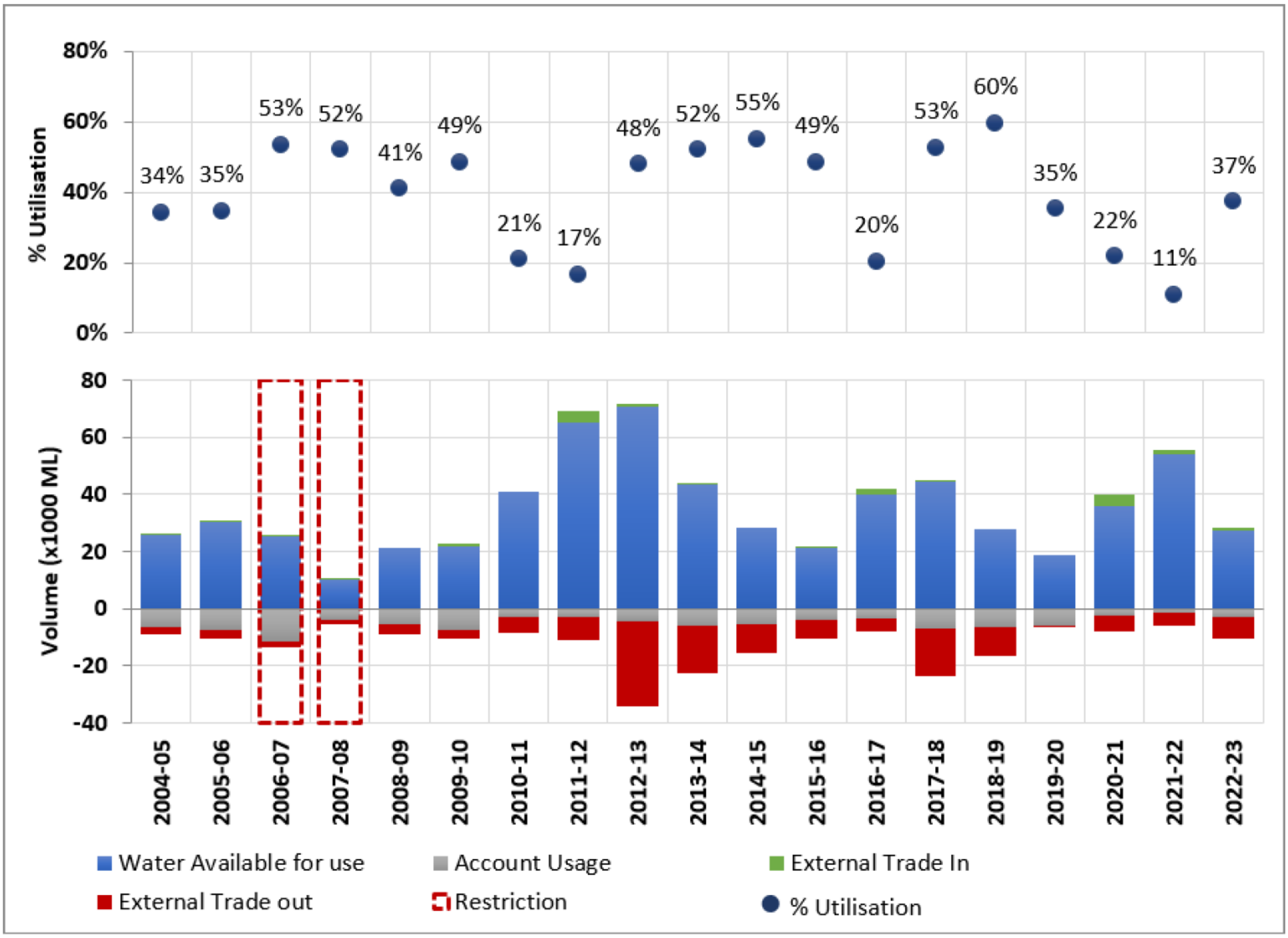


Figure 7 Percentage utilisation for the Cudgegong Regulated water sources (water availability plus trade in from external water source against account usage and trade out to external water source). Source: General purpose water accounting report.

6.3.1.2 Dealings

Dealings (trade) into the Macquarie from the Cudgegong in 2022-23 were 10,621 ML and into the Cudgegong from the Macquarie was 3,221 ML. The net intervalley transfer was 7,400 ML. There is a relatively active market for temporary (allocation) trades but the market for permanent trades is less active. This means that most proponents should be able to access raw water allocation on the open market providing that the market functions as expected. Dealings rules in the Water Sharing Plan for the Macquarie and Cudgegong Regulated Rivers Water Source 2016 define any restrictions on dealings within and between the water sources (see Part 10).

Permanent trade provides the buyer with permanent entitlement to receive an allocation up to the total shares held, subject to an available water determination. Temporary trades for allocation enable the buyer to take the allocation during the water year in which the available water determination was made and does not guarantee access to water in the following year. Proponents relying on temporary trade will need to trade each water year to maintain access.

6.3.2 Unregulated water sources

Water usage in the unregulated water sources is not well understood due to limited metering and reporting of usage. This will largely be addressed with the implementation of the non-urban metering framework. It is assumed that proponents will prefer to access water from regulated and groundwater sources due to their generally higher level of reliability than the unregulated water sources.

6.3.3 Alignment of water sources with clusters

The Macquarie-Cudgegong Regulated Rivers Water Source has the potential to provide water for projects within the Gulgong, Mudgee, Wellington and Dubbo clusters. The peak annual demand for these clusters appears to be within the volume of temporary trades of general security water in previous years. However, there is no guarantee that past market activity reflects future activity.

6.4 Availability and capacity of groundwater sources

The Central-West Orana REZ spans across several groundwater sources, which are managed via the following water sharing plans:

- Macquarie-Castlereagh Alluvial Groundwater Sources 2020
- NSW Great Artesian Basin Groundwater Sources 2020
- North Coast Fractured and Porous Rock Groundwater Sources 2016
- NSW Murray–Darling Basin Fractured Rock Groundwater Sources 2021
- NSW Murray–Darling Basin Porous Rock Groundwater Sources 2020.

The northern part of the Macquarie River catchment downstream of Warren is part of the Great Artesian Basin, and other sources include fractured rock groundwater such as the Orange Basalt, Oxley Basin and the Lachlan Fold Belt. Major water users from these sources include irrigators and local water utilities.

6.4.1 Groundwater sources closest to proposed projects

Most of the proposed projects are located above the Lachlan Fold Belt and Gunnedah-Oxley Basin Murray-Darling Basin (MDB) Groundwater Sources. However, projects are also located above the Southern Recharge, Sydney Basin-North Coast, Lower Macquarie Zone 6 and Liverpool Ranges Basalt Coast Groundwater Sources.

6.4.1.1 Gunnedah-Oxley Basin and Sydney Basin Groundwater Sources

In the Gunnedah-Oxley Basin and the Sydney Basin the ambient salinity levels are generally unsuitable for potable or irrigation supplies but may be suitable for stock supply. Exceptions include the low-salinity groundwater within the Jurassic sandstone in the Spring Ridge area of the Gunnedah-Oxley Basin that supports irrigated agriculture and the Coolah area of the Sydney Basin, although high yields have not been obtained sufficient for irrigation supplies.

6.4.1.2 Lachlan Fold Belt MDB Groundwater Source

Water quality within the Lachlan Fold Belt varies significantly based on rock type, fracture density, aquifer depth, and climate. Salinity can range across all beneficial use classes from fresh to saline. The Lachlan Fold Belt is the host rock for several ore bodies and so the background trace metal chemistry of the groundwater is heavily influenced by these deposits.

Some areas (e.g., the Wellington Caves) have received intensive water quality monitoring but large areas are not well understood, with no groundwater users or mines. Analysis of groundwater quality data sampled from bores in the Yass Catchment groundwater source indicates there is a broad range of groundwater salinities throughout the catchment, ranging from 300 to 6,100 µS/cm. The hardness of the water (the CaCO3 concentration) ranges between 230 and 1,100 mg/L. This indicates that it is very hard to extremely hard water based on the Australian and New Zealand guidelines for fresh and marine water quality (2000). Water quality results for NSW Government monitoring bores located in the Murrumbateman area shows a neutral pH, a salinity range of between 800 and 5,360 µS/cm with an average of 1940 µS/cm. Sodium is the dominant cation, and bicarbonate and chloride are the dominant anions, reflecting the volcanic geology.

6.4.1.3 Liverpool Ranges Basalt Coast Groundwater Source

The shallow aquifers, which tend to be responsive to rainfall events, have typically low-salinity groundwater. The deeper aquifers have longer flow paths and increased residence times. Consequently, the aquifer water quality is influenced by soluble salts from weathering of the host geology. The deeper aquifer systems have higher concentrations of silica and bicarbonates with a rise in alkalinity. Groundwater quality samples collected in 2011 in the Orange Basalt had low electrical conductivity (salinity; less than 600 µS/cm) and a slightly alkaline pH (between 7.8 and 8.5. Major ion compositions were Ca-Mg-Na-HCO3 and suitable for most domestic and horticultural purposes (DPI Water 2013).

6.4.1.4 Lower Macquarie Zone 6 Groundwater Source

Groundwater quality in the Lower Macquarie Alluvium is good and is suitable for all purposes such as irrigation, domestic and stock as well as town water supply. There are 7,243 share components in Zone 6. Outside of the deep alluvial aquifer the groundwater quality is spatially variable, ranging from fresh to brackish, and its use may be more limited (NWC, 2011). Although groundwater salinity levels are spatially and temporally variable, on average the electrical conductivity ranges between 500 and 2,000 µS/cm. The deep alluvium can be slightly brackish in some locations along the Bogan River with salinities over 4,000 µS/cm (NWC, 2011).

6.4.1.5 Talbragar Alluvial Groundwater Source

Groundwater quality in the Castlereagh Alluvium and the Coolaburragundy-Talbragar Alluvium is likely to be spatially and temporally variable but is suitable for most purposes such as irrigation, domestic and stock, and town water supply. Current share components in this resource total 6,011. The available information suggests the salinity in the Coolaburragundy-Talbragar Alluvium is around 1,000 µS/cm but water quality information is sparse.

6.4.1.6 Other Groundwater Sources

The Oxley Basin Coast Groundwater Source and the Sydney Basin-North Coast Groundwater Source do not have available resource descriptions. The Southern Recharge Groundwater Source has no routine monitoring program to provide water quality parameters.

6.4.2 Utilisation of entitlement

Groundwater utilisation in the water sources underlying proposed projects for the 2022-23 water year was less than 9% of entitlement (Table 10). Low groundwater utilisation is common in most areas during wet years with high surface water availability. In dry periods, proponents should be able to source groundwater from the market, although reduced availability will result in a price premium compared to the long-term average.

Table 10 Summary of groundwater entitlement and utilisation in the Central-West Orana REZ.

Groundwater Source (2022-23)	Usage (ML)	Entitlement (ML)	Utilisation
Lachlan Fold Belt Coast	15	3,137	0.46%
Lachlan Fold Belt Greater Metropolitan	9	8,099	0.11%
Lachlan Fold Belt MDB	4,192	89,836	4.67%
Gunnedah-Oxley Basin MDB	4,989	32,524	15.34%
Southern Recharge	2,284	30,157	7.57%
Sydney Basin-North Coast	9,252	78,321	11.81%
Lower Macquarie Zone 6	1,061	9,073	11.69%
Liverpool Ranges Basalt Coast	183	3,477	5.27%
Grand Total	21,984	254,623	8.63%

6.4.3 Dealings

Historic dealings in the groundwater sources underlying proposed projects are summarised in Table 11 and Table 12. While not as active as the surface water market, there has been historic trade of both allocation and entitlement in most of the relevant water sources.

Table 11 Temporary trade (Section 71T of the *Water Management Act 2000*) and Allocation Trade (all years).

Groundwater Source	Average Price per ML ($)
Gunnedah-Oxley Basin MDB	21
Lachlan Fold Belt Greater Metropolitan	108
Lachlan Fold Belt MDB	39
Lower Macquarie Zone 6	3
Southern Recharge	132
Sydney Basin-North Coast	233

Table 12 Permanent Trade (71 quarters) and Entitlement Trade (All years).

Groundwater Source	Average Price per ML($)
Gunnedah-Oxley Basin MDB	838
Lachlan Fold Belt Greater Metropolitan	333
Lachlan Fold Belt MDB	610
Liverpool Ranges Basalt MDB	2,000
Lower Macquarie Zone 6	200
Southern Recharge	473
Sydney Basin-North Coast	3,500

6.4.4 Challenges in accessing groundwater resources

Water quality is a limiting factor across the water sources in the Macquarie-Castlereagh region due to high salinity levels in some areas, which are likely to be unsuitable for construction activities. Concrete production for structural purposes must have access to water with salt (Cl^-) less than 1,000 ppm (1,417 µS/cm). Therefore, proponents may need to consider onsite water treatment to improve water quality or enter into an agreement with a local water utility to supply water of a suitable quality to undertake the necessary activities. Whilst some groundwater sources have higher water quality, such as the Macquarie and Talbragar alluvial water sources, these water sources typically have a higher level of existing demand.

Yield from groundwater sources is variable. Individual assessment would be a requirement to install a new bore, including a water quality monitoring assessment, which must be considered by proponents in their construction timelines. Accessing groundwater by entering agreements with existing owners of a water supply work may be a more time-efficient option where timeframes will not allow for a new assessment.

Further information about individual groundwater sources, trade, water quality, and guides for groundwater assessment can be found on the department's website. A list of relevant resources include:

- Annual groundwater reports can be found in the Water Publications Library.
- Trade prices and activity can be viewed on the Trade dashboard | NSW Government Water.
- Information about Groundwater quality | NSW Government Water.
- Groundwater data from monitoring bores is accessible through Water Insights.
- A Guide to Groundwater Resources in NSW.
- Technical Guidelines for Groundwater Documentation for SSD/SSI Projects.
- Groundwater assessment toolbox for major projects in NSW.

6.5 Licensing and approvals

6.5.1 Water access licences

Water access licences and water supply work approvals are required under the *Water Management Act 2000* to extract water from a water source, unless exempt. These requirements ensure equitable sharing of water resources among users and protect the environment and existing water users from adverse impacts.

Proponents in the Central-West Orana REZ are responsible for securing access to water and will require a water supply work approval to be assessed via the SSD/SSI approvals process (e.g., new bores and pumps) if they are seeking to extract water.

Water allocations are credited to water access licences based on available water determinations, providing licence holders with a proportionate share of available water. In regulated water sources, water allocations can be traded on the water market providing access to water entitlement with the appropriate level of security for the intended use (i.e., general or high security). In unregulated water sources, take is restricted by flow rules.

6.5.1.1 Security of entitlement

Proponents intending to access raw water will need to understand the opportunities and risks associated with each resource type and licence type and ensure that the most appropriate options are selected for their intended use. Generally, it is advisable to build a portfolio of entitlement with options to spread out risk. This is particularly important in planning for extreme events including extreme water shortage (drought) and flooding.

In severe drought, water access for critical human water needs will be prioritised in line with the NSW Extreme Events Policy. This means licences with the town water supply category will be prioritised over other categories. Proponents using licences with a lower level of security (e.g., general security) may not be able to take water or their allocations may be reduced.

In periods of flooding, water quality may be too poor to treat for some uses and proponents may be better served by accessing groundwater sources. However, installing a new bore requires assessment and approval so this needs to be undertaken in advance.

6.5.2 Water supply work approvals

A water supply work approval is required to install a work (e.g., a bore or pump) for the purpose of taking water from a water source. However, projects assessed as SSDs do not require a separate water supply work approval so long as the planned work is included in the SSD assessment. A water access licence with entitlement will still be required to take water in accordance with water sharing plan rules. If a proponent intends to construct any additional water supply works following the SSD assessment, they will need to apply for a separate water supply work approval.

