Water and wastewater security study

New England Regional Major Infrastructure Studies

NSW GOVERNMENT

December 2025

Uralla

Acknowledgement of Country

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

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Introduction

Renewable energy zones (REZs) are a critical part of our plan to provide affordable, clean and reliable energy for NSW.


Walcha

A secure energy future for everyone in NSW

Five REZs have been identified so far which will help keep the lights on as coal-fired power stations retire.

Regional communities play a vital role in hosting the power lines and renewables we need. We are committed to working with communities to minimise impacts and maximise the benefits of this investment in our regions. REZs will contribute to the growth, prosperity of regional communities through jobs, training, investment and funding for local projects.

Investigating priority areas for the New England REZ

EnergyCo is leading the delivery of the REZs to ensure long-term energy security for NSW. We are working closely with a range of stakeholders to coordinate investment and provide long-term benefits to communities who are hosting new energy projects.

EnergyCo has been investigating how potential impacts will be managed in the New England REZ. This work includes a program of engagement with local councils, government agencies and other key stakeholders to understand local issues.

In 2024, we commissioned a series of studies to understand the potential constraints and challenges caused by concurrent development in the region, as well opportunities that could be used to support renewable energy development. The studies aim to provide a point-in-time analysis of the potential impacts of REZ development along with other major infrastructure projects in the region.

We will use this information, along with local feedback, to develop the REZ in a way that supports growth and sustainable demand for skills, services and infrastructure across the region in the years to come. We understand the importance of these issues for the New England region, in particular water availability. Community, council and key stakeholder input will help us to focus efforts where they are needed.

Purpose of this document

This document provides the water and wastewater security study developed by Jacobs. The study aims to understand current treatment capacity across the region, expected water use and wastewater treatment needed to support the REZ development. It also identifies potential opportunities to support REZ delivery in a proportionate and appropriate way which also meets the needs of local councils and communities.

Study development and limitations

Information contained in the study is based on knowledge and understanding at the time of its development. For this reason, it may not accurately represent local conditions at the time of reading.

The study provides a point-in-time analysis based on available data, proposed developments and the delivery timeframes for the New England REZ as of November 2024. The study does not predict future developments or changes in policy and should not be interpreted as a predictive or exhaustive assessment of all cumulative impacts over time.

Information has been sourced from EnergyCo, councils, government agencies, industry stakeholders, related third parties and/or as available in the public domain at the time of writing, coupled with research and industry knowledge of the study consultants. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed within the study.

The study should not be interpreted as specific advice or relied upon in lieu of appropriate professional advice.

Project lists

Inclusion of projects or infrastructure in the study does not imply endorsement, approval or funding commitment by any government agency or private entity. Decisions about development approvals and infrastructure investments will be subject to separate statutory and policy processes.

Scenarios outlined in the study include renewable energy projects and non-renewable energy projects at various stages of the project development lifecycle (pre-planning, planning, construction and operation). Major projects, state significant development, state significant infrastructure and critical state significant infrastructure have been considered.

The number and configuration of renewable energy projects within the New England REZ may change and will be influenced by factors such as generation availability and network connection capacity.

The modelling undertaken for this study is based on the proposed projects identified at the time of writing and may exceed what can feasibly be realised due to factors such as generation availability and transmission capacity within the REZ network infrastructure. The scenarios used are sufficient to support the study's key findings, addressing the challenges and opportunities associated with the REZ. Subsequent studies (if undertaken) may build on this as more information becomes available. This methodology was used so that the full extent of potential impacts was presented in the study, allowing NSW Government to plan for a higher impact to communities. Some sections of the study are redacted due to confidential information provided by renewable energy developers or other key stakeholders. While this data was used in modelling, its removal does not affect the overall findings.

Potable water demand assessment

The potable water demand used as part of the modelling for the water and wastewater security study is heavily influenced by the assumptions used to generate a water demand for concrete. At the time of the study very little information was available on the grades and volumes of concrete that might be used on projects, and so a conservative approach was taken. As projects within the study area continue to be developed, information on the potential water demands will be refined which will provide a more up to date assessment of impacts. EnergyCo will continue to monitor the status of projects as they develop.

Opportunities

The study has identified opportunities to address potential cumulative impacts. The study does not represent a list of commitments or set of guaranteed actions to be implemented. EnergyCo will share the studies with community, councils and key stakeholders for feedback to help us identify and prioritise a list of potential opportunities to investigate further. We will then work with councils, renewable energy developers, other government agencies and key stakeholders to develop the opportunities into initiatives which provide legacy benefits for the region.

New England REZ network infrastructure corridor changes

In October 2025, EnergyCo announced that the corridor of the New England network infrastructure project is to be changed between Bayswater Power Station near Muswellbrook and the energy hub near Walcha. More information on this change is available at: energyco.nsw.gov.au/nerez

What the corridor updates mean for the studies

The studies provide a baseline understanding of the region and consider a point-in-time analysis of the potential challenges and opportunities from major infrastructure development in the region. These insights, together with community feedback, will help develop the REZ as a whole to best support growth, meet the future demand for skills, services, and infrastructure across the region, and provide legacy outcomes. As no new council areas are impacted by the revised corridor and due to the regional nature of the studies, the baseline information provided by the studies is largely unaffected. There may be changes in the timing of peak construction periods which will be determined by changes to the New England REZ network infrastructure project, and any changes renewable energy projects make to their programs.

A key part of the next phase will be for EnergyCo to monitor the status of projects as they continue to develop and refine the understanding of the potential cumulative impacts from development in the region. Further investigations will be carried out as part of the development of the REZ to capture these changes and respond to the identified impacts.

We will continue to work closely with community and stakeholders, including councils, to understand the areas that matter most to local communities. We are also continuing to work closely with renewable energy developers to identify opportunities and strategies to manage potential impacts from development in the region over time.

What the corridor updates mean for the water and wastewater security study

The New England REZ network infrastructure project forms one part of the demand assessment generated for water and wastewater, along with renewable energy and non-renewable projects. While the contribution of non-renewable and renewable energy projects to the demand remains unchanged, the demand from the network infrastructure project may be different. Based on the regional nature of the modelling and the approaches used in the study, the key findings and opportunities identified are still relevant to the revised corridor.

Acknowledgements

The study has been developed with assistance from a range of key stakeholders providing their input, expertise and local insights. EnergyCo thanks all those individuals and organisations who have participated in the development of this water and wastewater security study.

For more information

If you have any questions about the contents of this document, please get in touch with our team on 1800 061 114 (toll free) or by emailing nerez@energyco.nsw.gov.au.

For more information about the New England REZ visit our website at energyco.nsw.gov.au/nerez.


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Water & Wastewater Security Study

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New England Renewable Energy Zone

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The sole purpose of this Report and the associated services performed by Jacobs is to prepare a water and wastewater security study in accordance with the scope of services set out in the contract between Jacobs and Energy Corporation of NSW ('the Client'). That scope of services, as described in this Report, was developed with the Client.

In preparing this Report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the Report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this Report may change.

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Note about the timeframes used in this Report

The water and wastewater estimates presented in this Report are based on the delivery timeframes for the New England Renewable Energy Zone (NE REZ) Network Infrastructure Project (NRNIP) as of October 2024 when the analytical framework was established for the Study.

These timeframes are:

- Stage 1 completion by July 2031 and
- Stage 2 by January 2033

These timeframes were also used for the constructability water demand projections provided by EnergyCo for the Study.[1] These projections were a key input into the analysis presented in this Report.

In December 2024, the Australian Energy Market Operator (AEMO) released revised delivery timeframes for the NE REZ NRNIP as follows:

- Stage 1 completion by July 2032 and
- Stage 2 by January 2034

The revised delivery timeframes differ from the timeframes used in this Report by 12 months.

Assuming the whole portfolio of development in the NE REZ and along the NRNIP corridor included in the analysis presented in this Report occurs 12 months later, the water and wastewater projections presented would also likely occur 12 months later. However, this does not account for changes in timing of individual projects or subcomponents of either the projects or NRNIP.

Readers should also keep in mind that it is only the NRNIP energisation delivery dates that have been revised. Non-renewable and other projects outside the scope of the NRNIP may be delayed and / or brought forward independently. Such changes would also have implications on the timing of peak water demand and wastewater volumes to be treated.

[1] 20250117 NE REZ Construction Water Demand 2.0.xlsx

Executive summary

The New South Wales (NSW) Government is leading the development of Renewable Energy Zones (REZs) across NSW to increase the State's renewable energy supply in line with its net-zero policy ambitions and targets. REZs group new renewable energy power generation into locations where good renewable energy resources exist (e.g. wind and solar resources) to facilitate efficient storage and transmission across NSW.

Development of a REZ requires the coordination and delivery of power generation, power storage and transmission infrastructure. The construction and operation of this infrastructure requires water and contributes to wastewater that needs to be treated within or near the REZ footprint.

This Report focuses on the New England Renewable Energy Zone (NE REZ) that aims to provide up to 6 gigawatts of renewable energy capacity in NSW by 2033. To support planning for the NE REZ, this Report presents a strategic assessment of the potential water supply needs and water and wastewater treatment requirements.

Objectives and approach to the Study

The objectives of the Water and Wastewater Security Study (the Study) were to:

- Undertake a desktop analysis of the existing water resources, water uses, water and wastewater to be treated and the associated treatment infrastructure in the local government areas (LGAs) that are either within the NE REZ or impacted by the NE REZ Network Infrastructure Project (NRNIP).
- Estimate the potential additional water use and wastewater to be treated from the NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Assess the extent to which the water and wastewater treatment infrastructure has the capacity to accommodate the potential additional water use and wastewater that would need to be treated from NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Identify potential impacts on water and wastewater, including potential shortfalls in water supply and treatment infrastructure capacity required to support NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Identify opportunities for consideration about how the impacts can be mitigated and further investigations that may be required.

The Study approach comprised three assessments:

- Water resources assessment (Assessment 1)
- Water treatment infrastructure capacity assessment (Assessment 2)
- Wastewater treatment infrastructure capacity assessment (Assessment 3).

Each assessment considered:

- two scenarios (base case and NE REZ development case)
- sensitivity analyses to account for different water availability conditions and groups of renewable projects that might go ahead (based on the likelihood of the proposed projects proceeding)
- three time periods across the planning and construction stages
    - Planning stage (present to 2027)
    - Stage 1 construction (2027-2031)
    - Stage 2 construction (2030-2033).

Key findings

The results of the three assessments reveal the key water and wastewater issues that emerge given the intensity of NE REZ development, both temporally and geographically.

- From a temporal perspective, construction of the NE REZ development is planned to occur across six years (2027-2033). This is the period during which water demand from NE REZ development will be most material. Once the NRNIP and NE REZ projects become operational, water and wastewater impacts are considerably less. While the Study did not include analysis of the long-term operational water and wastewater needs of the NRNIP and NE REZ projects, the analysis showed how, based on current information about the commencement and duration of construction, water demand is projected to be highest in 2031, then reduce in 2032 and 2033 as the NRNIP and NE REZ projects become operational.
- From a geographical perspective, some LGAs, especially Uralla and Walcha, will be impacted more than others due to the combination of the NRNIP and NE REZ renewable energy projects planned to occur within these LGAs.

These temporal and geographic aspects of the NE REZ development provide guidance about the key issues to address, including intensity of water demand over the construction period, and with which local councils they need to engage. The identified options for addressing these issues are presented below. These options are then described in detail in Section 8.

Water resources assessment

The water resources assessment highlights the extent to which the NE REZ development may place pressure on the water resources within the NE REZ and along the NRNIP corridor. The data available to estimate water supply was based on hydrological water systems, rather than LGAs in line with the geographic unit of analysis used in the Study. This means that a qualitative analysis was adopted for the water resources assessment.

The water resources assessment has highlighted the key regulated surface water and groundwater sources that may come under pressure if the full scale of NE REZ development goes ahead.

From the perspective of regulated surface water sources, the key issues are:

- Peel Regulated River Source which flows through Tamworth LGA and may be a water source for the NE REZ projects and the NRNIP in this LGA. This source is already under pressure as noted in the latest compliance assessment report (2022-23), and may come under additional pressure if the 4 NE REZ projects currently planned in Tamworth LGA and near the Peel Regulated River Source go ahead. This assumes all projects are approved and commence construction based on current planned timelines and NE REZ water demand would come from the Peel Regulated River Source (in line with the LGA geographic unit of analysis). This may not be the case as it will depend on the timing of relevant approvals, the specific location the NE REZ projects, and how they opt to meet their water requirements. Nevertheless, from a regulated river perspective, it is an area that requires further investigation and collaboration with Tamworth Regional Council.
- Hunter Regulated River Source which flows through Upper Hunter, Muswellbrook and Singleton LGAs. While this source is currently not fully utilised and the additional volumes from NE REZ development relative to historical trends in usage are low, in the context of the water demand from the NE REZ development, and the development of the Hunter-Central Coast REZ, any cumulative impacts between the two REZs need to be understood. Water availability in this system does not fluctuate much across most water years, so the analysis of NSW Water Register data does not highlight any immediate risks under a repeat of the most recent drought.

From the perspective of groundwater sources, the extent to which the existing volumes held under local water utility licences and town water supply licences and the available storage capacity can accommodate additional potable demand is likely the key issue. This is especially the case in LGAs in the east of the NE REZ that source water from unregulated and groundwater sources, i.e., Armidale, Walcha and Uralla. Across these

three LGAs, the additional potable and non-potable water demand from NE REZ development could be 46 ML/d (16,790 ML per year) in 2031. Towns and communities within these LGAs are likely even more reliant on groundwater sources during dry periods when storages may be depleted and unregulated sources are either constrained or not available. Therefore, if the NE REZ development coincides with a dry period, there may be challenges with meeting the additional demand.

Further engagement with the respective local councils and investigations into the specific water supply, water storage and access arrangements for the towns and communities that will be directly impacted by the NE REZ development are required (see Section 8). There is a key opportunity to collaborate with the respective local councils as they prepare / update their integrated water cycle management plans (IWCM). This needs to be undertaken in the context of the available water treatment capacity (see Section 6).

However, a related issue is the water treatment capacity for the potable water demand from NE REZ development. This is demonstrated through the estimates of total water demand from the NE REZ development. It indicates that the key opportunity involves engaging with local councils in the LGAs that have planned NRNIP and NE REZ project development to understand their specific water supply situation alongside the capacity of their respective water treatment infrastructure (see below for further discussion).

From a water demand perspective, to demonstrate a range of potential outcomes, estimates of the water demand (potable and non-potable) from NE REZ development were generated for average water demand (potable and non-potable) and peak water demand (potable and non-potable). The average water demand indicates what the typical demand may be as an average across a year (average water demand). While the peak water demand demonstrates the potential demand if there is a small number of consecutive days when demand for potable water is extremely high.

The estimates of water demand (potable and non-potable) from NE REZ development project that the year in which the largest volume of water may be required will be in 2031, the last year of Stage 1. The projected volume is 182.2 ML/d (average water demand) and 247.9 ML/d (peak water demand). This is 61.1 ML/d higher than under the base case in 2031 (under both average and peak water demand). This large volume of additional water required for NE REZ development primarily reflects water demand from the NE REZ projects, rather than the NRNIP. The NRNIP water demand were provided by the EnergyCo Constructability Team, while the assumptions underpinning water demand from the NE REZ projects were developed in collaboration with EnergyCo.

The composition of the additional water demand is evenly balanced between potable and non-potable. The water demand estimates generated in the Study indicate that 58% (35.2 ML/d) of the additional water demand under NE REZ development is for potable water, while the remaining 42% (25.9 ML/d) is for non-potable water.

Given need for large volumes of potable water, these findings indicate that close engagement with the local councils will be necessary, as well as exploration of ways in which the NRNIP and NE REZ projects may be able to integrate water treatment facilities on site.

Water treatment infrastructure capacity assessment

The water treatment capacity assessment highlights the extent to which the water treatment capacity available in the LGAs in the NE REZ and along the NRNIP corridor is utilised due to NE REZ development. Irrespective of the water availability conditions that coincide with the construction of the NE REZ development, these findings show that water treatment capacity for potable demand is likely to be the key issue that requires solutions under NE REZ development.

The NE REZ development will increase the demand for water in the NE REZ and along the NRNIP corridor. Crucially, more than 50% of the additional water may need to be potable to support human use (on-site and in workers' accommodation) and in the production of concrete (e.g., footings of the NRNIP towers, wind turbines). This demand for potable water will place pressure on the existing water treatment infrastructure, especially in those LGAs where there is intensive development from both the construction of the NRNIP and

NE REZ projects. As was the case with the estimates of water demand (potable and non-potable), to demonstrate a range of potential outcomes, the water treatment infrastructure capacity assessment was completed using average water demand (potable) and peak water demand (potable).

Approximately 44% of the estimated additional potable water demand under NE REZ development in 2031 is for concrete production. At the time of the Study, there was limited information about the grade of concrete required for construction, so a conservative approach was adopted. It is likely that some of the water demand for concrete production could be a lesser quality that assumed in this Study. This is a key area for further investigation, including confirmation of concrete volumes and grade required, pouring timeframes and logistics / delivery method.

Under the NE REZ development, there is a projected surplus in combined water treatment capacity when considering average water demand (potable) in Stage 1 and Stage 2. Under peak water demand (potable), there is a projected deficit in combined water treatment capacity in Stage 1 and Stage 2 (-25.2 ML/d). However, the results vary across the LGAs.

When considering average water demand (potable), the water demand (potable) from NE REZ development potentially exceeds treatment capacity in three out of the 11 LGAs, Muswellbrook, Uralla and Walcha, each of which have intensive NE REZ development planned. Most of the projects planned to occur in these LGAs are categorised as high or medium likelihood to proceed. When removing projects categorised as low from the analysis, the water treatment capacity assessment results for Uralla and Walcha are unchanged. This indicates that engagement with the respective local councils should be a high priority to identify effective solutions.

When considering peak water demand (potable), capacity shortfalls are projected in six out of the 11 LGAs (Uralla, Armidale, Liverpool Plains, Muswellbrook, Tamworth, Walcha). Given this is under peak water demand, this indicates what could happen under a series of consecutive days of high water demand, rather than highlighting more enduring issues. The water treatment capacity assessment results assume no management strategies are in place. This is an important area for further engagement and collaboration with the respective local councils to understand options for managing high demand events. For both average water demand (potable) and peak water demand (potable), in several LGAs, there is a material change in the utilisation of the water treatment infrastructure under the demand sensitivity that removes projects with a low and medium likelihood of proceeding. This indicates that there may be options to manage potable demand load on water treatment infrastructure via careful management of the scheduling of the NRNIP and coordination of NE REZ renewable energy projects.

Wastewater treatment infrastructure capacity assessment

The wastewater treatment capacity assessment highlights the extent to which the wastewater treatment capacity available in the LGAs in the NE REZ and along the NRNIP corridor is utilised due to NE REZ development. While the NE REZ development will increase the wastewater to be treated in those LGAs where there are either NE REZ projects or the NRNIP, in most LGAs, there is a projected surplus in wastewater treatment infrastructure capacity. This is based on average dry weather wastewater volumes which demonstrates what the typical wastewater load may be on wastewater treatment infrastructure as an average across a year.

However, in most LGAs, under NE REZ development, the volumes of wastewater to be treated are near or exceeding the available wastewater treatment capacity. This indicates that further consultation with local councils will be required to understand the efficiency of the respective wastewater treatment plants and the mechanisms they have available to manage increased volumes of wastewater to be treated and the extent to which these mechanisms are considered effective, especially under wet weather events.

The LGA that has a large change in the wastewater treatment capacity that is utilised is Uralla. This is estimated to increase from 52% in the Planning Stage to 105% in Stage 1 and Stage 2 under the NE REZ development case. Liverpool Plains shows a current deficit in wastewater treatment capacity under the base case (Planning Stage), and also under NE REZ development. These results are based on the wastewater treatment infrastructure capacity data available to the Study. Based on these capacity estimates, it indicates

that the wastewater treatment plants in Liverpool Plains may already be operating at capacity and management mechanisms may already be used (e.g., use of storage ponds). This is an area for further consultation and verification with Liverpool Plains Shire Council and the operator of the wastewater treatment infrastructure.

In addition, further information is required about the potential wastewater that will be generated from construction activities in the NRNIP and NE REZ projects. The extent to which these additional volumes will impact the wastewater treatment infrastructure capacity assessment results reported in this Study will depend on the volumes involved, treatment required, and any sustainable water management strategies implemented at construction sites. There are a range of alternative solutions that could help manage wastewater from construction, including on-site recycling and treatment, especially for volumes that may be contaminated with chemicals and is therefore unsuitable for being treated at the existing wastewater treatment plants. These aspects require further investigation.

Opportunities for addressing the water and wastewater-related risks and funding mechanisms

The opportunities for consideration are organised into four groups. Each group of opportunities is listed below. See Section 8 for full details on each opportunity.

Water supply

There are seven opportunities (signified by WS) that focus on addressing issues with water supply identified in the Study.

Category	Opportunity	Rationale
Stakeholder engagement	**WS 1:** Understand the potential volume of water access licences held by LWUs with access to regulated river sources, and in which there is intensive NE REZ development.	▪ Large demand for potable water, primarily for concrete production in NE REZ projects and the Network Infrastructure Project (NRNIP), with peak demand projected for 2031. ▪ Potential pressure on regulated surface water sources (particularly Peel and Hunter Regulated River Sources) and groundwater sources, especially in LGAs in which communities are supplied from groundwater sources like Armidale, Walcha, and Uralla. ▪ Risks may be exacerbated during dry periods or droughts, with potential cumulative impacts from the Hunter-Central Coast REZ development on shared water sources. ▪ Limited current plans for expanding recycled water production or rainwater harvesting, highlighting the need for exploring alternative water sources and careful planning of NE REZ development.
Stakeholder engagement	**WS 2:** Understand the potential volume of water access licences held by LWUs with access to groundwater sources. Explore supply network capacity, and in which there is intensive NE REZ development.	
Stakeholder engagement	**WS 3:** Collaborate with those local councils that are currently preparing or updating IWCM strategies and support integration of NE REZ development water and wastewater requirements.	
Alternative water sources	**WS 4:** Explore the feasibility of increasing the volume of alternative water sources to support the NRNIP and NE REZ projects.	
Regulatory	**WS 5:** Investigate potential barriers to/limitations on use of alternative water sources, including regulations	
NE REZ development procurement options	**WS 6:** Embed recycled water capability in NRNIP projects and enabling infrastructure.	
NE REZ development and procurement	**WS 7:** Incentivise GDPs to include sustainable water management into their project designs.	

Water demand

There are seven opportunities (signified by WD) that focus on addressing issues with water demand identified in the Study.

Category	Opportunity	Rationale
Subsequent analyses and investigations	**WD 1:** Understand the potential volume of water required to support NE REZ development for water uses that were not included in the Study.	▪ Significant increase in water demand, with projections showing a peak of 61.1 ML/d above the base case in 2031, primarily driven by construction activities of the NRNIP and NE REZ projects. ▪ High proportion of potable water demand, accounting for approximately 58% (35.2 ML/d) of the additional water demand from NE REZ development, largely due to concrete production requirements. ▪ Concentrated demand over a short 3-4 year period (2028-2032) during peak construction, potentially straining local water resources and infrastructure. ▪ Geographical concentration of demand in certain LGAs, particularly those intersecting with both the NE REZ and NRNIP, such as Armidale, Uralla, Walcha, and Tamworth.
REZ interfaces	**WD 2:** Engage with the EnergyCo Team leading the early stages of planning for the Hunter-Central Coast Renewable Energy Zone to understand cumulative construction and operational water use demands from the Hunter Regulated River Source.	
NE REZ development procurement options	**WD 3:** Plan and sequence NE REZ development to support management of existing water resources, especially potable water demand.	
Subsequent analyses and investigations	**WD 4:** Undertake a critical assessment of the alternative delivery pathways through negative wellbeing valuations and targeted stakeholder engagement.	
Community engagement and awareness	**WD 5:** Partner with agencies who are advocating for sustainable and on-going behaviour change related to water efficiency across all water users.	
Subsequent analyses and investigations	**WD 6:** Explore potential for temporary storage dams for construction water for: earthworks compaction and dust suppression and concrete production.	
Subsequent analyses and investigations	**WD 7:** Update water and wastewater security assessments based on additional data.	

Water treatment infrastructure capacity

There are six opportunities (signified by WC) that focus on addressing issues with water treatment capacity identified in the Study.

Category	Opportunity	Rationale
Stakeholder engagement and analysis	**WC 1:** Undertake a strategic assessment of the location of the workers accommodation camps for the NRNIP in the context of the location of the existing WTPs.	▪ Potential deficits in water treatment capacity in multiple LGAs, particularly under peak water demand scenarios. Six LGAs (Uralla, Armidale, Liverpool Plains, Muswellbrook, Tamworth, Walcha) may face capacity shortfalls during peak demand periods.
Subsequent analyses and investigations	**WC 2:** Determine the most cost-effective solutions for treating potable water volumes required to support NRNIP and NE REZ projects.	

Category	Opportunity	Rationale
Subsequent analyses and investigations	**WC 3:** Assess the most cost-effective transportation of potable water to NRNIP and NE REZ sites not connected to the network infrastructure.	▪ Significant overutilisation of water treatment infrastructure in some LGAs, with Uralla potentially reaching 333% utilisation and Walcha up to 244% utilisation during peak demand in Stages 1 and 2. ▪ Geographical concentration of water treatment capacity challenges, with LGAs intersecting both the NE REZ and NRNIP (e.g., Uralla, Walcha, Muswellbrook) facing the most severe capacity constraints.
NE REZ development and procurement	**WC 4:** Incentivise GDPs to include on-site WTPs for potable water, especially to meet use in concrete production.	
Stakeholder engagement and analysis	**WC 5:** Engage with Uralla and Walcha councils to identify effective solutions to accommodate increased demand for water treatment	
Subsequent analyses and investigations	**WC 6:** Consider the viability of establishing new local council-operated WTPs.	▪ Geographical concentration of water treatment capacity challenges, with LGAs intersecting both the NE REZ and NRNIP (e.g., Uralla, Walcha, Muswellbrook) facing the most severe capacity constraints.

Wastewater treatment infrastructure capacity

There are seven opportunities (signified by WWC) that focus on addressed issues with wastewater treatment capacity identified in the Study.

Category	Opportunity	Rationale
Stakeholder engagement and analysis	**WWC 1:** Undertake a strategic assessment of the location of the workers accommodation camps for the NRNIP in the context of the location of the existing WWTPs.	▪ Most LGAs are projected to operate close to full wastewater treatment capacity (80-98% utilisation) under Average Dry Weather Flow conditions, leaving little room for additional load or unexpected increases. ▪ Based on data available to the Study, Liverpool Plains LGA shows a deficit in wastewater treatment capacity, operating at 195% utilisation in the Planning Stage and up to 199% in Stage 2, indicating a potential 95%-99% shortfall in current capacity. ▪ Based on data available to the Study, Uralla shows a deficit in wastewater treatment capacity in Stages 1 and 2, operating at 105% utilisation, indicating a potential 5% shortfall in capacity. ▪ Wastewater treatment infrastructure capacity remains constant throughout the planning and
Subsequent analyses and investigations	**WWC 2:** Understand the potential volume of wastewater generated during construction of the NRNIP and NE REZ projects.	
Stakeholder engagement	**WWC 3:** Understand the extent to which the WWTPs identified in the Study as nearing or exceeding their capacity under NE REZ development have effective management in place to manage wastewater flows during wet weather events.	
Subsequent analyses and investigations	**WWC 4:** Determine the most cost-effective solutions for treating wastewater volumes from NRNIP and NE REZ projects	
Subsequent analyses and investigations	**WWC 5:** Assessing the most cost-effective transportation of wastewater to WWTPs.	

Category	Opportunity	Rationale
		construction stages, despite increased demand from NE REZ development, potentially leading to capacity constraints. ▪ The assessment only includes wastewater generated by human activities, lacking data on construction-related wastewater volumes, which could further strain treatment capacities if significant.
Stakeholder engagement	**WWC 6:** Engage with Liverpool Plains Shire Council to understand WWTP capacity.	
Subsequent analyses and investigations	**WWC 7:** Further analysis to understand impact of extreme wet weather events on flow in the NE REZ and surrounds.	▪ Wastewater treatment infrastructure is typically under the highest load during extreme wet weather events. Peak wet weather wastewater to be treated estimates were beyond the scope of the Study as this involves more complex analyses, including integration of rainfall data.

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Key term	Description
Base case	Provides water and wastewater estimates based on projected population change and construction / operation of non-REZ projects (i.e., projects such as schools, hospitals, other energy projects that are planned irrespective of NE REZ development and are planned to connect into other, existing networks (e.g., Transgrid)).
Baseline	Baseline is used in some other EnergyCo documentation. Referred to as 'Planning Stage' in this Study for clarity and to differentiate from the base case. Represents the present day to the anticipated start of construction of Stage 1 of the NRNIP (estimated 2027).
Development scenarios	Sensitivities applied to understand different levels of renewable energy development based on the likelihood of renewable energy projects proceeding.
Generation Design Partner	Proponents or developers of major renewable energy projects which intend to connect to the NRNIP.
Most recent drought	The most recent drought relevant to the geographic context occurred between 2017-20.
NE REZ development	NE REZ development includes the NE REZ Network Infrastructure Project the planning for which is being led by EnergyCo, and other planned renewable energy infrastructure that was known at the time of the Study. These renewable energy projects may be led by other developers, including other government agencies and Generation Design Partners.
NE REZ development case	Provides water and wastewater estimates based on NE REZ development. This means it includes the base case, construction / operation of the NRNIP, and construction / operation of renewable energy projects planned to connect into the NRNIP based on information available at the time of the Study.
NE REZ projects	Suite of renewable energy projects planned to be delivered by Generation Design Partners.
NE REZ Network Infrastructure Project	Infrastructure designed to support the NE REZ by enhancing transmission capacity. Includes 500kv transmission infrastructure, including 340km transmission lines, energy hubs to connect future energy generation and storage projects within the NE REZ, and supporting enabling works.
Non-potable water	Water that is not intended nor safe for human consumption.
Non-REZ projects	Suite of other non-renewable infrastructure projects and other renewable energy projects planned to connect into other, existing networks (e.g. Transgrid).
Potable water	Water that is safe for human consumption and domestic use.
The Report	Water and Wastewater Security Study (this document).
Wastewater to be treated	The volume of water that needs to undergo a series of processes to remove contaminants and impurities before being released back into the environment or reused.

Key term	Description
Wastewater treatment infrastructure	The wastewater treatment plants through which wastewater to be treated passes.
Water demand	Volume of water required or desired by users.
Water supply	The volume of water that is accessible and usable for various purposes within the NE REZ based on the NSW water management framework.
Water treatment infrastructure	The water treatment plants through which water passes to ensure it is suitable for human consumption.

Acronyms and abbreviations

Key term	Description
ADWF	average dry weather flow
AWD	available water determination
CSSI	Critical State Significant Infrastructure
BESS	Battery Energy Storage Systems
DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW)
DPHI	Department of Planning, Housing and Infrastructure
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EnergyCo	Energy Corporation of NSW
GDP	Generation Design Partner
HCC REZ	Hunter-Central Coast Renewable Energy Zone
IWCM	integrated water cycle management plans
LGA	Local Government Area
LWU	Local Water Utility
MDB	Murray-Darling Basin
NE REZ	New England Renewable Energy Zone
NRNIP	New England Renewable Energy Zone Network Infrastructure Project
REZ	Renewable Energy Zone

Key term	Description
WSAA	Water Services Association of Australia
WSP	water sharing plan
ML/d	megalitres per day

1. Background and context

Renewable energy is a key component of Australia's low emissions future. The Australian[2] and NSW governments[3] have developed policy frameworks for achieving net-zero emissions by 2050 through renewable energy generation.

The NSW Government is leading the development of Renewable Energy Zones (REZs) across NSW to increase the renewable energy supply in line with its net-zero policy ambitions and targets. REZs group new renewable energy power generation into locations where good renewable energy resources exist (e.g. wind and solar resources) to facilitate efficient storage and transmission across NSW. Development of a REZ requires the coordination and delivery of power generation, power storage and transmission infrastructure. The construction and operation of this infrastructure requires water and contributes to wastewater that needs to be treated within or near the REZ footprint.

1.1 Study purpose and objectives

The purpose of the Study was to provide a strategic assessment of the potential water and wastewater related impacts from development of the New England Renewable Energy Zone (NE REZ) to inform a coordinated whole-of-government approach to managing cumulative impacts. The NE REZ aims to provide up to 6 gigawatts of renewable energy capacity in NSW by 2033.

The Report was prepared for the Energy Corporation of NSW (EnergyCo), a division of the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) to provide an overview of how water supply, water demand, wastewater and its associated infrastructure in the NE REZ may be impacted by the development. At the time the Water and Wastewater Study was undertaken (late 2024 – early 2025), the NE REZ is in the early stages of planning and development.

The Study objectives were to:

- Undertake a desktop analysis of the existing water resources, water uses, wastewater to be treated and the associated treatment infrastructure in the local government areas (LGAs) that are either within the NE REZ or impacted by the NE REZ Network Infrastructure Project (NRNIP).
- Estimate the potential additional water use and wastewater to be treated from the NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Assess the extent to which the water and wastewater treatment infrastructure has the capacity to accommodate the potential additional water use and wastewater that would need to be treated from NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Identify potential impacts on water and wastewater, including potential shortfalls in water supply and treatment infrastructure capacity required to support NE REZ development across the construction timeframes: Stage 1 (2027-2031) and Stage 2 (2030-2033).
- Identify opportunities for consideration about how the impacts can be mitigated and further investigations that may be required to support latter stages of planning for the NE REZ.

[2] Net Zero Plan, Australian Government (Net Zero - DCCEEW)

[3] Net Zero Plan Stage 1 2020-2030 (Net Zero Plan | NSW Climate and Energy Action)

1.2 New England Renewable Energy Zone and geographic scope of the Study

In December 2021, the NSW Government declared the NE REZ which is centred around the regional town of Armidale.[4] The declaration was the first step in formalising the NE REZ and established EnergyCo as the Infrastructure Planner responsible for coordinating the development of the NE REZ.

While the NE REZ spans an area of 15,500 square kilometres and crosses the boundaries of the LGAs of Inverell, Tenterfield, Glen Innes Severn, Armidale, Uralla and Walcha, Tamworth, the NRNIP extends as far south as Muswellbrook LGA. Given this geographic footprint, the scope of the Study includes the LGAs within the NE REZ and the LGAs impacted by the NRNIP (Figure 1-1 and Table 1-1). LGAs are used as a geographic unit of analysis in the Study. However, when referring to the respective entities, the term local councils is used.

Further details about the development of the NE REZ and the NRNIP are provided in Section 2.

Table 1-1: LGAs within the geographic scope of the Study

LGA	Intersects with the NE REZ	Intersects with the NE REZ and impacted by the NRNIP	Outside of NE REZ, but impacted by the NRNIP
Inverell	●		
Tenterfield	●		
Glen Innes Severn	●		
Armidale	●	●	
Uralla	●	●	
Walcha	●	●	
Tamworth	●	●	
Liverpool Plains			●
Upper Hunter			●
Muswellbrook			●
Singleton			*While Singleton is not directly impacted by the NRNIP, it has been included given its proximity to Hunter-Central Coast and NE REZ Network Infrastructure Projects*

[4] The NE REZ was declared by the Minister for Energy under section 19(1) of the *Electricity Infrastructure Investment Act 2020 (NSW).*

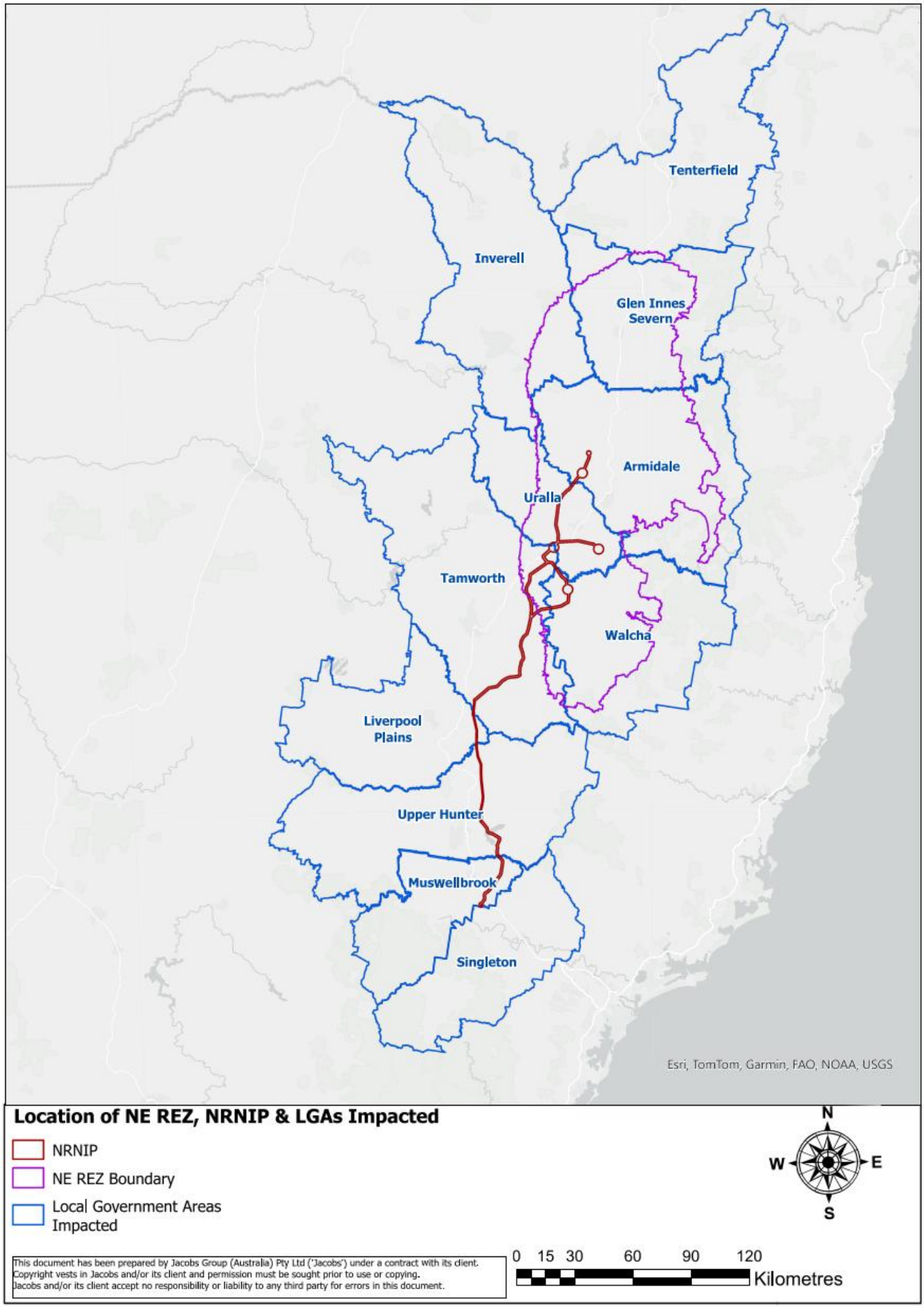


Figure 1-1: Location of the NE REZ and NRNIP

1.3 Approach to the Study

To support the construction and operation of NE REZ development (both renewable energy projects and the NRNIP), water will be required for a range of construction and operational uses, as well as the human water needs from the workers involved. The extent to which the water sources and water / wastewater infrastructure within or near the NE REZ and along the NRNIP corridor can accommodate the development is the subject of the Study.