6.5.3 Timeframes for approvals

Timeframes for assessment of a water access licence is typically 45 working days, and 80 working days for water supply work and use approval. However, there may be delays in processing applications if:

- there is a delay in payment of application fees
- the application is incomplete, or the wrong form was used
- additional information has been requested by agencies
- a proposal or design is revised after lodgement
- a statutory referral to other agencies is required
- compulsory advertising and resolution of submissions is needed
- there are high departmental workloads.

Proponents need to plan ahead for assessment timeframes to ensure that project commencement is not delayed. Some proponents may not be aware of these risks and would benefit from additional information.

6.6 Limitations of analysis

6.6.1 Challenges in estimating demand to support pathway decisions

The following challenges were identified with estimating the raw water needs of renewable projects:

- **Data availability regarding project raw water requirements:** There is a risk that the volume of raw water required for projects has been underestimated given the challenge faced by proponents in estimating non-potable requirements at an early planning stage in a project. Validation was attempted for 'per MW' estimates of raw water demand by constructing an activity-based schedule of water use. This covered activities such as concrete batching, dust suppression, soil compaction and landscaping. However, specific activity-level data was often not available in SEARs or EIS documents and will not likely be available until detailed design stage.
- **Variable estimates in EISs:** Two projects, Valley of the Winds wind farm and Burrendong wind farm, had detailed raw water requirements estimated per activity in their EISs. However, those estimates significantly greater than other proposed wind farms in the REZ. Raw water demands for these projects were estimated using the standard assumptions and average per MW figures due to those projects' EISs appearing to be outliers that would skew the results.
- **Climate:** The largest raw water demands during construction are for compaction of earthworks and dust suppression. The amount needed would vary depending on prevailing soil types, soil moisture conditions, and the number of wet and dry days during construction. Therefore, accuracy of raw water estimates would require refinement with the addition of climate considerations.

7 Wastewater

Wastewater is water that has been used in residential and commercial settings and is no longer clean. It includes wastewater of a domestic nature (e.g., sewage and water from laundry or kitchen uses) and liquid trade waste (including kitchen oils). Wastewater requires treatment in a sewage treatment plant to a standard suitable for disposal or beneficial reuse.

7.1 Key findings

7.1.1 Challenges

Analysis of wastewater has revealed the following key challenges:

- Limited capacity: Most sewage treatment plants (STPs) are close to capacity and would require temporary or permanent upgrades to accept additional loads from TWA camps. This means that most projects will need on-site treatment of wastewater at temporary worker accommodation and construction sites.
- Resourcing constraints: Some councils have reported that staff shortages are a potentially limiting factor in operating and receiving additional wastewater. Staff losses could significantly impact a council's ability to service an increased need for wastewater services.
- Limited liquid trade waste and septage receival: Even with on-site wastewater management for TWAs and construction sites, residual sludge and commercial trade waste will require periodic disposal. Currently, only the Dubbo STP can accept these wastes within the REZ. Liquid trade waste volumes and classifications must be verified with Dubbo council.
- Timeline for upgrades: Any major upgrades to existing STPs will require planning, funding, approval, contracting, delivery and commissioning. This process takes time and may not align with the forecast peak demand from REZ construction.
- Truck movements: If STPs were able to accept and treat the additional wastewater, this would result in a significant number of tanker movements per day, with impacts on roads. There also may not be enough licenced tankers available and STPs could likely not service the frequency of delivery due to infrastructure and resourcing limitations.

More detailed information about the capacity of wastewater treatment plants and specific challenges is contained in Section 11.5.

7.1.2 Opportunities

While wastewater treatment capacity is currently limited, the following opportunities exist:

- Adoption of temporary accommodation camps: Many proponents have indicated in EISs that they intend to construct TWA camps and this report assumes that all accommodation will be temporary. While this presents some challenges, careful planning of on-site wastewater treatment will enable construction of the REZ projects to proceed without impacting significantly on local water utilities and existing customers.

- **Strong baseline population projections:** Where there is strong projected population growth beyond the REZ construction period, a case can be made to invest in permanent wastewater infrastructure upgrades to meet construction demands while also providing a long-term community benefit. However, this requires detailed investigation, and major upgrades may not be achievable in time to meet peak construction demand.

7.1.3 Pathways to address wastewater requirements

The following pathways have been identified to address wastewater requirements:

- **Onsite treatment:** Proponents will need to establish onsite wastewater treatment to suitably treat wastewater generated at TWA camps and construction sites. Providing the onsite treatment is not designed for servicing more than 2,500 people or processing more than 750 kL/d, no EPA licencing will be required. However, consultation with local councils on sludge and trade waste management will be necessary.
- **Augmentation of wastewater treatment plants:** A combination of short- and long-term augmentation is an option to support wastewater treatment throughout the REZ, particularly for treating additional septage sludge. Upgrades may include increasing the capacity of the STP by augmenting processes and/or providing additional storage and receival areas to facilitate wastewater transfer. Temporary augmentation, e.g., via installation of a package plant, may be suitable where longer-term population growth can be accommodated within current capacity and/or where additional capacity is required while constructing a more permanent solution. More detailed discussion with local water utilities is required in each case to avoid the risk of investing in infrastructure that cannot be maintained or operated efficiently beyond the period of REZ construction.

7.2 Wastewater loads

Wastewater of a domestic nature is produced at TWA camps and construction sites during project construction, at operational facilities, and from both temporary and ongoing operational workforce residing within existing towns.

Some project proponents have assumed that local towns can accommodate their peak workforce with wastewater treated at the local sewage treatment plants. Several of the larger projects are proposing TWA camps with full wastewater treatment and effluent reuse. The population and housing cumulative impact study identified that the significant increase in peak construction workers for the Central-West Orana REZ will need to be accommodated in TWA camps, near project worksites. Wastewater services for these camps will be managed either by transferring septic waste to a suitable local sewage treatment plant with treatment capacity or treating appropriately on-site.

For the purposes of this analysis:

- the peak construction workforce is assumed to be accommodated in TWA camps across the Central-West Orana REZ
- wastewater needs for the small percentage of workers and families accommodated within local towns during both the construction and ongoing operations is assumed to be manageable with the local council’s existing wastewater services capacity due to utilisation of existing housing stock

- ongoing wastewater services for operational sites are assumed to be provided by approved on-site wastewater systems operated by each project proponent or pumped out by licensed contractors and transported to an appropriate treatment facility.

7.2.1 Wastewater requirements in the construction phase

Expected wastewater loads for each cluster are summarised in Table 13 with non-REZ (non-renewables) projects excluded. The wastewater loads for each cluster including the non-REZ projects are summarised in Table 14. As described in Section 2.4.8.8 wastewater loads are expressed in terms of equivalent persons (EP), which is commonly used for sizing infrastructure. 1 EP equates to approximately 150 L/day.

Table 13 Construction wastewater demand for clusters excluding non-renewable projects.

Cluster	Peak FTE	Est. Peak Date	Peak Load TWA camps (kL/d)	Peak Load at construction sites (kL/d)	EP (TWA camps)
1 - Coolah	1070	Q1 2027	187	54	1248
2 - Dunedoo	2905	Q4 2027	508	145	3389
3 – Gulgong	1845	Q4 2027	323	92	2153
4 – Mudgee	1200	Q4 2026	210	60	1,400
5 - Wellington	825	Q2 2025	144	41	963
6 – Dubbo	355	Q2 2027	62	18	414
7 - Gilgandra	300	Q2 2029	53	15	350

Table 14 Construction wastewater demand for clusters including non-renewable projects.

Cluster	Peak FTE	Est. Peak Date	Peak Load TWA camps (kL/d)	Peak Load at construction sites (kL/d)	EP (TWA camps)
1 – Coolah	1076	Q1 2027	188	54	1255
2 - Dunedoo	2905	Q4 2027	508	145	3389
3 – Gulgong	1905	Q4 2027	333	95	2223
4 – Mudgee	1200	Q4 2026	210	60	1400
6 – Dubbo	1493	Q3 2025	261	75	1742

7.2.2 Wastewater requirements in the operational phase

Operational wastewater demands have not been estimated and are assumed to be minimal due to low numbers of operational and maintenance staff and the assumption that they would be housed in existing towns following construction. Wastewater is assumed to be managed on-site at operational facilities.

7.2.3 Liquid trade waste during construction and operational phases

Available data were insufficient for estimation of liquid trade waste requirements during construction. Most likely sources of liquid trade waste are cooking oils from kitchen facilities at TWA camps, which can likely be managed by existing licenced operators.

7.2.4 Wastewater treatment byproducts

During the wastewater treatment process, particles in the wastewater accumulate and settle to form a sludge. The sludge is collected and undergoes a treatment and drying process to form the product referred to as biosolids.

Biosolids must receive a classification rating to determine its future use. Sludge classified as 'Unrestricted use' may be applied to agricultural land, whereas a classification rating of 'Not Suitable For Use' would require disposal at a landfill site or approved surface land disposal (site dependent). The NSW EPA's 'Use and disposal of biosolid products' provides a detailed overview of biosolids management in NSW.

The sludge formed by multiple TWA camps with individual package wastewater treatment plants would require on-site sludge capture. The sludge would need periodic pump outs and transport to an appropriate LWU STP for further treatment. This may cause a cumulative effect on LWUs ability to accept sludge volumes from multiple TWAs. There is no standardised way of estimating the amount of sludge that will be produced by TWA camps that requires treatment at a STP.

7.3 Options for wastewater management

Options for wastewater management for each cluster, based on assessment of expected wastewater loads and capacities of STPs, are identified in Table 15. Note that since this analysis was undertaken, upgrades to Coolah and Dunedoo sewage treatment systems have been funded under the Community Employment and Benefits Program. However, the upgrades as scoped at time of writing are intended to improve processing rather than increasing capacity and are not expected to affect these results.

Table 15 Options for wastewater management in each cluster.

Cluster	Options for wastewater management
Coolah	Projects will likely need to establish wastewater treatment on-site at TWA camps and construction sites. The closest STPs are at Coolah and Dunedoo and neither have sufficient capacity to accept the peak loads of 1,255 EP. The only STPs with potential capacity are Mudgee (115km) and Dubbo (135km). Transfer of wastewater to either Mudgee or Dubbo is considered impractical due to the distance and number of truck

Cluster	Options for wastewater management
	movements. It also may not be possible to transport waste between LGAs. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and source of wastewater.
Dunedoo	Projects will likely need to establish wastewater treatment on-site at TWA camps and construction sites. Dunedoo STP has no capacity to treat an estimated peak wastewater load of 3,389 EP from projects in that cluster. This would be over three times the current plant capacity. The nearest with potential capacity is Dubbo STP, approximately 87km away. This would require up to 17 tanker movements per day. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and source of wastewater.
Gulgong	Projects will likely need to establish wastewater treatment on-site at TWA camps and construction sites. Gulgong STP may have some capacity to treat additional wastewater but does not have the capability to accept tankered wastewater. It may be possible to transport wastewater to the Mudgee STP, which also has some capacity to treat wastewater, but this facility cannot currently accept additional deliveries due to resourcing constraints.
Mudgee	Projects will likely need to establish wastewater treatment on-site at TWA camps and construction sites. If wastewater could be accepted by Mudgee STP, this would require up to 7 tanker movements per day.
Wellington	Projects may be able to have wastewater or septage treated at either the Wellington or Dubbo STPs subject to agreement from Council and further information about volumes and concentration of waste. These STPs have some additional capacity to treat wastewater but have limitations in their receival facilities. Locating temporary worker accommodation sites adjacent to the sewerage network could avoid excessive tankering. Upgrading the receival facilities would help to manage wastewater in this cluster subject to detailed assessment of longer-term suitability.
Dubbo	Projects may be able to have wastewater or septage treated at the Dubbo STP subject to agreement from Council and further information about volumes and concentration of waste. Dubbo STP has some additional capacity to treat wastewater but has limitations in its receival facilities. Locating temporary worker accommodation sites adjacent to the sewerage network could avoid excessive tankering and avoid the need to transport tankered waste between LGAs. Upgrading the receival facilities would help to manage wastewater in this cluster subject to detailed assessment of longer-term suitability.

Cluster	Options for wastewater management
Gilgandra	Projects may be able to have wastewater treated at the Gilgandra STP via connection to the sewerage network subject to agreement from Council and further information about volumes and concentration of waste. Gilgandra STP cannot accept tankered waste. Temporary augmentation of capacity using a package treatment plant could service projects in the cluster, but this solution would require additional tanker movements between the plant and source of wastewater.

7.4 Limitations of analysis

Wastewater needs are not well defined for renewable energy projects due to lack of data. There is also a general lack of standardised wastewater estimates and industry standards associated with large scale development. These factors affect confidence in the results presented here. Specific limitations of this analysis include:

- **Data availability regarding project wastewater requirements:** More detailed project data around construction start, duration and worker profiles would improve granularity of temporal wastewater production and confidence in cumulative volumes. There was also insufficient information about liquid trade waste requirements, so this could not be assessed.
- **Data availability regarding local water utilities:** A lack of detailed data on the surplus capacity and operational constraints of council STPs restricted assessments of their ability to accommodate additional demand to the use of average figures.

8 Recycled water

Recycled water is wastewater treated to a suitable standard for beneficial reuse. It can be reused for a range of purposes depending on the level of treatment.

8.1 Key findings

8.1.1 Challenges

The key issues relating to recycled water as a non-potable water supply option for Central-West Orana REZ projects are:

- Sewage treatment capability: All regional STPs within or adjacent to the REZ (with the exception of Dubbo) would require upgrades and investment to enable production of recycled water to meet the standard requirements for recycling in construction activities.
- Timeline for upgrades: The time required to upgrade facilities may not align with the peak demand for construction water from REZ projects.
- Public health: There are strict guidelines for managing recycled water in accordance with the Australian Guidelines for Water Recycling. If not adhered to when using recycled water, there is significant risk to public health.

Further information on individual recycled water schemes is outlined in Section 11.3.

8.1.2 Opportunities

Recycled water offers the following opportunities:

- Alternative non-potable supply: Recycled water can supplement other non-potable sources, especially during drought, and offers an alternative non-potable supply for future renewable projects and operational uses. Infrastructure planning should consider expanding or establishing recycled water schemes, aligning with the Draft Recycled Water Roadmap's focus on water resource diversification.

8.1.3 Pathways for recycled water

Infrastructure planning should consider recycled water as an option for providing construction water and delivering community benefits, aligning with the Draft Recycled Water Roadmap's focus on water resource diversification. Local water utilities need an approval from DCCEEW Water to construct a recycled water scheme and to supply recycled water in accordance with the Regulatory and Assurance Framework. Securing approvals to use recycled water in any activity that may impact human health (including dust suppression or toilet flushing) requires the development of a robust recycled water management system in accordance with Australian Guidelines for Water Recycling.

9 Additional projects not within clusters

This section provides information about the requirements of projects not included in clusters due to their geographic location and/or not being renewable energy-related projects. They are included here for context, aligning with the cumulative impacts approach.

9.1 Narromine to Narrabri Inland Rail

The Narromine to Narrabri Inland Rail project consists of approximately 300km of new single track rail line. Several TWA camps are proposed within proximity of the Central-West Orana REZ, including Narromine South, Narromine North, Baradine, and Gilgandra. These camps would include package water treatment plants that will treat extracted groundwater. The proponent has indicated that exact volumes of water would be confirmed during detailed design, however an estimated 14.7 ML/year is estimated to be required for the Narromine North facility and 29.4 ML/year for the Baradine facility. The volumes would be obtained via the water market. An estimated 0.5 ML/d of wastewater would be treated onsite and reused for irrigation at the accommodation facilities or at other locations. Construction is expected to commence in 2028.

9.2 Nevertire Solar Farm Modification 4

Nevertire Solar Farm is an existing development in Warren Shire LGA. The modification has been approved to install a 50 MW/100 MWh BESS; construction start dates are unknown. The project will require 50 construction staff over a period of 12 months using approximately 300 kL of water for compaction and dust suppression. The proponent has indicated that water will be sourced from the Nevertire Solar Farm or from groundwater sources and trucked to site when required. Potable water would be sourced from the roof catchment of the control building and stored on site in a 30,000 L water tank. No sewer services are required for the project.

9.3 Cadia East Gold Mine Modification 14

Cadia East Gold Mine Modification 14 has been approved to increase the mines ore processing from 32 Mtpa to 35 Mtpa, including upgrades to the existing processing and storage infrastructure. The construction will be accommodated by the existing workforce and will require an additional 35 operational workers. There are no changes to water supply or storage, however there will be an increase in water demand in-line with the proposed increased processing rate (approximately 9.4%). The planning documents do not provide precise water demand forecasts.

10 Possible next steps to address key findings

This section identifies possible next steps. Actions to address the key findings will be developed and included in the whole-of-government implementation plan, including timeframes and agreed responsibilities.

10.1 Communicate with proponents

Communicate early with proponents the available pathways for water access and wastewater management. This should focus informing proponents that:

1. if they are seeking to access town water supplies or wastewater treatment, they need to engage early with councils to discuss their needs and secure agreement
2. alternatives will be needed where local water utilities cannot meet expected demands and loads and this may include on-site treatment
3. they are responsible for securing raw water for construction use and as source water for treatment via the water market and need to consider the licensing and approval requirements for that take
4. they are responsible for understanding the level of risk associated with each water source and licence type and planning for potential interruptions to supply, including due to drought
5. they are responsible for managing human health and environmental risks associated with on-site water and wastewater treatment.

10.1.1 Rationale

The department's analysis has identified that:

- most local water utilities currently have limited capacity to provide additional potable water or wastewater treatment to REZ projects
- upgrades to existing infrastructure could help to meet demands where justified by longer-term servicing needs, noting that timeframes for approval and construction are challenging
- alternatives are needed for potable water access and wastewater treatment where local water utilities cannot meet additional demands and loads, including on-site treatment during construction and operations
- proponents may need to source raw water on the open market, subject to licensing and approval conditions.

Government will have an important role in supporting proponents with the information they need to manage their responsibilities regarding water and wastewater management.

10.2 Work with councils to identify opportunities to address capacity constraints

Work with councils within the Central-West Orana REZ to identify opportunities to address capacity constraints, including:

1. where investment in long-term infrastructure is supported by long-term population projections, to identify infrastructure needs and potential sources of funding, noting that no existing sources of funding have been identified
2. where water entitlement is a limiting factor, reviewing the volume local water utilities need to service projected population increases and assess options including review of entitlement under s66 of the *Water Management Act 2000*.
3. initiatives to address critical skill or workforce shortages, particularly for plant operators.

10.2.1 Rationale

The department's analysis has identified that factors constraining the capacity of water and sewage treatment plants to support the short-term water and wastewater needs of REZ projects vary between local water utilities.

Specific actions to address constraints should be targeted to the causes of constraints in each LGA, where they pose risk to the delivery of REZ projects or where the impacts of increased demand are unacceptable.

10.3 Prepare for situations where projects cannot access water on the market to meet demands

Prepare for situations where projects cannot access water on the market to meet demands by considering potential actions and forming positions as required.

10.3.1 Rationale

The department's analysis found that the volume of water entitlement in the relevant groundwater and surface water sources exceeds estimated project demands. However, access to that water requires willing sellers in the open market. There is a risk that the market will not function as expected and proponents will not be able to trade, either due to low market activity/maturity or entitlement holders choosing not to trade. If drought occurred during construction, it would reduce the water able to be allocated to licence holders.

10.4 Engage with partner agencies

DCCEEW Water to **engage with partner agencies** to understand impacts of increased raw water demand on environmental needs, in addition to town water and commercial extraction.

10.4.1 Rationale

Increased demand for raw water and changing timing for peak demands could have impacts on planning and delivery of environmental water. Engagement is needed across NSW agencies to understand these risks and address them as needed.

10.5 Coordinate sharing of information

Coordinate sharing of information about changes in proposed projects, including start/finish times, worker populations and water/wastewater requirements, and identify additional actions as needed to manage risks.

10.5.1 Rationale

This report contains the best available information as of March 2025 and changes to project timings or scope may require new actions or changes to agreed actions. All agencies need timely access to current information from a consistent source.

11 Appendices

11.1 Appendix A Capacity of water treatment facilities

Information in this appendix has been removed from the public version of this document due to confidentiality. Its removal does not affect the overall findings.

11.2 Appendix B Capacity of wastewater treatment facilities

Information in this appendix has been removed from the public version of this document due to confidentiality. Its removal does not affect the overall findings.

11.3 Appendix C Capacity of recycled water schemes

Information in this appendix has been removed from the public version of this document due to confidentiality. Its removal does not affect the overall findings.

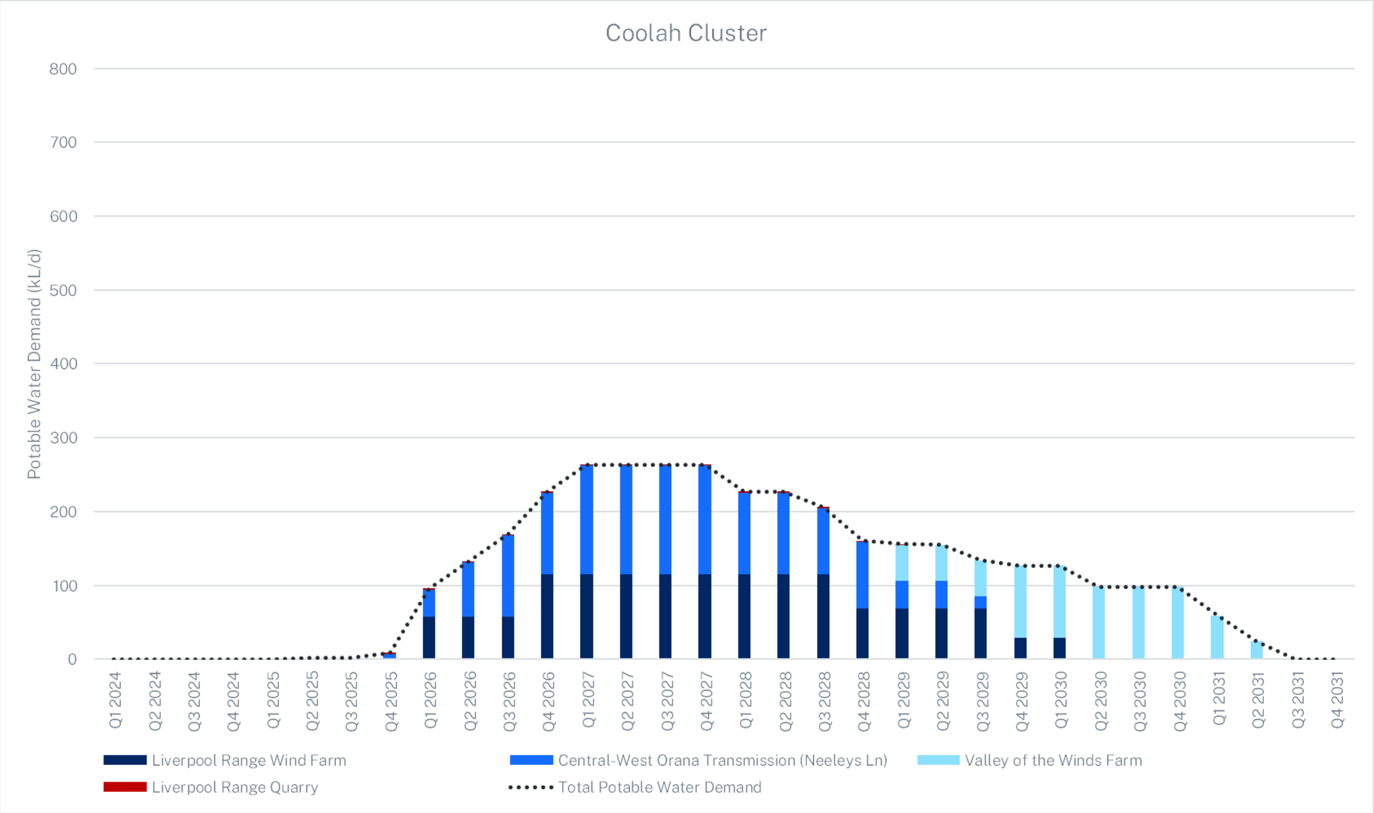
11.4 Appendix D Potable water demand for construction under different likelihood scenarios

This section presents estimated potable water demand for each cluster under 3 likelihood scenarios, based on the population and housing cumulative impact assessment completed by DPHI. The scenarios are:

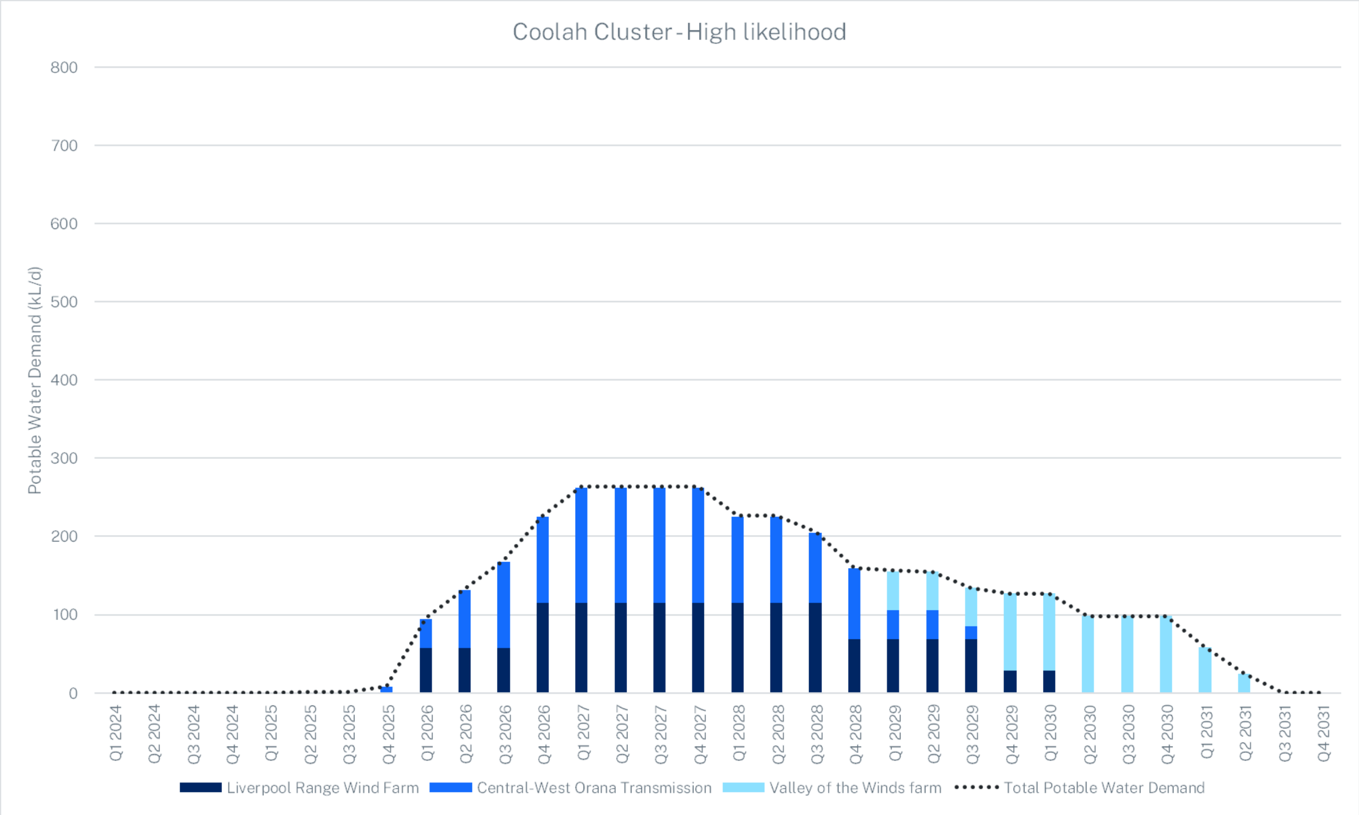
1. All planned projects are constructed
2. Only projects with a high likelihood of being constructed are constructed
3. Only projects with a high or medium likelihood of being constructed are constructed.

11.4.1 Coolah Cluster

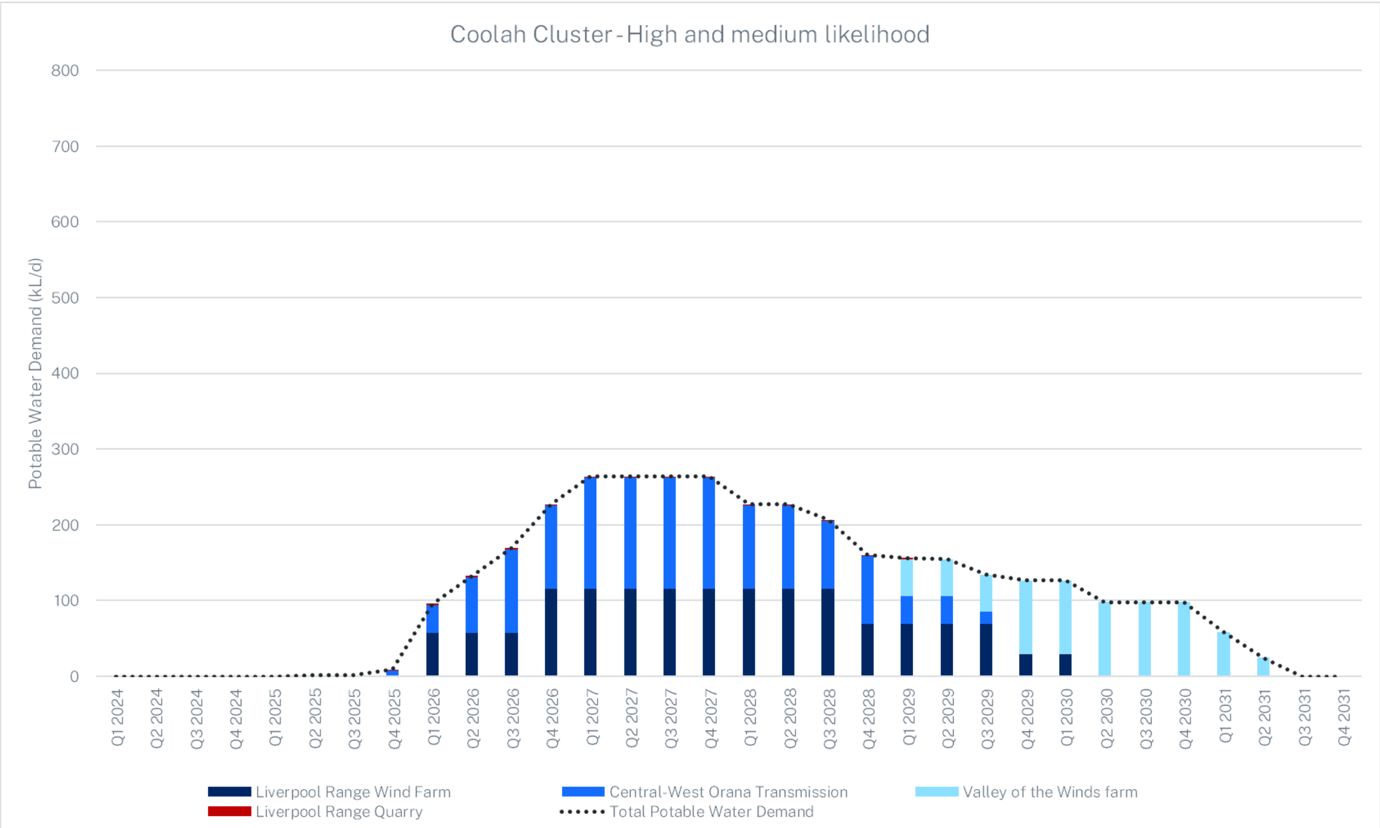
11.4.1.1 All projects potable water demand