The Study approach comprised three assessments:

- Water resources assessment (Assessment 1)
- Water treatment infrastructure capacity assessment (Assessment 2)
- Wastewater treatment infrastructure capacity assessment (Assessment 3).

These assessments were informed by:

- Information and data from EnergyCo's NE REZ Project Team and other consultants engaged by EnergyCo to undertake related assessments.
- Inputs from key stakeholders from the NSW Government, including NSW DCCEEW.
- Workshops and inputs from representatives of the local councils either within the NE REZ or those impacted by the NRNIP.
- Meetings with and information provided by selected Generation Design Partners (GDPs). GDPs are the project proponents/developers for renewable energy infrastructure that are planned to connect into the NRNIP. EnergyCo facilitated introductions between GDP representatives and the Study team.
- Desktop research and publicly available data about water and wastewater.

Consultation with other stakeholders (such as communities, Traditional Owners or industry bodies) was beyond the scope of this Study. EnergyCo may engage more broadly during the development of a policy proposal that will build on the options and next steps presented in this Report.

Each assessment considered the following scenarios:

- Base case: Includes water and wastewater estimates that include projected population change, and planned, non-REZ projects (excludes NE REZ development). Non-REZ projects include projects such as new schools and hospitals, as well as renewable energy projects that will connect into other, existing networks (e.g., Transgrid). The base case provides a point of comparison to the NE REZ development case.
- NE REZ development case: Includes the base case and the NE REZ development. NE REZ development comprises the NRNIP and renewable energy projects that will connect into the NRNIP.

The data and inputs obtained were used to:

- Inform the assumptions used to generate water and wastewater estimates from present day to the completion of Stage 2 in 2033 (6 GW cumulative transfer capacity).
- Estimate the potential impact of the NE REZ development on water, wastewater and associated infrastructure by examining the base case (which assumes no NE REZ development) and development case (which includes the NE REZ development).
- Explore the extent to which the assessment results vary under different water supply and demand conditions through sensitivity tests.

Further information on the approach to the water and wastewater assessments is provided in Section 4.

1.4 Structure of this Report

This Report is organised as follows:

- **Section 2 NE REZ development: Infrastructure scope and proposed staging:** Provides an overview of the NE REZ ambitions, the scope of the proposed infrastructure and the intended staging of construction and energisation of the NRNIP.
- **Section 3 Water and wastewater context across the NE REZ and along the NRNIP corridor:** Provides an overview of the water and wastewater context of the NE REZ and NRNIP corridor, including how water and wastewater is managed, the water sources, water uses and the existing treatment infrastructure.
- **Section 4 Approach to the Water and Wastewater Security Study:** Provides an overview of the methodology applied to assess NE REZ water and wastewater security.
- **Section 5 Water resources assessment (Assessment 1):** Presents the results of the water resources assessment (i.e., water supply versus demand) across the NE REZ and along the NRNIP corridor under the base case and NE REZ development case. LGAs are the geographic unit of analysis.
- **Section 6 Water treatment infrastructure capacity assessment (Assessment 2):** Presents the results of the water treatment infrastructure assessment (i.e., water demand (potable) versus water treatment infrastructure) across the NE REZ and along the NRNIP corridor under the base case and NE REZ development case. LGAs are the geographic unit of analysis.
- **Section 7 Wastewater treatment infrastructure capacity assessment (Assessment 3):** Presents the results of the wastewater treatment infrastructure capacity assessment (i.e., wastewater to be treated versus wastewater treatment infrastructure capacity) across the NE REZ and along the NRNIP corridor under the base case and NE REZ development case. LGAs are the geographic unit of analysis.
- **Section 8 Opportunities to address water and wastewater impacts from NE REZ development:** Provides an overview of key water and wastewater impacts and proposed opportunities to address these impacts across the NE REZ.

2. NE REZ development: Infrastructure scope and proposed staging

2.1 NE REZ ambitions

The NE REZ aims to provide up to 6 gigawatts of network capacity to deliver renewable energy to NSW consumers by 2033 as coal-fired power stations are decommissioned.[5] This initiative is expected to create around 6,000 construction jobs and 2,000 ongoing operational jobs, and attract over $24 billion in private investment by 2034.[6]

2.2 NE REZ development scope

The NE REZ development includes:

- the NRNIP, the planning for which is led by EnergyCo (see Section 2.2.1).
- other planned, renewable energy infrastructure led by developers referred to as Generation Design Partners (GDPs). Collectively, these projects are instrumental in achieving the region's renewable energy goals. Renewable energy projects could include new solar and wind farms, battery energy storage systems (BESSs), and hydroelectric projects.

Figure 2-1 presents a schematic of the NE REZ development.

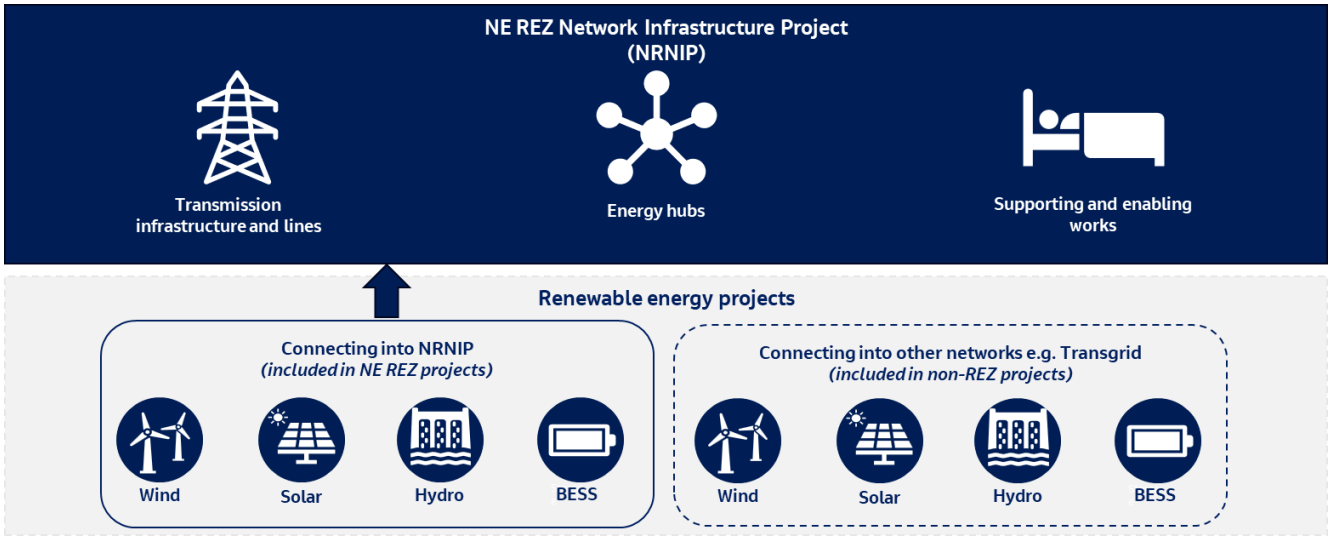


Figure 2-1: Overview of NE REZ development

2.2.1 NE REZ Network Infrastructure Project (NRNIP)

EnergyCo is leading the development of the REZ transmission network infrastructure as the Infrastructure Planner for the REZs in NSW. This includes the following NRNIP infrastructure:

- **New 500 kv transmission infrastructure**, including 340 km transmission lines. These transmission lines will connect to existing infrastructure where possible to accommodate increased renewable energy capacity.

[5] The NE REZ has an intended network capacity of up to 6 gigawatts, aligning with the Australian Energy Market Operator's (AEMO's) 2020 Integrated System Plan (ISP).

[6] NSW Government. Available at: New England Renewable Energy Zone | EnergyCo

- Four **energy hubs** to connect future energy generation and storage projects within the NE REZ to the new 500 kV transmission infrastructure
- **Supporting enabling works**, including:
  - Establishment and/or upgrade of access tracks and public roads
  - Upgrade and/or augmentation to existing electricity and utility infrastructure
  - Installation and operation of communications infrastructure and facilities
  - Other construction-related works and facilities, such as laydown and staging areas, earthwork material sites with crushing and screening plants, concrete batching plants, stringing sites, helicopter landing pads, site offices and workforce accommodation camps.

The NRNIP will be constructed in two stages, both involving concurrent construction of the energy hubs and transmission infrastructure (Figure 2-2 and Figure 2-3).

Infrastructure	Infrastructure scope
Stage 1 Energy hubs	• Central Hub: 500/330 kV substation. • Central-South and North hubs: 330 kV switchyard (capable of future expansion to 500 kV). • East Hub: 330 kV switchyard.
Stage 1 Transmission lines (around 340 km)	• Bayswater substation to Central Hub: 500 kV transmission line. • Central-South Hub to Central Hub: 500 kV transmission line, operated at 330 kV. • Central Hub to North Hub: 500 kV transmission line, operated at 330 kV. • Central Hub to East Hub: 330 kV transmission line.
Stage 2 Energy hubs	• Expand the Central-South Hub to be a 500 kV/330 kV substation. • Expand the North Hub to be a 500 kV/330 kV substation (with potential northern connection to existing Transgrid line).
Stage 2 Transmission lines (around 220 km)	• Bayswater substation to Central-South Hub: additional 500 kV transmission line. • Central Hub to Central-South Hub: convert operations of lines from 330 kV to 500 kV. • Central Hub to North Hub: convert operations from 330 kV to 500 kV.

Figure 2-2: Overview of NRNIP stages

Source: NSW Government. (2024). *New England Renewable Energy Zone Network Infrastructure Project: Scoping Report.* Available at: New England Renewable Energy Zone Network Infrastructure Project

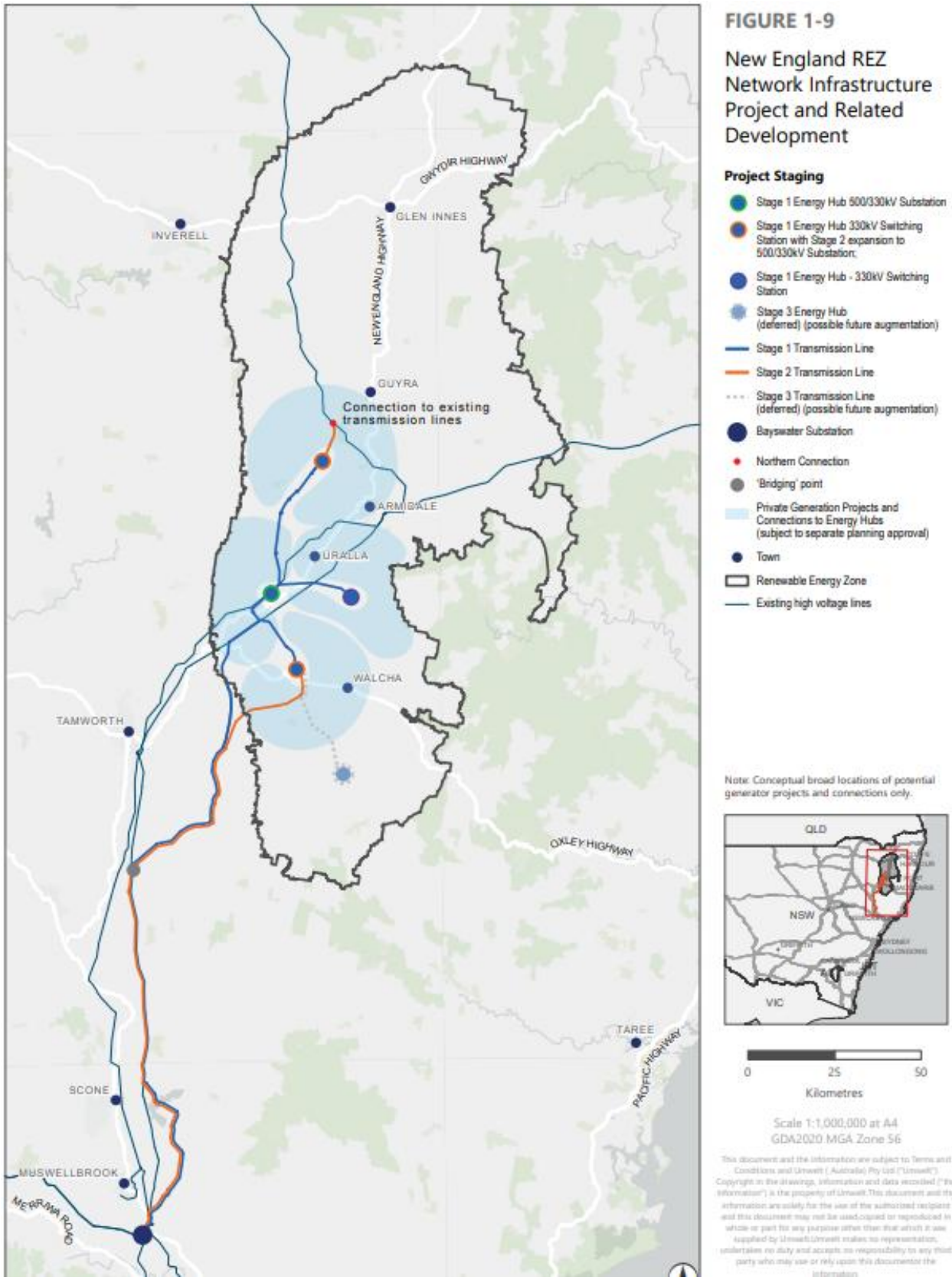


Figure 2-3: Map of NRNIP

Source: NSW Government. (2024). *New England Renewable Energy Zone Network Infrastructure Project: Scoping Report.* Available at: New England Renewable Energy Zone Network Infrastructure Project

2.2.2 Renewable energy projects

The NE REZ development includes a suite of renewable energy infrastructure projects planned to be delivered by independent developers (i.e., GDPs) that will connect into the NRNIP and distribute energy from the NE REZ. GDPs are responsible for delivering their projects, including ensuring their access to water resources and obtaining all approvals.[7] EnergyCo is responsible for joint planning and coordination of the connection of any such generation and storage projects to the NRNIP.

At the time of the Study, the renewable energy projects that may connect to the NRNIP are at various stages of development. Project proponents are responsible for obtaining their own planning approvals in accordance with the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and obtaining required Access Licences from EnergyCo or relevant existing operators. They are also responsible for securing their own water access, including any water access licences, share component and works approvals to extract water.

There is also a suite of other renewable energy projects that at various stages of planning that may connect into existing transmission networks (e.g., Transgrid). In this Study, these projects are called non-REZ projects, so are not part of the NE REZ development. Where information is available about these non-REZ, renewable energy projects, they have been included in the base case (see Section 4 for further details).

2.2.3 About the projects considered in this study

It is noted that the analysis within this Study is based on a 'point-in-time' analysis using information available at the end of 2024 / start of 2025. The scenarios include renewable energy projects and non-renewable energy projects that are at various stages of the project development lifecycle (pre-planning, planning, construction and operation). The exact number and configuration of renewable energy projects within the NE REZ is subject to change and the ultimate generation figure is anticipated to be influenced by factors such as generation availability and network connection capacity within the region. It is considered that the scenarios used in the analysis are sufficient to form a basis for the development of the key findings in this Study which respond to the challenges and opportunities brought by the NE REZ development. This information will likely improve over time, and subsequent studies (if undertaken) can incorporate this information.

2.3 Stages of development and energisation

At the time the Study was undertaken (late 2024 – early 2025), the stages of the NRNIP were as follows:[8]

- **Planning Stage:** present day to the anticipated start of construction of the NRNIP (estimated 2027).[9]
- **Stage 1 Construction:** commencing in 2027 and completed by 2031. First energisation. Involves delivery of the northern components of the transmission line and northern Energy Hubs. Expected to facilitate energisation of 2.4 GW.
- **Stage 2 Construction:** commencing in 2030 and completed by 2033. Involves delivery of the southern components of the transmission line. Expected to facilitate energisation of 3.6 GW.

This staging is intended to support energy security and ensure a smooth transition to renewable energy distribution. The staging of the renewable energy projects will be determined by the project proponents.

[7] Renewable energy projects currently defined as NE REZ projects in this Study may connect into the existing Transgrid network. Providing any projects that connect into the Transgrid network proceed, aggregate water and wastewater estimates are unlikely to change.

[8] In December 2024, the Australian Energy Market Operator (AEMO) announced revised timeframes for the NRNIP. For further details, please see 'Note about the timeframes used in this Report', p.i.

[9] The Planning Stage is referred to as 'Baseline' in some EnergyCo documentation. It has been renamed in this Study for clarity and to clearly differentiate the Planning Stage from the base case.

A series of planning, design and development activities are required to be completed ahead of energisation in 2031. An overview of key development activities is provided in Figure 2-4.

Figure 2-4: NRNIP key development phases

2.3.1 Current planning, engagement and approvals

Planning, engagement and approvals are underway to support NRNIP construction, commencing in 2027. The current activities underway within the planning and approvals phase include:

- **Scoping Report:** EnergyCo lodged a Scoping Report to the Department of Planning, Housing and Infrastructure (DPHI) in July 2024.[10] This provides an overview of the project and potential impacts that will require further consideration under the EP&A Act. It identifies a preferred NRNIP corridor which will continue to be refined in response to subsequent engagement and assessments.
- **Supporting investigations:** EnergyCo has commenced field investigations to help refine the NRNIP and assess project impacts. Field studies currently underway include flora and fauna surveys, aerial mapping surveys and groundwater impact assessments.
- EnergyCo is preparing an **Environmental Impact Statement (EIS)** to assess the overall merits of the NRNIP and identify options to avoid, minimise and mitigate potential impacts. The EIS will be submitted to the NSW Planning Secretary[11] for assessment. Water related matters including water availability and water quality will form a key matter of this EIS. Work to develop the EIS will continue throughout 2024 and 2025. During this time, EnergyCo will continue undertaking Aboriginal and historic heritage surveys and carrying out field investigations and consultation with landowners and communities to refine the NRNIP corridor and assess its impacts.
- DPHI has also issued Secretary's Environmental Assessment Requirements (SEARs) which includes the requirement to assess water supply and security, including cumulative impacts.

[10] NSW Government. (2024). *New England REZ Transmission Project.* Available at: New England REZ Transmission Project | Planning Portal - Department of Planning and Environment

[11] At the time of writing (early 2025), this department was known as the Department of Planning, Housing and Infrastructure (DPHI).

3. Water and wastewater context across the NE REZ and along the NRNIP corridor

This section provides the water management and planning context in NSW that is relevant to NE REZ development. First it describes the NSW water management framework and key terms that are necessary to understand the subsequent descriptions of water sources relevant to NE REZ development (this section) and some of the options for addressing water and wastewater impacts from NE REZ development (see Section 8).

Second, this section describes the water sources relevant to the NE REZ development, and the water and wastewater treatment infrastructure. This information sets the scene for the results from the three assessments (sections 6, 7 and 8).

3.1 Water and wastewater management relevant to the NE REZ

In NSW, outside of the major metropolitan areas of Sydney and the Lower Hunter, water and sewerage services are provided by the council-owned and operated local water utilities (LWUs). This is the case in the NE REZ and along the NRNIP corridor.

3.1.1 Agencies responsible for water management in NSW

There are three agencies responsible for developing and implementing the regulatory framework for water management in regional NSW. These agencies are:

- DCCEEW (NSW).
- WaterNSW.
- Natural Resources Access Regulator.

Collectively, these agencies are involved in the design of the water market, NSW water management rules, operating the river system and other water delivery systems within NSW, and encouraging and enforcing compliance with NSW water management rules. The roles of these agencies are shown in Figure 3-1.

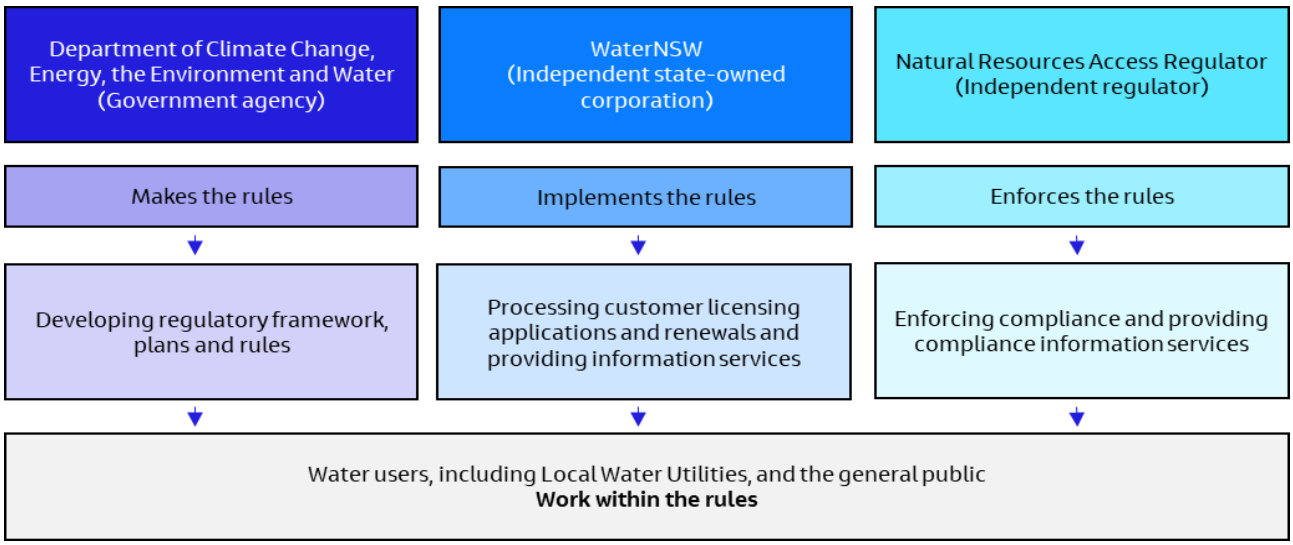


Figure 3-1: NSW Government agencies engaging with water users and communities on licensing and compliance

Source: NSW Government. (2018). *Roles of water management agencies in NSW.* Available at Water-Roles-and-Responsibilities.pdf

3.1.2 NSW water policy and planning context

There is a range of legislation, policies and plans that guide the management of water resources in NSW (Figure 3-2). This context has been provided here so that options for addressing any water- and wastewater-related risks / impacts associated with NE REZ development can be aligned with initiatives that are either already underway or being considered (see Section 8).

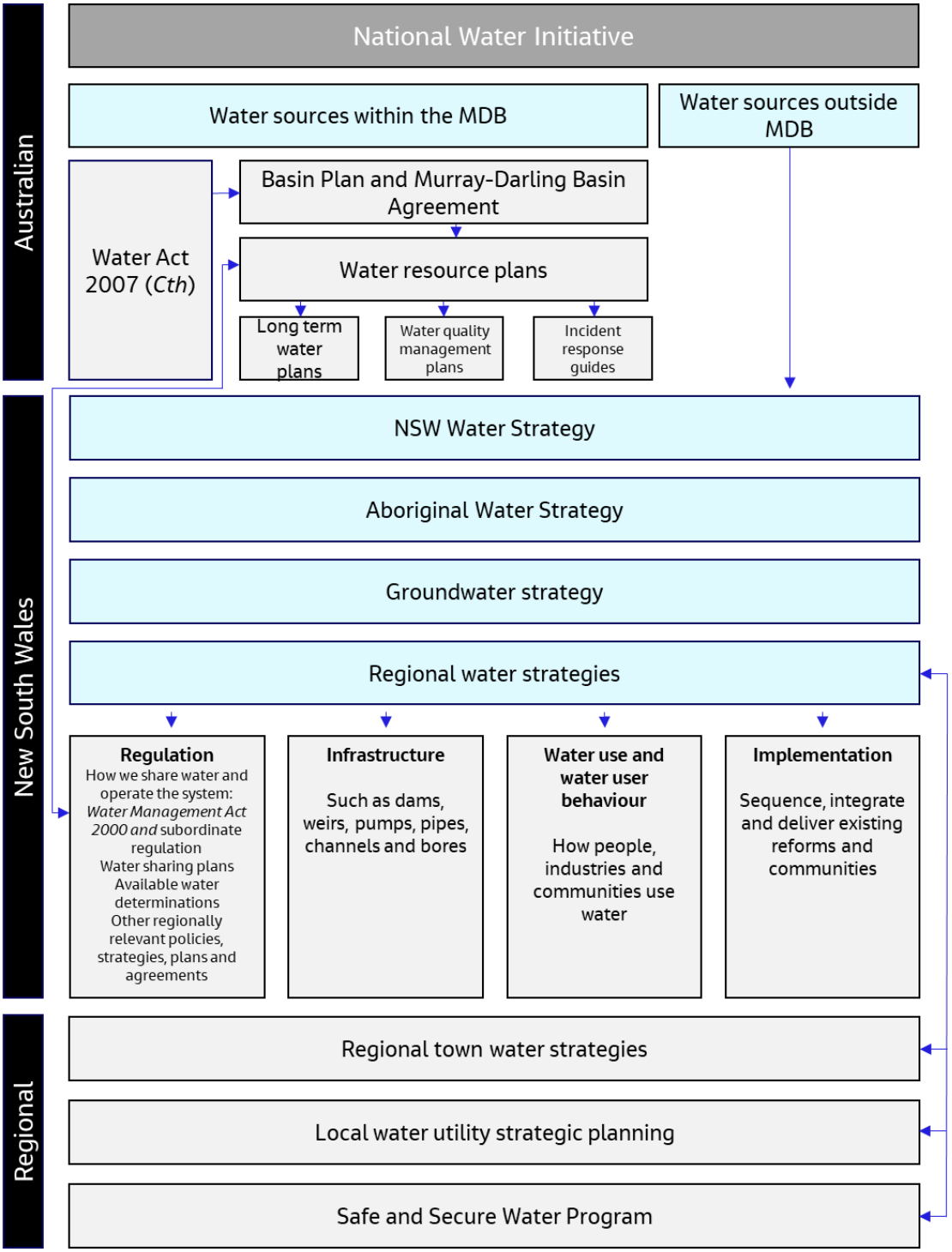


Figure 3-2: NSW water management – legislative, policy and planning context

Source: Based on NSW Government. *Regional water strategies.* Available in each regional water strategy Final regional water strategies | NSW Government Water

3.2 Water sharing and access arrangements

Access to water in NSW is determined by the *Water Management Act 2000* (NSW), and associated water sharing plans for each water system. This section:

- defines key terms relevant to water access and water sharing in NSW
- presents a brief overview of overarching water access and licensing arrangements to aide interpretation of the descriptions of the water sources relevant to NE REZ development and the charts explaining historical trends in water availability and usage.

3.2.1 Key terminology

Table 3-1: List of key terms and definitions relevant to water sharing and access arrangements

Term	Definition
Allocation	The specific volume of water licence holders can access. The amount of water allocated to licence holders varies from year to year based on the type of licence, amount of share component, dam storage levels, river flows and catchment conditions. Water allocations are tradable.
Available water determination (AWD)	An available water determination sets the amount of water credited to the water allocation accounts associated with water access licences. As such, the available water determinations influence how much water is available for use in a given year. An available water determination applies to a category of water access licence, and there are various categories of water access licences in each water source. Available water determinations are announced at the start of each water year (1 July), and further available water determinations can be made throughout the water year. The available water determination for regulated surface water and groundwater access licences is expressed as the number of megalitres (ML) per unit share, as these access licence share components are specified as a number of shares.
Share component	A key element of a water access licence. The share component specifies the shares in the available water within a specified water management area or from a specified water source that the water access licence holder is entitled to.
Water access licence	A water access licence entitles its holder to take water from a water source in accordance with the licence conditions. Water access licences provide holders with continuing or 'perpetual' licences, which have a title separate from the land. Many categories of water access licences are tradeable. Key elements of a water access licence are: ▪ specified shares in the available water within a specified water management area or from a specified water source (the share component), and ▪ authorisation to take water: 1) at specified times, at specified rates or in specified circumstances, or in any combination of these, and 2) in specified areas or from specified locations (the extraction component). Must be held with a water supply work approval in order to take water from a specified water source.
Water sharing plan (WSP)	A plan made under the NSW *Water Management Act 2000*, which sets out the rules for sharing water between the environment and water users, and between different water users, within whole or part of a water management area or water source.
Water supply work approval	Water supply work approvals allow water users to construct and use a work that takes water from a river, lake, or underground aquifer. Water supply works include pumps, bores, dams, weirs, irrigation channels, banks, and levees.
Water year	1 July to 30 June each year.

Source: NSW Government. (2024). *Glossary.* Available from: Glossary | NSW Government Water

3.2.2 NSW Water Management Act 2000 (NSW)

The *Water Management Act 2000* (NSW) (the Act) provides for the sustainable and integrated management of NSW's water resources. It's relevance to the Study is that the Act is the legislative basis for the following:

- water access provisions and provisions for licencing take of surface water and groundwater for urban, domestic and stock, commercial and irrigation purposes via water access licences and any associated share component and / or the conditions under which water can be taken in unregulated systems.[12]
- sets the priorities for different categories of water access licence.
- the making of AWD
- requirements to prepare, and for the content of, WSPs for each valley.

Relevant sections of the Act are highlighted in Table 3-2.

Table 3-2: Key sections of the *Water Management Act 2000* (NSW) related to water sharing and access

Section of the Act	Detail
Section 19 - 21	Details provisions that must be contained in a WSP, as well as additional provisions that may be included. The water sharing provisions (Section 20 Core provisions) of a WSP must establish a bulk access regime for the extraction of water under access licences. The bulk access regime may contain provisions with respect to the priorities according to which water allocations are to be adjusted because of any reduction in the availability of water.
Section 56	Establishes water access licences as 'perpetual' licences, which have a title separate from the land, that entitle holders to take water from a water source in accordance with the licence conditions.
Section 57	Specifies the different categories of licence, including regulated river, unregulated river, and aquifer (groundwater) access licences.
Section 58	Establishes the priorities between different categories of licence.
Section 59 - 60	Sets out the provisions for making AWDs based on water availability. Details the frameworks and constraints for the minister to make an AWD. This includes rules of priority and compliance with any management plan (including a WSP).

3.2.3 Water access licence categories and typical uses

The Act specifies a range of water licence categories as set out in Table 3-3. Some licence categories are specific purpose licences. In general, specific purposes licences are afforded higher priority than other licence categories and generally receive an AWD of 100% of their share component at the start of each water year. Specific purpose licences are generally signified by the purpose being stated and contained within parentheses. These licences are restricted and cannot be traded.

The priority of each licence category is specified in Section 58 of the Act as follows:

> (1) For the purposes of this Act, the following priorities are to be observed in relation to access licences—
>
> (a) local water utility access licences, major utility access licences and domestic and stock access licences have priority over all other access licences,
>
> (b) regulated river (high security) access licences have priority over all other access licences (other than those referred to in paragraph (a)),

[12] Note: The Act provides for a range of licence exemptions. This means that not all water take is subject to licensing requirements.

(c) access licences (other than those referred to in paragraphs (a), (b) and (d)) have priority between themselves as prescribed by the regulations,

(d) supplementary water access licences have priority below all other licences.

(2) If one access licence (the higher priority licence) has priority over another access licence (the lower priority licence), then if the water allocations under them have to be diminished, the water allocations of the higher priority licence are to be diminished at a lesser rate than the water allocations of the lower priority licence.

Not all licence categories are represented in all water systems. For example, regulated licence categories are only in regulated systems, and likewise for unregulated licence categories. Aquifer licences only apply to groundwater systems.

Table 3-3: Water access licence categories and typical uses

Licence category under Section 56 of the Act	Details and typical uses
Regulated river (high security) access licences	Licences that entitle holders to a share of water from regulated river sources. Often used for irrigation, especially uses that require a high reliability of water access across years. Receives allocations ahead of general security licences.
Regulated river (general security) access licences	Licences that entitle holders to a share of water from regulated river sources. Often used for irrigation, especially uses that can alter water requirements from year to year.
Unregulated river access licences	Unregulated river access licences have pumping conditions (e.g., river flows) that determine access (when water can be taken). Often used for irrigation purposes. A specific purpose can be specified (e.g., town water supply, domestic and stock).
Aquifer access licences	Licences that entitle holders to a share of water from aquifer water sources. A specific purpose can be applied (e.g., town water supply, domestic and stock).
Supplementary water access licences	Licences that entitle holders to take water during supplementary flow events which occur during wet periods when not all inflows can be held in storages. Supplementary flow events can occur in any regulated system at any time and therefore access is purely opportunistic.
Major utility access licences	Licences that entitle holders to take water for the purposes of supply of commercial and industrial activities. A specific purpose access licence that is afforded the highest priority under the Act.
Local water utility access licences	Licences that entitle holders to take water for the purposes of supply of water for urban use. A specific purpose access licence that is afforded the highest priority under the Act.
Domestic and stock access licences	Licences that entitle holders to take water for normal household purposes in domestic premises situated on the land or for the watering of stock animals being raised on the land.

Note: The licence categories listed in the table above are those that are listed in Section 56 of the Act. Licence categories in a specific water source may be different due to the specification of specific purpose access licences. All licences can fall under one of the available categories.

3.3 Water sources relevant to the NE REZ and NRNIP

The raw water sources relevant to the NE REZ development can broadly be described as:

- **Regulated surface water systems** are those in which the supply of water is controlled by releases from water held in major dam storages.

- **Unregulated surface water systems** are those in which the water supply depends solely on rainfall and natural flows. Unregulated systems relevant to the NE REZ development are either upstream tributaries of the regulated rivers (i.e., upstream of the major dam storages) or generally, flow east from the NE REZ.
- **Groundwater systems** are those in which water is located beneath the surface of the ground in the spaces between sediments and in the fractures of rock formations. Water supply depends on aquifer recharge.

Details of each of these system types are presented below.

While outside of the scope of this analysis, temporary storage dams may also be used to provide a water supply during construction and operation of GDP projects. These dams would function like a farm dam that could either be filled by rainfall (interception activities) or filled by extraction from a water source. If extracting from a water source, water users would need a water access licence, and the relevant infrastructure approvals.

3.3.1 Regulated surface water sources

The regulated surface water sources relevant to the NE REZ development generally flow west of the NE REZ into the Murray-Darling Basin (MDB). The Hunter River is also a regulated river source. It flows southeast from the southern end of the NRNIP corridor. Figure 3-3 shows the regulated surface water sources relevant to the LGAs within the geographic scope of the Study (see section 1.2).

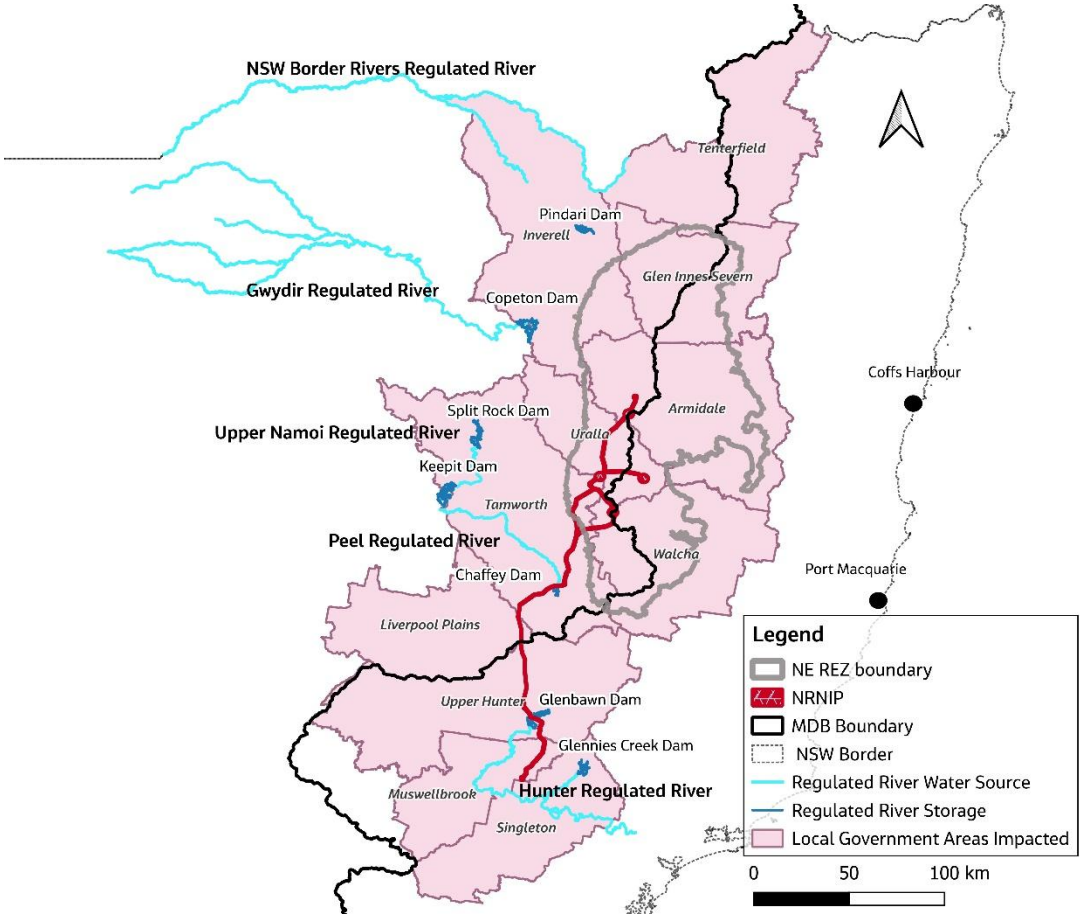


Figure 3-3: Regulated surface water sources relevant to the geographic scope of the Study

Source: Regulated surface water sources accessed at NSW Government. *SEED. The Central Resource for Sharing and Enabling Environmental Data in NSW.* WATER SHARING PLANS SPATIAL DATA | Dataset | SEED

3.3.1.1 Regulated surface water storages

As explained above (see also Figure 3-3), regulated river sources are managed by releasing water held in major dam storages. Compared to unregulated sources, the storages on regulated rivers support water availability and access during dry periods. However, during extended dry periods, storages can be drawn down (i.e., when outflows exceed inflows) and this influences the volume of water that can be made available through AWDs to different licence categories.

Below is a series of charts that show the volume held in each of the major regulated river storages relevant to the NE REZ development between 2015-16 and 2024-25. These charts show that during the 2017 to 2020 drought, all the storages were drawn down, but to different extents. This variability reflects several dynamics, including volume of inflows, size of storage and water allocation rules. During this time, the volume of water available for use was constrained through reduced AWDs (i.e., less than 100%) (see Section 3.4.1).

Pindari Dam | NSW Border Rivers Regulated River

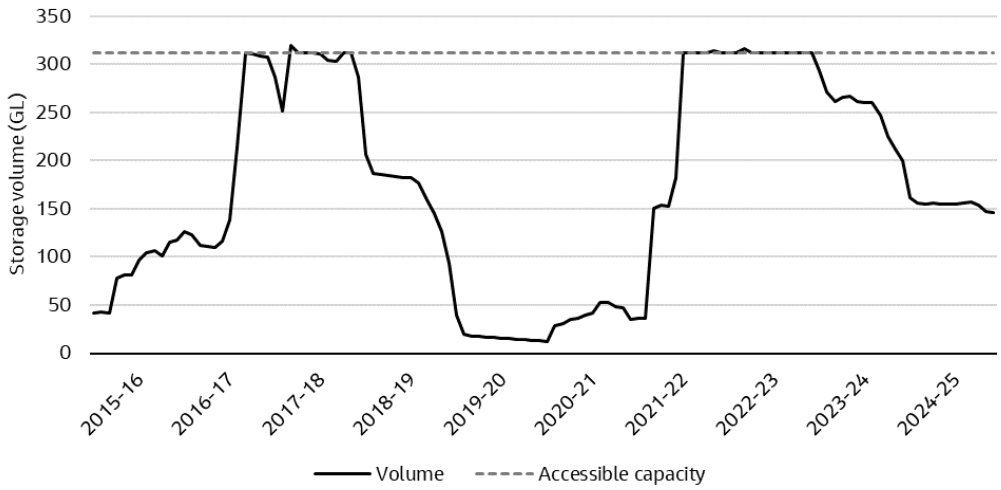


Figure 3-4: Accessible capacity held in storage at Pindari Dam (January 2015 to 8 December 2024)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Copeton Dam | Gwydir Regulated River

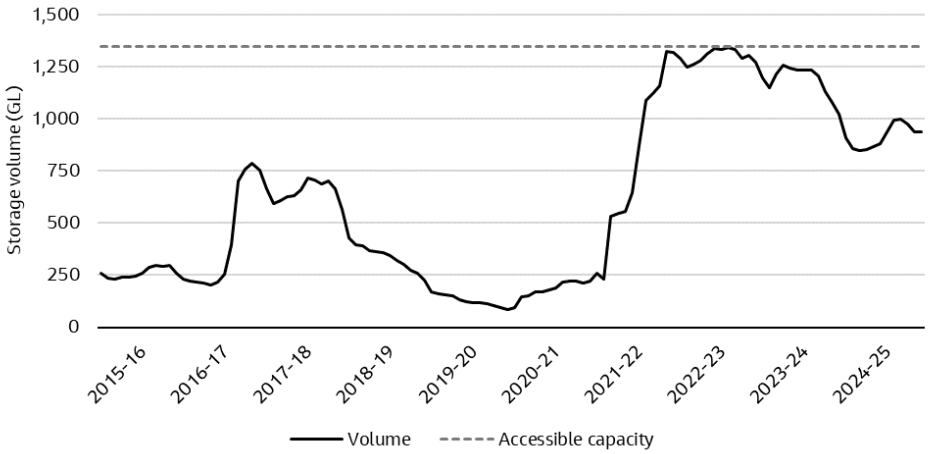


Figure 3-5: Accessible capacity held in storage at Copeton Dam (January 2015 to 8 December 2024)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Split Rock Dam | Upper Namoi Regulated River

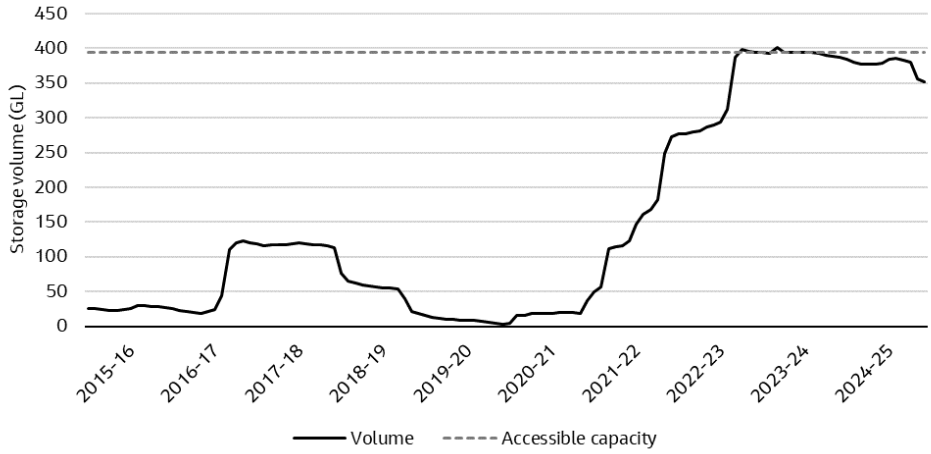


Figure 3-6: Accessible capacity held in storage at Split Rock Dam (January 2015 to 8 December 2024)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Keepit Dam | Namoi Regulated River

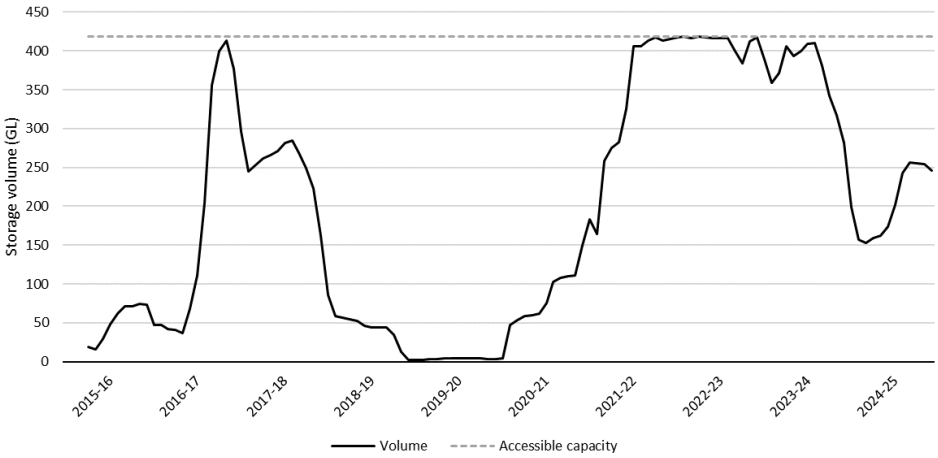


Figure 3-7: Accessible capacity held in storage at Keepit Dam (April 2015 to 20 March 2025)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Chaffey Dam | Peel Regulated River

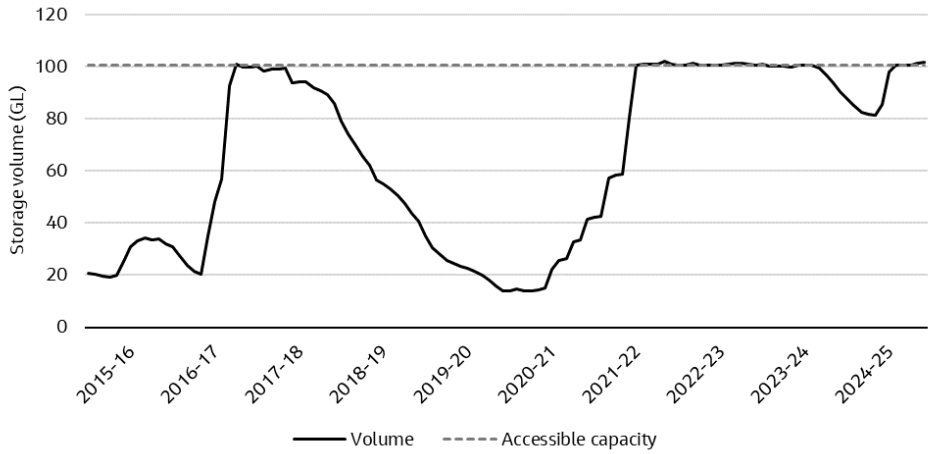


Figure 3-8: Accessible capacity held in storage at Chaffey Dam (January 2015 to 8 December 2024)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Glenbawn Dam | Hunter Regulated River

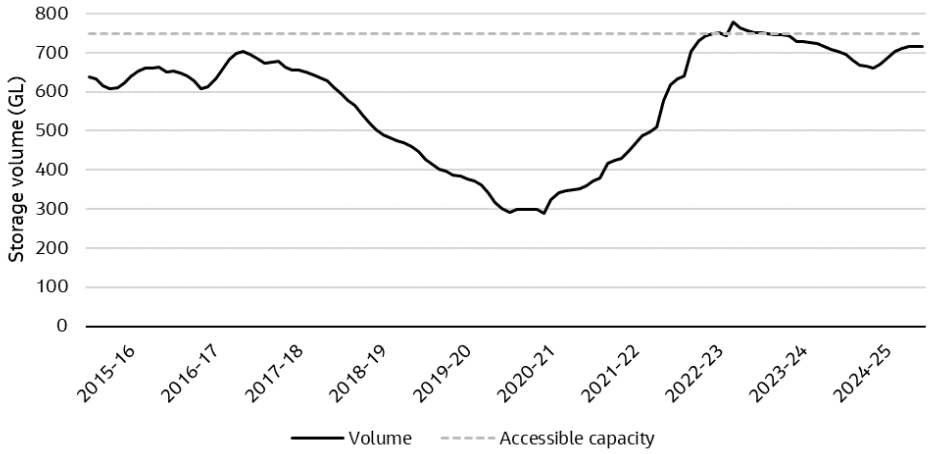


Figure 3-9: Accessible capacity held in storage at Glenbawn Dam (January 2015 to 16 December 2024)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

Glennies Creek Dam | Hunter Regulated River

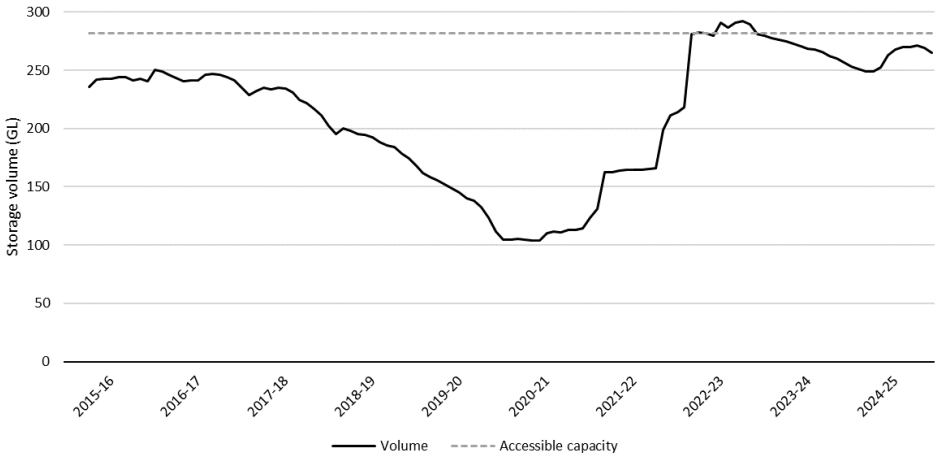


Figure 3-10: Accessible capacity held in storage at Glennies Creek Dam (April 2015 to 20 March 2025)

Source: Water NSW. (2025) *Water Insights.* Available at: WaterInsights - WaterNSW

3.3.2 Unregulated surface water sources

Unregulated surface water sources are those in which the water supply depends solely on rainfall and natural flows. Unregulated sources that intersect with the LGAs within the geographic scope of the Study are either upstream tributaries of the regulated rivers (i.e., upstream of the major dam storages) or generally, flow east from the NE REZ. There are 109 unregulated surface water sources in or near the NE REZ development for which NSW Water Register data were available. Figure 3-11 shows how the unregulated surface water sources align with the LGAs within the geographic scope of the Study (see Section 1.2).

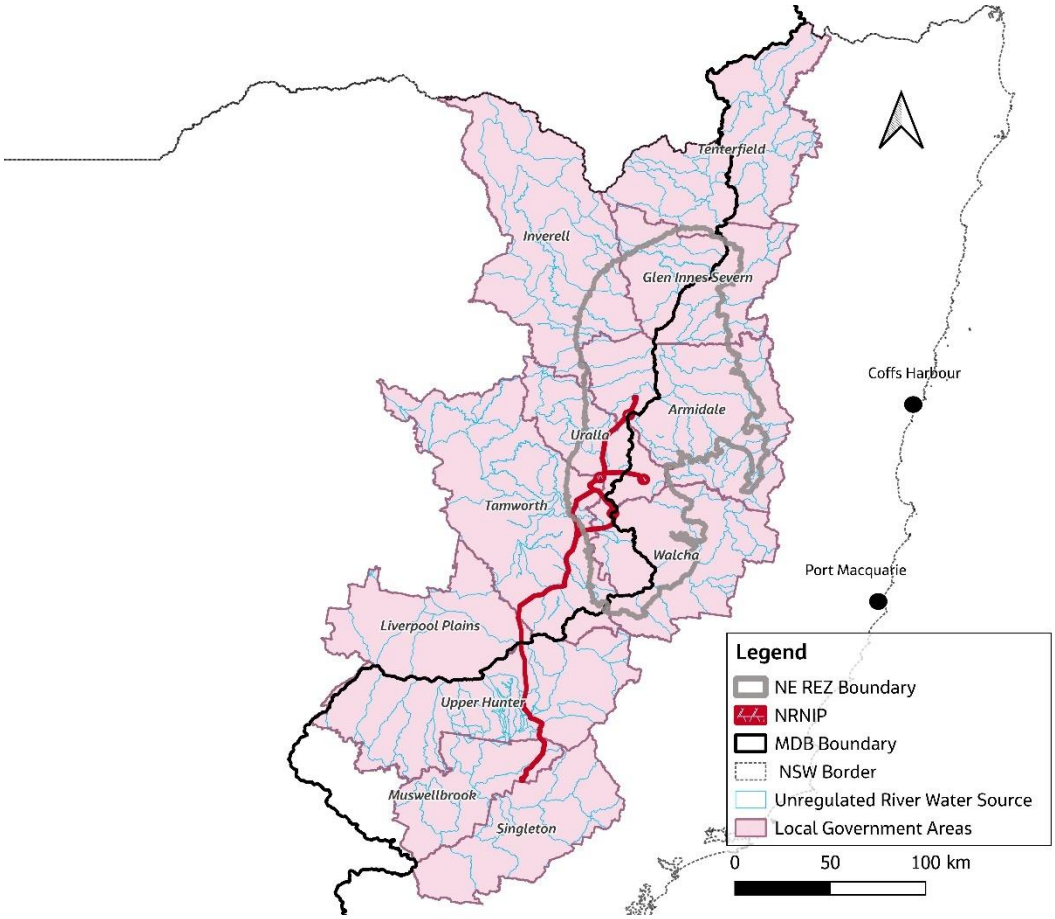


Figure 3-11: Unregulated surface water sources that intersect with the LGAs within the geographic scope of the Study

Source: Unregulated surface water sources accessed at NSW Government. *SEED. The Central Resource for Sharing and Enabling Environmental Data in NSW.* WATER SHARING PLANS SPATIAL DATA | Dataset | SEED

3.3.3 Groundwater sources

Groundwater sources are those in which the water supply depends on aquifer recharge. There are 30 groundwater sources that intersect with the LGAs relevant to NE REZ development for which NSW Water Register data were available. Figure 3-12 shows how the groundwater sources align with the LGAs within the geographic scope of the Study (see Section 1.2).

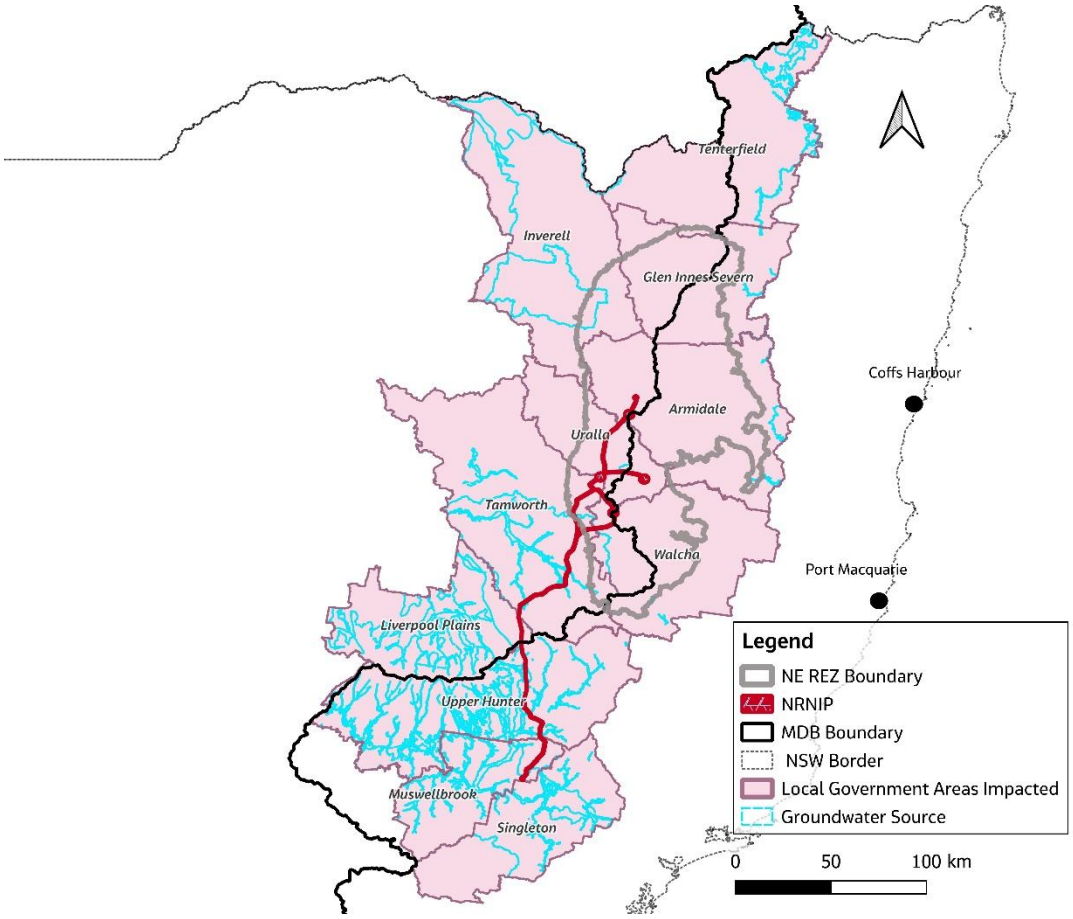


Figure 3-12: Groundwater sources that intersect with the LGAs within the geographic scope of the Study

Source: Groundwater sources accessed at NSW Government. *SEED. The Central Resource for Sharing and Enabling Environmental Data in NSW.* WATER SHARING PLANS SPATIAL DATA | Dataset | SEED

3.4 Historical water availability and usage in the surface water sources

3.4.1 Regulated surface water sources

Figure 3-3 shows the regulated surface water sources relevant to the LGAs within the geographic scope of the Study. The total volume of water that could be available for use in each of these sources each year is determined by the volume of shares (e.g., the total share component across all water access licences).

Table 3-4 presents the relative proportions of shares across the licence categories in the regulated surface water sources. The priority of these licence categories is determined by Section 58 of the Act (see Section 3.2.3). The relative priority determined by Section 58 for of each licence category in shown in the first column. Except for Peel Regulated River, Local Water Utility licences make a relatively small proportion of the overall shares in each regulated river source.

Table 3-4: Entitlement volumes (share component) across licence categories in regulated river sources relevant to the geographic scope of the Study (2023-24)

Priority	Licence category[2]	NSW Border Rivers Regulated River[1]		Gwydir Regulated River		Peel Regulated River		Upper Namoi Regulated River		Hunter Regulated River	
		ML	% of total	ML	% of total	ML	% of total	ML	% of total	ML	% of total
1	Domestic and stock access licences	850	0.2%	2,498	0.3%	77	0.2%	74	0.6%	1,562	0.6%
1	Local water utility access licences	640	0.2%	3,836	0.5%	16,400	36.5%	515	4.0%	10,832	4.4%
1	Major utility access licences (power generation)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	36,000	14.6%
2	Regulated river (high security) access licences	1,500	0.4%	20,200	2.8%	801	1.8%	80	0.6%	21,740	8.8%
3	Regulated river (general security) access licences	263,218	68.2%	509,665	71.0%	27,683	61.6%	12,072	94.7%	128,544	52.0%
4	Supplementary	120,001	31.1%	181,398	25.3%	0	0%	0	0.0%	48,519	19.6%

Source: Extract from the NSW Water Register provided by NSW DCCEEW

Note 1: Regulated river (general security) access licences for NSW Border Rivers includes the sum of licence categories General Security A and General Security B.

Note 2: Licence categories listed are those contained within the NSW Water Register. The licence categories listed in the table above may differ to those listed in Section 56 of the Act. This is because licence categories in a specific water source may be special purpose licences.

However, the actual water available for use in a given water year is determined by the water allocation rules (i.e., the AWDs) and any trading permitted between systems. The extent to which AWDs change over time is determined by the priority of each water access licence category.

On the following pages a series of charts are presented that show the:

- volume of water available (AWD + opening balance + trade in) under regulated river (general security) access licences and the usage (account usage + trade out) in that year (Figure 3-13).
- volume of water available (AWD + opening balance + trade in) under regulated river (high security) access licences and the usage (account usage + trade out) in that year (Figure 3-14).

The key takeaways from this series of charts are that:

- Regulated river (high security) access licences in all sources tend to receive more consistent allocations because these licences are a higher priority than general security. These licences were largely unaffected during the 2017 to 2020 drought.
- Regulated river (general security) access licences are a lower priority than regulated river (high security) access licences so the water available tends to fluctuate from year to year. These licences were strongly affected during the 2017 to 2020 drought. Because regulated river (general security) access licences tend to represent the largest proportion of all shares in a given water source, the available water determination to regulated river (general security) access licences are the main influence in total water available during dry periods.

Figure 3-13: Volume of water available (including opening balance, AWD and trade in) usage (account usage and trade out) against regulated river (general security) access licences in regulated river sources relevant to the geographic scope of the Study

Source: Based on data extract from the NSW Water Register provided by NSW DCCEEW.

Note: Bars show AWD + opening balance + trade in. Lines show account usage + trade out. Any water forfeited during the year is not accounted for.

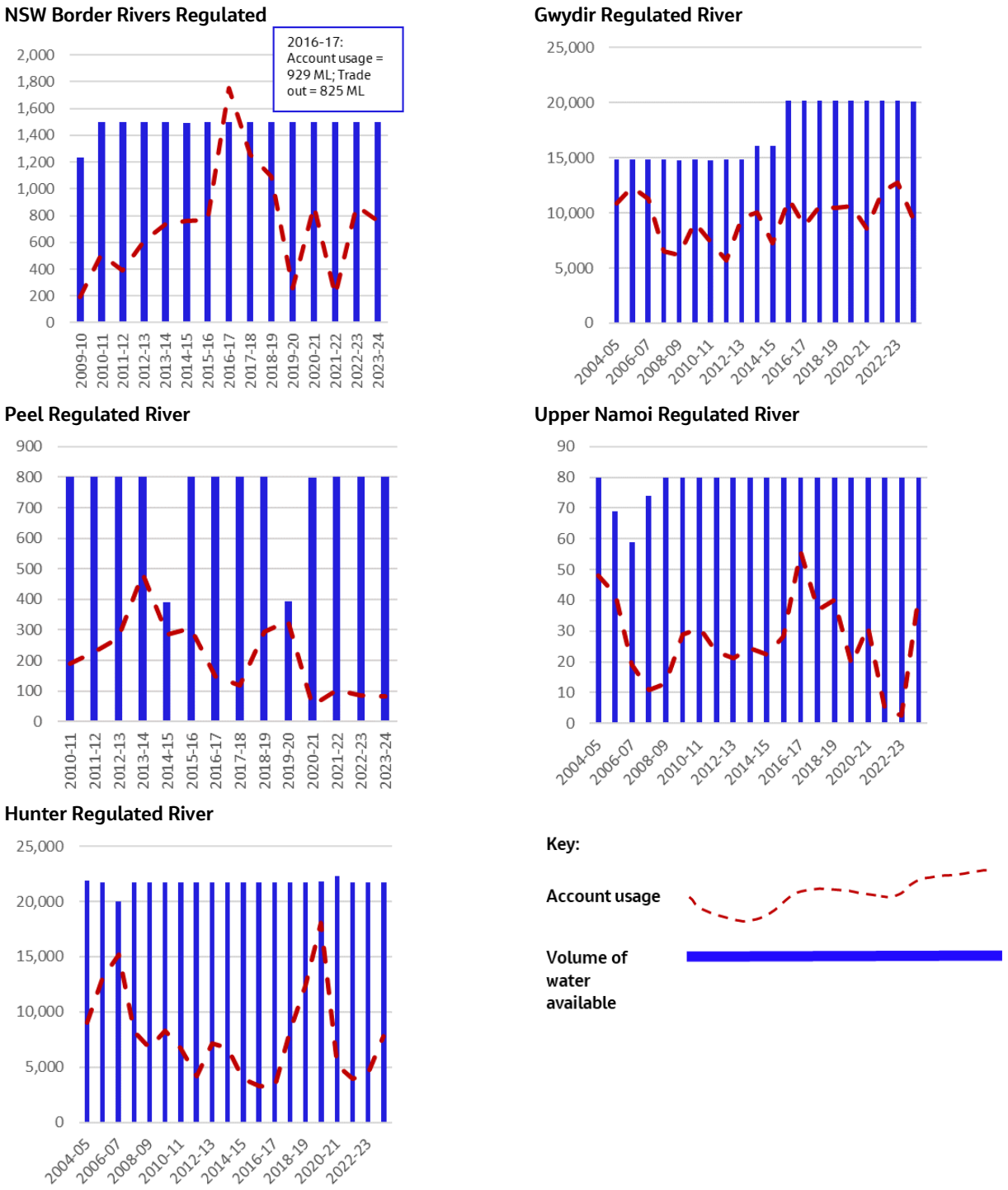


Figure 3-14: Volume of water available (including opening balance, AWD and trade in) and usage (account usage and trade out) against regulated river (high security) access licences in regulated river sources relevant to the scope of the Study

Source: Based on data extract from the NSW Water Register provided by NSW DCCEEW.

Note: Bars show AWD + opening balance + trade in. Lines show account usage + trade out. Any water forfeited during the year is not accounted for.

3.4.2 Unregulated surface water sources

Although water access in unregulated surface water sources is licensed, because these water sources do not have large storages, take of water under an unregulated river licence is based on licence conditions that stipulate when pumping or diversion can commence, and when it must cease. In this way, access to water is determined by when there is sufficient natural flow (level) in the waterway.

During dry periods and low flows, take of water is unlikely to be allowed under unregulated river licences. However, unregulated river licences with a specific purpose, and therefore, higher priority of access as stipulated under the NSW *Water Management Act 2000* (i.e., domestic and stock purposes, local water utility licences), may be able to continue to extract at lower levels of flow.

Table 3-5 shows the total volume of each type of licence in the unregulated surface water sources that intersect with the LGAs within the scope of the Study. Most of these licences are unregulated river licences (84.1% of the total volume). As noted above, take under these licences is generally not allowed during dry periods. This means these licences are generally not suitable for uses that require high reliability of access.

As was the case with most regulated surface water sources, licences for urban / domestic water use represent a relatively small proportion of the overall shares in the unregulated sources that intersect with the LGAs within the geographical scope of the Study.

Table 3-5: Volume of each water licence category in unregulated surface water sources that intersect with the LGAs within the geographic scope of the Study

Licence category[1]	Share component (ML)	Proportion of all share component
Domestic & stock	1,525	0.5%
Domestic & stock (stock)	138	0.05%
Domestic & stock (domestic)	389	0.1%
Domestic & stock (town water supply)	8,424	2.8%
Local water utility	10,120	3.3%
Local water utility (domestic & commercial)	379	0.1%
Major utility	27,700	9.0%
Unregulated river	257,317	84.1%
Unregulated river (special additional high flow)	92	0.0%
Total volume of unregulated surface water licences	**306,083**	**100%**

Source: Data extract from the NSW Water Register provided by NSW DCCEEW. Jacobs requested the relevant NSW Water Register data for the water sources within the following Regional Water Strategies: NSW Border Rivers, Gwydir, Namoi, North Coast and Greater Hunter.

Note: Licence categories listed are those contained within the NSW Water Register. The licence categories listed in the table above may differ to those listed in Section 56 of the Act. This is because licence categories in a specific water source may be special purpose licences.

3.4.2.1 Water access and usage by local water utilities or town water supply

Some of the local councils and major utilities in the NE REZ and along the NRNIP corridor hold unregulated licences. The sources in which these licences are held are shown in Figure 3-15. This indicates where unregulated water sources may be used to meet the water requirements for some communities. Across these sources (which extend beyond the boundaries of the LGAs within the geographic scope of the Study), approximately 20,000 ML (per water year, depending on AWD) could be taken under local water utility or domestic and stock licences.

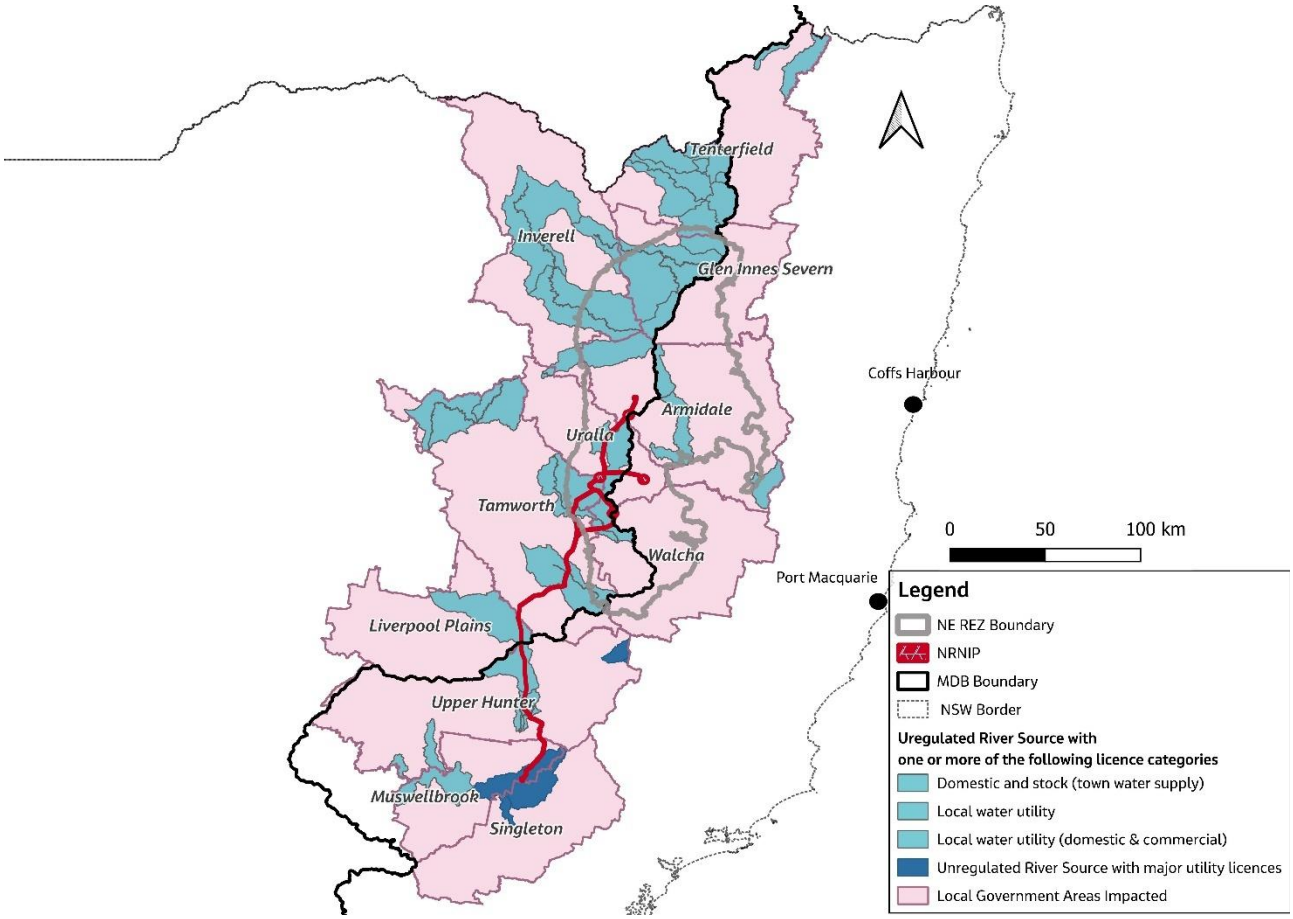


Figure 3-15: Unregulated surface water sources within which there are local water utility, town water supply or major utility licences

Source: Unregulated surface water sources accessed at NSW Government. *SEED. The Central Resource for Sharing and Enabling Environmental Data in NSW.* WATER SHARING PLANS SPATIAL DATA | Dataset | SEED

Source: Data extract from the NSW Water Register provided by NSW DCCEEW. Jacobs requested the relevant NSW Water Register data for the water sources within the following Regional Water Strategies: NSW Border Rivers, Gwydir, Namoi, North Coast and Greater Hunter.

However, because water can only be extracted under unregulated river licences when river flows meet certain thresholds (pending conditions on each water access licence), usage tends to be relatively low and highly variable. Figure 3-16 shows:

- the total share component for local water utility, domestic and stock (town water supply), local water utility (domestic & commercial) licences that could be taken in the unregulated sources that intersect with the LGAs within the scope of the Study if licence conditions were met.
- versus account usage for those same licence categories.

These trends likely reflect the low reliability of unregulated river licences and the fact that for urban use other water sources are used first (i.e., regulated river and groundwater).

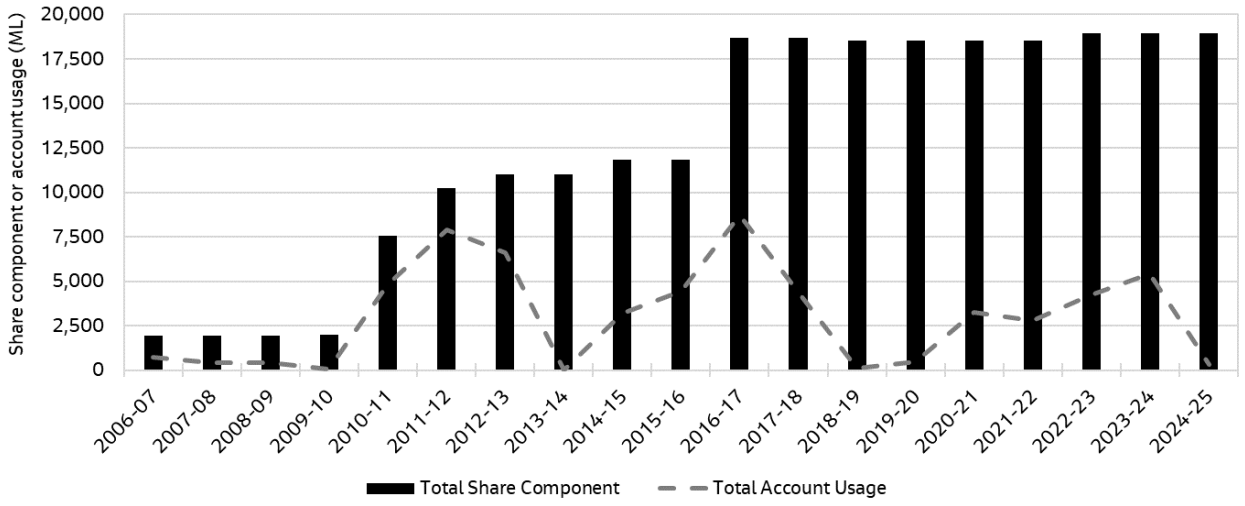


Figure 3-16: Total share component and account usage across local water utility, domestic and stock (town water supply), local water utility (domestic & commercial) licences in unregulated sources that intersect with the LGAs within the geographic scope of the Study

Note: As advised by NSW DCCEEW, accuracy of account usage data for unregulated sources may be low.

3.4.3 Groundwater sources

Table 3-6 shows the total volume of each type of licence in the groundwater systems that intersect with the LGAs within the geographic scope of the Study. As was the case with most regulated and unregulated surface water systems, licences on which groundwater for urban / domestic use represent a relatively small proportion of the overall shares in the groundwater sources relevant to these LGAs.

Extractions from groundwater sources are managed to the long-term average annual extraction limit (LTAAEL) set by the respective water sharing plan. LTAAELs are expressed in megalitres per year. See Section 5 for details on how LTAAELs compare to the volume of share component.

Table 3-6: Volume of each water licence category in groundwater sources for which data were available on the NSW Water Register that intersect with the LGAs within the geographic scope of the Study

Licence category	Share component (ML)	Proportion of all share component
Aquifer	332,999	86.0%
Aquifer (General Security)	34,679	9.0%
Aquifer (High Security)	1,558	0.4%
Aquifer (Aboriginal Culture)	10	0.0%
Aquifer (Town Water Supply)	500	0.1%
Domestic and stock	107	0.0%
Domestic and stock (Domestic)	446	0.1%
Domestic and stock (Town Water Supply)	136	0.0%
Local Water Utility	15,682	4.1%
Local Water Utility (Domestic and Commercial)	1,019	0.3%
Total volume of groundwater licences	387,136	100%

Source: Extract from the NSW Water Register provided by NSW DCCEEW. Jacobs requested the relevant NSW Water Register data for the water sources within the following Regional Water Strategies: NSW Border Rivers, Gwydir, Namoi, North Coast and Greater Hunter.

Note: Licence categories listed are those contained within the NSW Water Register. The licence categories listed in the table above may differ to those listed in Section 56 of the Act. This is because licence categories in a specific water source may be special purpose licences.

3.4.3.1 Water access and usage by local water utilities or town water supply

Some of the local councils in the NE REZ and along the NRNIP corridor hold groundwater licences (key local councils include: Tenterfield, Armidale, Inverell, Glen Innes Severn, Tamworth, Walcha, Liverpool Plains, Upper Hunter, Muswellbrook and Singleton). The systems in which these licences are held are shown in Figure 3-17. This indicates where groundwater sources may be used to meet the water requirements for some communities. Across these systems (which extend beyond the boundaries of the LGAs within the geographic scope of the Study), approximately 17,000 ML (per water year, depending on AWD) could be taken under local water utility, town water supply or domestic and stock licences.

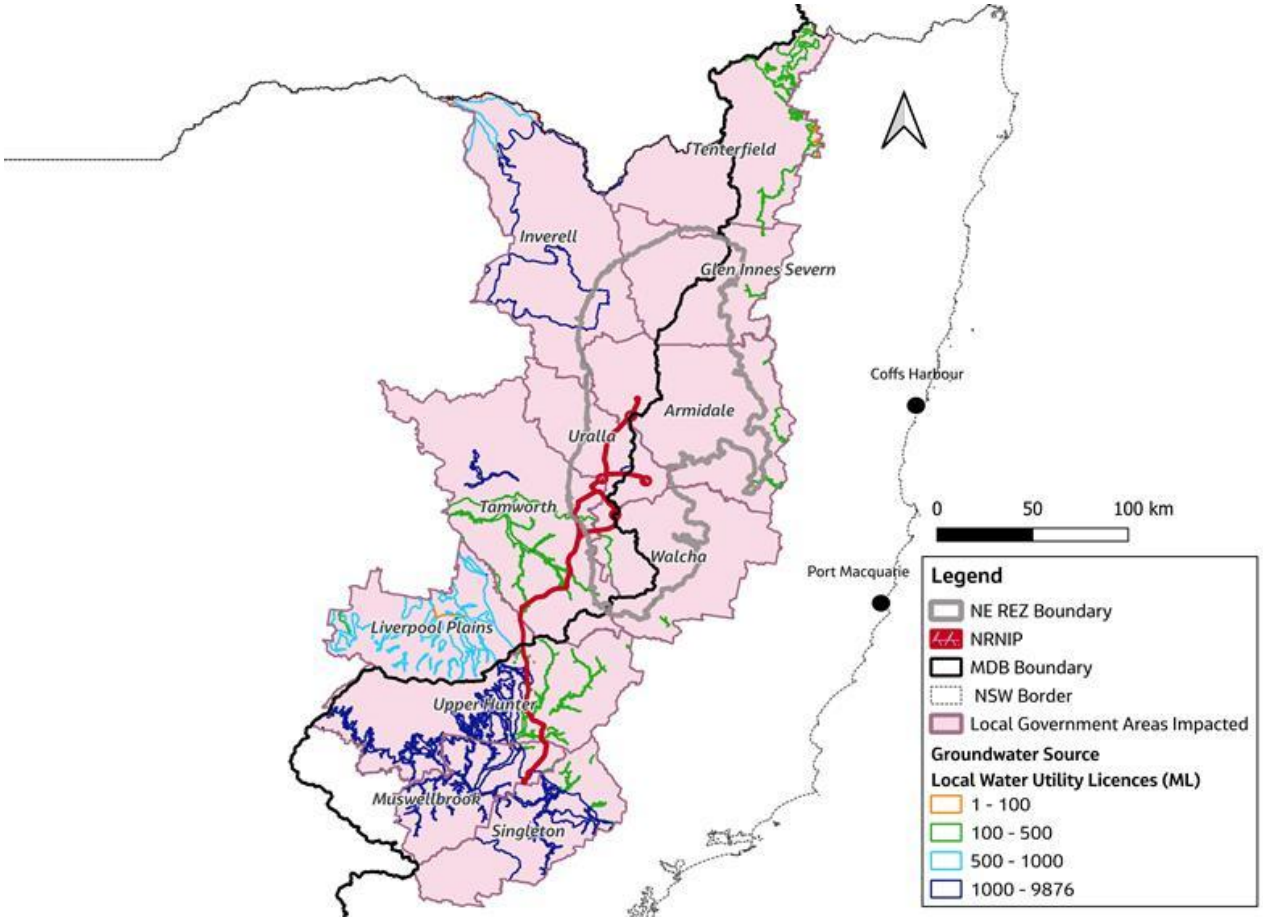


Figure 3-17: Groundwater sources within which there are local water utility licences

Source: Groundwater sources accessed at NSW Government. *SEED. The Central Resource for Sharing and Enabling Environmental Data in NSW.* WATER SHARING PLANS SPATIAL DATA | Dataset | SEED

Source: Data extract from the NSW Water Register provided by NSW DCCEEW. Jacobs requested the relevant NSW Water Register data for the water sources within the following Regional Water Strategies: NSW Border Rivers, Gwydir, Namoi, North Coast and Greater Hunter.