11.4.1.2 High likelihood projects potable water demand

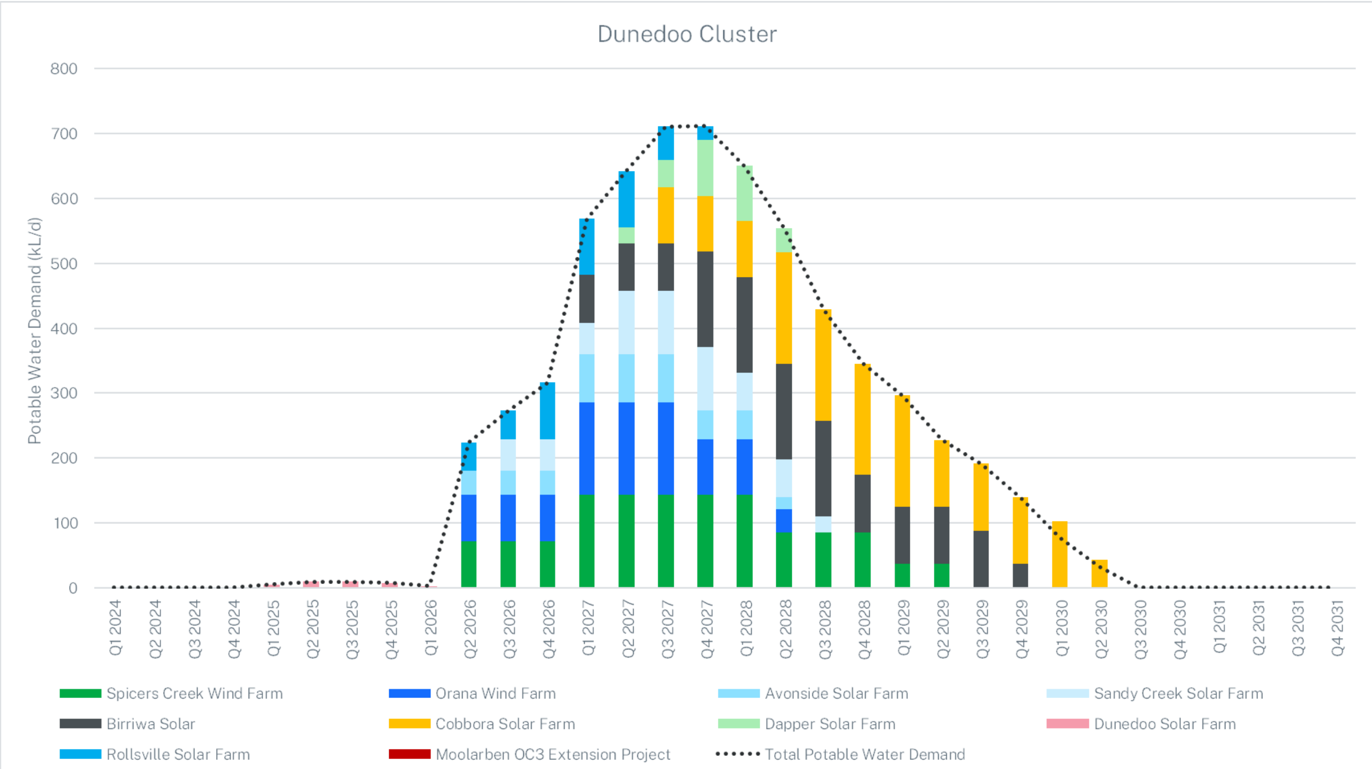


11.4.1.3 High and medium likelihood projects potable water demand

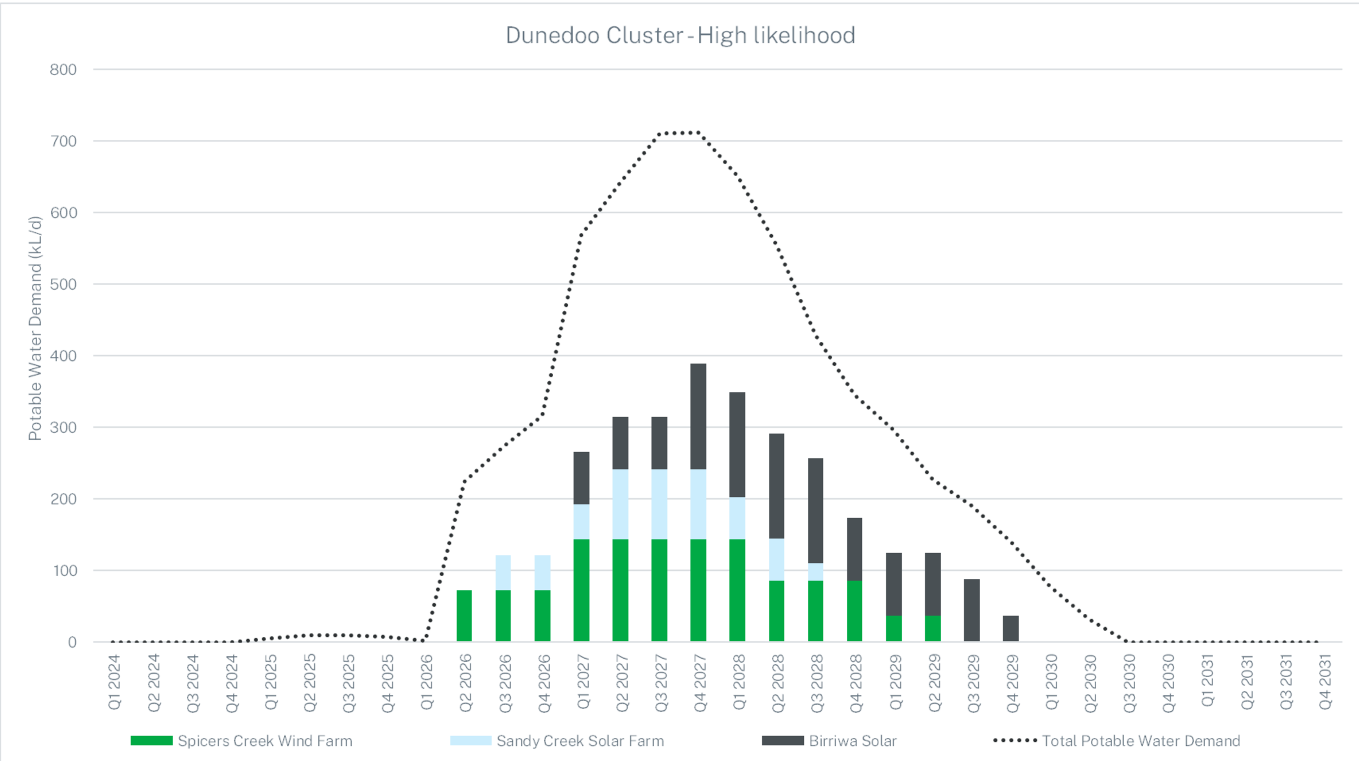


11.4.2 Dunedoo Cluster

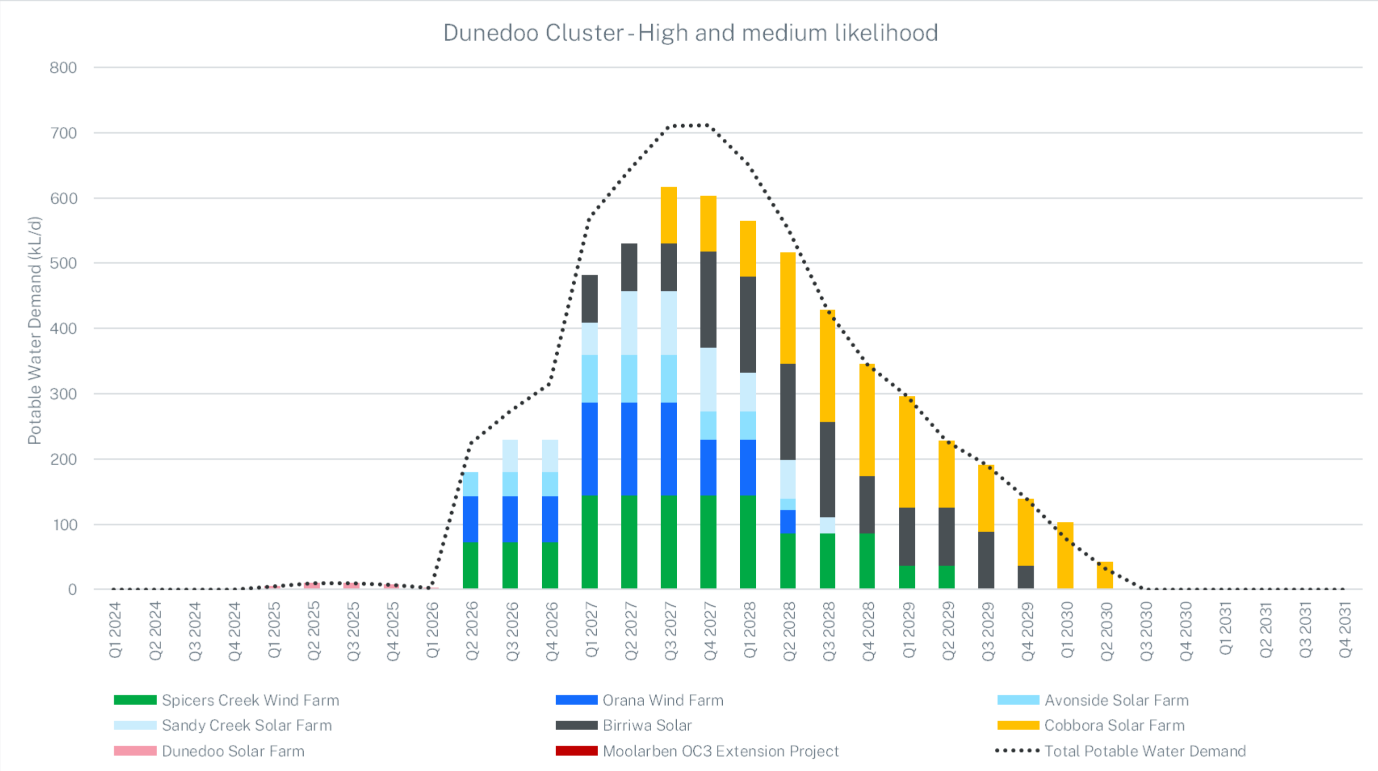
11.4.2.1 All projects potable water demand