Because extracting groundwater is more expensive than extracting surface water, groundwater usage tends to be lower in wet periods, but higher in dry periods when surface water availability may be constrained. This is shown in Figure 3-18.

- the total share component for local water utility, domestic and stock (town water supply), local water utility (domestic & commercial) licences that could be taken if available water determinations allow.

- versus account usage for those same licence categories. Compared to unregulated usage which fluctuates based on rainfall, and therefore river flows (Figure 3-16), account usage for groundwater systems tends to be more consistent over time, but increased during the drought of 2017 to 2020.

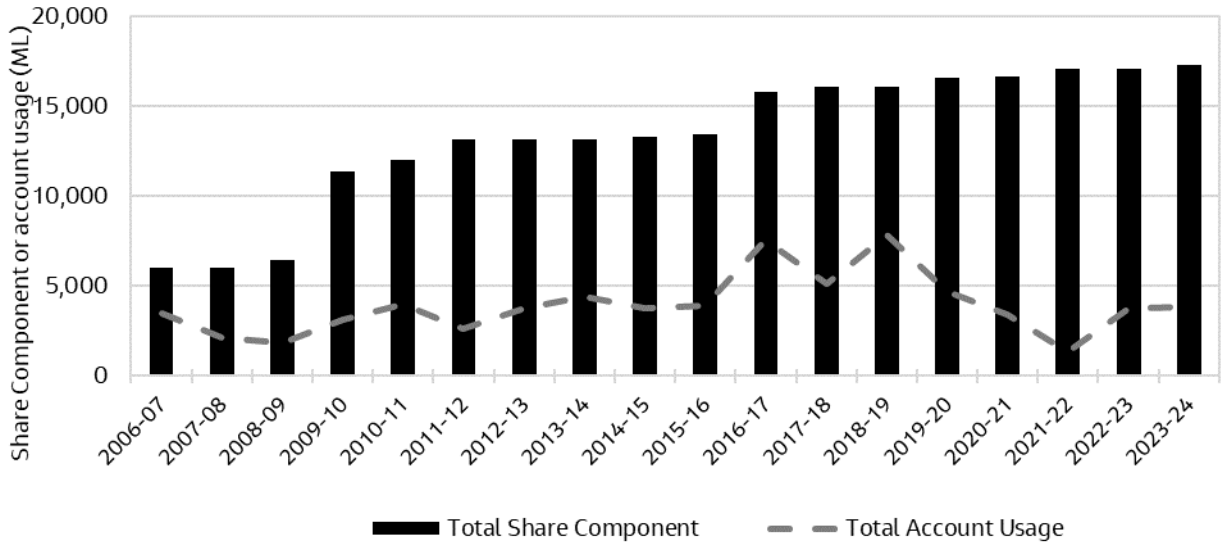


Figure 3-18: Total share component and account usage across local water utility and town water supply licences in groundwater systems that intersect with the LGAs within the geographic scope of the Study

Source: Data extract from the NSW Water Register provided by NSW DCCEEW. Jacobs requested the relevant NSW Water Register data for the water sources within the following Regional Water Strategies: NSW Border Rivers, Gwydir, Namoi, North Coast and Greater Hunter.

Note 1: In NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete.

Note 2: Water available in accounts may be less than shown in some years due to specific rules in the water sharing plans that limit the volume that can be held in accounts for certain licences.

3.5 Summary of water sources that are relevant to the NE REZ development

Table 3-7 shows a summary of the water sources that are relevant to the NE REZ development. Further analysis of these water sources is set out in Section 5 for the water resources assessment.

Table 3-7: Summary of water sources relevant to the NE REZ development

Water source type	Relevance to NE REZ development
Regulated surface water sources	▪ These sources are supported by major dam storages to provide more reliable water supplies over time. ▪ Could provide a water supply for non-REZ and REZ projects in the western part of the NE REZ, and for the NRNIP (Peel Regulated River Source, Hunter Regulated River Source). ▪ Discussed further in Section 5.
Unregulated surface water sources	▪ Contingent on sufficient river flows in accordance with individual licence conditions. Not suitable for uses that require a degree of reliability over multiple years.
Groundwater sources	▪ Groundwater sources are an important water source for the eastern part of the NE REZ. ▪ Can be accessed across most of the NE REZ and NRNIP corridor. ▪ Groundwater is often an important water source, especially during dry times when water availability in regulated surface water sources is constrained. ▪ Discussed further in Section 5.

3.6 Historical water demand (potable)

Figure 3-19 shows the historical water demand (potable) for the LGAs within the NE REZ or along the NRNIP corridor. The data reveals patterns and trends in water usage between 2013-14 and 2023-24 which may be attributed to population changes, changing industrial activities, water management policies, and climate conditions. Key trends in water demand (potable) are:

- There is a significant scale difference between the larger LGAs (like Tamworth) and smaller LGAs (like Walcha). These differences will reflect differences in the size of the populations and scale of water using industries in each LGA. Tamworth consistently shows the highest demand across the years. Conversely, Walcha represents the smallest water demand from all relevant LGAs.
- Many LGAs show peak values in the middle of the period (2017-18 or 2018-19), followed by a sharp decline from 2019-20. This may reflect water restrictions that were in place at the end of the 2017-20 drought.
- Liverpool Plains and Glen Innes Severn show significant fluctuations in their water demand across the years.
- Tamworth, Singleton, and Muswellbrook show relatively consistent volumes over the years, with fewer fluctuations compared to other LGAs.
- Some LGAs like Upper Hunter and Liverpool Plains show a general declining trend over the 10-year period.

Figure 3-20 shows the total potable water demand by use for the LGAs in the vicinity of the NE REZ or impacted by the NRNIP. The key takeaways are that:

- Across all LGAs, the highest volume of water was supplied for residential use, followed by commercial use. Industrial use is significant in some LGAs, particularly Tamworth (4.4 ML/d) and Inverell (1.3 ML/d).
- Rural water use is the smallest source of water use but more significant in larger LGAs like Tamworth (0.5 ML/day).

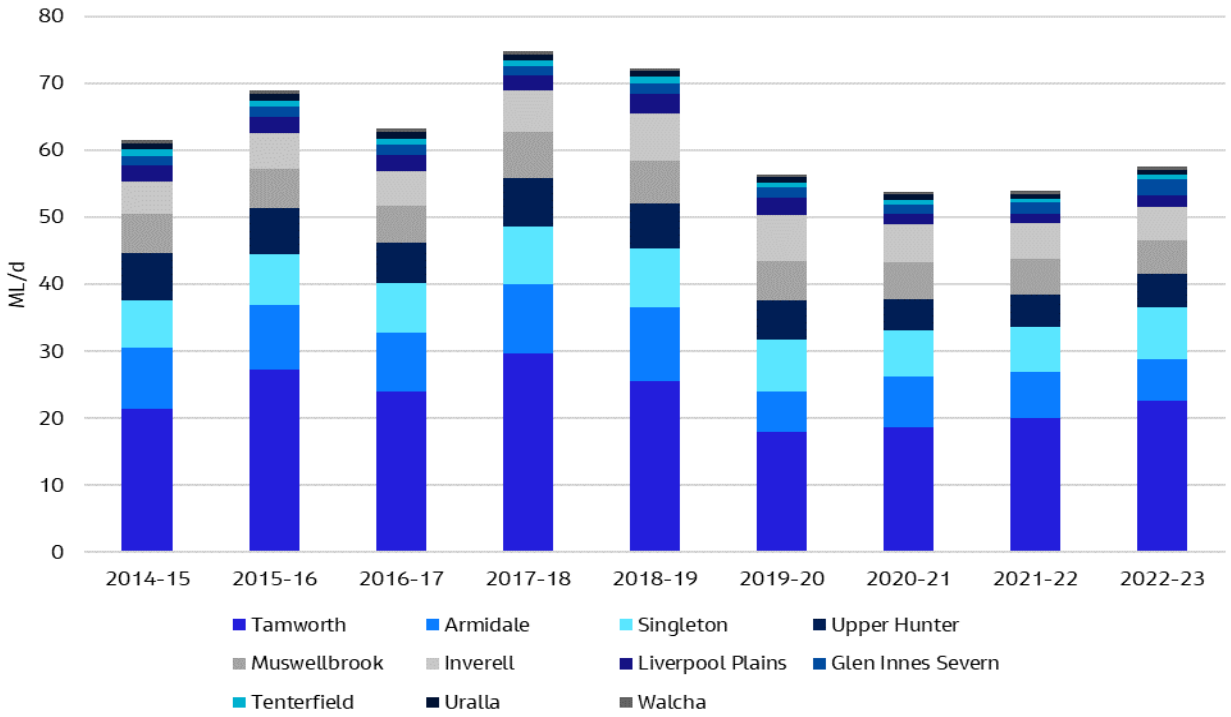


Figure 3-19: Historical volumes of water demand (potable) (2014-15 to 2022-23) in the LGAs relevant to NE REZ development

Source: Water supplied data by relevant local water utilities from the *NSW Local Water Utility Performance Monitoring Database*. Available at: Local water utility performance | NSW Government Water

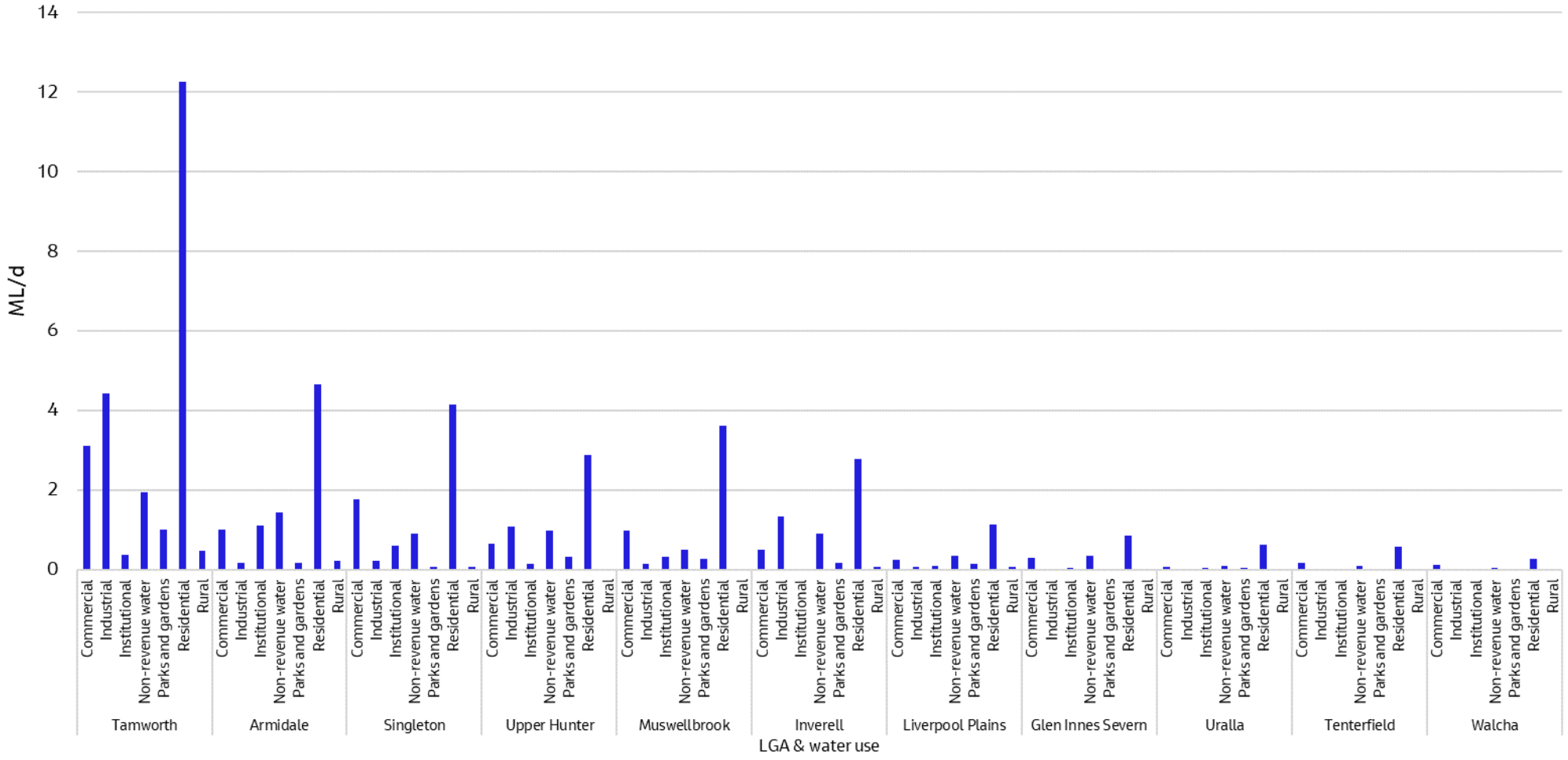


Figure 3-20: Average historical volumes of water demand (potable) in the LGAs relevant to NE REZ development by use category (2013-14 to 2022-23)

Source: Water supplied data from the *NSW Local Water Utility Performance Monitoring Database*. Available at: Local water utility performance | NSW Government Water

3.7 Water treatment infrastructure

Across the LGAs within the NE REZ or impacted by the NRNIP, there are 19 water treatment plants that are owned / operated by the local councils as the LWUs responsible for potable water supply. Table 3-8 lists the water treatment plants within each LGA and the treatment capacity data that was available for the Study. Combined, these water treatment plants have a treatment capacity of 176.1 ML /d.

Generally, the water treatment plants are located away from the proposed NRNIP corridor. See further discussion in Section 4. Figure 3-21 shows the locations of the water treatment plants across the LGAs within the NE REZ and along the NRNIP corridor.

Table 3-8: Identified water treatment plants across the NE REZ and along the NRNIP corridor

LWU	Water treatment plant	Capacity (ML/d)
LGAs impacted by NRNIP		
Muswellbrook Shire Council	Muswellbrook	15.0
Muswellbrook Shire Council	Denman	2.7
Upper Hunter Shire Council	Murrurundi	2.4
Upper Hunter Shire Council	Cassilis	0.6
Upper Hunter Shire Council	Scone	11.9
Upper Hunter Shire Council	Merriwa	2.3
Liverpool Plains Shire Council	Quipolly	6.0
Tamworth Regional Council	Tamworth	55.0
Walcha Council	Walcha Plant	4.0
Uralla Shire Council	Uralla	5.0
Armidale Regional Council	Armidale Plant	19.0
Armidale Regional Council	Guyra	4.0
Singleton Council	Obanvale	30.0
Within NE REZ but not in vicinity of NRNIP		
Glenn Innes Severn Shire Council	Glen Innes	12.7
Inverell Shire Council	Copeton	*Data unavailable*
Inverell Shire Council	Ashford	*Data unavailable*
Tenterfield Shire Council	Tenterfield	3.5
Tenterfield Shire Council	Urbenville	1.5
Tenterfield Shire Council	Jennings	0.5
Estimated total capacity of water treatment plants		***176.1***

Note: The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

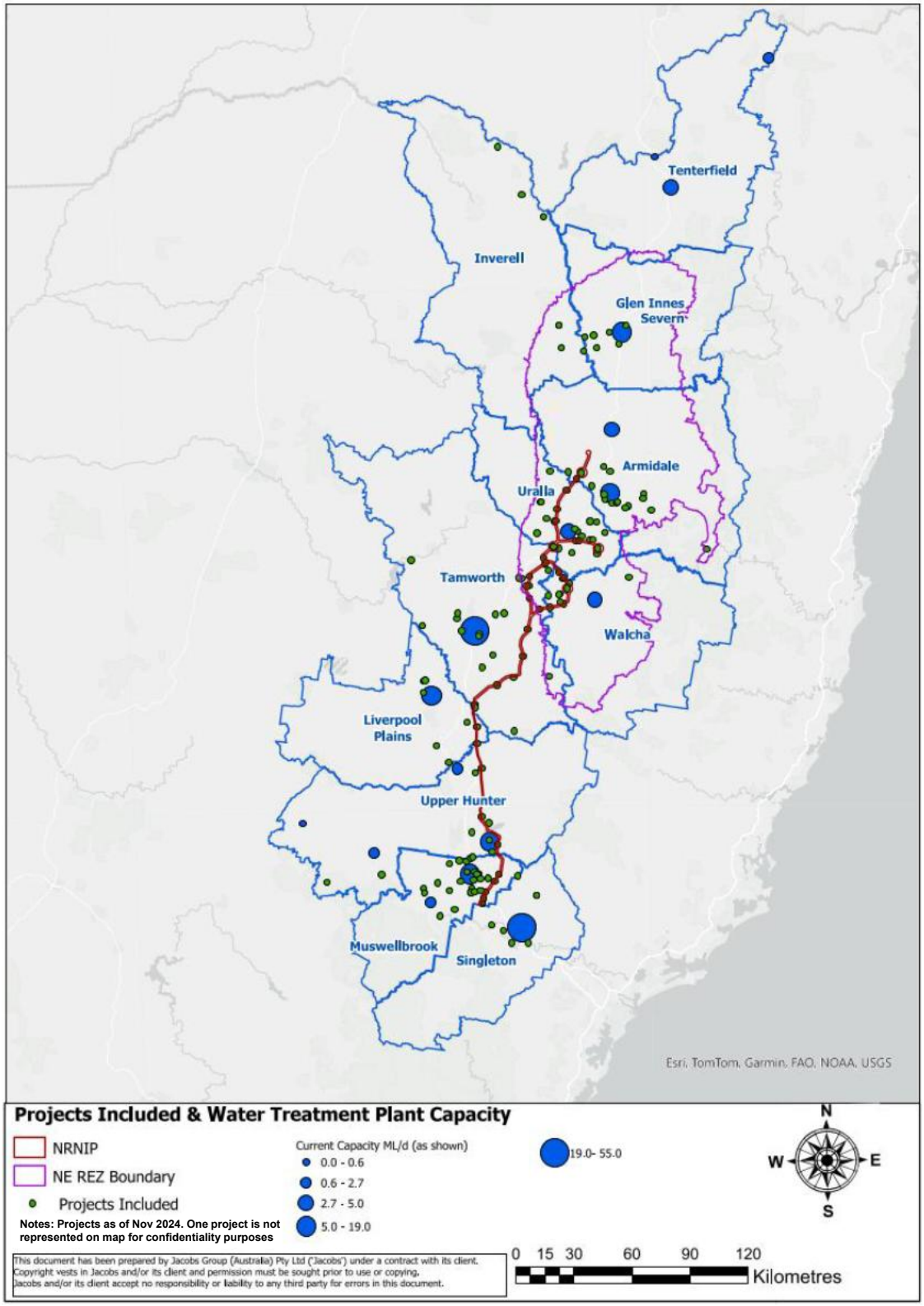


Figure 3-21: Locations of the water treatment plants across the NE REZ and along the NRNIP corridor relative to the locations of NE REZ and non-REZ projects included in the analysis

Note: See the relevant appendices for information about the data sources.

3.8 Historical wastewater to be treated

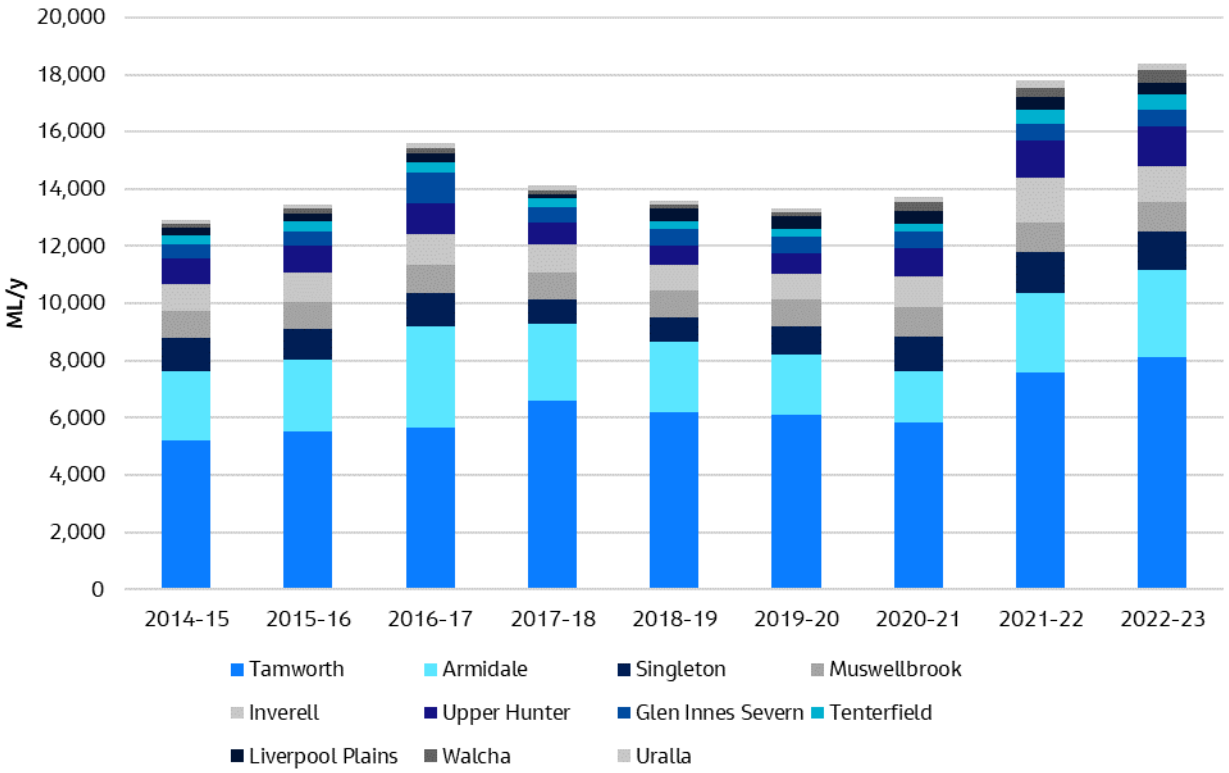


Figure 3-22 shows the historical wastewater to be treated for the LGAs within the NE REZ or along the NRNIP corridor. The data reveals patterns and trends in wastewater between 2014-15 and 2022-23 which may be attributed to population changes, industrial activities, water management policies, and climate conditions. These key trends are outlined below:

- Consistent with Tamworth being the largest regional centre and area of industrial activity, Tamworth consistently has the highest volumes of wastewater to be treated.
- Many LGAs show an upward trend between 2020-21 and 2022-23. The higher trend in wastewater could be attributed to multiple factors, including population growth, COVID-19 impacts on residential water usage, economic recovery, and potential changes in rainfall patterns or infrastructure improvements.

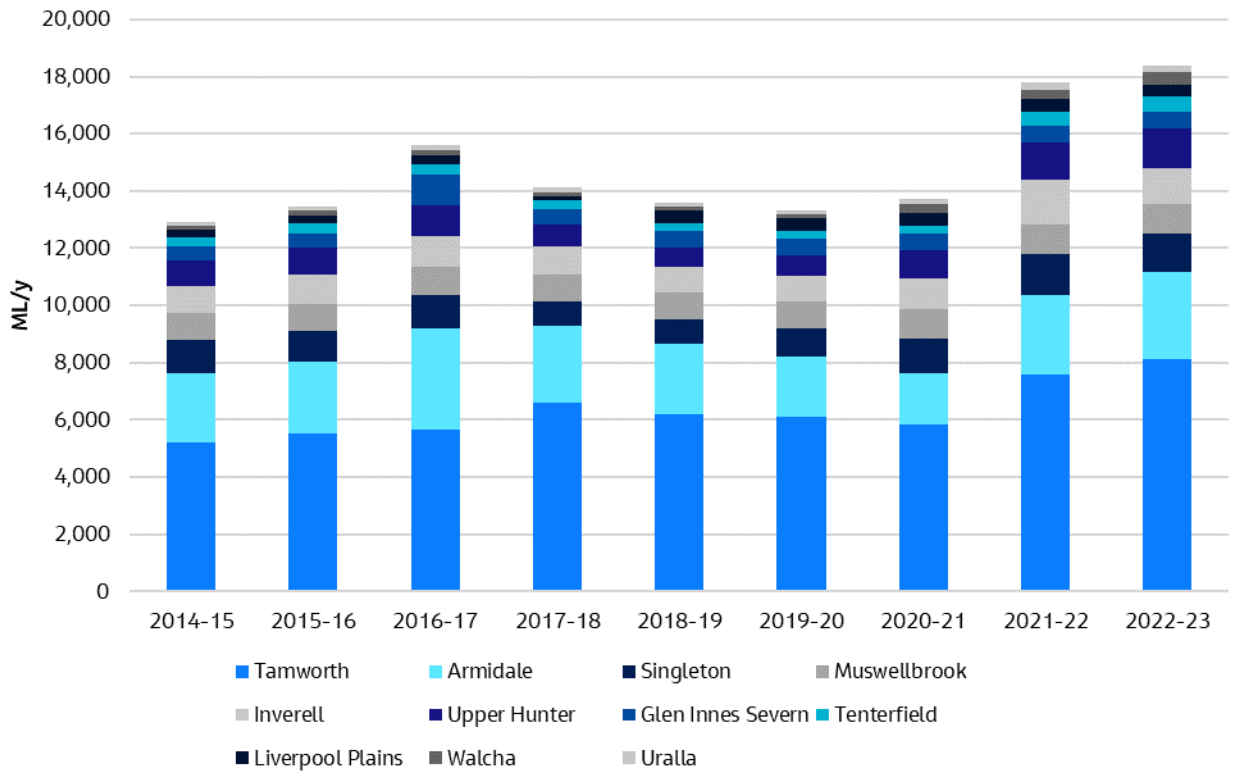


Figure 3-22: Historical volumes of wastewater to be treated in the LGAs relevant to NE REZ development (2014-15 to 2022-23)

Source: Wastewater to be treated is based on the sewage collected data from the NSW Local Water Utility Performance Monitoring Database. Available at: Local water utility performance | NSW Government Water

3.9 Wastewater treatment infrastructure

Across the LGAs either within the NE REZ or impacted by the NRNIP, there are 20 wastewater treatment plants that are owned / operated by the local councils as the local water utilities responsible for wastewater services. Table 3-9 lists the wastewater treatment plants within each LGA and their treatment capacities. Combined, these wastewater treatment plants have a treatment capacity of 52.3 ML/d.

Generally, the wastewater treatment plants are located away from the proposed NRNIP corridor. See further discussion in Section 4. Figure 3-23 shows the locations of the wastewater treatment plants across the LGAs within the NE REZ and along the NRNIP corridor.

Table 3-9: Identified wastewater treatment plants across the NE REZ and along the NRNIP corridor

LWU	Wastewater treatment plant	Capacity (ML/d)
LGAs impacted by NRNIP		
Muswellbrook Shire Council	Muswellbrook	5.7
Muswellbrook Shire Council	Denman	0.3
Upper Hunter Shire Council	Aberdeen	1.2
Upper Hunter Shire Council	Murrurundi	0.3
Upper Hunter Shire Council	Cassilis	*Data unavailable*

LWU	Wastewater treatment plant	Capacity (ML/d)
Upper Hunter Shire Council	Scone	2.1
Upper Hunter Shire Council	Merriwa	0.3
Liverpool Plains Shire Council	Werris Creek	0.5
Liverpool Plains Shire Council	Quirindi	0.6
Tamworth Regional Council	Tamworth	21.0
Walcha Council	Walcha	3.0
Uralla Shire Council	Uralla	1.2
Armidale Regional Council	Armidale Plant	6.6
Armidale Regional Council	Guyra	1.0
Within NE REZ but not in vicinity of NRNIP		
Glenn Innes Severn Shire Council	Glen Innes	2.4
Inverell Shire Council	Inverell	*Data unavailable*
Tenterfield Shire Council	Tenterfield	1.1
Tenterfield Shire Council	Urbenville	0.2
Singleton Council	Singleton	4.8
Estimated total capacity of wastewater treatment plants		***52.3***

Note: The wastewater treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, wastewater treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

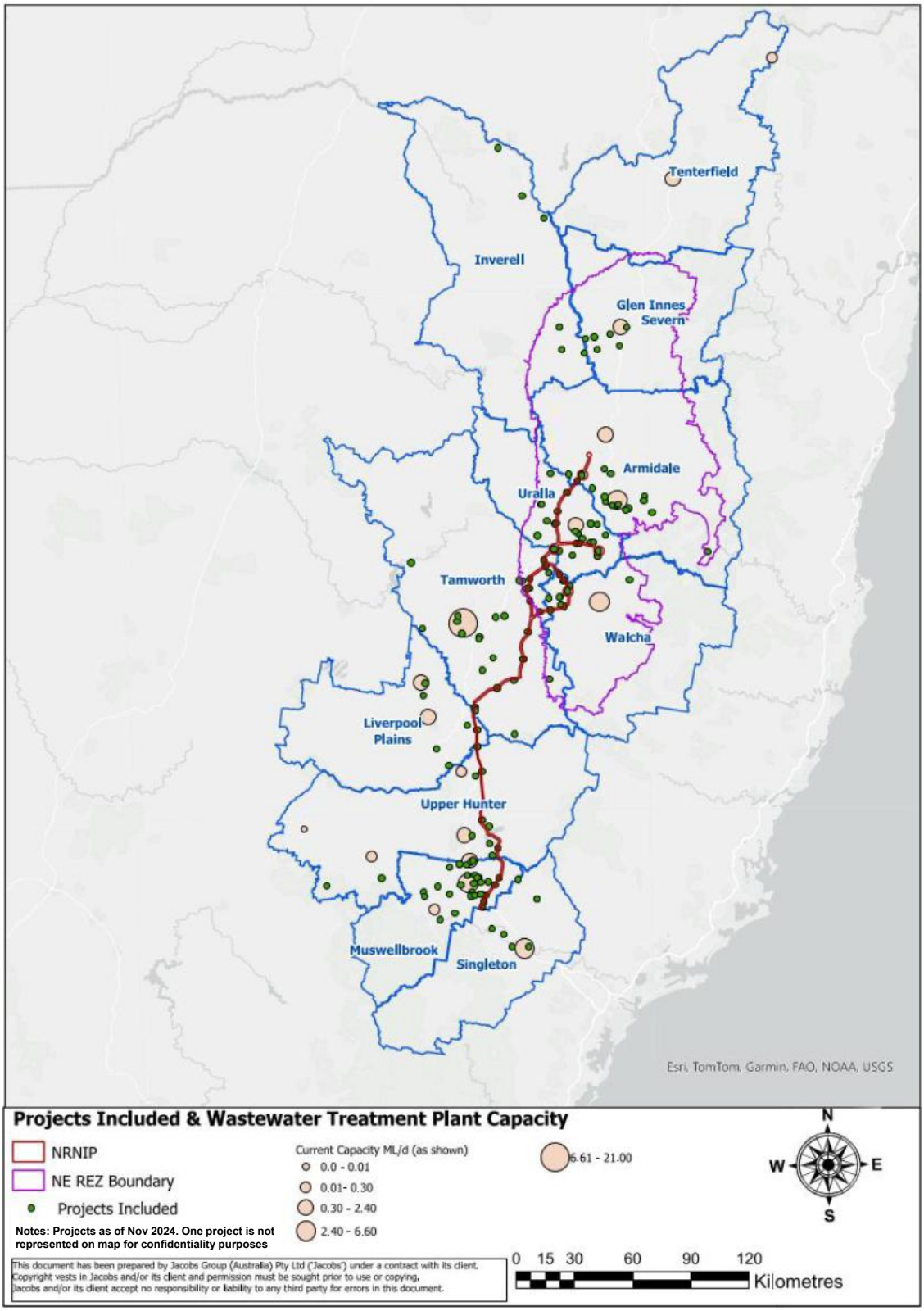


Figure 3-23: Locations of the wastewater treatment plants across the NE REZ and along the NRNIP corridor relative to the locations of NE REZ and non-REZ projects included in the analysis

Note: See the relevant appendices for information about the data sources.

4. Approach to the Water and Wastewater Security Study

This section describes the approach used to assess the capacity of the water resources and water and wastewater treatment infrastructure likely to be impacted from NE REZ development. The Study approach comprised three separate assessments that were completed by generating estimates of the underlying concepts. The three assessments are:

1. Water resource assessment (Assessment 1)
2. Water treatment infrastructure assessment (Assessment 2)
3. Wastewater treatment infrastructure assessment (Assessment 3)

The three assessments are shown in Figure 4-1. This section also explains the scenarios, time horizons and sensitivity tests used to understand the implications of NE REZ development on water resources and water and wastewater treatment infrastructure in the region.

	Assessment Name	Purpose of the Assessment	Further Details
Assessment 1	Water Resource Assessment	Explores the differences between water supply and water demand from NE REZ development	See Section 4.1 for details of how this assessment was undertaken
Assessment 2	Water Treatment Infrastructure Assessment	Explores the capacity of the water treatment infrastructure to meet the demand for potable water from NE REZ development	See Section 4.2 for details of how this assessment was undertaken
Assessment 3	Wastewater Treatment Infrastructure Assessment	Explores the capacity of the wastewater treatment infrastructure to process wastewater to be treated from NE REZ development	See Section 4.3 for details of how this assessment was undertaken

Figure 4-1: Overview of the three assessments used to explore the impacts on water resources and water and wastewater treatment infrastructure from NE REZ development

Each assessment involved:

- defining key concepts and metrics to undertake the assessment.
- generating estimates of the underlying concepts for each of the time horizons. The time horizons are shown in Table 4-1.
- estimating the potential impact of the NE REZ development on water, wastewater and associated infrastructure by examining the base case and NE REZ development case. The base case and NE REZ development case are described in Table 4-2.
- scoping the base case and NE REZ development case. This included categorising each of the projects listed in the EnergyCo Data and Assumptions Workbook v.2.1 to the base case of NE REZ development case. The NE REZ Data and Assumptions Workbook provided the key details of all relevant renewable and non-renewable energy projects which were to be considered in this Study. This categorisation was informed by a high-level inspection of the spatial proximity of the projects listed in the EnergyCo Data and Assumptions Workbook v.2.1 to the regulated surface water systems that are relevant to the NE REZ development. See Table 4-3 for a summary of the infrastructure and projects that were included in the base case and NE REZ development case. It should be noted that the analysis assumes all the identified

projects will be approved, be constructed and delivered according to the timing information available to the Study. Any changes to the number and size of projects, construction and delivery timeframes will influence the results.

- exploring the extent to which the assessment results vary under different water supply and demand conditions through sensitivity tests. See Section 4.4. for details.

How each assessment was completed is explained in the following sections.

No capacity assessment of the water network and wastewater network infrastructure was undertaken. This is because most of the project sites or proposed locations for workers accommodation are located notable distances from the existing network infrastructure and as such would require significant network upgrades to connect. Therefore, the use of water tankers or abductor trucks to ferry water / sewage to the treatment facilities is likely to be the most feasible. When considering a buffer of 5km from each of the water and wastewater treatment plants, only in Armidale, Uralla, Muswellbrook and Tamworth are there projects within this distance of the nearest plant (see Appendix B). These locations may provide opportunities for the NE REZ development to leave a legacy by improving nearby infrastructure to facilitate the construction. Such opportunities are considered in Section 8.

An additional challenge for the Study was that network infrastructure data was only available for some of the LGAs which means a holistic assessment was not possible. Subsequent assessments could consider investigations of the capacity of the water and wastewater network infrastructure if suitable data are available.

Table 4-1: Time horizons used in the Study

Time horizon	Description
Planning Stage	Present day to the anticipated start of construction of the NRNIP (estimated 2027)
Stage 1	Construction: Commencing in 2027 and completed by end of 2031
Stage 2	Construction: Commencing in 2030 and completed by end of 2033

Note: The time horizons used in the assessments align with those that applied when the analytical framework was developed. In December 2024, the Australian Energy Market Operator (AEMO) announced revised timeframes. See 'Note about the timeframes used in this Report' (p.i).

Table 4-2: Scenarios used in the Study

Scenario	Description
Base case	Provides water and wastewater estimates based on projected population change and construction / operation of non-REZ projects (i.e., projects such as schools, hospitals, other energy projects that are planned irrespective of NE REZ development and are planned to connect into other, existing networks (e.g., Transgrid)).
NE REZ development case	Provides water and wastewater estimates based on NE REZ development. This means it includes the base case, construction / operation of the NRNIP, and construction / operation of renewable energy projects planned to connect into the NRNIP.

Note: The scenarios were discussed and developed in collaboration with EnergyCo and have been designed so that the potential impact of NE REZ development can be understood.

Table 4-3: Scope of the base case and NE REZ development case

Project type / infrastructure		Base case	NE REZ development case
Projected population change		💧	💧
Non-REZ projects and infrastructure	Renewable energy projects that connect into other networks (e.g., Transgrid)	💧	💧
	Non-renewable projects (e.g., education, coal, extractives, food and beverages, livestock, waste, roads and other)	💧	💧
REZ projects and infrastructure	NRNIP		💧
	Renewable energy projects (solar, wind, battery, hydro) connecting into the NRNIP		💧

Note: The categorisation of the projects and infrastructure to either the base case or NE REZ development case was completed in collaboration with EnergyCo based on the project list EnergyCo provided in the Data and Assumptions Book v.2.1. This exercise required filling a number of information gaps across the project list to ensure each project could be appropriately categorised. It is noted that this information is subject to change as projects are developed further. See also Section 2.2.3 for further details.

4.1 Assessment 1: Water resources assessment

The water resources assessment explored the relationship, including any surplus or shortfall, between water supply and water demand in the NE REZ and along the NRNIP corridor across the three time horizons. The two underlying concepts used in this assessment were:

- **Water supply:** Qualitative commentary of the overall water availability in the NE REZ and along the NRNIP corridor. The following sources of water could contribute to the overall water supply.
  - Water allocated to, and available from, entitlements (regulated surface water and groundwater) in water systems near the NE REZ development
  - Recycled water production by local water utilities, non-REZ projects and NE REZ development
  - Rainwater harvesting by non-REZ projects and NE REZ development
- **Water demand**: Estimates of the demand for water in the NE REZ and along the NRNIP corridor. Projected water demand in this Report is based on estimates of water usage.

Figure 4-2 shows the underlying concepts and metrics that were used to generate the estimates of water supply and water demand, and Table 4-4 presents the definitions of the metrics that were used to build the estimates of water supply and water demand. See Appendix C (Water supply) and Appendix D (Water demand) for details about the data sources used and assumptions applied.

The data available to estimate water supply is based on hydrological water systems, rather than LGAs as with the other metrics used in the assessments. This means that when presenting the results of the water resources assessment, a qualitative commentary style of reporting was required. Where possible, water supply and water demand estimates have been quantified.

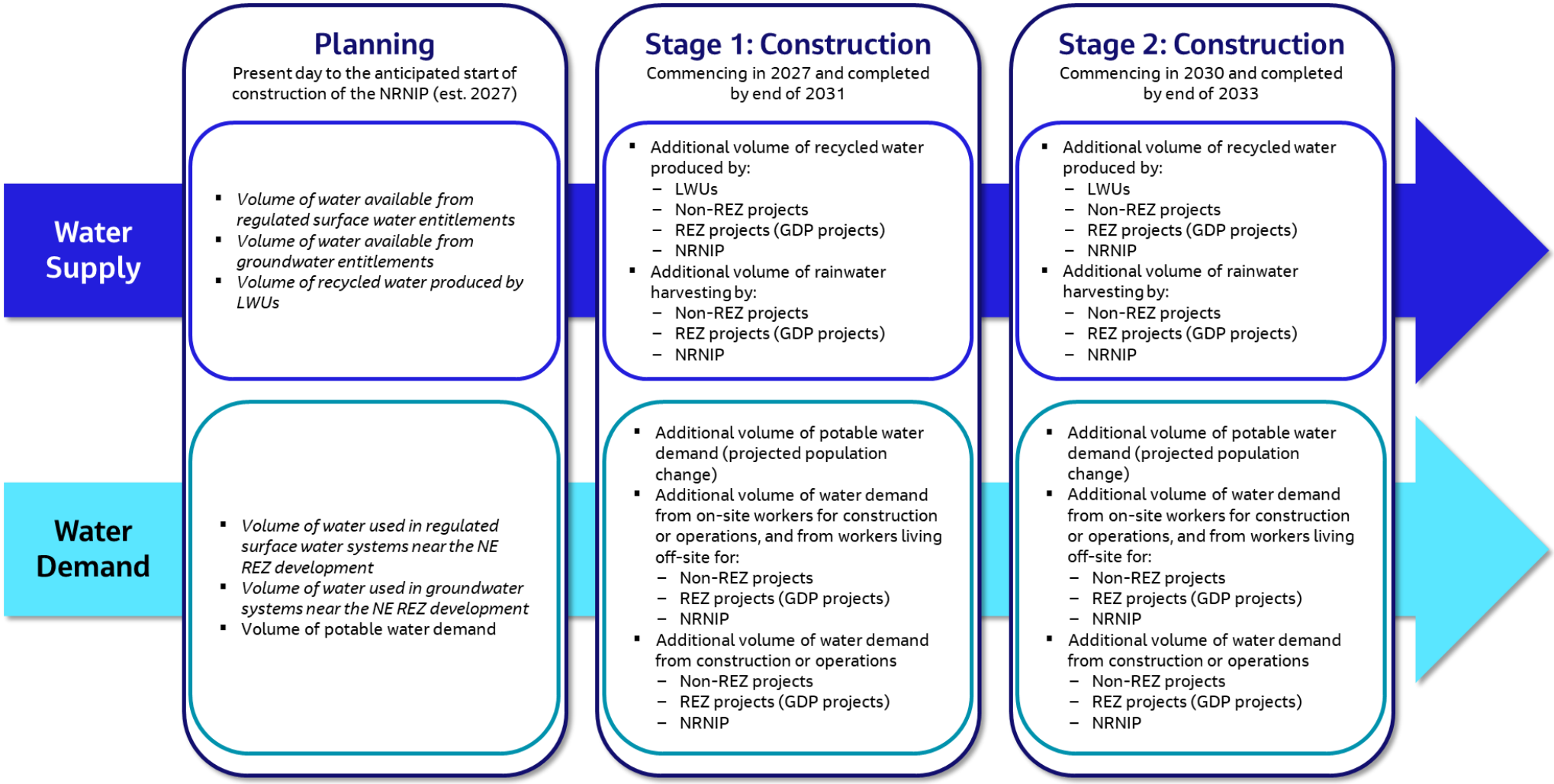


Figure 4-2: Overview of the water resource assessment

Note: Concepts highlighted in italics are explored through qualitative commentary.

Table 4-4: Concepts and metrics used in the water resources assessment

Concept	Metric	Details
Water supply[1]	**Baseline water supply**	
	Volume of water available from entitlements in regulated surface water systems near the NE REZ development	*Qualitative commentary of the total volume of water available from regulated surface water entitlements. Includes all water access licence types (e.g., general security, high security, town water supply).*
	Volume of water available from entitlements in groundwater systems near the NE REZ development	*Qualitative commentary of the total volume of water available from groundwater entitlements. Includes all types of water access licences to extract water from groundwater sources.*
	Volume of recycled water produced	*Qualitative commentary of the total volume of recycled water produced by LWUs and non-REZ projects.*
	Additional water supply: Stage 1 and Stage 2	
	Additional volume of recycled water produced	The total volume of additional recycled water production from LWUs, non-REZ projects, REZ projects and NRNIP.
	Additional volume of rainwater harvesting	The total volume of additional rainwater harvesting from non-REZ projects, REZ projects and NRNIP.
Water demand[2]	**Baseline water demand**	
	Volume of water used in regulated surface water systems near the NE REZ development	*Qualitative commentary of the total volume of water used in regulated surface water systems, relevant licence categories.*
	Volume of water used in groundwater systems near the NE REZ development[5]	*Qualitative commentary of the total volume of water extracted from groundwater sources, relevant licence categories.*
	Volume of water demand supplied by LWUs	The volume of water supplied for potable use by LWUs. Baseline includes: ▪ the annual average peak day potable water supplied based on 10 years up to 2022-23 ▪ a projection from 2024 to 2026 based on the projected growth rate (2022 NSW Population, Housing, and Implied Dwelling Projections) for the number of properties in the respective LGAs. ▪ water demand from commercial, industrial, institutional, public parks and gardens, and rural was assumed to be constant.
	Additional water demand: Stage 1 and Stage 2	
	Additional volume of potable water demand	The estimated projected volume of potable water that may need to be supplied based on the baseline average peak day potable water supplied and the projected growth rate for the number of properties in the respective LGAs through Stage 1 and Stage 2.

Concept	Metric	Details
	Additional volume of water demand from on-site workers for construction or operations[3] (water used for on-site worker activities)	The estimated volume of potable water demand from on-site workers during construction and operations for: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP
	Additional volume of water demand from non-REZ and REZ project workers living off-site[3] (water used for off-site worker activities)	The estimated volume of potable water demand from workers living off-site (outside of temporary accommodation camps) who are involved in the construction or operations of: ▪ Non-REZ projects ▪ REZ projects (GDP projects) *NRNIP (additional living volumes from temporary camps included in potable numbers)*
	Additional volume of water demand from construction and / or operations[3]	The estimated volume of water demand from selected water uses (e.g., dust suppression, concrete production) for construction or operations of: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP

Note 1: See Appendix C for details on the data sources and assumptions used to generate the estimates of each metric for water supply.

Note 2: See Appendix D for details on the data sources and assumptions used to generate the estimates of each metric for water demand.

Note 3: For non-REZ projects and NE REZ projects, estimates are based on the projected number of workers and a range of water use assumptions (see Appendix J). Estimates for NRNIP are based on the constructability data provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx

Note 4: Concepts highlighted in italics are explored through qualitative commentary.

Note 5: In NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete.

4.2 Assessment 2: Water treatment infrastructure assessment

The water treatment infrastructure assessment explored the differences between demand for potable water and the capacity of the water treatment infrastructure to meet the demand from NE REZ development across the three time horizons. The two underlying concepts used in this assessment were:

- **Water demand (potable)**: Estimates of the demand for potable water in the NE REZ and along the NRNIP corridor.
- **Water treatment plant capacity**: Estimates of the capacity of the water treatment plants / facilities located in or near the NE REZ development.

Figure 4-3 shows the key concepts and metrics that were used to generate the estimates of water treatment infrastructure capacity. Table 4-5 presents the definitions of the concepts and metrics. See Appendix D (Water demand) and Appendix E (Water treatment infrastructure capacity) for details about the data sources used and assumptions applied to generate estimates of each metric.

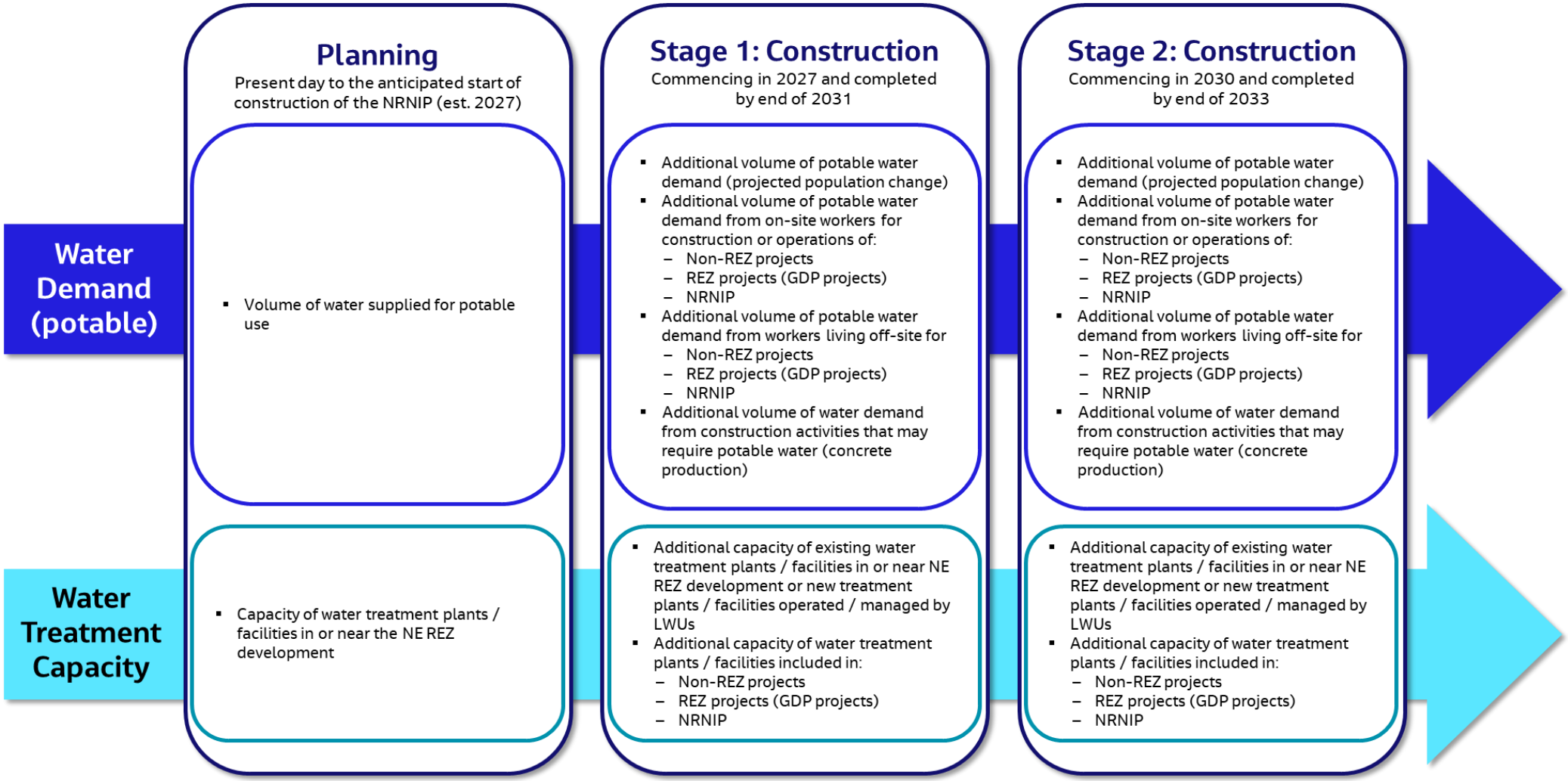


Figure 4-3: Overview of the water treatment infrastructure assessment

Table 4-5: Concepts and metrics used in the water treatment infrastructure assessment

Concept	Metric	Definition
Water demand (potable)[1]	**Baseline water demand (potable)**	
	Volume of water supplied for potable use	The volume of water supplied for potable use by LWUs. Baseline includes: ▪ the annual average peak day potable water supplied based on 10 years up to 2022-23 ▪ a projection from 2024 to 2026 based on the projected growth rate for the number of properties in the respective LGAs. (2022 NSW Population, Housing, and Implied Dwelling Projections)
	Additional water demand (potable): Stage 1 and Stage 2	
	Additional volume of potable water demand (projected population change)	The estimated projected volume of potable water that may need to be supplied based on the baseline average peak day potable water supplied and the projected growth rate for the number of properties in the respective LGAs through Stage 1 and Stage 2.
	Additional volume of water demand from on-site workers for construction or operations[3] (water used for on-site worker activities)	The estimated volume of potable water demand from on-site workers during construction and operations for: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP
	Additional volume of water demand from non-REZ and REZ project workers living off-site[3] (water used for off-site worker activities)	The estimated volume of potable water demand from workers living off-site (outside of temporary accommodation camps) who are involved in the construction or operations of: ▪ Non-REZ projects ▪ REZ projects (GDP projects) *NRNIP (additional living volumes from temporary camps included in potable numbers)*
	Additional volume of water demand from construction activities that may require potable water	The estimated volume of potable water required for concrete production for use in tower footings (wind farms) and BESS projects.
Water treatment capacity[2]	**Baseline water treatment capacity**	
	Capacity of water treatment plants / facilities in or near the NE REZ development	Combined capacity of water treatment facilities as of 2024, plus additional capacity of any existing water treatment plants or new water treatment plants that will be commissioned before Stage 1.
	Additional water treatment capacity: Stage 1 and Stage 2	
	Additional capacity of water treatment plants / facilities in or near the NE REZ development	Additional capacity of existing water treatment plants / facilities in or near NE REZ development or

Concept	Metric	Definition
		new treatment plants / facilities operated / managed by LWUs. Additional capacity of water treatment plants / facilities included in: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP

Note 1: See Appendix D for details on the data sources and assumptions used to generate the estimates of each metric for water demand (potable)

Note 2: See Appendix E for details on the data sources and assumptions used to generate the estimates of each metric for water treatment plant capacity

Note 3: For non-REZ projects and NE REZ projects, estimates are based on the projected number of workers and a range of water use assumptions (see Appendix J). Estimates for NRNIP are based on the constructability data provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx

4.3 Assessment 3: Wastewater treatment infrastructure assessment

The wastewater treatment infrastructure assessment explored the differences between the volume of wastewater to be treated and the capacity of the wastewater treatment infrastructure to process the wastewater from the NE REZ development across the three time horizons. The two key concepts used in this assessment were:

- **Wastewater to be treated:** Estimates of the volume of wastewater to be treated in the NE REZ and along the NRNIP corridor.
- **Wastewater treatment capacity**: Estimates of capacity of the wastewater treatment plants / facilities located in or near the NE REZ development.

Figure 4-4 shows the key concepts and metrics that were used to generate the estimates of wastewater treatment infrastructure capacity. Table 4-6 presents the definitions of the concepts and metrics. See Appendix F (Wastewater to be treated) and Appendix G (Wastewater treatment infrastructure capacity) for details about the data sources used and assumptions applied to generate estimates of each metric.

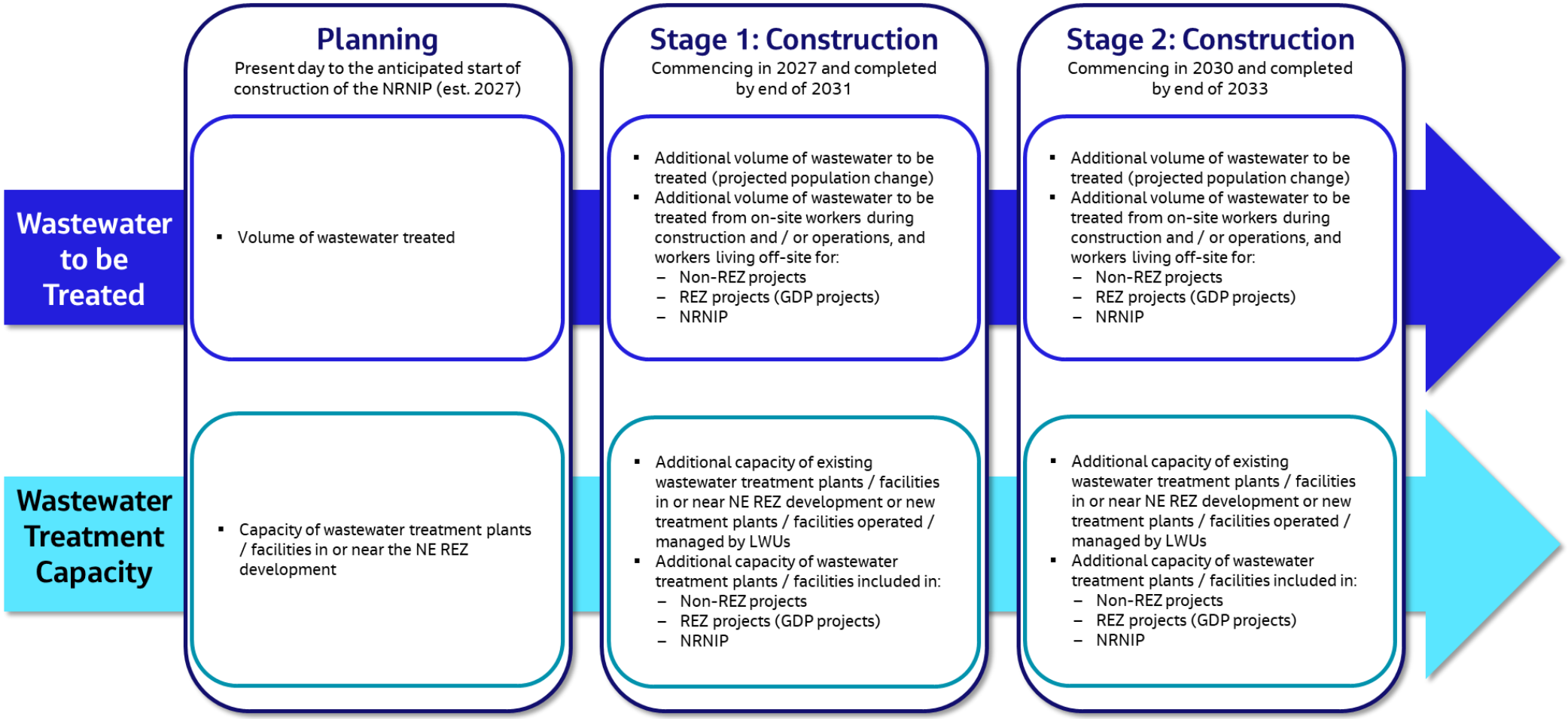


Figure 4-4: Overview of the wastewater treatment infrastructure assessment

Table 4-6: Concepts and metrics used in the wastewater treatment infrastructure assessment

Concept	Metric	Definition
Wastewater to be treated[1]	**Baseline wastewater to be treated**	
	Volume of wastewater to be treated	The volume of sewage collected by LUWs, including residential, non-residential, trade waste and other. Baseline includes: ▪ the annual average volume collected based on 10 years up to 2022-23 ▪ a projection from 2024 to 2026 based on the projected growth rate for the number of properties in the respective LGAs. (2022 NSW Population, Housing, and Implied Dwelling Projections) ▪ average sewage collected per residential property multiplied by the Water Services Association of Australia (WSAA) Peak Wet Weather Flow factor for Trunk Sewers.
	Additional wastewater to be treated: Stage 1 and Stage 2	
	Additional volume of wastewater to be treated (projected population change)	The estimated projected volume of sewage collected based on the baseline average day volume collected and the projected growth rate for the number of properties in the respective LGAs through Stage 1 and Stage 2. *This includes additional off-site worker demand from NRNIP.*
	Additional volume of wastewater to be treated from on-site workers during construction and / or operations[3] (wastewater generated from on-site worker activities)	The estimated volume of wastewater to be treated from on-site workers during construction and operations for: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP
	Additional volume of wastewater to be treated from workers living off-site[3] (wastewater generated from off-site worker activities)	The estimated volume of wastewater to be treated from workers living off-site who are involved in the construction or operations of: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪
Wastewater treatment capacity[2]	**Baseline wastewater treatment capacity**	
	Capacity of wastewater treatment plants / facilities in or near the NE REZ development	Combined capacity of wastewater treatment facilities as of 2024, plus additional capacity of any existing wastewater treatment plants or new wastewater treatment plants in each LGA that will be commissioned before Stage 1.
	Additional wastewater treatment capacity: Stage 1 and Stage 2	

Concept	Metric	Definition
	Planned additional capacity of wastewater treatment plants / facilities in or near the NE REZ development	Additional capacity of existing wastewater treatment plants / facilities in or near NE REZ development or new treatment plants / facilities owned / operated by LWUs. Additional capacity of wastewater treatment plants / facilities included in: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP

Note 1: See Appendix F for details on the data sources and assumptions used to generate the estimates of each metric for wastewater to be treated

Note 2: See Appendix G for details on the data sources and assumptions used to generate the estimates of each metric for wastewater treatment plant capacity

Note 3: Estimates are based on the projected number of workers and a range of water use assumptions (see Appendix J).

4.4 Sensitivity tests

To explore the results of the three assessments further, three sensitivity tests were undertaken. The sensitivity tests are shown in Table 4-7. See Appendix H for the data sources and assumptions. A *wet water / very high water availability* sensitivity was considered for inclusion. However, these conditions will primarily affect water and wastewater network infrastructure. See Section 4 for details on this issue.

Table 4-7: Sensitivity tests undertaken in the Water and Wastewater Security Study

	Purpose	Sensitivities	Rationale	Details
Water supply	To explore the implications of construction of the NE REZ coinciding with constrained availability conditions.	Extremely dry / very low water availability conditions	Considers possible future climate conditions which can impact the quality and quantity of water resources.	Based on a repeat of the 2019-20 water year when water availability was very low.
Water demand (i.e., NE REZ Projects)	To explore the implications of different combinations of NE REZ projects proceeding	Relevant projects that are highly likely to proceed	Considers delivering only projects have commenced construction/operations. Assesses implications of low future development.	Likelihood as specified in EnergyCo's NE REZ Data and Assumptions book.[13] Projects categorised as medium or low likelihood were removed from the analysis.
		Relevant projects that are categorised as either a high or medium likelihood of proceeding	Considers delivering only projects that have been approved or commenced construction/operations. Assesses implications of moderate future development.	Likelihood as specified in EnergyCo's NE REZ Data and Assumptions book.[14] Projects categorised as low likelihood were removed from the analysis.

[13] Version 2.1. following clarifications and updates based on Jacobs and EnergyCo discussion in January and February 2025.

[14] Version 2.1 following clarifications and updates based on Jacobs and EnergyCo discussion in January and February 2025.

5. Water resources assessment (Assessment 1)

This section presents the water resources capacity assessment. The data available to estimate water supply is based on hydrological water systems, rather than LGAs in line with the geographic unit of analysis used in the Study. This means that Section 5 is presented using a qualitative commentary style of reporting. Where possible, water supply and demand estimates have been quantified.

The key findings from the water resources assessment are presented first using two tables, one for regulated surface water sources and one for groundwater sources (Section 5.1). Then, the evidence and analysis supporting these key findings is presented (Section 5.2).

5.1 Key findings from water resources assessment

The water resources assessment highlights the extent to which the NE REZ development may place pressure on the regulated surface water and groundwater sources in the NE REZ and along the NRNIP corridor.

Table 5-1 shows the summary of key findings from the water resources assessment for the regulated surface water sources that are relevant to the geographic scope. This summary shows that:

- The regulated surface water sources that may come under pressure are primarily the:
  - Peel Regulated River Source which flows through Tamworth LGA and may be a water source for the NE REZ projects and the NRNIP in this LGA. This source is already under pressure as noted in the latest compliance assessment report (2022-23).[15] There are currently 4 NE REZ projects that may be in Tamworth near the Peel Regulated River Source. The Study assumes all projects are approved and commence construction based on current planned timelines and NE REZ water demand would come from the Peel Regulated River Source (in line with the LGA geographic unit of analysis). This may not be the case as it will depend on the timing of relevant approvals, the specific location the NE REZ projects, and how they opt to meet their water requirements.[16]
  - Hunter Regulated River Source which flows through Upper Hunter, Muswellbrook and Singleton LGAs. While this source is currently not fully utilised (based on historical data) and the additional volumes from NE REZ development relative to historical trends in usage are low, in the context of the water demand from the NE REZ development, and the development of the Hunter-Central Coast REZ, any cumulative impacts between the two REZs need to be understood. Water availability in this system does not fluctuate much across most water years, so the analysis of NSW Water Register data does not highlight any immediate risks under a repeat of the most recent drought. There are opportunities for further investigations (see Section 8).

Table 5-2 shows a summary of key findings from the water resources assessment for the groundwater sources that are relevant to the geographic scope.[17] Overall, while there are many groundwater sources that intersect with the geographic scope of the Study, there are only a few groundwater sources that are likely to be potential sources of water for the NE REZ projects and NRNIP (based on spatial proximity). Of those groundwater sources identified in the Study that may be accessible to the NE REZ development, extractions do not appear to be nearing the long-term annual average extraction limits (LTAAEL). If they were nearing these limits, there would be a risk that additional water demand from the NE REZ development would trigger compliance action (i.e., reduced AWD in subsequent years) which would create third party impacts on other users. This suggests that at the groundwater source level, if groundwater sources are suitable for NE REZ projects (i.e., suitable salinity and mineral content), and proponents were to acquire aquifer access licences to

[15] NSW Government. *LTAAEL compliance assessment for Peel Regulated River Water Source.* Available at: LTAAEL compliance assessment for Peel Regulated River Water Source.

[16] See also Section 4. This assumption applies to all non-REZ and REZ projects included in the analysis.

[17] 30 groundwater sources were included in the Study which was based on those that could be identified from the spatial data available and for which there was matching data on the NSW Water Register.

meet their water needs, third party impacts on other water users are unlikely. However, impacts are assessed at a bore scale (including impacts on third party bores, connected surface water sources and aquifers, and groundwater dependent ecosystems), so more granular investigations of impacts may be required once more certain information about project locations is available.[18] In addition, market activity in these groundwater sources is extremely low. Low market activity may result in proponents being unable to acquire allocation or water access licences via trade on the open market even if there is sufficient water available.

Another key issue likely relates to the volumes held under local water utility licences and town water supply licences, the storage capacity and the extent to which these water supplies can accommodate additional potable demand. The volumes of local water utility licences shown in Table 5-2 are based on the NSW Water Register data and reflect the volume held within the groundwater source (i.e., not by specific local water utilities).

This is especially the case in LGAs in the east of the NE REZ that are highly reliant on unregulated and groundwater sources, Armidale, Walcha and Uralla. Across these three LGAs, the additional potable and non-potable demand from NE REZ development could be 46 ML/d in 2031 (16,790 ML per year). Towns and communities within these LGAs are likely even more reliant on groundwater sources during dry periods when storages may be depleted and unregulated sources are either constrained or not available. Therefore, if the NE REZ development coincides with a dry period, there may be challenges with meeting the additional demand.

Further engagement with the respective local councils and investigations into the specific water supply and access arrangements for the towns and communities that will be directly impacted by the NE REZ development are required (see Section 8). This needs to be undertaken in the context of the available water treatment and water network capacity (see Section 6).

Alternative water supplies include some recycled water production in the LGAs. Based on the information available to the Study there are no confirmed plans for recycled water production to increase. The volumes of recycled water production are relatively consistent in most LGAs, which indicates there may be established commitments for the recycled water currently produced. In others (like the Upper Hunter), recycled water production has increased over time. This may indicate that there is excess capacity or flexibility in their recycled water supply / usage, potentially allowing for repurposing.

From a water demand perspective, to demonstrate a range of potential outcomes, estimates of the water demand (potable and non-potable) from NE REZ development were generated for average water demand (potable and non-potable) and peak water demand (potable and non-potable). The differences between the average water demand and peak water demand highlight what the typical demand may be as an average across a year (average water demand). While the peak water demand demonstrates the potential demand if there is a small number of consecutive days when demand for potable water is extremely high.

The estimates of water demand (potable and non-potable) from NE REZ development project that the year in which the largest volume of water may be required will be in 2031, the last year of Stage 1. The projected volume is 182.2 ML/d (average water demand) and 247.9 ML/d (peak water demand). This is 61.1 ML/d higher than under the base case in 2031.

The composition of the additional water demand is evenly balanced between potable and non-potable. The water demand estimates generated in the Study indicate that in 2031 58% (35.2 ML/d) of the additional water demand under NE REZ development is for potable water, while the remaining 42% (25.9 ML/d) is for non-potable water. This additional water demand is largely driven by REZ projects, with REZ projects demanding additional water of 34.8 ML/d by 2031, compared to the additional water use demands attributed to the NRNIP requiring a peak of 0.6 ML/d by 2028. Overall water consumption shows an upward trend from 2023 to 2031, driven primarily by consistent population growth and base case water demands.

[18] As noted in Section 2.2.2, GDPs responsible for securing their own water access, including any water access licences, share component and works approvals to extract water.

The estimated increase in potable water demand is influenced by the assumptions around potable water use in concrete production. See Section 6 for further details and discussion.

Given the need for large volumes of additional water, these findings indicate that close engagement with the local councils will be necessary, as well as exploration of ways in which the NRNIP and NE REZ projects may be able to integrate water treatment facilities on site.

Table 5-1: Key findings summary from the water resources assessment – Regulated surface water sources

	Regulated surface water sources where issues may arise from NE REZ development				
LGA	**Relevant water sources**	**Most water years**	**Reduced demand: NE REZ projects with high and medium likelihood to proceed, most water years**	**Reduced demand: NE REZ projects with high likelihood to proceed, most water years**	**Extremely dry: Repeat of most recent drought (2017-2020)**
Intersects with the NE REZ only					
Inverell	**NSW Border Rivers Regulated River Source**	**Unlikely:** Generally, utilisation is below 50%, and there are 0 NE REZ projects planned in this LGA that may draw from this source.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	**Unlikely:** Increased utilisation during the most recent drought (95% in 2018-19). However, there are no NE REZ projects planned in this LGA, so no influence under this sensitivity.
	Gwydir Regulated River Source	**Unlikely:** While in some water years, the Gwydir is highly utilised, there are 0 NE REZ projects planned in this LGA that may draw from this source.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	**Unlikely:** Increased utilisation during the most recent drought (88% in 2018-19). However, there are 0 NE REZ projects planned in this LGA, so no influence under this sensitivity.
Tenterfield	**NSW Border Rivers Regulated River Source**	**Unlikely:** Generally, utilisation is below 50%, and there are 0 NE REZ projects planned in this LGA that may draw from this source.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	There are no NE REZ projects planned in this LGA, so no influence from reduced demand under this sensitivity.	**Unlikely:** High utilisation in the most recent drought (95% in 2018-19). There are no NE REZ projects planned in this LGA that may draw from this source.
Glen Innes Severn	No regulated surface water sources				
Intersects with the NE REZ and impacted by the NRNIP					
Armidale	No regulated surface water sources				
Uralla	No regulated surface water sources				
Walcha	No regulated surface water sources				
Tamworth	**Upper Namoi Regulated River Source**	**Unlikely:** While in most water years, this source is highly utilised, there are 0 NE REZ projects planned in this LGA that may draw from this source (based on spatial proximity).	There are no NE REZ projects planned in this LGA that may draw from this source, so no influence from reduced demand under this sensitivity.	There are no NE REZ projects planned in this LGA that may draw from this source, so no influence from reduced demand under this sensitivity.	**Unlikely:** Increased utilisation during the most recent drought (75% in 2018-19). However, based on spatial proximity, there are 0 NE REZ projects planned in this LGA that may draw from this source.
	Peel Regulated River Source	**Area for further investigation:** There are 4 NE REZ projects planned in this LGA, which is also impacted by NRNIP, that may draw from this source. Highest projected average water demand from NE REZ development (i.e., above base case) is 14.4 ML/d (2031), or 5,256 ML per year. Highest projected average water demand (potable) from NE REZ development (i.e., above base case) is 9.7 ML/d (2031), or 22% of the volume of local water utility licences in this system. (See commentary related to the influence of concrete production on the water demand estimates).	**Area for further investigation:** There are 4 NE REZ projects planned in this LGA that are high or medium likelihood to proceed and may draw from this source. No change from most water years.	**Area for further investigation:** There are 0 NE REZ projects planned in this LGA categorised as high likelihood, so potential demand from NE REZ development will only be from the NRNIP.	**Area for further investigation:** There are 4 NE REZ projects planned in this LGA, which is also impacted by NRNIP, that may draw from this source. Highest projected average water demand from NE REZ development (i.e., above base case) is 14.4 ML/d (2031), or 5,256ML per year. Which is about the same volume used in 2019-20 from this system (based on NSW Water Register data). (See commentary related to the influence of concrete production on the water demand estimates).
Outside of NE REZ, but impacted by the NRNIP					
Liverpool Plains	No regulated surface water sources				

	Regulated surface water sources where issues may arise from NE REZ development				
LGA	**Relevant water sources**	**Most water years**	**Reduced demand: NE REZ projects with high and medium likelihood to proceed, most water years**	**Reduced demand: NE REZ projects with high likelihood to proceed, most water years**	**Extremely dry: Repeat of most recent drought (2017-2020)**
Upper Hunter	**Hunter Regulated River Source**	**Area for further investigation:** Generally, utilisation is low (less than 40%). There are 0 NE REZ projects planned in this LGA, so any additional water demand on this water source from NE REZ development is from the NRNIP. Highest projected average water demand from NE REZ development (i.e., above base case) is 0.6 ML/d (2028). In addition, the Hunter-Central Coast REZ is planned for downstream in this source which may create cumulative impacts that need to be understood.	**Area for further investigation:** Generally, utilisation is low (and activation). The NRNIP in this LGA is categorised as high likelihood of proceeding. Issues are consistent with those reported under 'most water years'.	Not applicable given findings reported to the left.	**Area for further investigation:** Increased utilisation during the most recent drought (~50% 2017-2020). If the Hunter-Central Coast REZ planned for downstream in this source created cumulative impacts in most water years, these would be exacerbated in low water availability conditions.
Muswellbrook	**Hunter Regulated River Source**	**Area for further investigation:** Generally, utilisation is low (less than 40%). There is 1 NE REZ project planned in this LGA. The NRNIP corridor also runs through this LGA. Highest projected average water demand from NE REZ development (i.e., above base case) is 0.2 ML/d (20328), or 73 ML per year. In addition, the Hunter-Central Coast REZ is planned for downstream in this source which may create cumulative impacts that need to be understood.	**Area for further investigation:** Generally, utilisation is low (and activation). The 1 NE REZ project and the NRNIP in this LGA is categorised as high likelihood of proceeding. Risks relate to the interdependency with Hunter-Central Coast REZ.	**Area for further investigation:** Generally, utilisation is low (and activation). The 1 NE REZ project and the NRNIP in this LGA is categorised as high likelihood of proceeding. Risks relate to the interdependency with Hunter-Central Coast REZ.	**Area for further investigation:** Increased utilisation during the most recent drought (~50% 2017-2020). If the Hunter-Central Coast REZ planned for downstream in this source created cumulative impacts in most water years, these would be exacerbated in low water availability conditions.
Singleton	**Hunter Regulated River Source**	**Area for further investigation:** Generally, utilisation is low (less than 40%). There is 1 NE REZ project planned in this LGA. Highest projected average water demand from NE REZ development (i.e., above base case) is 0.1 ML/d (2031), or 36.5 ML per year. In addition, the Hunter-Central Coast REZ is planned for downstream in this source which may create cumulative impacts that need to be understood.	Not applicable. The 1 NE REZ project in this LGA is categorised as low likelihood of proceeding.	Not applicable. The 1 NE REZ project in this LGA is categorised as low likelihood of proceeding.	**Area for further investigation:** Increased utilisation during the most recent drought (~50% 2017-2020). If the Hunter-Central Coast REZ planned for downstream in this source created cumulative impacts in most water years, these would be exacerbated in low water availability conditions.

Note: Utilisation numbers quoted in the table are based on the NSW Government's utilisation dashboard available at: Utilisation dashboard | NSW Government Water

Table 5-2: Key findings summary from the water resources assessment – Groundwater sources

		Groundwater sources where issues may arise from NE REZ development			
LGA	Sources that may come under pressure from NE REZ development	Most water years	Reduced demand: NE REZ projects with high and medium likelihood to proceed, most water years	Reduced demand: NE REZ projects with high likelihood to proceed, most water years	Extremely dry: Repeat of most recent drought (2017-2020)
Intersects with the NE REZ only					
Inverell	No NE REZ projects nor parts of the NRNIP corridor are located in these LGAs.				
Tenterfield					
Glen Innes Severn					
Intersects with the NE REZ and impacted by the NRNIP					
Armidale **Uralla** **Walcha**	▪ **New England Fold Belt Coast Groundwater Source** ▪ **New England Fold Belt MDB Groundwater Source**	**Likely impacts:** Towns in these LGAs are likely reliant on these groundwater sources. **NE Fold Belt Coast:** There is 340 ML of local water utility or town water supply licences. **NE Fold Belt MDB:** There is 1,418 ML of local water utility or town water supply licences. Given the large demand for potable water from NE REZ development, in these LGAs, a more detailed understanding of where there is supply capacity is required.	**No change from most water years:** All except for 1 NE REZ project in these LGAs are categorised as high and medium likelihood to proceed.	**Reduced impacts:** Only 1 NE REZ project is categorised as high likelihood to proceed, along with the NRNIP which impacts all three LGAs.	**Likely impacts:** Towns in these LGAs are likely more reliant on these groundwater sources when surface water availability is constrained, especially towns that may source water from unregulated systems. Given the large demand for potable water from NE REZ development, in these LGAs, a more detailed understanding of supply constraints is required.
Tamworth	▪ **New England Fold Belt Coast Groundwater Source**	**Possible impacts:** Towns in this LGA may be reliant on this groundwater source. There is 340 ML of local water utility or town water supply licences in this source. Given the large demand for potable water from NE REZ development, in this LGA, a more detailed understanding of where there is supply capacity is required. Impacts likely to be less than in Uralla, Walcha and Armidale because the Peel Regulated River Source could provide an alternative water source. (See above for issues associated with the Peel Regulated River Source).	**No change from most water years:** All NE REZ projects are categorised as medium likelihood to proceed.	**Reduced impacts:** None of NE REZ projects are categorised as high likelihood to proceed. Water demand will only be from the NRNIP.	As above.
Outside of NE REZ, but impacted by the NRNIP					
Liverpool Plains	▪ **Gunnedah-Oxley Basin MDB Groundwater Source**	**Impacts unlikely:** Towns in this LGA maybe reliant on this groundwater sources. There is 480 ML of local water utility in this source. However, additional demand for potable water from NE REZ development, in this LGA, is low.	**No change from most water years:** There are no NE REZ projects in this LGA, only the NRNIP.	**No change from most water years:** There are no NE REZ projects in this LGA, only the NRNIP.	**Impacts unlikely:** Additional demand for potable water from NE REZ development, in this LGA, is low.
Upper Hunter	▪ **Liverpool Ranges Basalt Coast Groundwater Source**	**Impacts unlikely:** There are no local water utility or town water supply licences in these groundwater sources. And, additional demand for potable water from NE REZ development, in this LGA, is low.	**No change from most water years:** There are no NE REZ projects in this LGA, only the NRNIP.	**No change from most water years:** There are no NE REZ projects in this LGA, only the NRNIP.	**Impacts unlikely:** There are no local water utility or town water supply licences in these groundwater sources.