11.4.2.2 High likelihood projects potable water demand

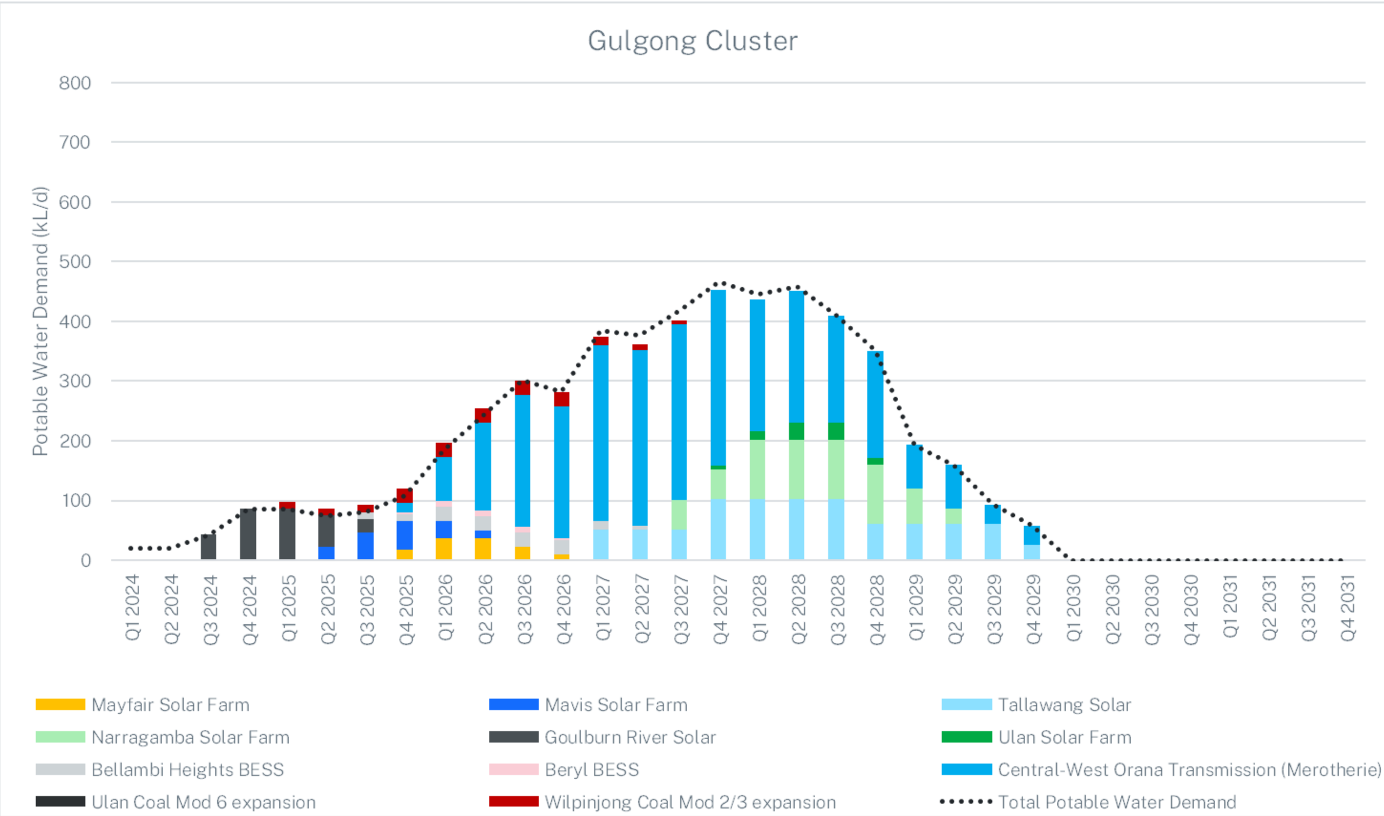


11.4.2.3 High and medium likelihood projects potable water demand

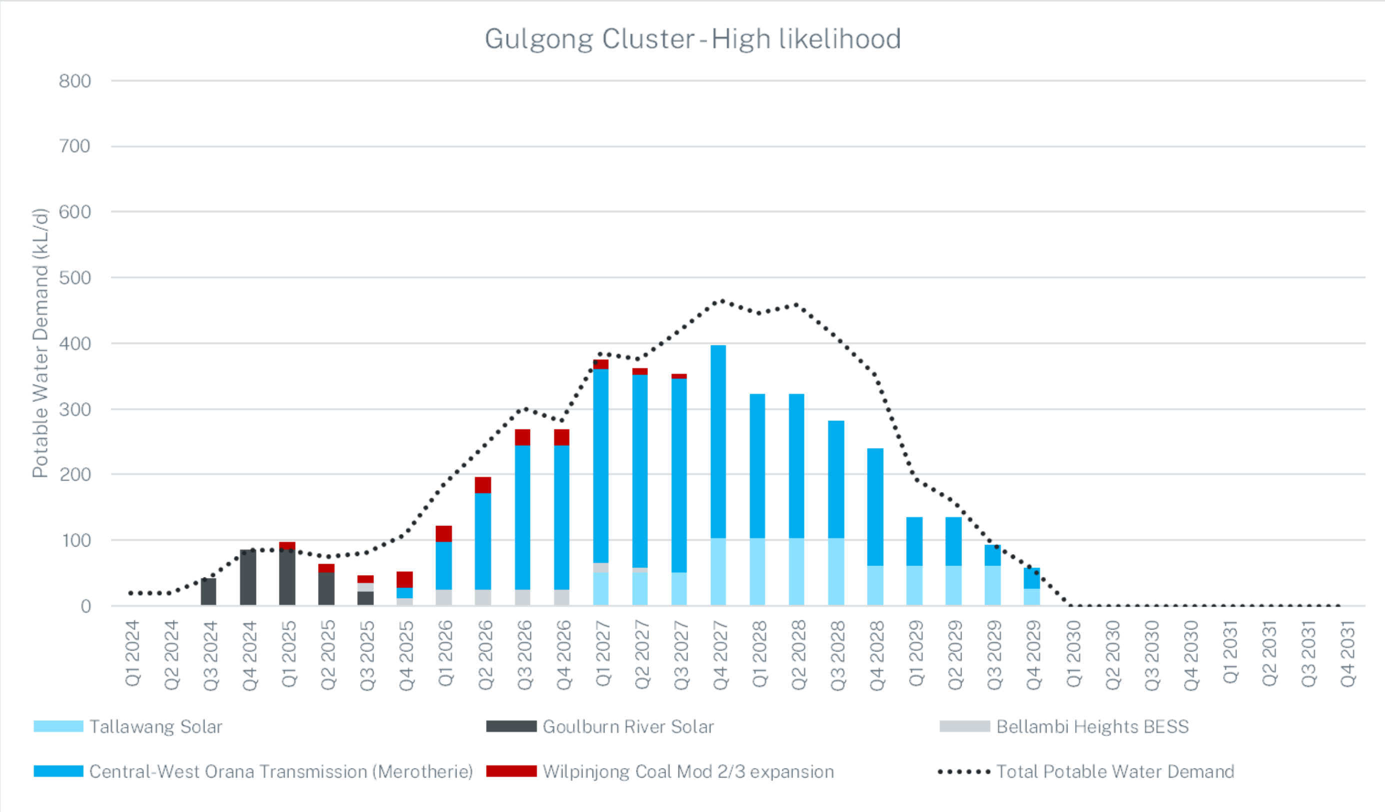


11.4.3 Gulgong Cluster

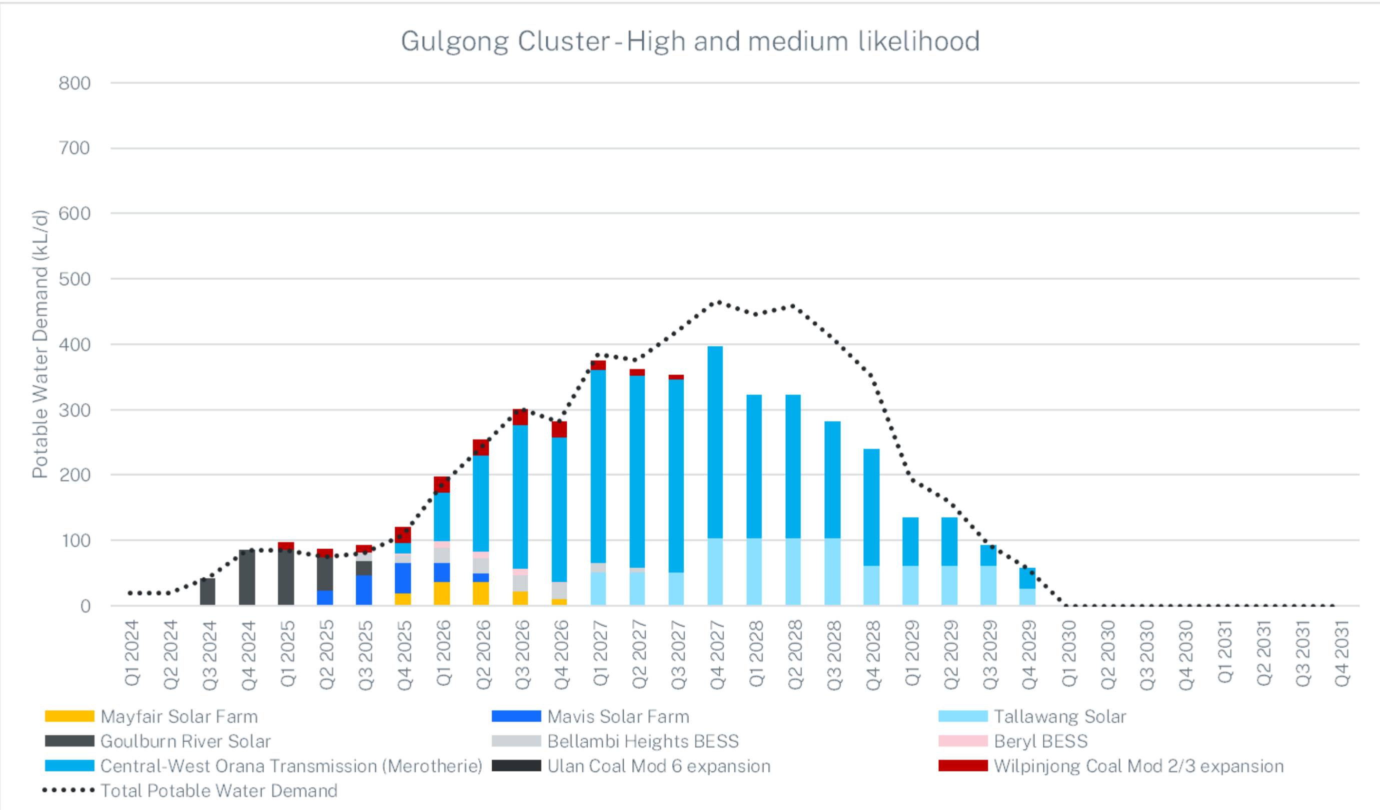
11.4.3.1 All projects potable water demand



11.4.3.2 High likelihood projects potable water demand

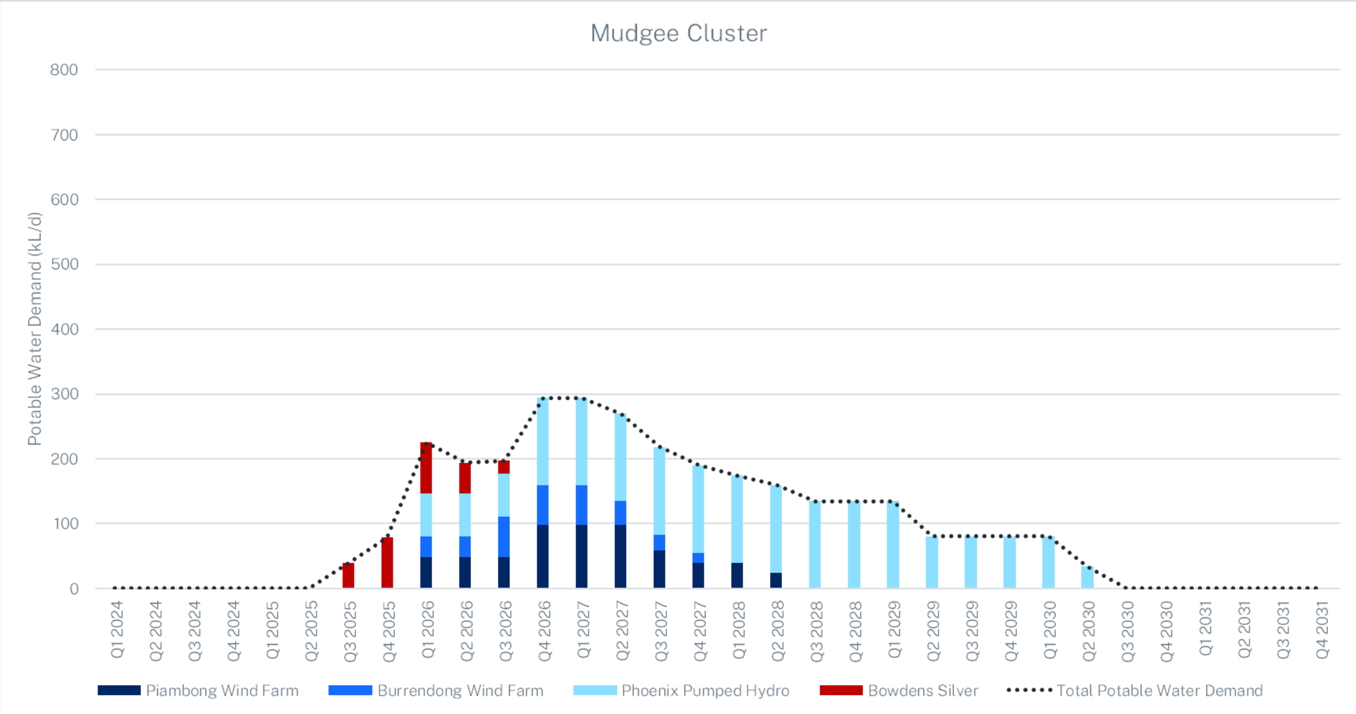


11.4.3.3 High and medium likelihood projects potable water demand



11.4.4 Mudgee Cluster

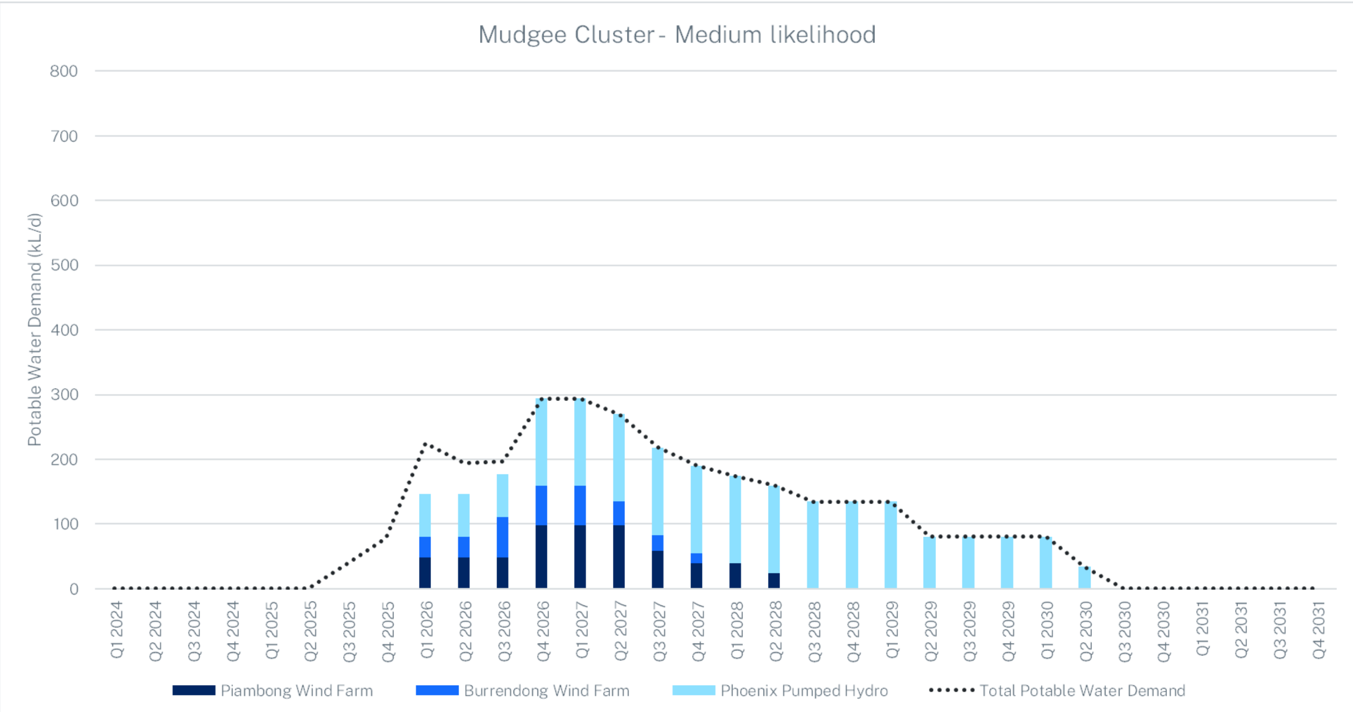
11.4.4.1 All projects potable water demand



11.4.4.2 High likelihood projects potable water demand

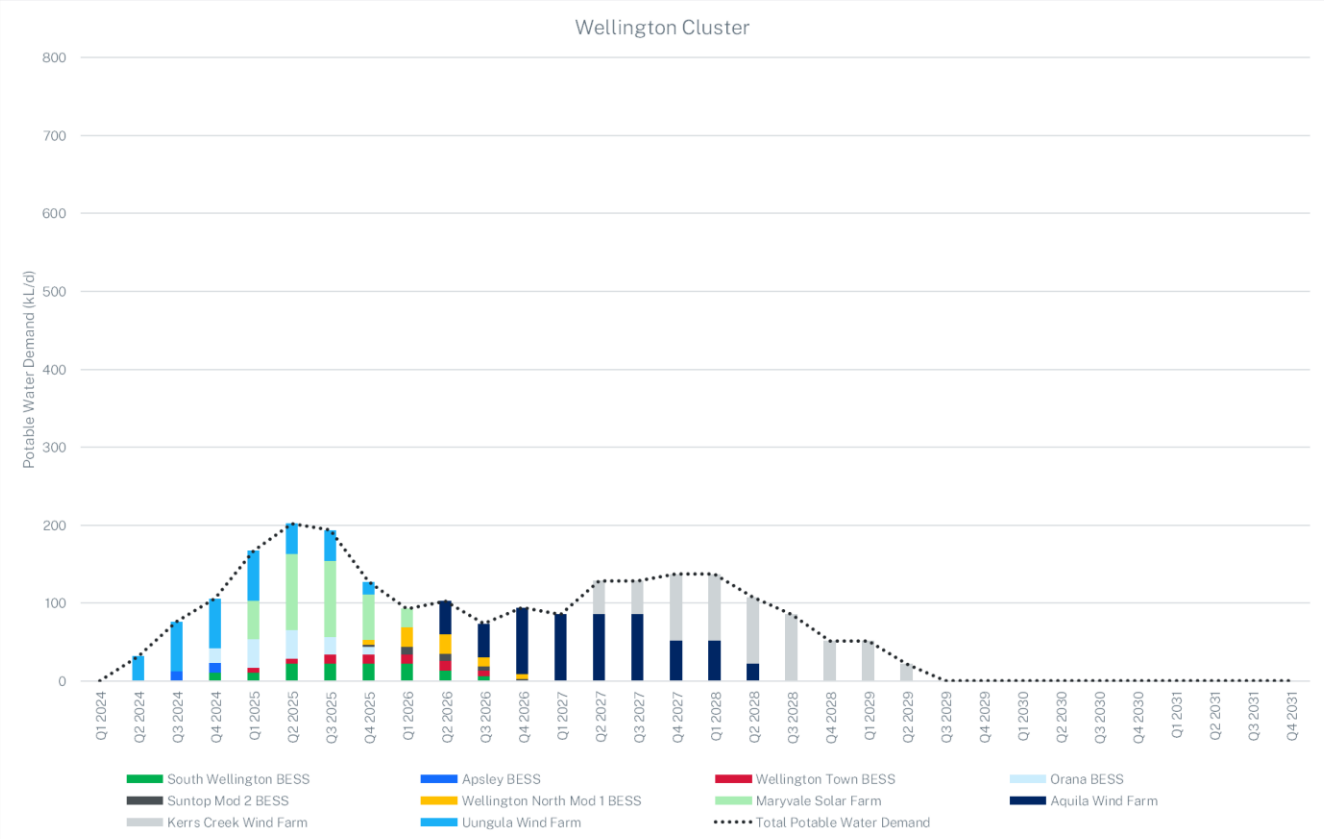
There are no projects in the Mudgee Cluster with a high likelihood.