		Groundwater sources where issues may arise from NE REZ development			
LGA	Sources that may come under pressure from NE REZ development	Most water years	Reduced demand: NE REZ projects with high and medium likelihood to proceed, most water years	Reduced demand: NE REZ projects with high likelihood to proceed, most water years	Extremely dry: Repeat of most recent drought (2017-2020)
	▪ **Liverpool Ranges Basalt MDB Groundwater Source** ▪ **Sydney Basin-North Coast Groundwater Source**	See below for Sydney Basin-North Coast Groundwater Source.			
Muswellbrook	▪ **Liverpool Ranges Basalt Coast Groundwater Source** ▪ **Sydney Basin-North Coast Groundwater Source**	**Impacts unlikely:** There is 1 NE REZ project planned in this LGA. The NRNIP corridor also runs through this LGA. If NE REZ development were to draw from this source, additional water demand is low. **Further investigation required:** Could be a source of water for the Hunter-Central Coast REZ. Any cumulative impacts need to be understood.	The 1 NE REZ project and the NRNIP in this LGA is categorised as high likelihood of proceeding. Risks relate to the interdependency with Hunter-Central Coast REZ.	The 1 NE REZ project and the NRNIP in this LGA is categorised as high likelihood of proceeding. Risks relate to the interdependency with Hunter-Central Coast REZ.	**Further investigation required**: The 1 NE REZ project and the NRNIP in this LGA is categorised as high likelihood of proceeding. Risks relate to the interdependency with Hunter-Central Coast REZ.
Singleton	▪ **Sydney Basin-North Coast Groundwater Source:**	**Impacts unlikely:** There is only 1 NE REZ project in this LGA. If it were to draw from this source, additional water demand is low. **Further investigation required:** Could be a source of water for the Hunter-Central Coast REZ. Any cumulative impacts need to be understood.	Not applicable. The 1 NE REZ project in this LGA is categorised as low likelihood of proceeding.	Not applicable. The 1 NE REZ project in this LGA is categorised as low likelihood of proceeding.	**Impacts unlikely:** There is only 1 NE REZ project in this LGA. If it were to draw from this source, additional water demand is low. **Further investigation required**: Could be a source of water for the Hunter-Central Coast REZ. Any cumulative impacts need to be understood.

Note 1: Volumes of local water utility and town water supply access licences relate to the groundwater source and may not be available to the LUWs in all LGAs.

Note 2: Groundwater impacts are assessed at a bore scale (including impacts on third party bores, connected surface water sources and aquifers, and groundwater dependent ecosystems), so more granular investigations of impacts may be required once more certain information about project locations is available. As noted in Section 2.2.2, GDPs are responsible for securing their own water access, including any water access licences, share component and works approvals to extract water.

5.2 Evidence and analysis

The commentary with the evidence and analysis is structured as follows:

- Water availability and usage across the regulated surface water and groundwater systems relevant to the NE REZ and NRNIP. This commentary provides insights into how water availability changes over time and how this compares to water usage. The underlying data is drawn from the NSW Water Register so is reported against licence categories rather than specific water uses. The term 'water available' is used to recognise that water availability in a given water year reflects various water allocation and sharing rules, including allocations to water access licences (AWD), and where permitted, carryover[19] and water trading.
- Water availability and usage for LWU and Town Water Supply licences across the regulated surface water and groundwater systems relevant to the NE REZ and NRNIP. The underlying data is drawn from the NSW Water Register.
- Recycled water production by LWUs.
- Potential sources of additional water supply.
- Estimates of the water demand (potable and non-potable) generated in the Study.

This analysis is synthesised in the water resources assessment presented above in Section 5.1.

5.2.1 Water available and usage across regulated surface water and groundwater systems

This section explores raw water supplies that are relevant to the NE REZ and NRNIP corridor by presenting the analysis of the NSW Water Register data on water availability, water usage, utilisation and water market trade activity. As summarised in Section 3.5 the two types of water systems relevant to the Study are regulated surface water and groundwater.

Regulated surface water sources are present in western parts of the NE REZ and at the southern end of the NRNIP corridor. Groundwater sources are generally present throughout the NE REZ and along the NRNIP corridor.

The underlying data is drawn from the NSW Water Register and / the relevant publicly available dashboards which capture water data based on water systems. Readers should keep in mind that the water available, usage, utilisation and market trading information presented reflect all relevant water access licences within the water sources, and are not solely confined to the geographic scope of the Study.

5.2.1.1 Water availability and usage

As discussed in Section 3, the water available in any given year is heavily influenced by the volume of the share component held across the licence categories in each water source and the available water determination (AWD). It is also influenced by any carryover or trading rules in sources where permitted. The water available and usage information presented below is based on the NSW Water Register and / the relevant publicly available dashboards which aggregate water available and usage at the licence category level.

[19] Carryover allows water access licence holders to carryover water from one season to the next, generally subject to account limits. Carryover contributes to the volume of water that could be extracted/used in a given year.

5.2.1.1.1 Regulated surface water sources

Figure 5-1 shows the estimated water available and account usage in the regulated surface water systems relevant to the geographic scope of the Study between 2010-11 and 2023-24. The key takeaways from this chart are:

- Across the five regulated river sources, water availability has varied from around 1,400,000 ML (2021-22) to less than a quarter of this volume (2019-20).
- The main driver of the changes in the water available for use is the climate, which is then reflected in AWDs. This is shown in severely reduced water availability in the early 2000s (the Millenium Drought), the dry period between 2014-15 and 2015-16 and the most recent drought (2017-20). As discussed in Section 3, the AWD for licence categories that are a lower priority are affected first, this is generally regulated river (general security) licences.
- Across the five regulated river sources, water usage fluctuates in line with water availability. That is, more water is used when there is more availability. The largest water usage shown was in 2013-14 when around 700,000 ML was used. The lowest water usage shown was in 2019-20 and 2020-21 when less than 200,000 ML was used.
- Following a dry period, it can often take two years before usage increases again. This likely reflects agricultural usage for annual crops, demand from which fluctuates based on the area of plantings.

Figure 5-2 shows the same water availability versus usage charts for each of the regulated river sources. These charts show similar trends to Figure 5-1 (combined regulated river sources). Overall, the key takeaway from these charts is that if the NE REZ development were to coincide with a dry period in the regulated river sources, depending on the volume of the additional water demand, the development could place pressure on these sources. The exception is the Hunter Regulated River Source which has fairly consistent water availability.

5.2.1.1.2 Groundwater sources

Figure 5-3 shows the estimated water available in the groundwater systems that intersect with the geographic scope of the Study between 2010-11 and 2023-24. The key takeaways from this chart are:

- The main driver of the changes in water available is the timing of when the water sharing plans for the groundwater sources included in the Study came into effect. In other words, 2016-17 was the first year in which water sharing plans were in place for all groundwater sources that intersect with the LGAs in the geographic scope and from this time there is a complete dataset.
- The other driver of changes in water available is the carryover rules in each groundwater source. Carryover allows water access licence holders to carryover water from one season to the next, generally subject to account limits. Carryover contributes to the volume of water that could be extracted.
- Extractions (usage) from groundwater sources fluctuate over time. This is often due to changes in surface water availability. For water users who have access to both surface water and groundwater, when surface water availability is high, groundwater usage is low because it is more expensive to extract. And vice versa. This is shown in Figure 5-3 when during the most recent drought, in 2017-20 groundwater usage increased, then declined in 2020-21 and 2022-23 once surface water availability increased again. Readers should note that in NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete.

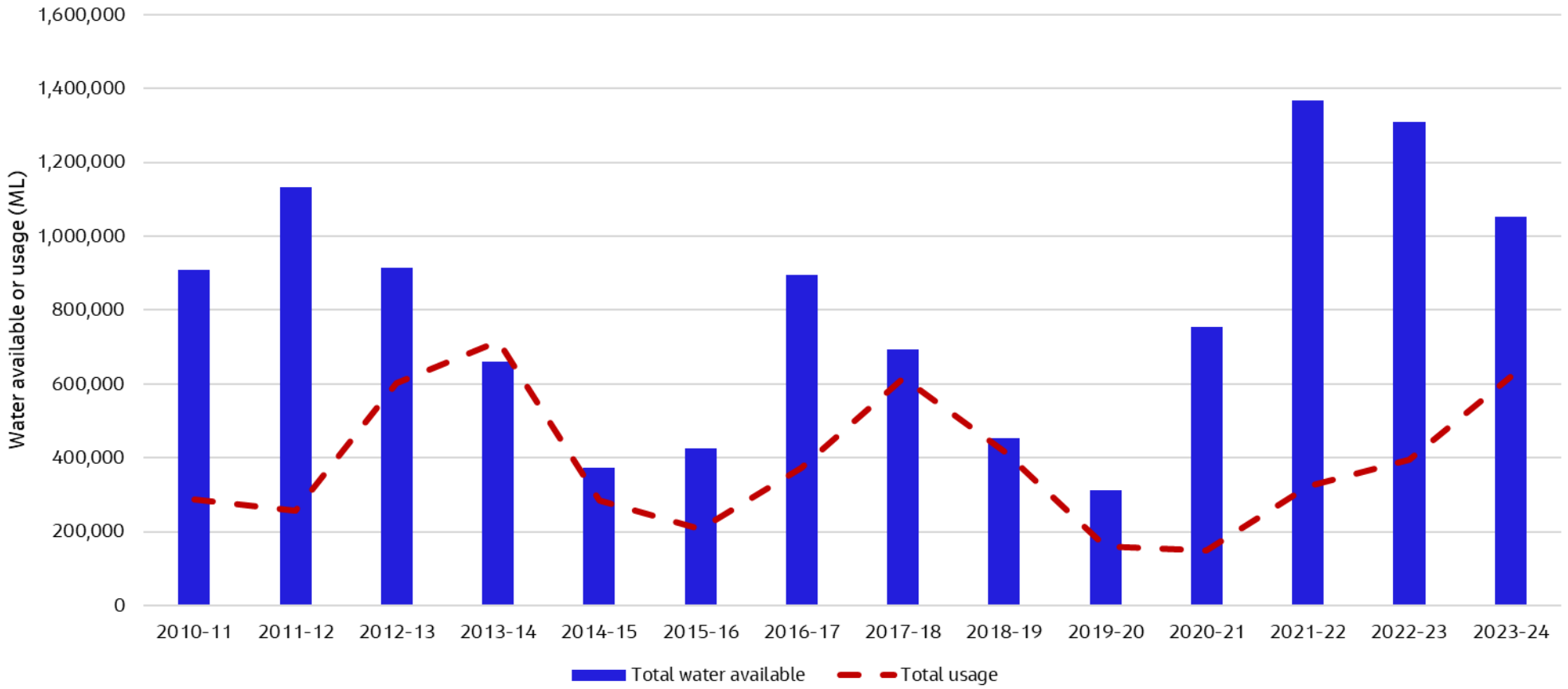
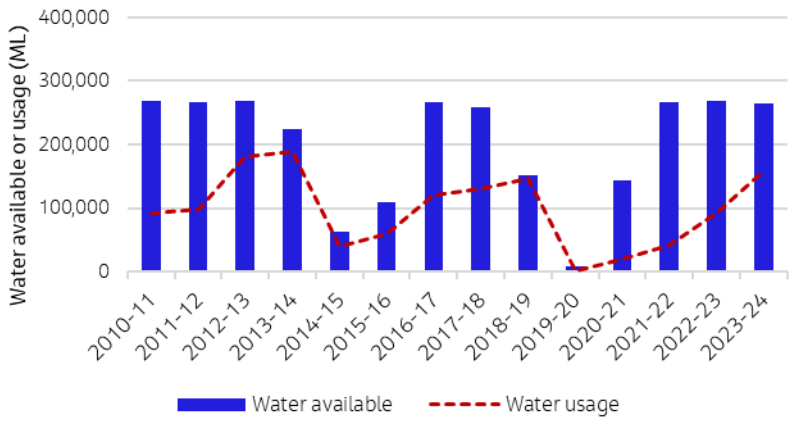


Figure 5-1: Estimated water available across regulated surface water sources relevant to the geographic scope of the Study (2010-11 to 2023-24)

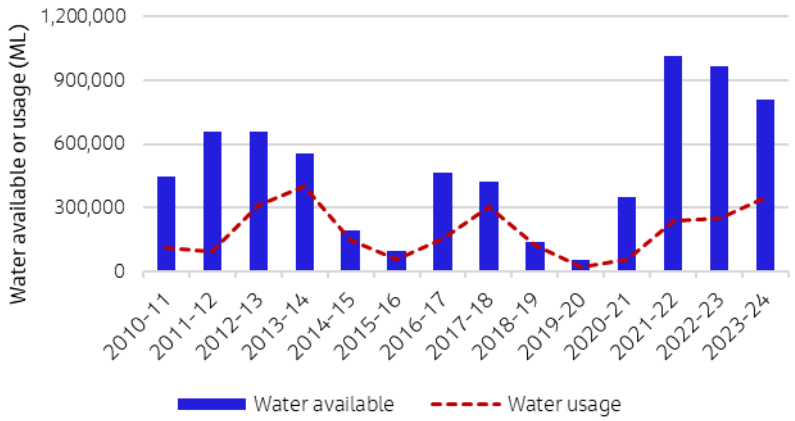
Source: Based on data from Utilisation dashboard | NSW Government Water, extracted June 2025 .

Note 1: Chart starts at 2010-11 because this is when water sharing plans were in place for all the regulated river sources shown.

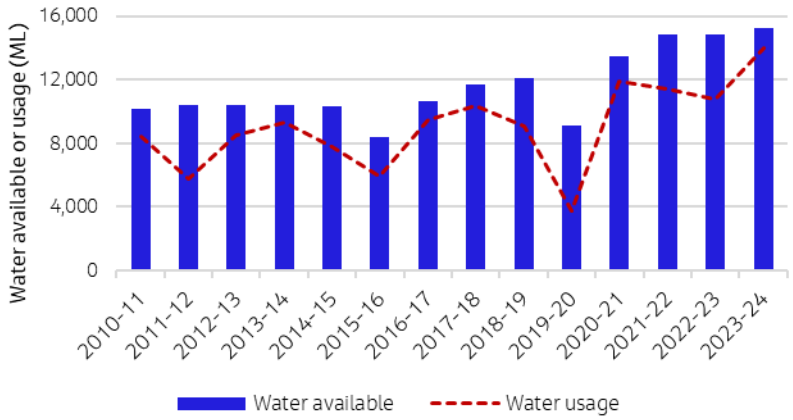
NSW Border Rivers Regulated River Source



Gwydir Regulated River Source



Upper Namoi Regulated River Source



Hunter Regulated River Source

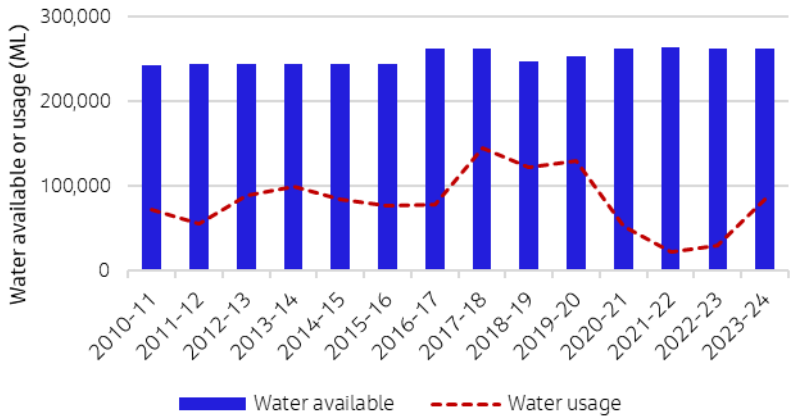


Figure 5-2: Estimated water available and account usage across regulated surface water sources (by source) relevant to the geographic scope of the Study (2010-11 to 2023-24)

Source and notes: See next page for continuation of Figure 5-2.

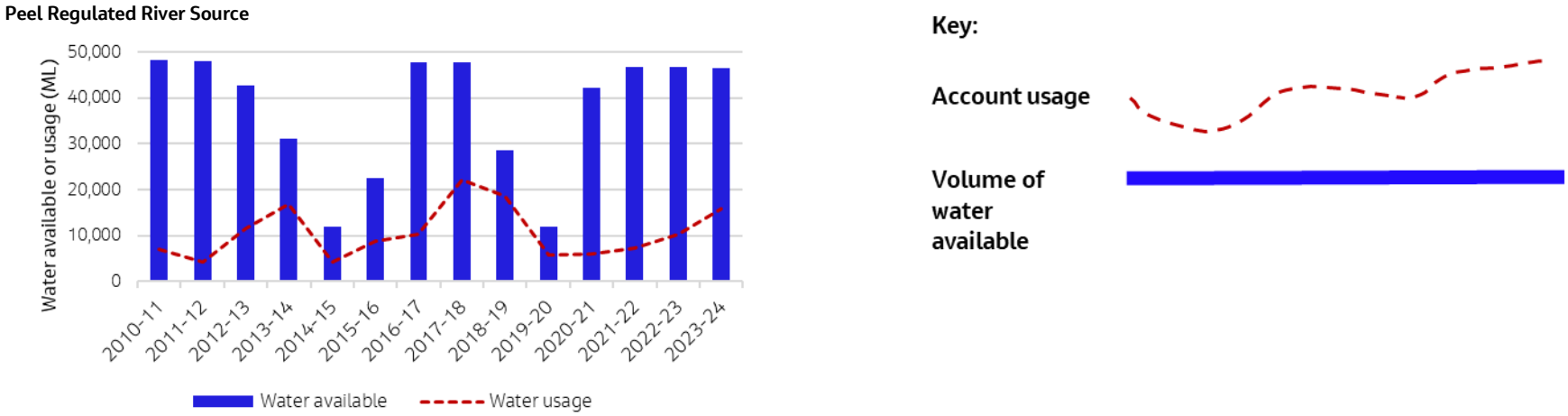


Figure 5-2 continued: Estimated water available and account usage across regulated surface water sources (by source) relevant to the geographic scope of the Study (2010-11 to 2023-24)

Source: Based on data from Utilisation dashboard | NSW Government Water, extracted June 2025.

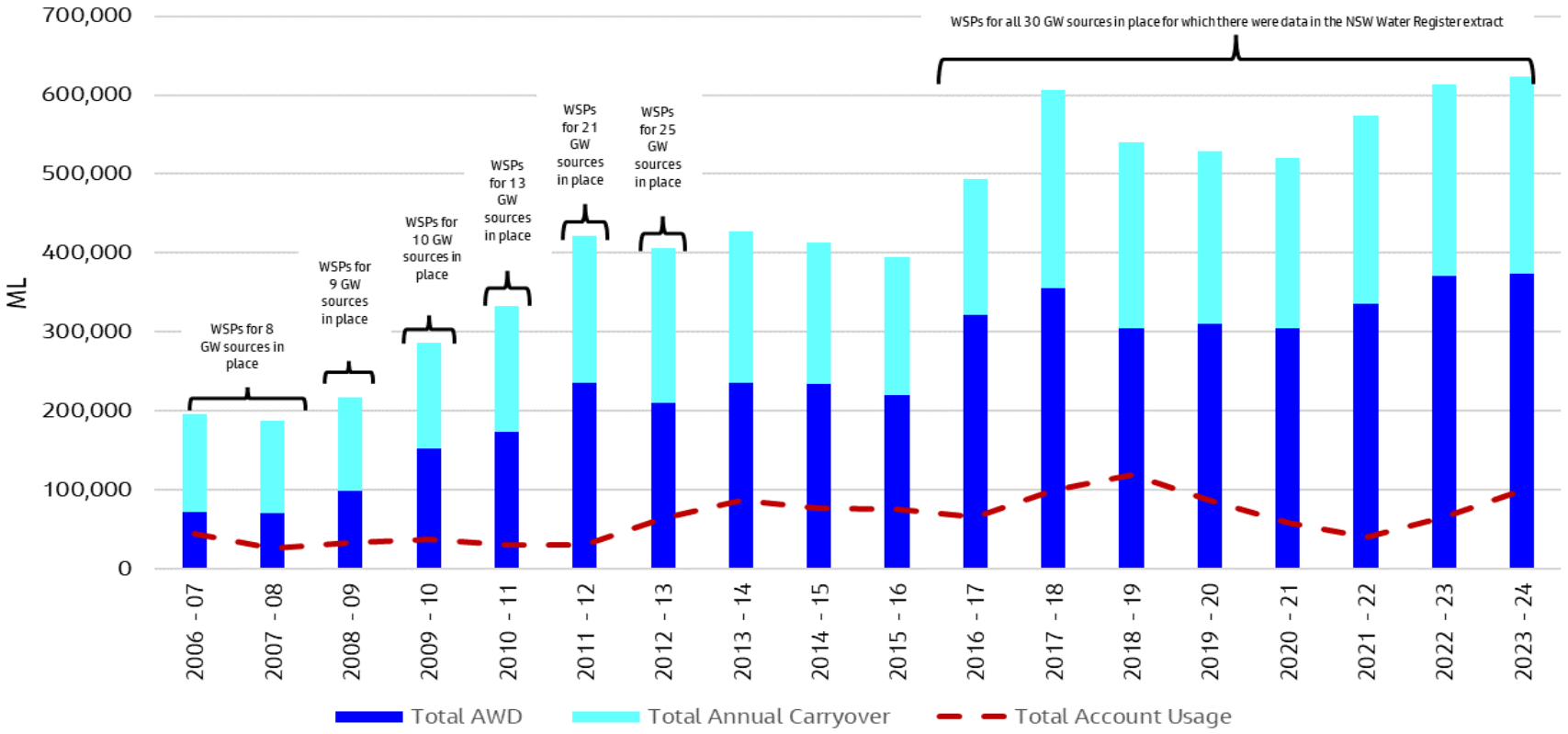


Figure 5-3: Estimated water available and account usage across groundwater systems that intersect with the geographic scope of the Study (2006-07 to 2023-24)

Source: Based on data extract from the NSW Water Register provided by NSW DCCEEW.

Note 1: Water available = AWD + carryover. Water available in accounts may be less than shown in some years due to specific rules in the water sharing plans that limit the volume that can be held in accounts for certain licences.

Note 2: Groundwater sources included reflect those for which data were available in the NSW Water Register extract. In NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete.

Note 3: Licence categories included are: Aquifer, Aquifer [High Security], Aquifer (General Security), Aquifer [Aboriginal Cultural], Aquifer [Town Water Supply], Domestic and Stock, Domestic and Stock [Domestic], Domestic and Stock [Stock], Domestic and Stock [Town Water Supply], Local Water Utility, Local Water Utility [Domestic and Commercial], Major Utility, Major Utility [Power generation], Major Utility [Urban Water].

5.2.1.1.3 Summary of water availability and usage

To summarise how water availability and usage fluctuate over time, Table 5-3 (regulated surface water sources) shows a summary of water availability and usage, including the average availability / usage, and the highest / lowest availability / usage. The key takeaway is that for all regulated river sources, except the Hunter Regulated River Source, water availability and usage fluctuate a lot based on overall climatic conditions. This highlights the potential risk that if NE REZ development coincides with low water availability, the additional water demand could place pressure on these systems.

Table 5-3: Summary of water available and usage between 2010-11 and 2023-24 for regulated water sources relevant to the geographic scope of the Study

Regulated surface water source	Water available (2010-11 to 2023-24)			Usage (2010-11 to 2023-24)		
	Average (ML)	Highest (ML)	Lowest (ML)	Average (ML)	Highest (ML)	Lowest (ML)
NSW Border Rivers Regulated River	201,906	268,854 (2012-13)	7,771 (2019-20)	97,856	189,676 (2013-14)	1,059 (2019-20)
Gwydir Regulated River	487,370	1,015,617 (2021-22)	51,348 (2019-20)	186,897	400,872 (2013-14)	21,000 (2019-20)
Peel Regulated River	37,313	48,280 (2010-11)	11,946 (2014-15)	10,593	22,053 (2017-18)	4,219 (2011-12)
Upper Namoi Regulated River	11,339	15,227 (2023-24)	8,355 (2015-16)	11,339	14,016 (2023-24)	3,744 (2019-20)
Hunter Regulated River	252,627	263,334 (2020-21)	241,913 (2010-11)	81,972	145,275 (2017-18)	22,688 (2021-22)

Source: Based on data from Utilisation dashboard | NSW Government Water, extracted June 2025.

Note 1: Regulated river sources - Water access licence categories included are (where applicable): Regulated river (high security), Regulated river (general security), Regulated river (general security A), Regulated river (general security B), Domestic and stock, Domestic and stock [stock], Domestic and stock [domestic], Local water utility, Major utility [power generation]

5.2.1.2 Activation and utilisation rates (regulated surface water) and risk of over extraction (groundwater)

Utilisation and activation of water access licences provides an indication of the extent to which the water available in a given year is actually used. It therefore provides useful context around the extent to which there may be supply that can support NE REZ development.

5.2.1.2.1 Regulated surface water sources

Table 5-4 presents the utilisation and activation rates for the five regulated river sources as reported on the NSW Government's publicly available utilisation dashboard. The activation rates and utilisation rates are defined as:

- The activation rate is the volume of water take including trade out as a percentage of the quantity of share component for each regulated river licence.[20]
- The utilisation rate is calculated as the water availability plus trade in from external water sources against account usage and trade out to external water sources.[21]

The cells highlighted grey show those water years in which activation rates and utilisation rates were above 70%. These data show that:

[20] NSW Government. *Utilisation Dashboard*. Available at: Utilisation dashboard | NSW Government Water

[21] NSW Government. *Utilisation Dashboard*. Available at: Utilisation dashboard | NSW Government Water

- For all regulated river systems except the Upper Namoi, activation rates and utilisation rates are generally below 70%. This indicates that in most years there is likely to be supply over and above historical usage.
- Utilisation rates tend to increase during years of lower water availability. For example, during the most recent drought (2017-2020) in the Gwydir was 73% (2017-18) and 88% (2018-19), much higher than years when more water is available.
- Utilisation and activation rates tend to be the highest in the Upper Namoi of the five regulated river sources. This indicates that if NE REZ development required water from this source it may come under pressure.
- The data below show that the Peel Regulated River Source is typically not fully utilised. However, these data are annual data rather than being based on the LTAAEL. The last LTAAEL compliance report for Peel Regulated Water Source was done for 2022-23. The compliance report shows while the usage within the Peel Regulated River Source did not exceed the LTAAEL, it was close to the LTAAEL.[22] This indicates that there may be risks in this system if usage continues to increase. Tamworth Regional Council and NSW DCCEEW are working together to address this issue.

Table 5-4: Activation rates and utilisation rates for regulated surface water sources relevant to the geographic scope of the Study (2004-05 to 2023-24)

Water year	NSW Border Rivers Regulated River		Gwydir Regulated River		Peel Regulated River		Upper Namoi Regulated River		Hunter Regulated River	
	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)
2004-05			6%	19%			66%	66%	60%	56%
2005-06			26%	52%			66%	66%	74%	70%
2006-07			24%	95%			78%	79%	39%	69%
2007-08			7%	25%			35%	69%	21%	20%
2008-09			17%	70%			37%	72%	33%	27%
2009-10	24%	62%	8%	75%			39%	58%	53%	43%
2010-11	26%	26%	20%	24%	14%	14%	81%	83%	36%	30%
2011-12	27%	27%	18%	14%	9%	9%	55%	56%	28%	23%
2012-13	60%	59%	59%	47%	24%	27%	82%	82%	45%	37%
2013-14	61%	73%	75%	72%	35%	54%	90%	89%	50%	41%
2014-15	14%	60%	28%	77%	9%	36%	74%	75%	43%	35%
2015-16	19%	46%	10%	58%	18%	39%	56%	71%	39%	32%
2016-17	41%	41%	29%	33%	30%	30%	82%	89%	40%	30%
2017-18	47%	48%	57%	73%	47%	47%	85%	89%	73%	55%
2018-19	53%	94%	23%	88%	39%	65%	75%	75%	61%	49%
2019-20	0%	11%	4%	41%	12%	48%	31%	41%	65%	51%
2020-21	7%	13%	11%	16%	13%	14%	97%	88%	27%	20%
2021-22	14%	14%	45%	24%	15%	15%	90%	77%	11%	9%
2022-23	27%	27%	39%	23%	22%	22%	84%	72%	15%	12%

[22] NSW Government. *LTAAEL compliance assessment for Peel Regulated River Water Source.* Available at: LTAAEL compliance assessment for Peel Regulated River Water Source.

Water year	NSW Border Rivers Regulated River		Gwydir Regulated River		Peel Regulated River		Upper Namoi Regulated River		Hunter Regulated River	
	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)	Activation rate (%)	Utilisation (%)
2023-24	47%	41%	54%	34%	36%	35%	108%	91%	42%	31%

Source: NSW Government. *Utilisation Dashboard.* Available from: Utilisation dashboard | NSW Government Water

Note 1: The activation rate is the volume of water take including trade out as a percentage of the quantity of share component for each regulated river licence.

Note: 2: The utilisation rate is calculated as the water availability plus trade in from external water sources against account usage and trade out to external water sources.

Note 3: Cells highlighted grey show activation rate of utilisation rate equal to or greater than 70%.

5.2.1.2.2 Groundwater water sources

In the case of groundwater sources, to understand the extent to which there may be water available above historical usage trends, useful metrics include:

- the difference between the long-term average extraction limit (LTAAEL) and usage.
- the extent to which the share component aligns with the LTAAEL.

The LTAAEL is a mechanism by which extraction from groundwater sources is managed. The LTAAEL is set out in the respective water sharing plan.

Each water sharing plan sets out how the LTAAEL is applied (generally as a rolling five-year average). If the LTAAEL is exceeded, compliance action can occur. Compliance actions typically involve a reduction in AWD in subsequent years to bring extraction back into line with the water sharing plan. In the context of NE REZ development, should demand from NE REZ development increase extractions from groundwater during the construction time so that compliance actions were implemented, this would mean NE REZ development would have third party impacts. That is, NE REZ development will have contributed to reduced water access for existing holders of groundwater licences.

These data in Table 5-5 show that:

- In all groundwater sources that intersect with the geographic scope of the Study, average usage is lower than LTAAEL. This is shown by the negative values in the respective column in Table 5-6.
- In most groundwater sources that intersect with the scope of the Study, the volume of share component is lower than the LTAAEL. This is shown by the negative values in the respective column in Table 5-6.
- For those groundwater sources where the share component is higher than the LTAAEL (shown by the cells highlighted grey), if extractions were to increase for consecutive years the LTAAEL trigger could be reached.

These findings are reinforced by the NSW Government's tracking of groundwater extractions from the systems that are being monitored.[23] The groundwater sources highlighted grey are currently considered to be unlikely or low risk of compliance actions. Readers should note that while the groundwater sources in the Upper Namoi are currently considered to be either unlikely or low risk of compliance action, in the past, extractions from some Upper Namoi groundwater sources have exceeded or been close to exceeding the LTAAEL (e.g., zones 4 and 6).[24] Readers should also note that not all groundwater usage is metered in NSW.

[23] NSW Government. *Status of Groundwater Extraction.* Tracking groundwater extraction against extraction limits | NSW Government Water

[24] NSW Government. *Status of Groundwater Extraction*. Tracking groundwater extraction against extraction limits | NSW Government Water

5.2.1.2.3 Summary of utilisation and risk of exceedance of groundwater sources

Based on the data and analysis in this section, from a water supply perspective:

- In most water years in the relevant regulated river sources, there appears to be additional water supply (shown by low utilisation rates). The exceptions are the Upper Namoi Regulated River Source and the Peel Regulated River Source.
- In the groundwater sources that intersect with the geographic scope, historical extraction levels are generally within LTAAELs. This indicates that there may be capacity for NE REZ development to draw from groundwater. Whether or not this can occur will be dependent on the proximity with which NE REZ projects and the NRNIP are located to specific groundwater sources and whether they have access to aquifer access licences and infrastructure to extract water. It will also be dependent on specific impact assessments because impacts are assessed at a bore scale (including impacts on third party bores, connected surface water sources and aquifers, and groundwater dependent ecosystems), so more granular investigations of impacts may be required once more certain information about project locations is available.[25]
- In line with the summary provided in Section 5.2.1.1.3 on water availability and usage in regulated river sources, the key area of concern for NE REZ development is if the two stages of construction coincide with a dry period similar to the most recent drought in 2017-2020 when utilisation rates increased. During dry periods, extraction from groundwater sources also tends to increase which increases the risk of extractions nearing LTAAELs, potentially leading to third party impacts.

[25] As noted in Section 2.2.2, GDPs responsible for securing their own water access, including any water access licences, share component and works approvals to extract water.

Table 5-5: Summary of the extent to which groundwater sources that intersect with the geographic scope may be at risk of compliance action

Groundwater source[1]	Share component (ML)	LTAAEL (ML)	Average usage (ML)[2] since water sharing plan was in place	Difference between share component and LTAAEL (ML)[3]	Difference between average usage and LTAAEL (ML)
Clarence Moreton Basin Groundwater Source	4,605	300,000	12	-295,395	-299,988
Currabubula Alluvial Groundwater Source	327	60	1	267	-60
Dorrigo Basalt Groundwater Source	609	5,000	No usage recorded	-4,391	No usage recorded
Eastern Recharge Groundwater Source	35,006	17,820	11,547	17,186	-6,273
Gunnedah-Oxley Basin MDB Groundwater Source	27,773	127,500	5,582	-99,727	-121,919
Hunter Regulated River Alluvial Water Source	29,056	29,024	634	32	-28,390
Inverell Basalt Groundwater Source	3,079	4,150	183	-1,071	-3,967
Liverpool Ranges Basalt Coast Groundwater Source	3,477	12,000	155	-8,523	-11,845
Liverpool Ranges Basalt MDB Groundwater Source	422	2,160	10	-1,738	-2,150
Macintyre Alluvial Groundwater Source	1,593	373	25	1,220	-348
Manilla Alluvial Groundwater Source	3,535	1229	115	2,306	-1,114
New England Fold Belt Coast Groundwater Source	17,355	60,000	1,292	-42,645	-58,708
New England Fold Belt MDB Groundwater Source	12,732	39,253	60	-26,521	-39,193
North Coast Volcanics Groundwater Source	3,879	13,000	5	-9,121	-12,996
NSW Border Rivers Downstream Keetah Bridge Alluvial Groundwater Source	485	8,085	1	-7,600	-8,084
NSW Border Rivers Upstream Keetah Bridge Alluvial Groundwater Source	15,402	8,894	4,283	6,508	-4,611
Oxley Basin Coast Groundwater Source	8,435	9,600	522	-1,165	-9,078

Groundwater source[1]	Share component (ML)	LTAAEL (ML)	Average usage (ML)[2] since water sharing plan was in place	Difference between share component and LTAAEL (ML)[3]	Difference between average usage and LTAAEL (ML)
Peel Alluvium Water Source	51,913	10,746	5,405	41,167	-5,341
Peel Fractured Rock Water Source	11,556	15,847	989	-4,291	-14,858
Quipolly Alluvial Groundwater Source	737	476	32	261	-444
Quirindi Alluvial Groundwater Source	2,796	1,231	102	1,565	-1,130
Sydney Basin MDB Groundwater Source	11,243	19,100	31	-7,857	-19,069
Sydney Basin-North Coast Groundwater Source	69,782	90,000	3,659	-20,219	-86,341
Upper Namoi Zone 1, Borambil Creek Groundwater Source	1,600	2,233	666	-633	-1,567
Upper Namoi Zone 4, Namoi Valley (Keepit dam to Gin's Leap) Groundwater Source	25,692	27,427	18,490	-1,735	-8,937
Upper Namoi Zone 6, Tributaries of the Liverpool Range (South to Pine Ridge Road) Groundwater Source	10,948	14,801	1,420	-3,853	-13,381
Upper Namoi Zone 7, Yarraman Creek (East of Lake Goran to Mooki River) Groundwater Source	3,697	3,907	1,783	-210	-2,124
Upper Namoi Zone 8, Mooki Valley (Quirindi-Pine Ridge Road to Breeza) Groundwater Source	16,172	16,920	12,976	-748	-3,944
Upper Namoi Zone 9, Cox's Creek (Up-stream Mullaley) Groundwater Source	11,342	12013	3,351	671	-8,662
Upper Namoi Zone 10, Warrah Creek Groundwater Source	2,635	4,744	223	-2,109	-4,521

Source: Based on extract from the NSW Water Register provided by NSW DCCEEW, and the respective water sharing plans.

Note 1: Groundwater source names highlighted in grey indicate those for which compliance monitoring is publicly available on the NSW Government dashboard. Tracking groundwater extraction against extraction limits | NSW Government Water. Groundwater sources included reflect those for which data were available in the NSW Water Register extract.

Note 2: Usage is based on the Account Usage field in the NSW Water Register data received from DCCEEW. In NSW, not all usage from groundwater bores is metered. Therefore, usage data may not be complete.

Note 3: Cells reporting the difference between share component and LTAAEL that are highlighted grey indicate those systems in which there is more share component than the LTAAEL.

5.2.1.3 Water market trade activity

The level of water market trade activity provides an indication of the extent to which project proponents may be able to meet their water supply needs by acquiring water access licences and / or water allocations on the market.

- **Water access licences:** Trading of water access licences involves transferring ownership of these long-term rights. Water access licences alongside an associated share component provide ongoing access to water, subject to availability, and offer greater security of supply.
- **Water allocations:** These are the actual volumes of water assigned to water access licence holders in a given period, based on available water and water allocation rules. Trading allocations involves buying or selling the right to use a specific volume of water for a limited time, usually within a water year.

5.2.1.3.1 Regulated surface water sources

For regulated surface water sources, historical water market trade statistics show that:

- There is almost no trade of regulated river (high security) water access licences in all the regulated systems. These licences offer project proponents the most reliable water supply (Table 5-6).
- There is limited trade of regulated river (general security) water access licences in the regulated systems, with between three and 17 individual trades occurring between 2019-20 and 2023-24 (Table 5-6).
- There is more market activity for water allocations, with the most trades and volumes typically occurring in Gwydir Regulated River and the Upper Namoi Regulated River (Table 5-7).

Table 5-6: Trade statistics for water access licences (by licence category) in regulated surface water systems relevant to the geographic scope of the Study (2019-20 to 2023-24)

Regulated surface water source	Regulated river (high security) access licences		Regulated river (general security) access licences		Regulated river (general security A) access licences		Regulated river (general security B) access licences	
	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)
NSW Border Rivers Regulated River	0	0	N/A	N/A	4	60	0	0
Gwydir Regulated River	0	0	3	2,906	N/A	N/A	N/A	N/A
Peel Regulated River	0	0	8	661	N/A	N/A	N/A	N/A
Upper Namoi Regulated River	0	0	9	437.5	N/A	N/A	N/A	N/A
Hunter Regulated River	1	3	17	1,312.2	N/A	N/A	N/A	N/A

Source: Extract from the NSW Water Register, extract retrieved March 2025.