11.4.4.3 High and medium likelihood projects potable water demand

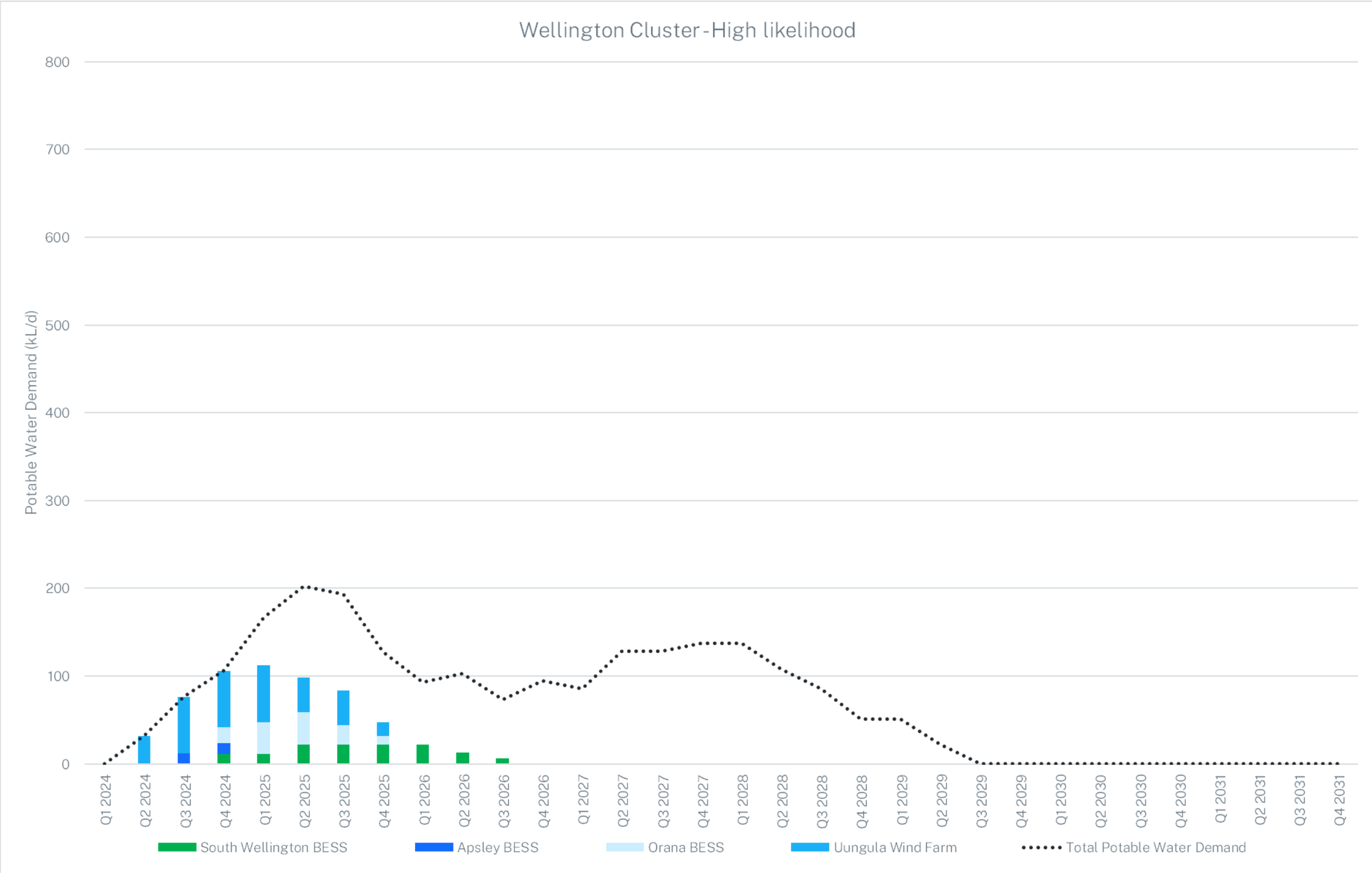


11.4.5 Wellington Cluster

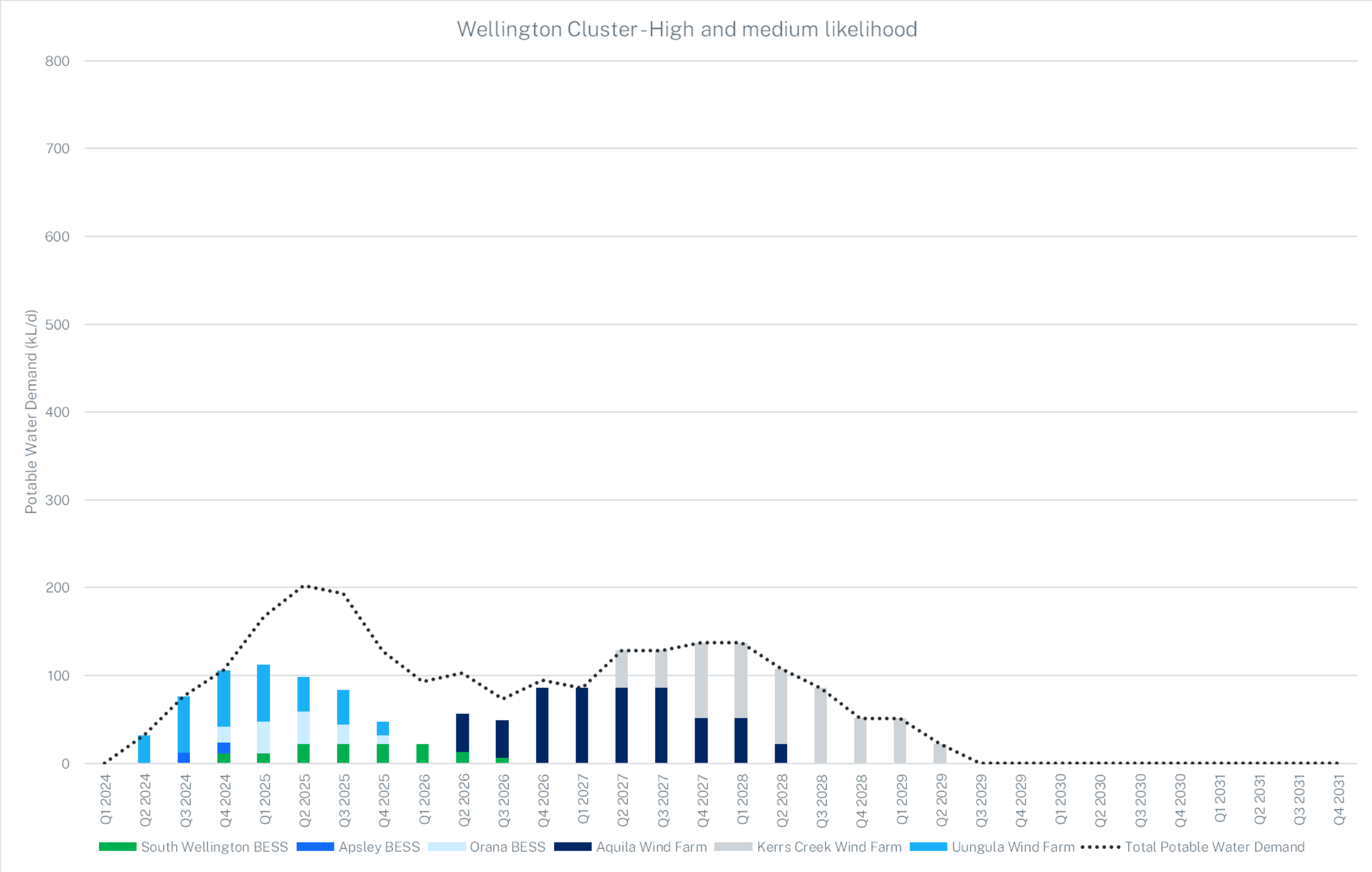
11.4.5.1 All projects potable water demand



11.4.5.2 High likelihood projects potable water demand

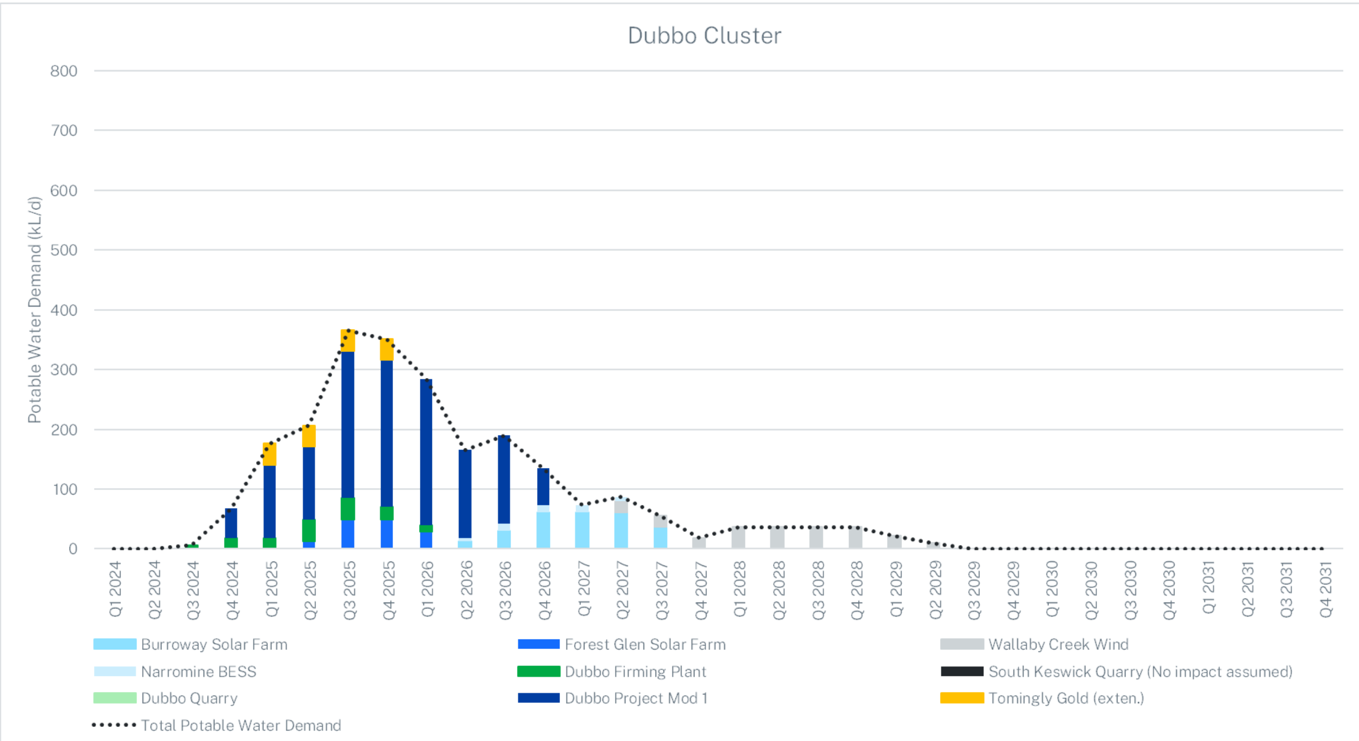


11.4.5.3 High and medium likelihood projects potable water demand

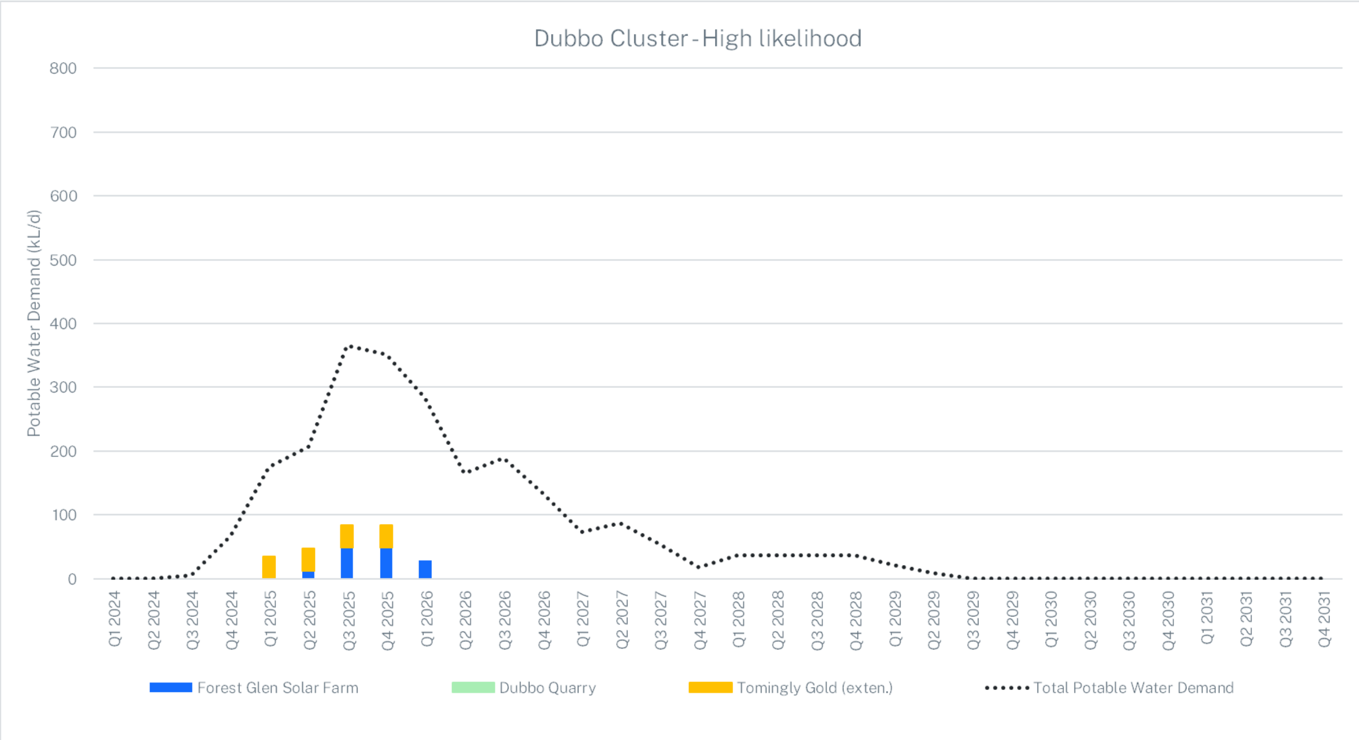


11.4.6 Dubbo Cluster

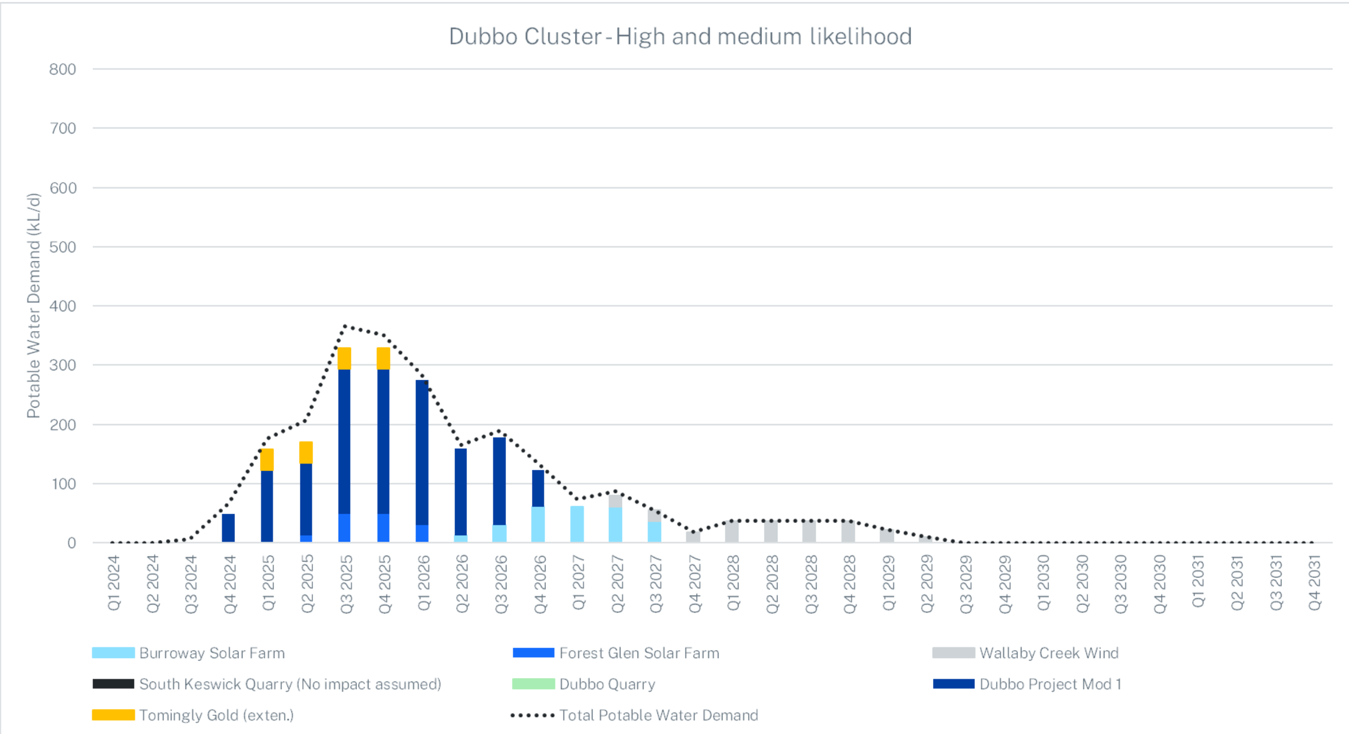
11.4.6.1 All projects potable water demand