Note: Trade statistics are aggregated for the five water years 2019-20 to 2023-24. $0 trades are excluded.

Table 5-7: Trade statistics for water allocation trading in regulated surface water sources relevant to the geographic scope of the Study (2020-21 to 2023-24)

Regulated surface water system	2020-21[1, 2]		2021-22[1]		2022-23[1]		2023-24[1]	
	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)
NSW Border Rivers Regulated River	55	2,461	14	3,245.1	49	5,714	42	3,432.2
Gwydir Regulated River	15	4,998	3	805	21	9,200.5	25	10,369
Peel Regulated River	2	13.2	3	135	2	150	11	685
Upper Namoi Regulated River[3]	82	6,221.7	51	6,903.5	52	5,996.1	71	6,592.9
Hunter Regulated River	11	736	7	457	6	326	27	2,289

Source: Extract from the NSW Water Register, extract retrieved March 2025.

Note 1: From November 2020, a trade purpose was recorded on the NSW Water Register. From November 2020 and for all subsequent water years, trade statistics reported are for those priced trades equal to or greater than $10 and categorised as 'standard commercial'.

Note 2: For trades recorded on the NSW Water Register between July 2020 and October 2020, trade statistics include priced trades equal to or greater than $10.

Note 3: Includes trades from the Lower Namoi Regulated River Water Source into Upper Namoi Regulated River Water Source.

5.2.1.3.2 Groundwater sources

For groundwater sources, historical water market trade statistics show that:

- Water access licences have only been traded in some systems relevant to the geographic scope. Table 5-8 shows all the groundwater systems that intersect with the geographic scope in which water access licences have been traded between 2019-20 and 2023-24.
- Only 31 trades of aquifer water access licences occurred over this five year period in these systems.
- There is also generally limited trade in water allocations (Table 5-9).

Table 5-8: Trade statistics for water access licences (by licence category) in groundwater sources that intersect with the geographic scope of the Study (2019-20 to 2023-24)

Groundwater source	Aquifer licences		Aquifer (general security) licences	
	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)
Clarence Moreton Basin Groundwater Source	1	3	N/A	N/A
Gunnedah-Oxley Basin MDB Groundwater Source	5	969	N/A	N/A
Inverell Basalt Groundwater Source	1	12	N/A	N/A
Liverpool Ranges Basalt MDB Groundwater Source	1	1	N/A	N/A
Manilla Alluvial Groundwater Source	-	-	1	4
New England Fold Belt Coast Groundwater Source	4	120	N/A	N/A

Groundwater source	Aquifer licences		Aquifer (general security) licences	
	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)
New England Fold Belt MDB Groundwater Source	4	249	N/A	N/A
Peel Alluvium Water Source	-	-	2	240
Peel Fractured Rock Water Source	11	345	N/A	N/A
Sydney Basin-North Coast Groundwater Source	3	1,401	N/A	N/A

Source: Extract from the NSW Water Register, extract retrieved March 2025.

Note: Trade statistics are aggregated for the five water years 2019-20 to 2023-24. $0 trades are excluded.

Table 5-9: Trade statistics for water allocation trading in groundwater sources that intersect with the geographic scope of the Study (2020-21 to 2023-24)

Groundwater source	2020-21[1, 2]		2021-22[1]		2022-23[1]		2023-24[1]	
	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)	No. of trades	Volume traded (ML)
Eastern Recharge Groundwater Source	6	666.3	-	-	-	-	1	146
Gunnedah-Oxley Basin MDB Groundwater Source	-	-	-	-	-	-	1	137
Hunter Regulated River Alluvial Water Source	1	40	-	-	1	10	-	-
New England Fold Belt Coast Groundwater Source	-	-	-	-	-	-	1	10
New England Fold Belt MDB Groundwater Source	-	-	-	-	-	-	-	-
Peel Alluvium Water Source	8	551.8	-	-	-	-	1	7
Peel Fractured Rock Water Source	2	60	-	-	-	-	5	177
Quirindi Alluvial Groundwater Source	-	-	-	-	-	-	1	50
Sydney Basin-North Coast Groundwater Source	-	-	-	-	1	55	-	-
Upper Namoi Zone 1, Borambil Creek Groundwater Source	3	159	-	-	-	-	3	163
Upper Namoi Zone 7, Yarraman Creek (East of Lake Goran to Mooki River) Groundwater Source	1	200	-	-	-	-	-	-
Upper Namoi Zone 8, Mooki Valley (Quirindi-Pine Ridge Road to Breeza) Groundwater Source	2	113	-	-	-	-	1	100
Upper Namoi Zone 9, Cox's Creek (Up-stream Mullaley) Groundwater Source	1	250	-	-	-	-	-	-

Source: Extract from the NSW Water Register, extract retrieved March 2025.

Note 1: From November 2020, a trade purpose was recorded on the NSW Water Register. From November 2020 and for all subsequent water years, trade statistics reported are for those priced trades equal to or greater than $10 and categorised as 'standard commercial'.

Note 2: For trades recorded on the NSW Water Register between July 2020 and October 2020, trade statistics include priced trades equal to or greater than $10.

5.2.1.3.3 Summary of water market trade activity

These historical trade statistics indicate that the water market is not particularly mature, and that it may be challenging for project proponents to acquire water on the open market. However, if project proponents were to enter the market this could materially influence demand and activate market activity. As discussed above, in most regulated systems, most licence categories are not fully utilised.

As noted in Section 2.2.2, project proponents are responsible for securing their own water, as well as the necessary approvals for infrastructure to access the water. The ability to directly access water at the required location will influence the extent to which acquiring water from willing sellers is a viable option for project proponents.

5.2.2 Water available and usage (town water supply and local water utility licences) across regulated surface water and groundwater

This section explores water availability and usage for town water supply and local water utility licences in the regulated surface water and groundwater sources relevant to the NE REZ and NRNIP corridor. As with Section 5.1, the underlying data are drawn from the NSW Water Register. This means the data and analysis presented here is a subset of the data and analysis presented in Section 5.1. By focusing on the town water supply and local water utility licences, it provides an indication of the potential water supply for potable use.

Readers should also keep in mind the water available and usage estimates reflect all town water supply and local water utility licences within the water sources. This includes licences held by local water utilities both within the study's geographic scope and by those located outside its defined boundaries (for example, while the Hunter water source supplies LGAs within the geographic boundary of the study including Muswellbrook, this water source also supplies other LGAs such as Maitland, which are outside of the geographic scope of this study). Regulated surface water sources

Figure 5-4 shows the water available under local water utility and town water supply licences in the regulated river sources between 2004-05 and 2023-24. The key takeaways from this chart are:

- The main driver of the changes in water availability is the increase in the volume of these licences in the Peel Regulated River Water Source, starting in 2010-11. Since that time, the water available has been relatively stable around 34,000 ML per year which reflects the fact that these licences are the highest priority and generally receive 100% allocations at the start of each water year. The reduced water available in 2014-15 and 2019-20 reflects reduced allocations to town water supply and local water utility licences in the Peel Regulated River Source.
- Although water usage against local water utility licences varies from year to year, these licences are typically not fully utilised.

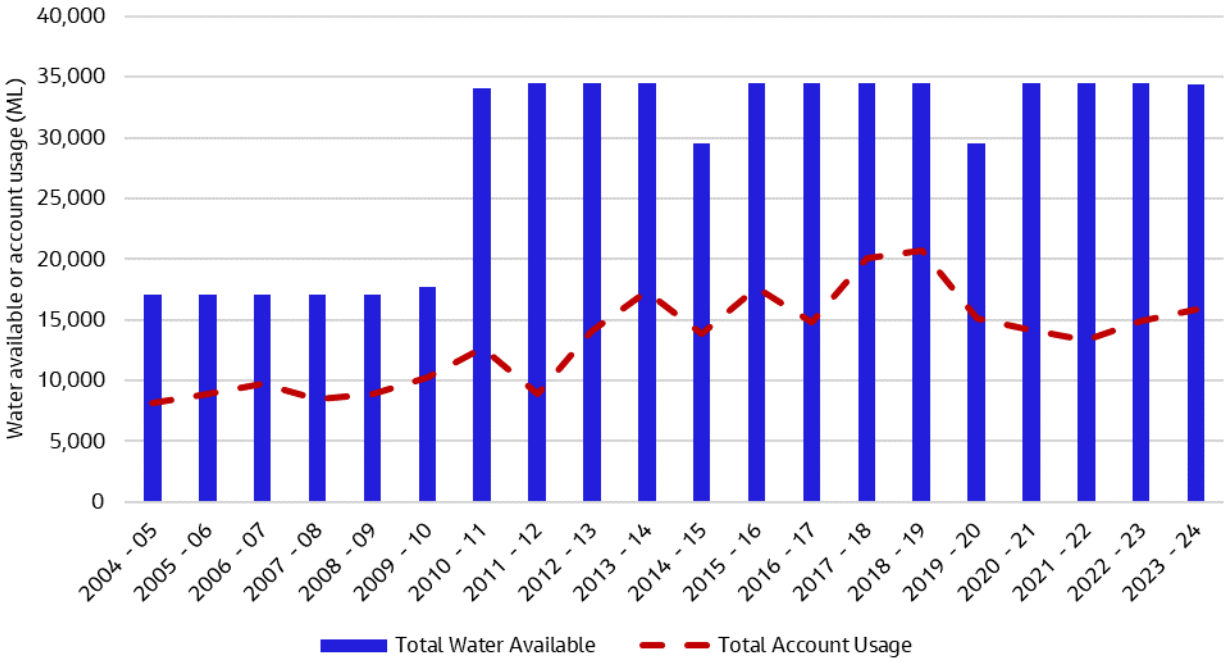


Figure 5-4: Estimated water available and account usage for local water utility licences across regulated surface water sources relevant to the geographic scope of the Study (2004-05 to 2023-24)

Source: Extract from the NSW Water Register provided by NSW DCCEEW.

Note: Water access licence categories included are: Local water utility access licences

5.2.2.1 Groundwater sources

Figure 5-5 shows the water available under local water utility and town water supply licences in the groundwater sources between 2004-05 and 2023-24. The key takeaways from this chart are:

- The main driver of the changes in water available is the total volume of local water utility or town water supply licences. See Figure 5-3 for the timing of when water sharing plans came into effect.
- Water usage tends to vary year-to-year, increasing during dry periods (e.g., 2017-2020). This likely reflects increased reliance on groundwater during these times when surface water supplies are constrained. As was the case with all access licences in the relevant groundwater sources, usage is well below the water available each year.

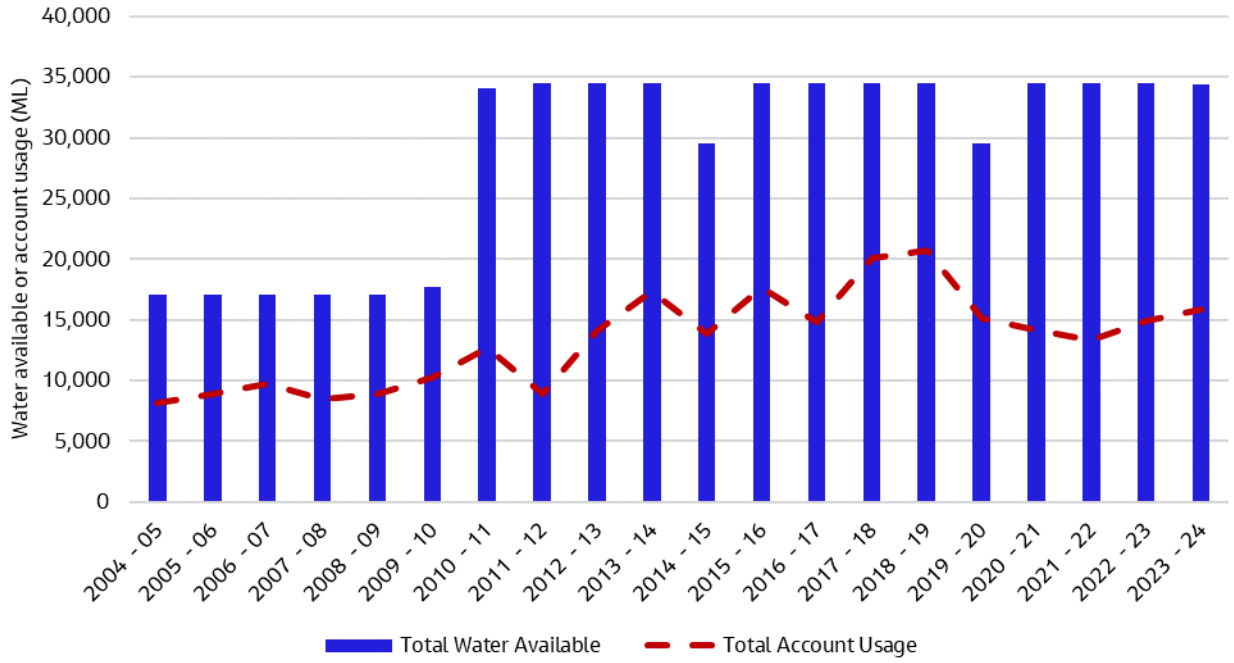


Figure 5-5: Estimated water available and account usage for town water supply and local water utility licences across groundwater sources that intersect with the geographic scope of the Study (2004-05 to 2023-24)

Source: Extract from the NSW Water Register provided by NSW DCCEEW.

Note 1: Water access licence categories included are: Aquifer [Town Water Supply], Domestic and Stock [Town Water Supply], Local Water Utility, Local Water Utility [Domestic and Commercial]

Note 2: Groundwater sources included reflect those for which data were available in the NSW Water Register extract. In NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete.

Note 3: Water available = AWD + carryover. Water available in accounts may be less than shown in some years due to specific rules in the water sharing plans that limit the volume that can be held in accounts for certain licences.

5.2.2.2 Sources of additional water supply (recycled water)

The data and information presented above explores raw water supplies. In some LGAs, there are recycled water facilities. Most recycled water supplied across the LGAs supports a range of non-urban uses such as agriculture, environmental flows or on site uses. Understanding where these facilities are helps identify opportunities for potential expansion to support NE REZ development.

An overview of the historical recycled water supplied by the LWUs within the LGAs is shown in Figure 5-6. This shows that:

- The combined volume of recycled water supplied across the LGAs is ~7,000 ML (2018-19).
- Tamworth, Muswellbrook, Armidale, Upper Hunter, Tenterfield and Glen Innes Severn (in respective order of volume) are the LGAs with historical records of recycled water supplied.
- Tamworth consistently supplies the highest recycled water volumes across the relevant LGAs, supplying approximately 27% of the total recycled water produced by the relevant LGAs between 2013-2023.
- Muswellbrook supplies consistent year-on-year recycled water volumes.
- Upper Hunter shows a significant increase in recycled water supplied across the period, indicating a possible increase in recycled water production facilities since 2014.

- There is significant variability in recycled water volumes across different LGAs, with some like Tamworth and Muswellbrook showing consistent supply, while others like Upper Hunter demonstrate significant increases over time. This indicates that some LGAs may have excess capacity or flexibility in their recycled water usage, potentially allowing for repurposing, while others may have more established commitments to existing users that would be difficult to alter without further investigation into local circumstances and agreements. Opportunities for recycled water to support NE REZ development could be explored in collaboration with LWUs (see Section 8).

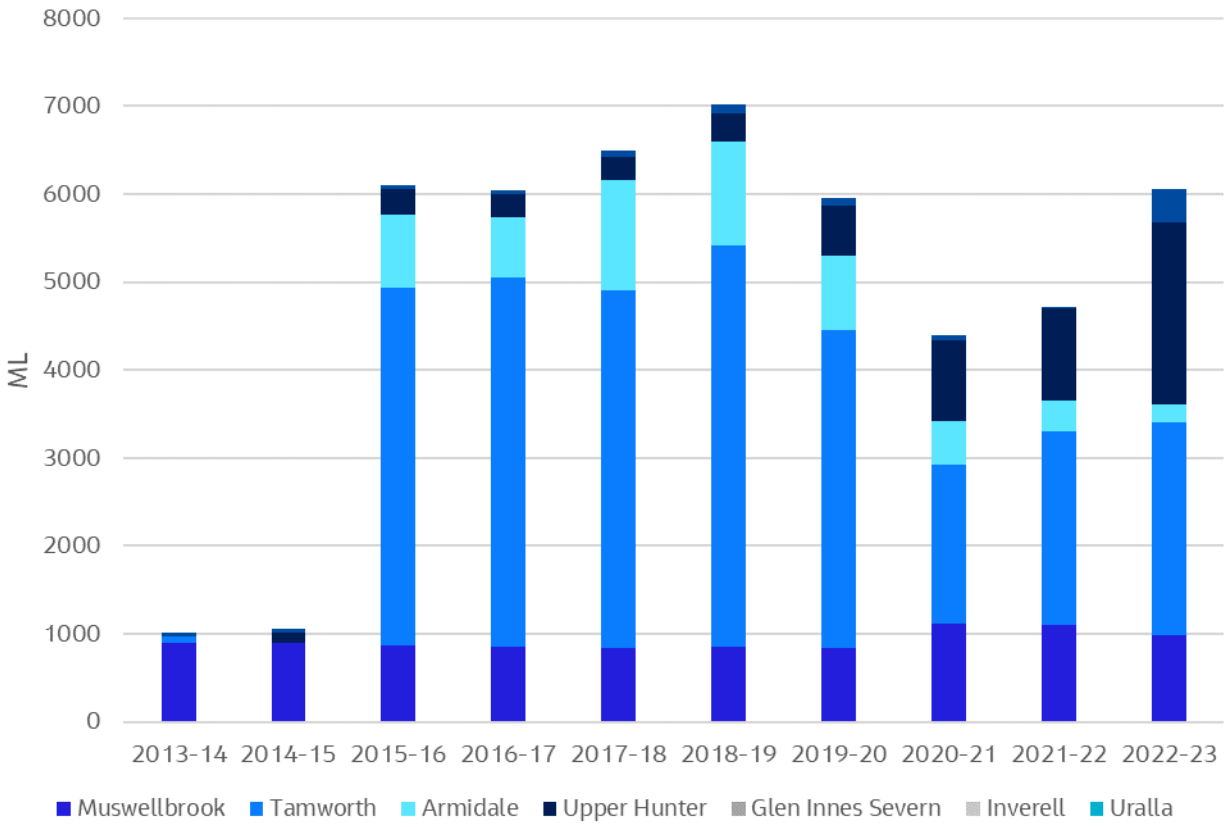


Figure 5-6: Total volume of recycled water supplied (2013-14 to 2022-23)

Source: Recycled water supplied is based on data from the NSW Local Water Utility Performance Monitoring Database. Available at: Local water utility performance | NSW Government Water

Note: Only LGAs showing supply of recycled water. No recycled water supplied in data set for Walcha, Uralla, Liverpool Plains and Inverell.

Through this Study, no data was found to confirm that there are plans by either local water utilities to expand their existing recycled water production or that project proponents are considering installing on-site rainwater harvesting facilities, however this may reflect the early stages of design and planning for many projects. Table 5-10 confirms no additional water supply from these sources was included in the Study.

Table 5-10: Additional water supply from recycled water production and rainwater harvesting

	Alternative water source	Planning stage (Present day – 2026)	Stage 1: Construction (2027 – 2031)	Stage 2 (2030 – 2033)
Base case	Recycled water production	0 ML	0 ML	0 ML
	Rainwater harvesting	0 ML	0 ML	0 ML

	Alternative water source	Planning stage (Present day – 2026)	Stage 1: Construction (2027 – 2031)	Stage 2 (2030 – 2033)
NE REZ development case	Recycled water production	0 ML	0 ML	0 ML
	Rainwater harvesting	0 ML	0 ML	0 ML

5.2.3 Estimates of non-potable and potable water demand

The Study generated estimates of total water demand for the base case and NE REZ development case. To show a range of possible outcomes, the capacity assessment was completed using average water demand (potable and non-potable) and peak water demand (potable and non-potable).

The differences between the average water demand and peak water demand highlight what the typical water demand may be on water treatment infrastructure as an average across a year (average water demand). While the peak water demand demonstrates the potential demand if there is a small number of consecutive days when demand for potable water is extremely high (generally in summer) compared to typical demands that may be placed. These results assume no management strategies are in place. Potential options are explored in Section 8. Both sets of data also show the relative proportion of demand for potable water versus non-potable water.

Figure 5-7 and Figure 5-8 show the base case and NE REZ development case results for annual average water demand (potable and non-potable) and annual peak water demand (potable and non-potable) respectively.

Annual average water demand (potable and non-potable)

Based on the estimates of annual average water demand (potable and non-potable), under the:

- Base case, average water demand (potable & non-potable) tends to increase through to 2026 (142.1 ML/d), then declines through to 2033. The reduction in water demand between 2027 and 2033 is 32.7 ML /d. This reduction in projected water demand is because the base case is influenced by projected population change and the delivery timing of the non-REZ projects. The base case includes 88 non-REZ projects, 45 of which are either operational or are scheduled for delivery before the end of 2026. Another 2 projects are scheduled for delivery by the end of 2027. This means that the water demand projections shown from 2028 generally only include projected population change and a relatively small number of non-REZ projects. Therefore, the projected water demand shows a step change downwards between 2027 and 2029.
- NE REZ development case, average water demand (potable and non-potable) could increase by 38.7 ML/d between the end of the Planning stage (2026) and peak potable water demand which is projected for 2031 (the last year of Stage 1). This indicates that it is the construction of the NRNIP and NE REZ projects in Stage 1 that has the largest influence on water demand (potable and non-potable) attributable to NE REZ development. Once NE REZ projects start to become operational and fewer projects are under construction in the outer years, total water demand under the NE REZ development case declines. The influence of water demand from the NE REZ projects versus the water demand NRNIP is shown in Figure 5-9.

Annual peak water demand (potable and non-potable)

Based on the estimates of annual peak water demand (potable and non-potable), under the:

- Base case, peak water demand (potable & non-potable) shows the same trend as average water demand. That is, an increase in water demand to 2027 (206.5 ML/d), then declines through to 2033. The reduction in water demand between 2027 and 2033 is 30.8 ML /d. This reduction in projected water demand is because of the timing of delivery of the non-REZ projects as explained above.

- NE REZ development case, peak water demand (potable) could increase by 39.9 ML/d between the end of the Planning stage (2026) and peak potable water demand which is projected for 2031 (the last year of Stage 1). The underlying drivers for this increase are the same as mentioned for average water demand. The influence of water demand from the NE REZ projects versus the water demand NRNIP is shown in Figure 5-10.

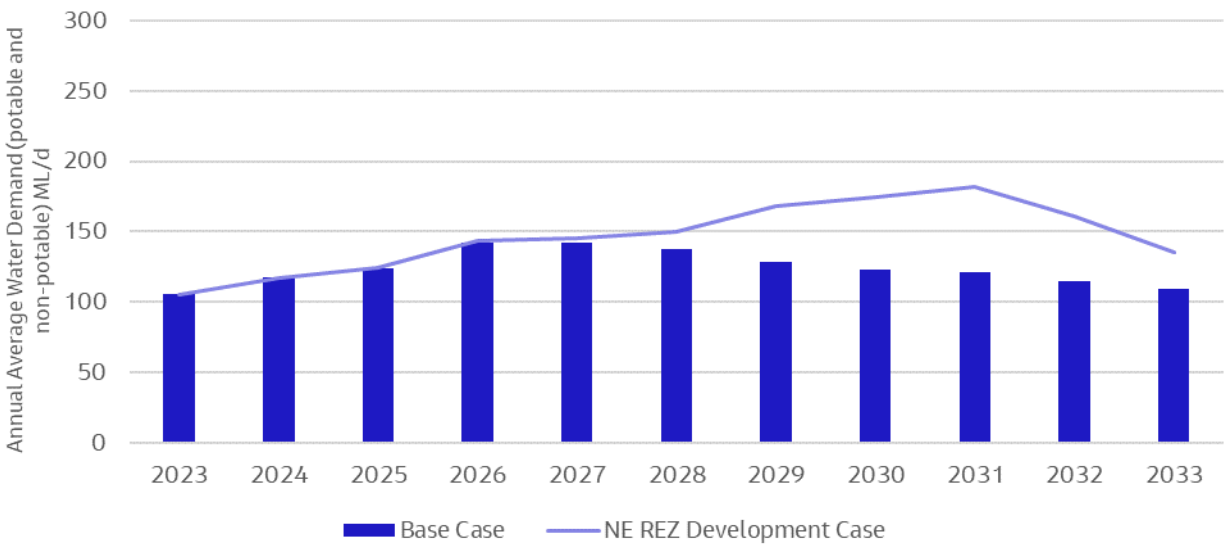


Figure 5-7: Annual average water demand (potable and non-potable) (ML/d) across the NE REZ and NRNIP corridor, base case v NE REZ development case

Note: The same y axis scale has been used in this figure as in Figure 5-8 (below) to enable easy comparison.

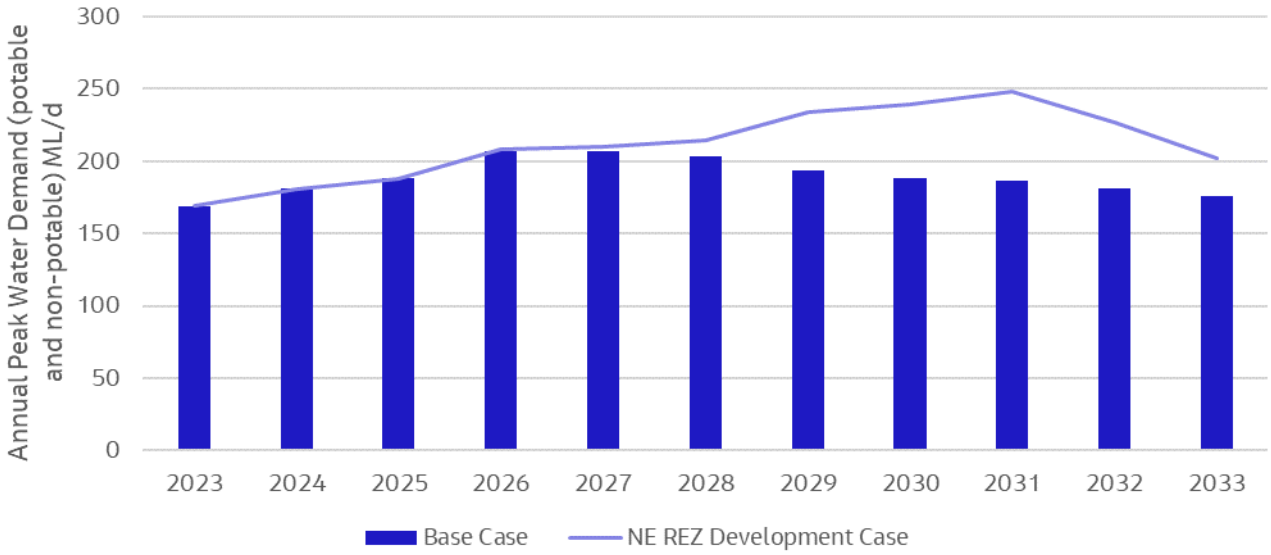


Figure 5-8: Annual peak water demand (potable and non-potable) (ML/d) across the NE REZ and NRNIP corridor, base case v NE REZ development case

Note: The same y axis scale has been used in this figure as in Figure 5-7 (above) to enable easy comparison.

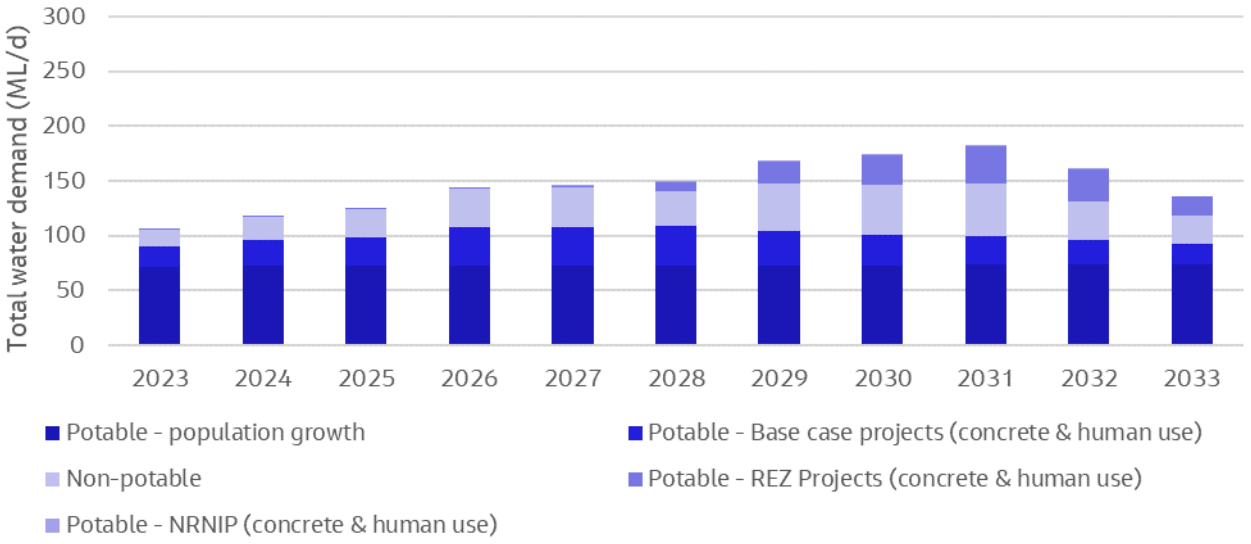


Figure 5-9: Breakdown of water demand estimates under the NE REZ development case (average water demand)

Note: The same y axis scale has been used in this figure as in Figure 5-10 (below) to enable easy comparison.

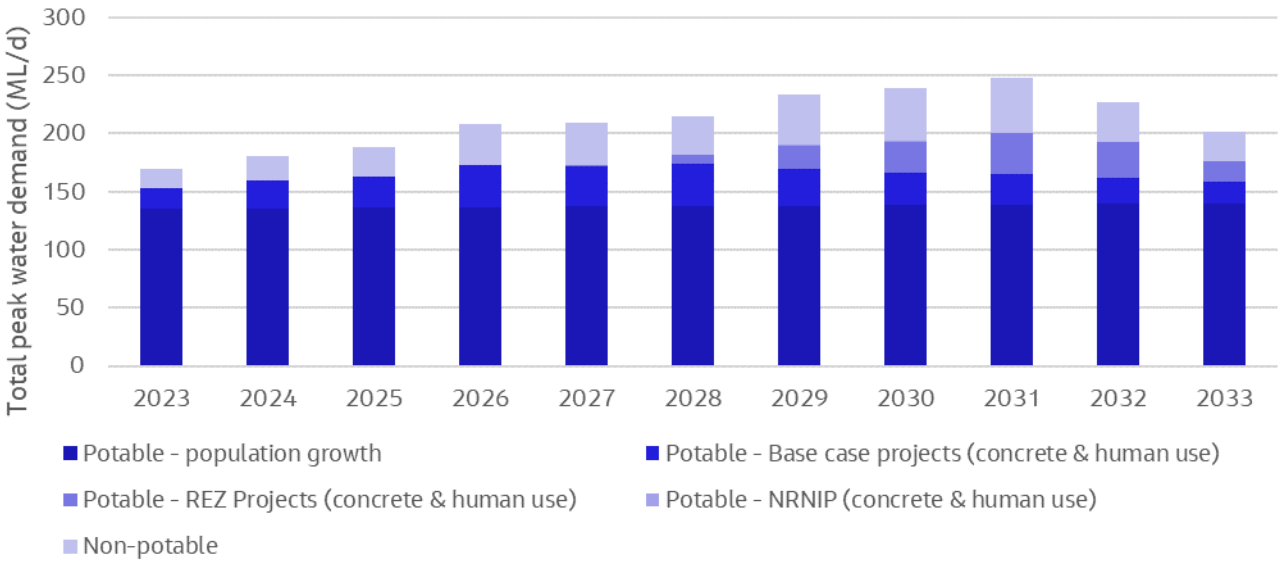


Figure 5-10: Breakdown of water demand estimates under the NE REZ development case (peak water demand)

Note: The same y axis scale has been used in this figure as in Figure 5-9 (above) to enable easy comparison.

Additional potable water demand versus non-potable water demand

The estimates of water demand (potable and non-potable) from NE REZ development project that the year in which the largest volume of water may be required will be in 2031, the last year of Stage 1. The projected volume is 182.2 ML/d (average water demand) and 247.9 ML/d (peak water demand). This is 61.1 ML/d higher than under the base case in 2031.

The composition of the additional water demand is evenly balanced between potable and non-potable. The water demand estimates generated in the Study indicate that 58% (35.2 ML/d) of the additional water demand under NE REZ development is for potable water, while the remaining 42% (25.9 ML/d) is for non-potable water. When the additional water demand from NE REZ development is combined with the base case results, the volume of potable water demand is far larger than the volume of non-potable water demand (driven by the underlying demand from population).

The proportion of projected additional water demand that is potable and non-potable under the NE REZ development case is shown in Figure 5-11. The large volume of potable water demand is driven by the assumptions used to derive water demand from concrete production. Potable water demand results are explored further in Section 6.

The increased demand for water under the NE REZ development case compared to the base case varies across the LGAs. These differences are shown in Table 5-11. These results show the order of magnitude with which the NE REZ development could impact each LGA from the perspective of total water demand.

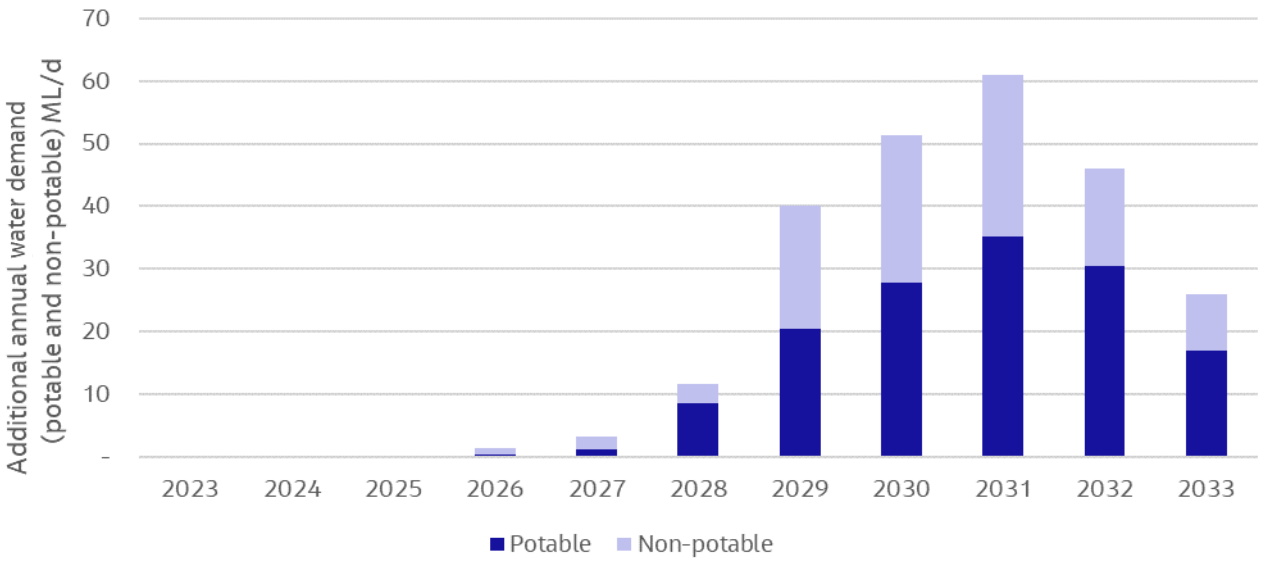


Figure 5-11 Additional water demand (potable and non-potable) (ML/d) across the NE REZ and NRNIP corridor, potable versus non-potable (NE REZ development)

Table 5-11: Summary of change in annual water demand (potable and non-potable) between the base case and NE REZ development case, by year (ML/d)

LGA	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Intersects with the NE REZ only											
Inverell	-	-	-	-	-	-	-	-	-	-	-
Tenterfield	-	-	-	-	-	-	-	-	-	-	-
Glen Innes	-	-	-	-	-	-	-	-	-	-	-
Intersects with the NE REZ and impacted by the NRNIP											
Armidale	-	-	-	-	0.1	5.7	11.8	11.8	11.7	11.6	0.0
Uralla	-	-	-	-	0.4	1.7	19.9	27.8	26.5	12.1	10.3
Walcha	-	-	-	-	0.6	0.7	0.9	4.2	7.8	11.9	8.0

LGA	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Tamworth	-	-	-	1.5	2.1	2.6	6.8	6.8	14.4	9.9	7.8
Outside of NE REZ, but impacted by the NRNIP											
Liverpool Plains	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-
Upper Hunter	-	-	-	-	0.1	0.4	0.5	0.6	0.5	0.4	-
Muswellbrook	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0
Singleton	-	-	-	-	0.0	0.1	0.1	0.0	0.0	-	-

Note: In LGAs like Liverpool Plains and Muswellbrook, there is a difference in water demand (potable) between the base case and NE REZ development case, but these are small increases so rounding of the results shows as zeros in the table.

5.2.4 Sensitivity test results

Table 5-12 presents a summary of how the water resources assessment results for the NE REZ development case may vary according to the supply and demand sensitivity tests. The supply sensitivity considers where issues may arise if a repeat of the 2017-2020 drought were to occur. The water demand sensitivities show how the total water demand may vary depending on the likelihood of NE REZ projects proceeding.

Table 5-12: Summary of how the water resources assessment may vary under the sensitivity tests

Sensitivity test		Summary
Water supply	Extremely dry, repeat of 2017-2020 conditions	Under a repeat of the 2017-2020 drought, increased pressure could be placed on the Peel Regulated River Source which flows through Tamworth LGA and may be a water source for the NE REZ projects and the NRNIP in this LGA. This source is already under pressure as noted in the latest compliance assessment report (2022-23). There are currently 4 NE REZ projects that may be in Tamworth near the Peel Regulated River Source which may place increased pressure on this source, especially in dry years. In 2019-20, total usage was just under 6,000 ML (based on data from the NSW Water Register). The average potable water demand projections generated in this Study for Tamworth are 9.7 ML/d above the base case, which is equivalent to 3,541 ML. Under a repeat for 2019-20 conditions, recorded usage in 2019-20, plus demand from NE REZ development would have exceeded the water available in 2019-20. This assumes all NE REZ water demand would come from the Peel Regulated River Source. This analysis is relatively simple, and reflects the data that were available to the Study and its high-level strategic nature. The water demand estimates are also based a conservative approach to water demand from concrete production. Further investigations are required to develop a more detailed understanding of the issues in this area. This could occur alongside the current work between Tamworth Regional Council and NSW DCCEEW. From the perspective of groundwater sources, in a repeat of the 2017-2020 drought, additional water demand from NE REZ development could increase usage from groundwater sources in Uralla, Walcha and Armidale. Communities in these three LGAs may be more reliant on groundwater sources during an extended dry period when unregulated sources are not available or constrained and town water supply storages may have been drawn down. Further investigations are required.
Water demand	Reduced demand:	▪ Impact on NE REZ development case results.