11.4.6.2 High likelihood projects potable water demand

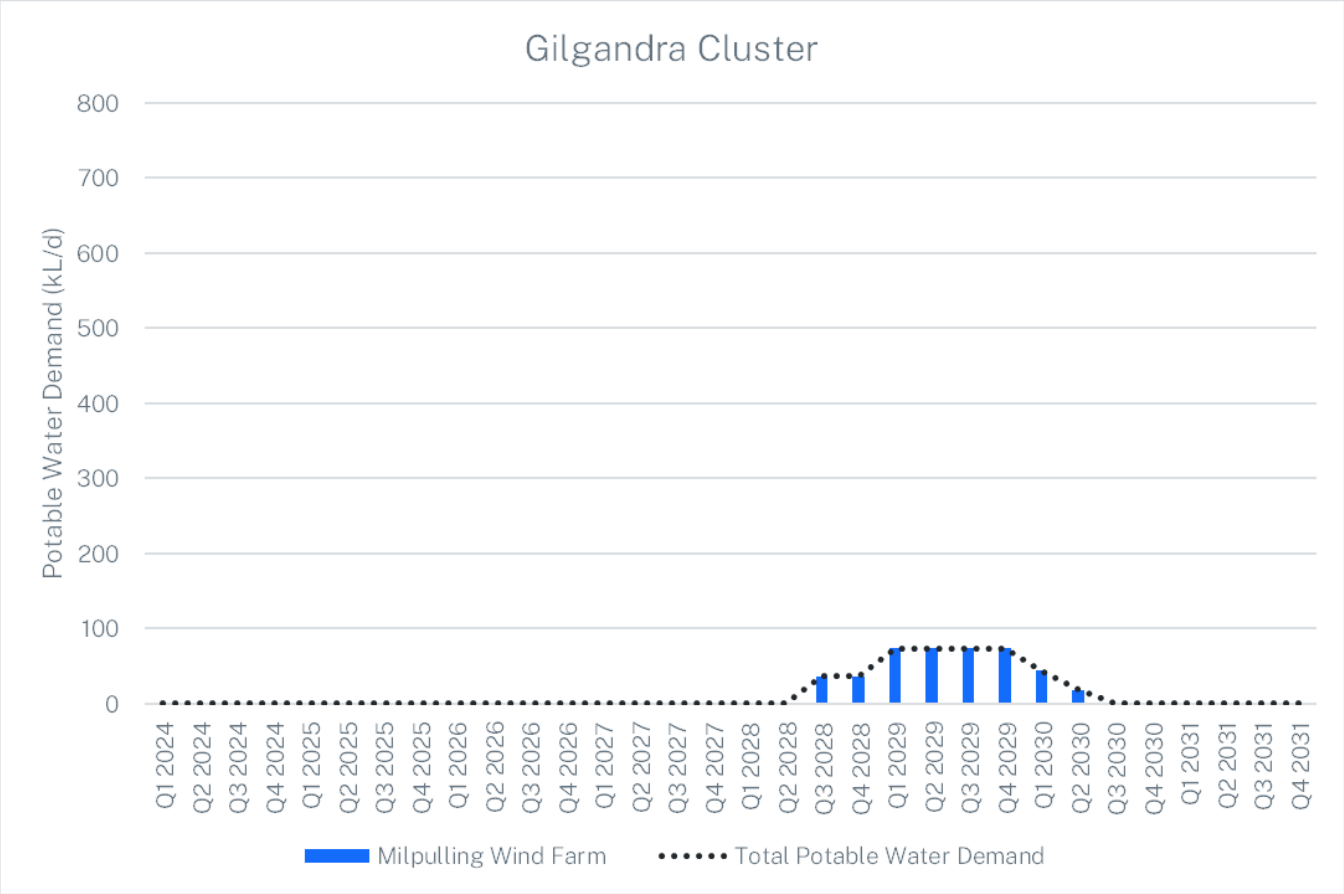


11.4.6.3 High and medium likelihood projects potable water demand



11.4.7 Gilgandra Cluster

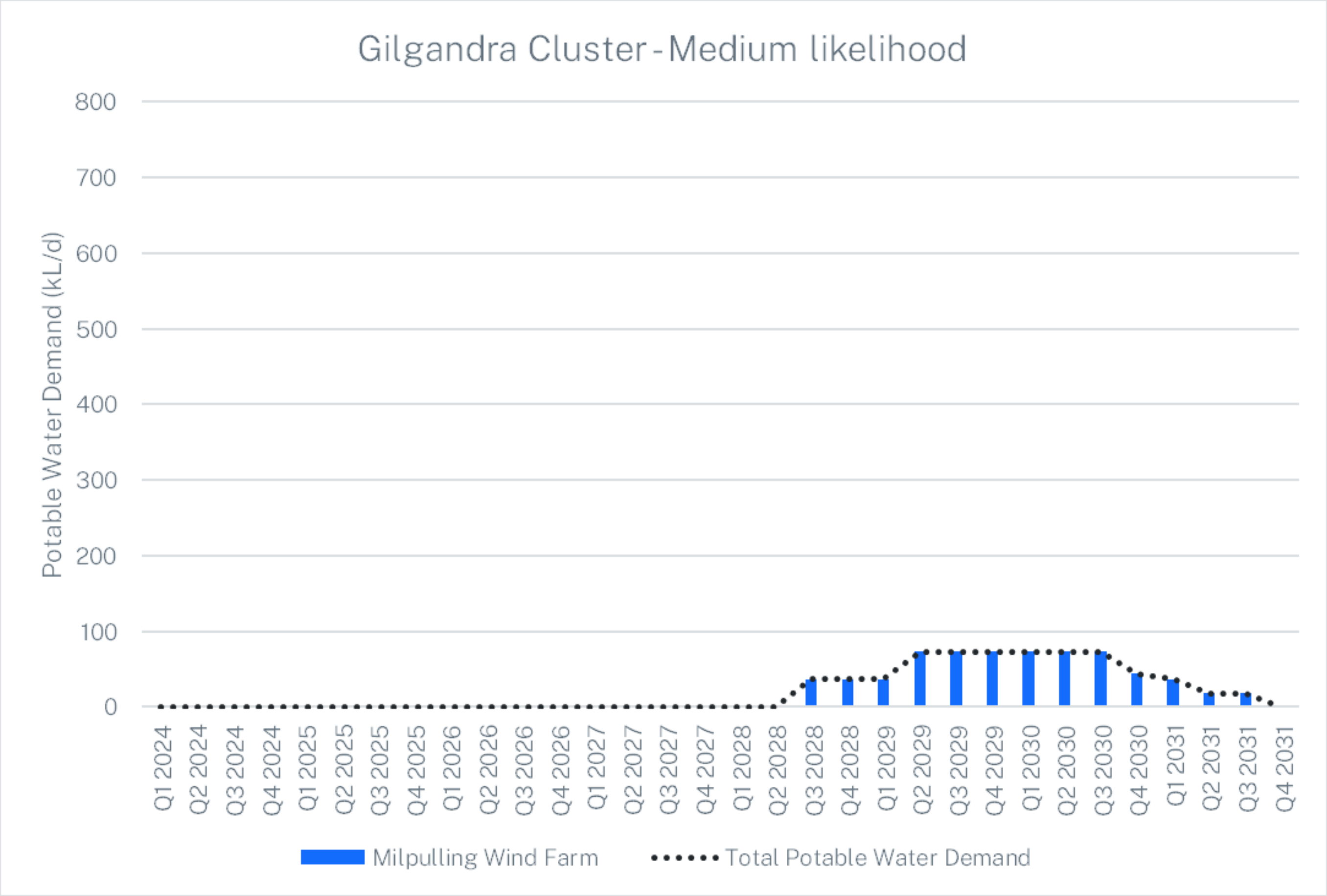
11.4.7.1 All projects potable water demand



11.4.7.2 High likelihood projects potable water demand

There are no projects with a high likelihood rating in the Gilgandra Cluster.

11.4.7.3 High and medium likelihood projects potable water demand



11.5 Appendix E Water entitlement held by local water utilities

Information in this appendix has been removed from the public version of this document due to confidentiality. Its removal does not affect the overall findings.

11.6 Appendix F Stakeholders consulted

Extensive internal and external consultation has underpinned this advice. Table 16 summarises the stakeholder groups consulted and the nature of consultation.

Table 16 Stakeholders consulted in development of this document.

Stakeholder group	Membership	Nature of consultation
Internal Water and Energy Technical Working Group	Subject matter experts in DCCEEW Water	Provided data and technical analysis to support development of findings. Participated in workshops to characterise risks and issues and identify potential possible next steps.
Internal Water and Energy Reference Group	Directors within DCCEEW Water	Briefed on emerging findings and potential possible next steps. Provided guidance on direction for possible next steps.
Whole-of-Government Roadmap Water Subcommittee	Executive Directors and Directors from NSW Government agencies	Briefed on emerging findings and potential possible next steps. Endorsement of final deliverable.
Central-West Orana REZ Environmental Projects Group	Local councils within Central-West Orana REZ and NSW Government agencies	Provided data relating to local water utilities' capacities and demands. Briefed on emerging findings and potential possible next steps. Reviewed findings relevant to each council including treatment plant capacities and constraints.

11.7 Appendix G Projects included in analysis

Projects included in this analysis are summarised in Table 17 along with their likelihood ratings, as provided by DPHI.

Table 17 List of projects included in analysis.

Project	Cluster	Access Rights Holder	Likelihood rating
Central-West Orana REZ Transmission	1-Coolah	Yes	High
Liverpool Range Quarry	1-Coolah	No	Medium
Liverpool Range Wind Farm	1-Coolah	Yes	High
Valley of the Winds	1-Coolah	Yes	High
Rollsville Solar Farm	2-Dunedoo	No	Early planning
Avonside Solar Farm	2-Dunedoo	No	Medium
Birriwa Solar and Battery Project	2-Dunedoo	Yes	High
Cobbora Solar Farm	2-Dunedoo	Yes	Medium
Dapper Solar Farm	2-Dunedoo	No	Low
Dunedoo Solar Farm	2-Dunedoo	No	Medium
Moolarben OC3 Extension	2-Dunedoo	No	Medium
Orana Wind Farm	2-Dunedoo	No	Medium
Sandy Creek Solar Farm	2-Dunedoo	Yes	High
Spicers Creek Wind Farm	2-Dunedoo	Yes	High
Ulan Solar Farm	3-Gulgong	No	Early planning
Bellambi Heights BESS	3-Gulgong	No	High
Beryl BESS	3-Gulgong	No	Medium
Central-West Orana REZ Transmission	3-Gulgong	Yes	High
Goulburn River Solar Farm	3-Gulgong	No	High
Mavis Solar Farm	3-Gulgong	No	Medium
Mayfair Solar Farm	3-Gulgong	No	Medium
Narragamba Solar Farm	3-Gulgong	Yes	Low
Stubbo Solar Farm	3-Gulgong	No	High
Tallawang Solar Farm	3-Gulgong	Yes	High
Ulan Coal Mine MOD 6	3-Gulgong	No	Medium
Wilpinjong Coal Mine Extension MOD 2	3-Gulgong	No	High
Wilpinjong Coal Mine Extension MOD 3	3-Gulgong	No	Low
Wollar Solar Farm MOD 4	3-Gulgong	No	Low
Bowdens Silver	4-Mudgee	No	Low
Burrendong Wind Farm	4-Mudgee	No	Medium
Piambong Wind Farm	4-Mudgee	No	Medium
Yarrabin (Phoenix) Pumped Hydro	4-Mudgee	No	Medium
Wellington Town BESS	5-Wellington	No	Low
Apsley BESS	5-Wellington	No	High
Aquila Wind Farm	5-Wellington	No	Medium

Project	Cluster	Access Rights Holder	Likelihood rating
Kerrs Creek Wind Farm	5-Wellington	No	Medium
Maryvale Solar Farm	5-Wellington	No	Low
Orana BESS	5-Wellington	No	High
Suntop Solar Farm MOD 2	5-Wellington	No	Low
Uungula Wind Farm	5-Wellington	Yes	High
Wellington North Solar Farm MOD 1	5-Wellington	No	Low
Wellington South BESS	5-Wellington	No	High
Burroway Solar Farm	6-Dubbo	No	Medium
Dubbo Firming Power Station	6-Dubbo	No	High
Dubbo Project (formerly Dubbo Zirconia Mine)	6-Dubbo	No	Low
Forest Glen Solar Farm	6-Dubbo	No	High
Narromine BESS	6-Dubbo	No	Low
South Keswick Quarry	6-Dubbo	No	Medium
Tomingley Gold Extension	6-Dubbo	No	High
Wallaby Creek Wind Farm	6-Dubbo	No	Medium
Dubbo Quarry Continuation Project	6 – Dubbo	No	High
Dubbo Quarry Continuation Project – Mod 1	6 – Dubbo	No	High
Milpulling Wind Farm	7-Gilgandra	No	Medium
Cadia East Gold MOD 14	Outliers	No	Medium
Narromine to Narrabri	Outliers	No	High
Nevertire Solar Farm MOD 4	Outliers	No	Medium

11.8 Appendix H Acronyms used in this document

Acronyms used in this document are defined in Table 18.

Table 18 Acronyms used in this document.

Acronym	Meaning
BESS	Battery Energy Storage System
CWO	Central West Orana
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPHI	Department of Planning, Housing and Infrastructure
EIS	Environmental Impact Statement
EP	Equivalent Population
LGA	Local Government Area
LTW	Liquid Trade Waste
LWU	Local Water Utility
REZ	Renewable Energy Zone
SSD	State Significant Development
SSI	State Significant Infrastructure
STP	Sewage Treatment Plant
TWA	Temporary Worker Accommodation
WTG	Wind Turbine Generator
WTP	Water Treatment Plant
WUDF	Water Usage Discharge Factor

11.9 Appendix I Surface water and groundwater source maps

This section contains maps showing the relationships between project locations and surface and groundwater water sources.

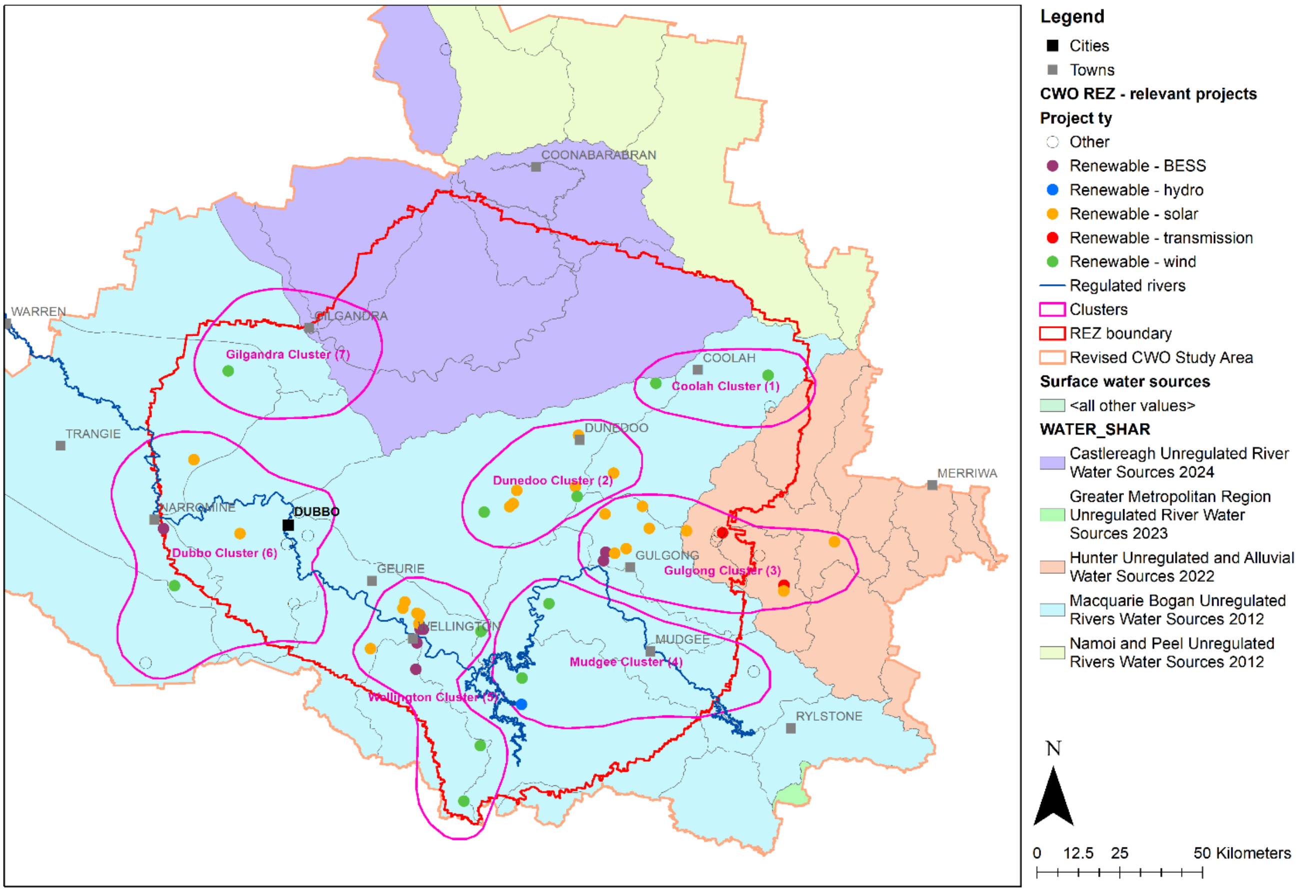


Figure 8 Surface water sources intersecting with the REZ, including unregulated and regulated water sources.

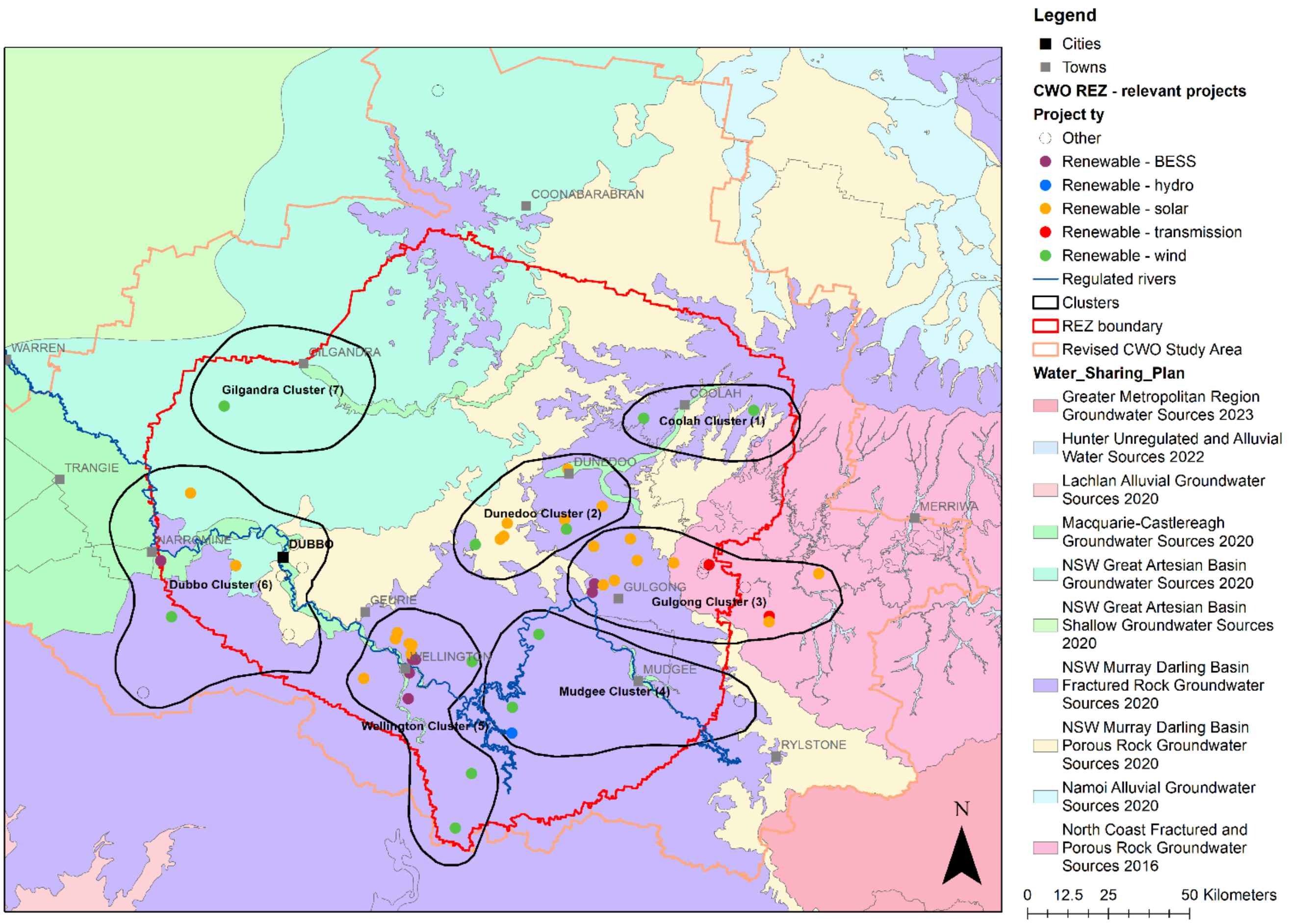


Figure 9 Groundwater sources (Level 1) intersecting with the REZ.

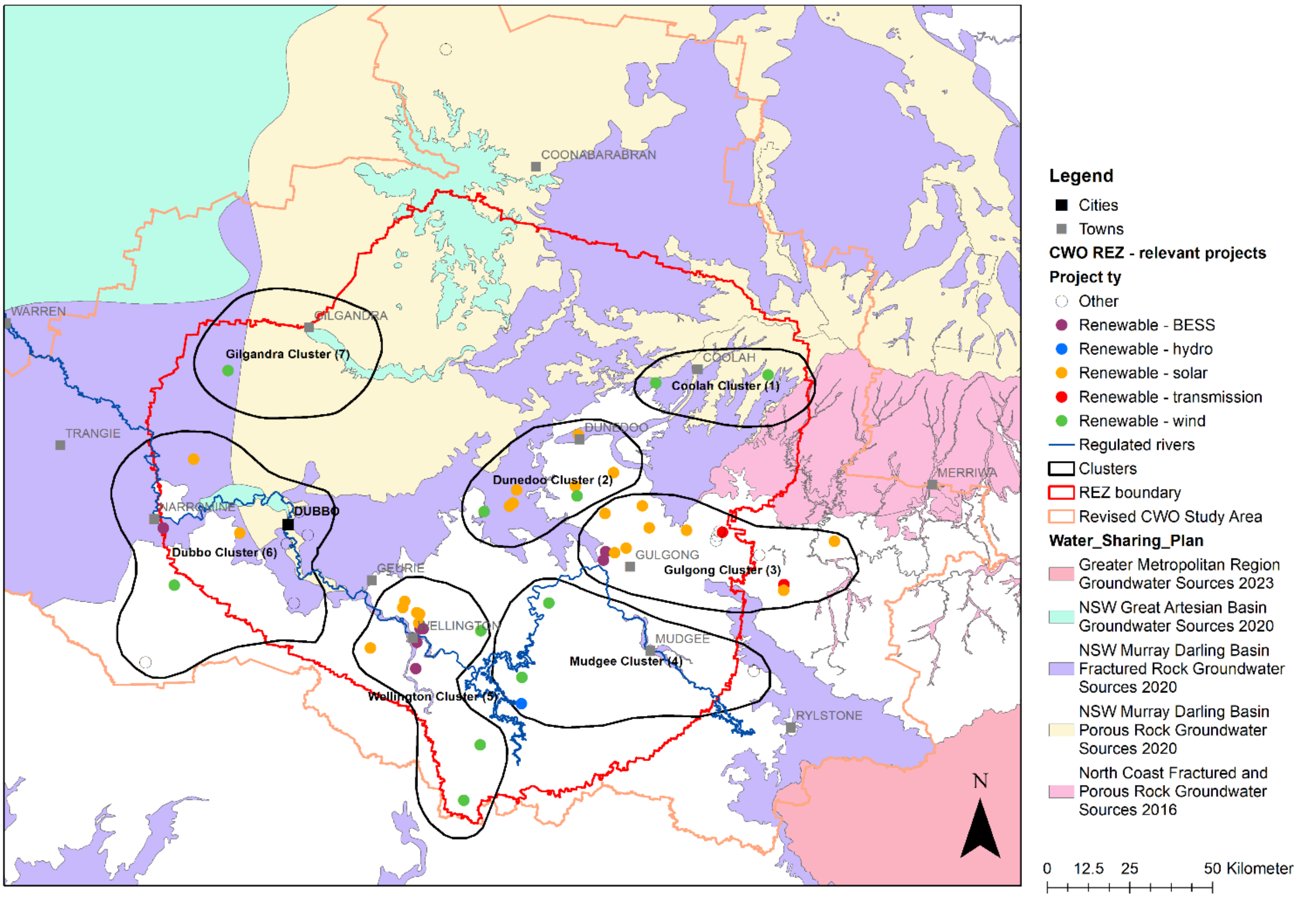


Figure 10 Groundwater sources (Level 2) intersecting with the REZ.

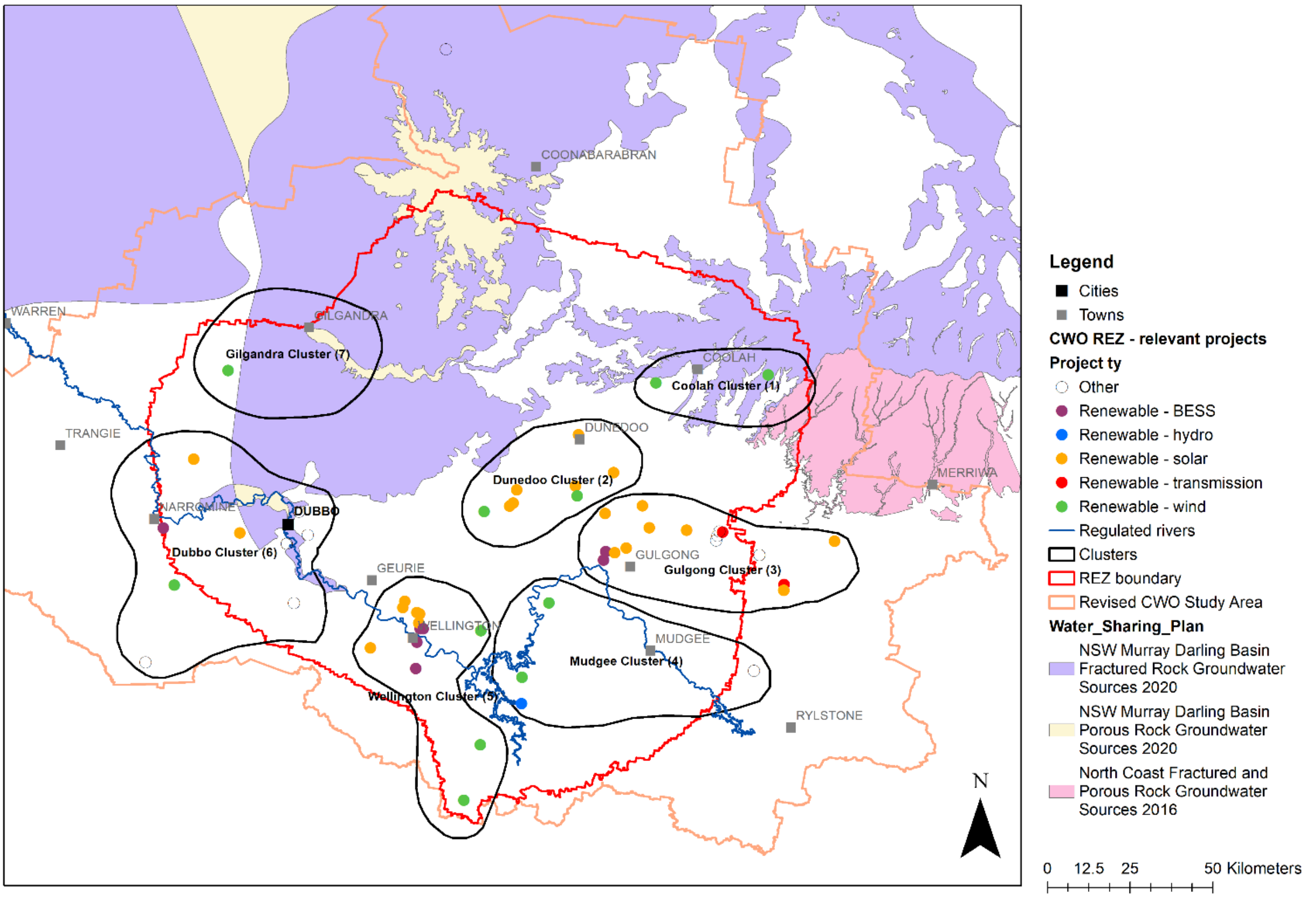


Figure 11 Groundwater sources (Level 3) intersecting with the REZ.

12 References

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