Sensitivity test		Summary
	NE REZ projects with high and medium likelihood to proceed	▪ Removing projects categorised as low likelihood to proceed decreases peak water demand (potable and non-potable) by approximately 12 ML/d across the LGAs in 2031 which is the projected year of highest water demand shown in Figure 5-7 and 5-8. The water demand (potable and non-potable) shown in those figures is 182.2 ML/d. ▪ There are only 13 projects categorised as low across the 114 projects included in the Study (base case and NE REZ development case), so the reduction in water demand (potable and non-potable) is relatively modest compared to the water demand sensitivity that removes projects categorised as high and medium likelihood to proceed.
	Reduced demand: NE REZ projects with high likelihood to proceed	▪ Significant impact on NE REZ development case results. ▪ Removing projects categorised as low and medium likelihood to proceed decreases peak water demand (potable and non-potable) by approximately 87.3 ML/d across the LGAs in 2031 which is the projected year of highest water demand shown in Figure 5-7 and 5-8. The water demand (potable and non-potable) shown in those figures is 182.2 ML/d. ▪ This larger decrease in water demand reflects the fact that 77 projects categorised as low and medium across the 114 projects included in the Study (base case and NE REZ development case). ▪ At an LGA scale, the largest decreases in average water demand (potable and non-potable) generally occur in Uralla, Armidale and Tamworth. This reflects the fact that these LGAs have the highest proportion of projects categorised as low and medium likelihood to proceed.

6. Water treatment infrastructure capacity assessment (Assessment 2)

This section presents the results from the water treatment infrastructure capacity assessment. The capacity assessment was based on a simple comparison between the estimated water demand and the total water treatment capacity (or the water treatment capacity within each LGA). The results presented in this section assume unconstrained water availability and do not account for other constraints across the water network. This is a simple approach based on the data that were available to the Study (i.e., only water treatment plant capacity data, generally in ML/d. See Appendix E). The results highlight key areas where issues may emerge, and further investigations are likely required. These are highlighted in the opportunities for consideration (Section 8).

The Study generated estimates of potable water demand for the base case and NE REZ development case. To show a range of possible outcomes, the capacity assessment is completed using average water demand (potable) and peak water demand (potable).

The differences between the average water demand and peak water demand highlight what the typical water demand may be on water treatment infrastructure as an average across a year (average water demand). Peak water demand demonstrates the potential demand if there is a small number of consecutive days when demand for potable water is extremely high (generally in summer) compared to typical demands. These results assume no management strategies are in place i.e. demand restrictions. Potential opportunities are explored in Section 8.

First, the key findings from the assessment are presented using two sets of two tables:

- The first two tables highlight whether there is a deficit or surplus in water treatment capacity across the NE REZ and NRNIP corridor, and for each LGA, when considering average water demand (potable) (Table 6-1) and peak water demand (potable) (Table 6-2).

The second tables then translate the surplus or deficit into the extent to which the water treatment capacity is utilised and / or exceeded, when considering average water demand (potable) (Table 6-3) and peak water demand (potable) (Table 6-4).

As noted in Section 5, the potable water demand estimates are heavily influenced by the assumptions used to generate water demand for concrete production. At the time of the Study, there was very little information available about the grade of concrete that would be required. So, a conservative approach was used. Further details are included below.

Following the key findings, Section 6.2 presents the supporting evidence and analysis.

6.1 Key findings from water treatment infrastructure capacity assessment

The water treatment capacity assessment highlights the extent to which the water treatment capacity available in the LGAs in the NE REZ and along the NRNIP corridor is utilised due to NE REZ development. Overall, these findings show that water treatment capacity for potable demand is likely to be the key issue that requires solutions under NE REZ development. As discussed in Section 5, potable water demand comprises more than 50% of the projected additional water required for the NE REZ development in 2031 (projected year of highest water demand). One of the reasons for the large demand for potable water is its use in concrete production for the NRNIP, and renewable energy projects. There are a range of options available for managing the load on water treatment infrastructure. These are explored in Section 8.

Under the NE REZ development, there is a surplus in combined water treatment capacity when considering average water demand (potable) in Stage 1 and Stage 2 (40.8 ML/d surplus), but a potential deficit in

combined water treatment capacity under peak water demand (potable) in Stage 1 and Stage 2 (-25.2 ML/d deficit under peak water demand). However, the results vary across the LGAs.

Table 6-1 and Table 6-2 show in which LGAs there may be a potential surplus or deficit in water treatment capacity for average water demand (potable) and peak water demand (potable) respectively. These summaries show that:

- When considering average water demand (potable), the water demand (potable) from NE REZ development potentially exceeds treatment capacity in three out of the 11[26] LGAs (Uralla, Walcha and Muswellbrook). This is particularly the case for these LGAs because in these LGAs projected water demand (potable) is driven by both REZ-projects and the NRNIP.
- When considering peak water demand (potable), the water demand (potable) from NE REZ development potentially exceeds treatment capacity in six out of the 11 LGAs (Uralla, Armidale, Liverpool Plains, Muswellbrook, Tamworth, Walcha).

Under the NE REZ development case, Table 6-3 and Table 6-4 shows the surplus or deficit in water treatment capacity as a percentage of the water treatment capacity available within the respective LGA for average water demand (potable) and peak water demand (potable). This summary shows that:

- For average water demand (potable), the potential utilisation of water treatment capacity for those LGAs where there is a potential deficit in capacity are:
  - Uralla is 276% (Stage 1 and Stage 2) based on the water treatment capacity information available to the project, meaning there is a deficit of 176%.
  - Walcha is 157% (Stage 1) and 209% (Stage 2), meaning there is a deficit of between 57% and 109%.
- For peak water demand (potable), the potential utilisation of water treatment capacity for those LGAs where there is a potential deficit in capacity are:
  - Uralla is 332% (Stage 1 and Stage 2) based on the water treatment capacity information available to the project, meaning there is a deficit of 232%.
  - Walcha is 173% (Stage 1) and 225% (Stage 2), meaning there is a deficit of between 73% and 125%.
  - Liverpool Plains is 170% (Stage 1) and 171% (Stage 2), meaning there is a deficit of between 70% and 71%.
  - Muswellbrook is 146% (Stage 1) and 133% (Stage 2), meaning there is a deficit of between 33% and 46%.
  - Armidale is 119% (for both Stages 1 and 2), meaning there is a deficit of 19% during NE REZ Development.

For both average water demand (potable) and peak water demand (potable), in several LGAs, there is a material change in the utilisation of the water treatment infrastructure under the demand sensitivity that removes projects with a low and medium likelihood of proceeding. This indicates that there may be options to manage potable demand load on water treatment infrastructure with careful management of the scheduling of the NRNIP and supporting NE REZ project proponents.

These results include meeting water demand for concrete production with potable water. At the time of the Study, there was limited information about the grade of concrete required for construction, so a conservative approach was adopted. It is likely that some of the water demand for concrete production could be a lesser quality. When the water demand from concrete is assumed to be met by non-potable water, the water treatment capacity assessment results change accordingly. For example, under average water demand, the

[26] Note: While included in these 11 LGAs, treatment capacity data for Inverell was unavailable at the time of this Study.

available water treatment capacity across all LGAs increases from 40.8 ML/d to 99.6 ML/d in 2031. And under peak water demand (potable), it increases from -24.8 ML/d to 34.4 ML/d.

Table 6-1: Key findings summary from the water treatment infrastructure capacity assessment – surplus or deficit, average water demand (potable)

	Base case	NE REZ development case		NE REZ development case - sensitivities			
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only							
Inverell	No treatment capacity data to enable capacity assessment						
Tenterfield	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Glen Innes Severn	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Intersects with the NE REZ and impacted by the NRNIP							
Armidale	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Uralla	Surplus	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus
Walcha	Surplus	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus
Tamworth	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Outside of NE REZ, but impacted by the NRNIP							
Liverpool Plains	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Upper Hunter	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Muswellbrook	Deficit	Deficit	Surplus	Surplus	Surplus	Surplus	Surplus
Singleton	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus

Source: All water treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Table 6-2: Key findings summary from the water treatment infrastructure capacity assessment – surplus or deficit, peak water demand (potable)

	Base case	NE REZ development case		NE REZ development case - sensitivities					
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed		Extremely dry, repeat of 2018-2020 conditions	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only									
Inverell	No treatment capacity data to enable capacity assessment								
Tenterfield	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Glen Innes Severn	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Intersects with the NE REZ and impacted by the NRNIP									
Armidale	Surplus	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus	Deficit	Deficit
Uralla	Surplus	Deficit	Deficit	Deficit	Deficit	Deficit	Surplus	Deficit	Deficit
Walcha	Deficit	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus	Deficit	Deficit
Tamworth	Surplus	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus	Deficit	Deficit
Outside of NE REZ, but impacted by the NRNIP									
Liverpool Plains	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit
Upper Hunter	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Muswellbrook	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit
Singleton	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus

Source: All water treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Table 6-3: Key findings summary from the water treatment infrastructure capacity assessment – water demand (potable) as a percentage of water treatment capacity, average water demand (potable)

	Base case	NE REZ development case		NE REZ development case - sensitivities			
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only							
Inverell	No treatment capacity data to enable capacity assessment						
Tenterfield	17%	17%	17%	17%	17%	17%	17%
Glen Innes Severn	23%	23%	15%	23%	15%	15%	15%
Intersects with the NE REZ and impacted by the NRNIP							
Armidale	58%	91%	91%	91%	91%	44%	44%
Uralla	19%	276%	276%	276%	276%	72%	22%
Walcha	84%	157%	209%	157%	209%	19%	19%
Tamworth	59%	69%	69%	69%	69%	52%	52%
Outside of NE REZ, but impacted by the NRNIP							
Liverpool Plains	58%	58%	59%	58%	59%	58%	59%
Upper Hunter	48%	68%	68%	62%	62%	40%	40%
Muswellbrook	108%	101%	88%	84%	71%	65%	65%
Singleton	38%	45%	44%	45%	44%	31%	28%

Source: All water treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Table 6-4: Key findings summary from the water treatment infrastructure capacity assessment – water demand (potable) as a percentage of water treatment capacity, peak water demand (potable)

	Base case	NE REZ development case		NE REZ development case - sensitivities					
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed		Extremely dry, repeat of 2018-2020 conditions	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only									
Inverell	No treatment capacity data to enable capacity assessment								
Tenterfield	45%	45%	46%	45%	46%	45%	46%	51%	52%
Glen Innes Severn	40%	41%	33%	41%	33%	33%	33%	38%	30%
Intersects with the NE REZ and impacted by the NRNIP									
Armidale	86%	119%	119%	119%	119%	72%	73%	130%	129%
Uralla	74%	332%	332%	332%	332%	128%	78%	328%	328%
Walcha	100%	173%	225%	173%	225%	35%	35%	170%	222%
Tamworth	90%	101%	101%	101%	101%	83%	84%	109%	109%
Outside of NE REZ, but impacted by the NRNIP									
Liverpool Plains	167%	170%	171%	170%	171%	170%	171%	185%	187%
Upper Hunter	63%	83%	83%	78%	77%	55%	55%	86%	86%
Muswellbrook	152%	146%	133%	128%	116%	111%	111%	153%	140%
Singleton	76%	83%	83%	83%	83%	69%	67%	92%	92%

Source: All water treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

6.2 Evidence and analysis

6.2.1 Water demand (potable) estimates

Figure 6-1 and Figure 6-2 show the base case and NE REZ development case results for annual average water demand (potable) and annual peak water demand (potable) respectively.

Annual average water demand (potable)

Based on the estimates of annual average water demand (potable), under the:

- Base case, average water demand (potable) tends to increase through to 2028 (108.7 ML/d), then declines through to 2033. The reduction in water demand between 2028 and 2033 is 16.4 ML/d. As explained in Section 5.2.3, this trend in water demand for the base case reflects the timing of delivery for the non-REZ projects.

- NE REZ development case, average water demand (potable) could increase by 26.7 ML/d between the end of the Planning stage (2026) and peak potable water demand which is projected for 2031 (the last year of Stage 1). This indicates that it is the construction of the NRNIP and NE REZ projects in Stage 1 that has the largest influence on water demand (potable) attributable to NE REZ development. Once NE REZ-projects start to become operational and fewer projects are under construction in the outer years, total water demand from NE REZ development declines.

Annual peak water demand (potable)

Based on the estimates of annual peak water demand (potable), under the:

- Base case, peak water demand (potable) shows the same trend as average water demand. That is, an increase in water demand to 2028 (173.6 ML/d), then declines through to 2033. The reduction in water demand between 2028 and 2033 is 15 ML/d. This reduction in projected water demand is because of the timing of delivery of the non-REZ projects as explained above.
- NE REZ development case, peak water demand (potable) could increase by 27.9 ML/d between the end of the Planning stage (2026) and peak potable water demand which is projected for 2031 (the last year of Stage 1). The underlying drivers for this increase are the same as mentioned for average water demand.

The analysis of average water demand (potable) provides an indication of what the typical water demand (potable) may be as an average across a year. However, to support planning decisions, the peak water demand (potable) is a conservative estimate of water requirements, and demonstrates the potential demand on treatment infrastructure during a series of very high water demand days. This supports planning processes to ensure adequate capacity for peak demand periods. In Section 6.2.3, the water treatment capacity assessment results are presented for annual peak water demand (potable) and average peak water demand (potable) to demonstrate this range of potential outcomes.

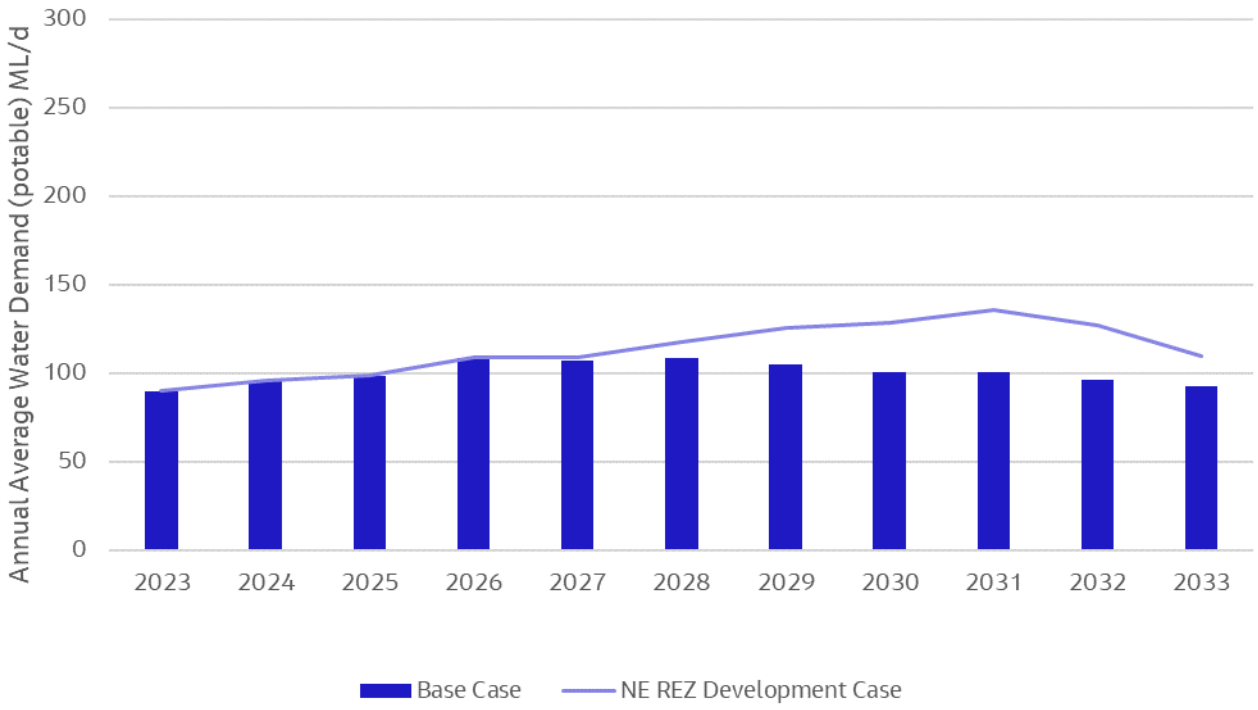


Figure 6-1: Projected annual <u>average</u> water demand (potable) (ML/d) across the NE REZ development, base case v NE REZ development case

Note: The same y axis scale has been used in this figure as in Figure 6-2 (below) to enable comparison.

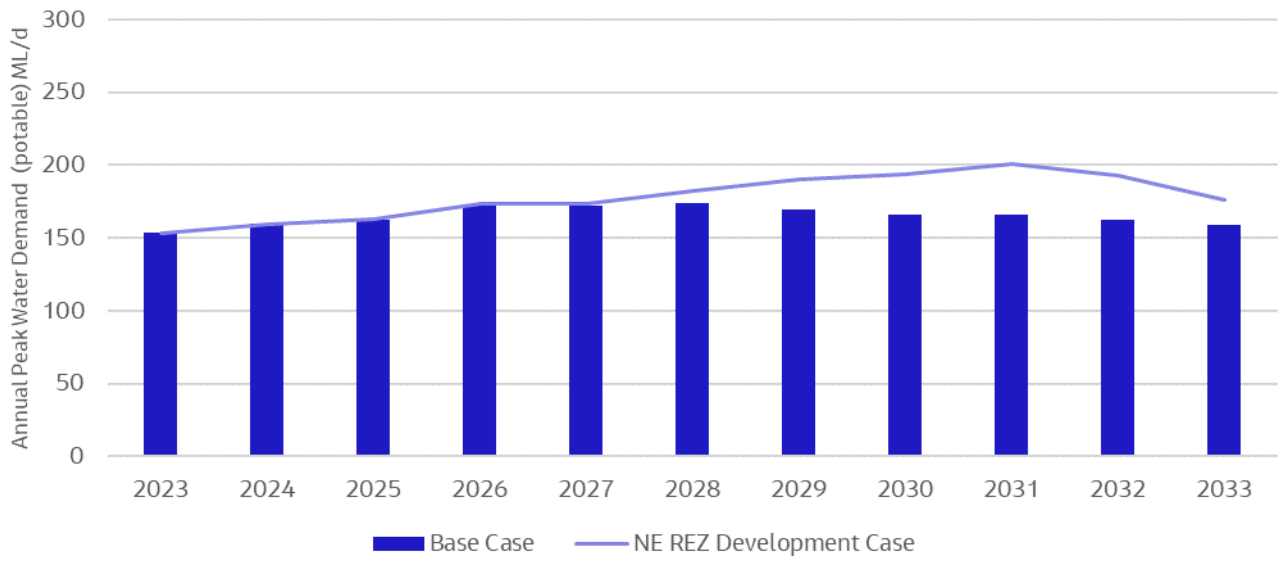


Figure 6-2: Projected annual peak water demand (potable) (ML/d) across the NE REZ development, base case v NE REZ development case

Note: The same y axis scale has been used in this figure as in Figure 6-1 (above) to enable comparison.

The increased demand for potable water under the NE REZ development case compared to the base case varies across the LGAs. These differences are shown in Table 6-5. These results show the order of magnitude with which the NE REZ development could impact each LGA from the perspective of potable water demand.

The results for water demand (potable) show the same trends as for water demand (potable and non-potable) (see Section 5.2.3). The largest increases in potable water demand occur in Armidale, Uralla, Walcha and Tamworth because these LGAs intersect with the NE REZ and are impacted by the NRNIP. In these LGAs, the increased water demand under the NE REZ development case increases through Stage 1 (2027-2031), then reduces through Stage 2. This reflects the transition of projects from construction into operations.

Table 6-5: Summary of change in annual water demand (potable) between the base case and NE REZ development case, by year (ML/d)

LGA	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Intersects with the NE REZ only											
Inverell	-	-	-	-	-	-	-	-	-	-	-
Tenterfield	-	-	-	-	-	-	-	-	-	-	-
Glen Innes	-	-	-	-	-	-	-	-	-	-	-
Intersects with the NE REZ and impacted by the NRNIP											
Armidale	-	-	-	-	0.0	5.7	8.7	8.7	8.7	8.6	0.0
Uralla	-	-	-	-	0.0	1.5	7.2	11.8	10.9	7.1	6.3
Walcha	-	-	-	-	0.1	0.1	0.2	3.1	5.8	7.8	5.0
Tamworth	-	-	-	0.5	1.1	1.1	4.1	4.1	9.7	6.8	5.8
Outside of NE REZ, but impacted by the NRNIP											
Liverpool Plains	-	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-

LGA	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Upper Hunter	-	-	-	-	0.0	0.1	0.1	0.1	0.1	0.1	-
Muswellbrook	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Singleton	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-

Note: In LGAs like Liverpool Plains and Muswellbrook, there is a difference in water demand (potable) between the base case and NE REZ development case, but these are small increases so rounding of the results shows as zeros in the table.

Influence of potable demand for concrete production

The additional water demand (potable) under NE REZ development is influenced by the estimates for concrete production. At the time of the Study, there was limited information about the grade of concrete that would be used in NE REZ projects, so a conservative approach was taken.

The estimated volume of potable water required for concrete production was based on an M40 grade of concrete (per m^3) that assumes a water / cement ratio of approximately 0.4 or 960 l/m^3. This ratio has been applied to all projects where concrete has been identified as part of the construction. Key project types and assumptions applied were:

- Wind farms: three blades per turbine requiring a foundation; the volume identified for wind turbines will be poured / installed over a period of three days in a week, covering several weeks depending upon the volume identified in the first instance.
- Battery projects: a BESS rating in MW based on discussions with EnergyCo around the volume of concrete and water required; the volume would be poured in three batches, each batch covering 10 days over three different months. Where no time frame could be identified for projects based on the information provided in the Data and Assumptions Workbook (v.2.1), then the peak volume of water required for the concrete requirement has been used to identify if this coincided with other projects, what the impact would be within the construction timeline on the LGAs.

This is a very conservative approach and if the concrete pours were to take longer, this would reduce the volume of water required at any moment in time. Further details about the concrete requirements for NE REZ projects is required for these estimates to be refined. Such investigations could consider the impact across the full portfolio of NRNIP, and NE REZ projects and the practicality of pouring the required volume of concrete in these timeframes including the logistics / method of delivery (i.e. site based batching plant over truck-based delivery).

To demonstrate the influence of concrete production on the potable demand estimates, Figure 6-3 and Figure 6-4 show how the estimates may change when concrete production is removed for 2031, the year in which the largest water demand may occur. Table 6-6 summarises the projected differences in 2031, the year of highest water demand.

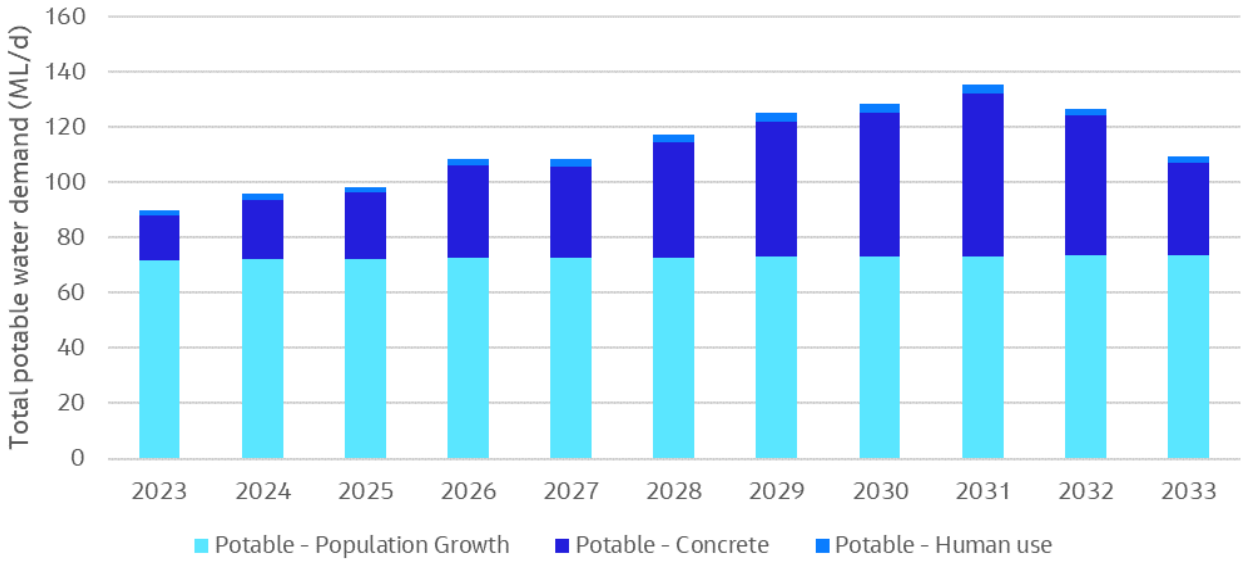


Figure 6-3: Breakdown of potable water demand estimates, concrete versus human use under the NE REZ development case (average water demand)

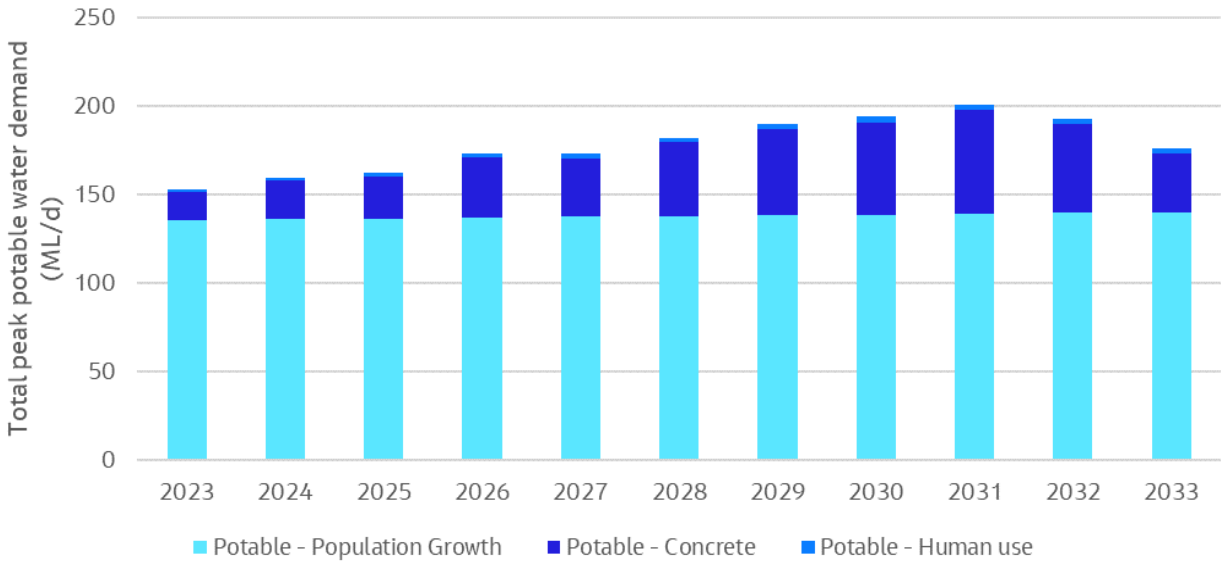


Figure 6-4: Breakdown of potable water demand estimates, concrete versus human use under the NE REZ development case (peak water demand)

Table 6-6: Influence of concrete production on water demand (potable) estimates in 2031 (water demand under NE REZ development case)

Scenario	Average water demand (potable)		Peak water demand (potable)	
	With concrete production (ML/d)	Without concrete production (ML/d)	With concrete production (ML/d)	Without concrete production (ML/d)
Base case	100.1	75.3	165.7	141
NE REZ development case	135.3	76.5	200.9	142.1

6.2.2 Water treatment infrastructure capacity estimates

Table 6-7 confirms the water treatment infrastructure capacities that were used in the capacity assessment (Section 6.2.3) for each time horizon.

Based on the estimates of water treatment infrastructure capacity, under the:

- Base case, water treatment infrastructure capacity remains constant between the Planning Stage and end of Stage 2 (2033). Water treatment capacity is 176.1 ML/d. This is likely a slight underestimate because no treatment capacity information was available for Inverell at the time of the Study.
- NE REZ development case, water treatment infrastructure capacity also does not change between the end of the Planning Stage and the end of Stage 2. While several local councils expressed interest in expanding or upgrading the existing water treatment facilities, at the time of the Study (late 2024 / early 2025) none of these upgrades had formal approvals, confirmed capacities or committed funding in place.

Water treatment plant upgrades and new facilities require long planning horizons and substantial capital investment. Given these factors, coupled with the early stages of NE REZ development,[27] any increases in water treatment capacity to meet demand for potable water are highly uncertain. This means that no projected capacity increases were included in the analysis. In addition, indicative timelines for building a new water treatment facility to meet any projected deficit in capacity extend well into Stage 2, and therefore, do not necessarily represent an effective solution. See Section 3.7 for the breakdown of water treatment capacity by LGA and water treatment plant.

Table 6-7: Estimated water treatment infrastructure capacity at the end of each time horizon under the base case and NE REZ development case (ML/d)

Scenario	Planning Stage (Present day – 2026)	Stage 1: Construction (2027 – 2031)		Stage 2: Construction (2030-2033)	
	Capacity ML/d)[1,2]	Capacity (ML/d)[1,2]	% difference compared to Planning stage	Capacity (ML/d)[1,2]	% difference compared to Planning stage
Base case	176.1	176.1	0%	176.1	0%
NE REZ development case	176.1	176.1	0%	176.1	0%
Difference in water treatment capacity	-	-	-	-	-

[27] From discussions with GDPs, most NE REZ projects are insufficiently developed to confirm whether water treatment facilities will be incorporated into the design of NE REZ projects. This is an area for further investigation (see Section 8).

Note 1: The treatment capacities are based on information from local councils or desktop research. No water treatment plant capacity information was available for Inverell at the time of the Study. The water treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, water treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Note 2: This analysis is limited to planned or approved projects to establish additional facilities or expand current facilities. No planned or approved projects have been provided by local councils.

6.2.3 Water treatment infrastructure capacity assessment

Table 6-8 shows the water treatment infrastructure capacity assessment results for average water demand (potable) and peak water demand (potable). Both are shown here to demonstrate a range of possible outcomes.

Capacity assessment based on average water demand (potable)

Based on the estimates of average water demand (potable) and the water treatment infrastructure capacity presented above, across the NE REZ development region under the:

- Base case, there is a water treatment infrastructure capacity surplus of between 68.0 ML/d (Planning Stage) and 75.4 ML/d (Stage 2). This increase in capacity between the Planning Stage and end of Stage 2 reflects the fact that most of the non-REZ projects included in the base case are completed by 2027.
- NE REZ development case there is also a projected surplus in water treatment capacity, albeit smaller than under the base case. In the Planning Stage the surplus is 67.6 ML/d; this reduces to 40.8 ML/d in Stage 2.

Capacity assessment based on peak water demand (potable)

Based on the estimates of peak water demand (potable) and water treatment infrastructure capacity presented above, across the NE REZ development region under the:

- Base case, there is a water treatment infrastructure capacity surplus of between 3.6 ML/d (Planning Stage) and 10 ML/d (Stage 2).
- NE REZ development case there is also a projected surplus in water treatment capacity in the Planning Stage (3.1 ML/d), then deficits in Stage 1 and Stage 2 (-24.8 ML/d).

The reduced water treatment capacity under peak water demand (potable) compared to average water demand (potable) demonstrates the potential pressure that water treatment infrastructure may come under during a series of high water demand days. As noted in Section 6.2.2, the water treatment infrastructure capacity remains constant at 176.1 ML/d throughout all stages in both the base case and NE REZ development case. Thus, the deficits and surpluses shown reflect changes in the projected water demand (potable).

Table 6-8: Water treatment infrastructure capacity assessment results – all LGAs in NE REZ and along NRNIP corridor

Scenario	Planning Stage (Present day – 2026)			Stage 1: Construction (2027 – 2031)			Stage 2: Construction (2030-2033)		
	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]
	Capacity assessment results based on **average water demand (potable)**								
Base case	108.1 (in 2026)	176.1	68.0	108.7 (in 2028)	176.1	67.4	100.7 (in 2030)	176.1	75.4

Scenario	Planning Stage (Present day – 2026)			Stage 1: Construction (2027 – 2031)			Stage 2: Construction (2030-2033)		
	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]
NE REZ development case	108.5 (in 2026)	176.1	67.6	135.3 (in 2031)	176.1	40.8	135.3 (in 2031)	176.1	40.8
	Capacity assessment results based on **peak water demand (potable)**								
Base case	172.5 (in 2026)	176.1	3.6	173.6 (in 2028)	176.1	2.5	166.1 (in 2030)	176.1	10
NE REZ development case	173 (in 2026)	176.1	3.1	200.9 (in 2031)	176.1	-24.8	200.9 (in 2031)	176.1	-24.8

Note 1: The analysis presented in this Report presents both peak potable water demand and average water demand figures to demonstrate a range of possible outcomes.

Note 2: Under each water demand (potable) estimate, the year in which this is projected is shown in brackets.

However, the surplus / deficit in water treatment infrastructure capacity varies geographically across the LGAs in the NE REZ and along the NRNIP corridor.

Average water demand (potable) by LGA

Figure 6-5 shows the percentage of the water treatment infrastructure capacity that is utilised in each LGA across the three time horizons under the NE REZ development case for average water demand (potable). These maps show that:

- In the Planning Stage, in most LGAs, there is a surplus in water treatment capacity when compared to average water demand (potable). The exception is Muswellbrook which shows a potential small deficit in treatment capacity (6%).
- These projected surpluses in the Planning Stage remain through Stages 1 and 2 in all LGAs assessed, except for in Uralla and Walcha; both of which show deficits. These projected deficits reflect the intensity of NE REZ project and NRNIP development in these LGAs. This is an area for further exploration with the respective local councils (see Section 8).
- While Armidale shows a projected surplus in all stages, in Stage 1 and 2, the NE REZ development in this LGA indicates that most of the available treatment capacity could be utilised.

Peak water demand (potable) by LGA

Figure 6-6 shows the percentage of the water treatment infrastructure capacity that is utilised in each LGA across the three time horizons under the NE REZ development case for peak water demand (potable). These maps show that:

- In the Planning Stage, there are three LGAs that show a potential deficit in water treatment capacity. These are Muswellbrook, Liverpool Plains and Walcha. These results do not suggest there are currently major issues in these LGAs because these deficits are under peak water demand (potable). Peak water demand (potable) is included in the analysis to show what could happen under a series of consecutive days with high water demand.
- In Stage 1 and Stage 2, as with average water demand (potable), there could be treatment capacity deficits in Uralla and Walcha, both of which increase in magnitude.

- In Stage 1 and Stage 2, water treatment capacity deficits under NE REZ development could also emerge in Armidale and Tamworth under a peak water demand (potable).

Influence of potable demand for concrete production

Table 6-9 shows how the water treatment capacity assessment changes across the LGAs in the NE REZ and along the NRNIP corridor when demand from concrete production is removed.

Table 6-9: Water treatment infrastructure capacity assessment results when concrete production is removed – all LGAs in NE REZ and along NRNIP corridor

Scenario	Planning Stage (Present day – 2026)			Stage 1: Construction (2027 – 2031)			Stage 2: Construction (2030-2033)		
	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]	Water demand (potable) (ML/d)	Water treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)[1]
	Capacity assessment results based on **average water demand (potable) – concrete production removed**								
Base case	75 (in 2026)	176.1	101.1	75.3 (in 2031)	176.1	100.8	75.4 (in 2033)	176.1	100.7
NE REZ development case	75.1 (in 2026)	176.1	101	76.5 (in 2031)	176.1	99.6	76.5 (in 2031)	176.1	99.6
	Capacity assessment results based on **peak water demand (potable) – concrete production removed**								
Base case	139.5 (in 2026)	176.1	36.6	141 (in 2031)	176.1	35.1	141.7 (in 2033)	176.1	34.4
NE REZ development case	139.5 (in 2026)	176.1	36.6	142.1 (in 2031)	176.1	34.0	142.3 (in 2033)	176.1	33.8

Note 1: The analysis presented in this Report presents both peak potable water demand and average water demand figures to demonstrate a range of possible outcomes.

Note 2: Under each water demand (potable) estimate, the year in which this is projected is shown in brackets.

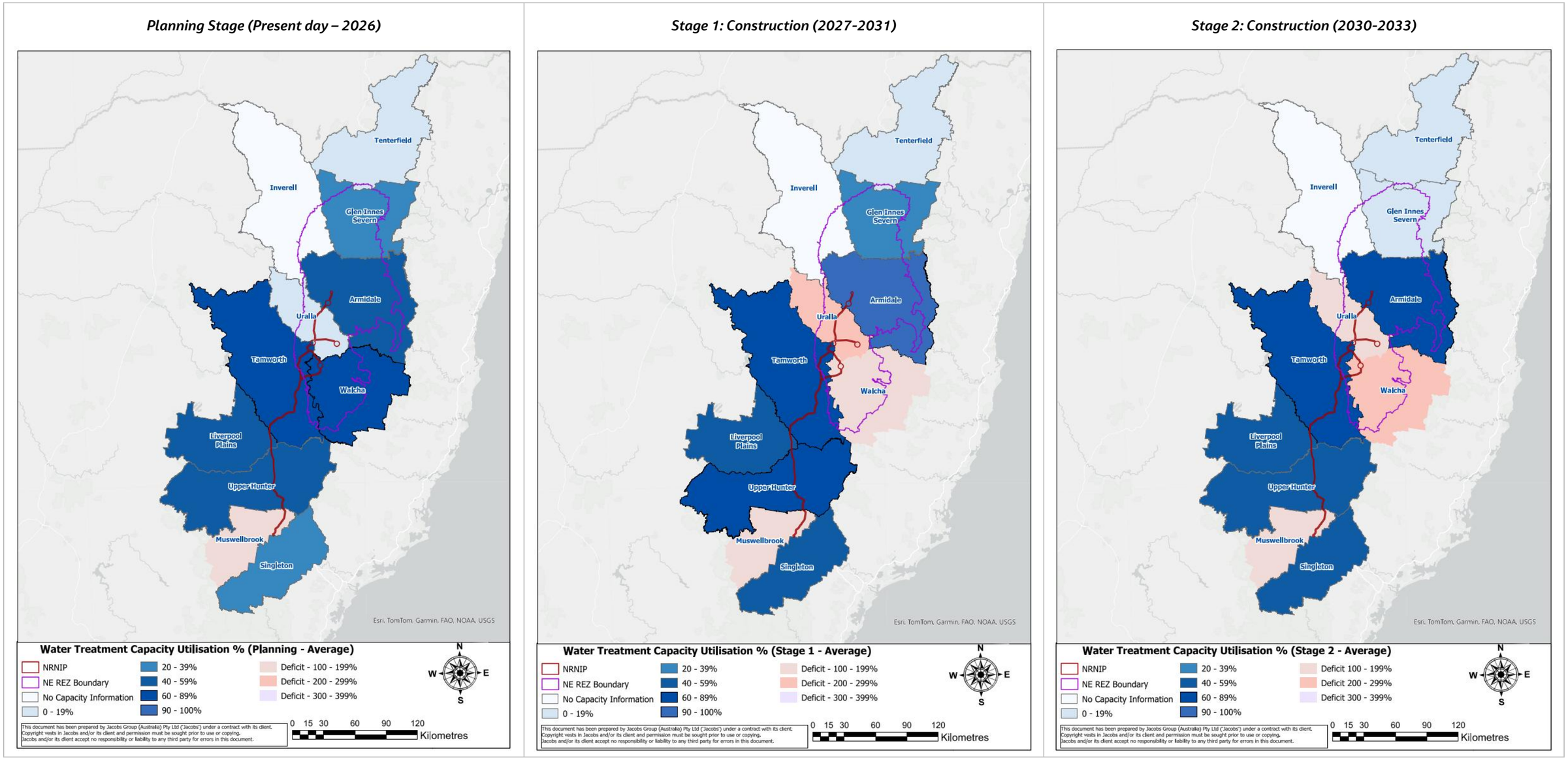
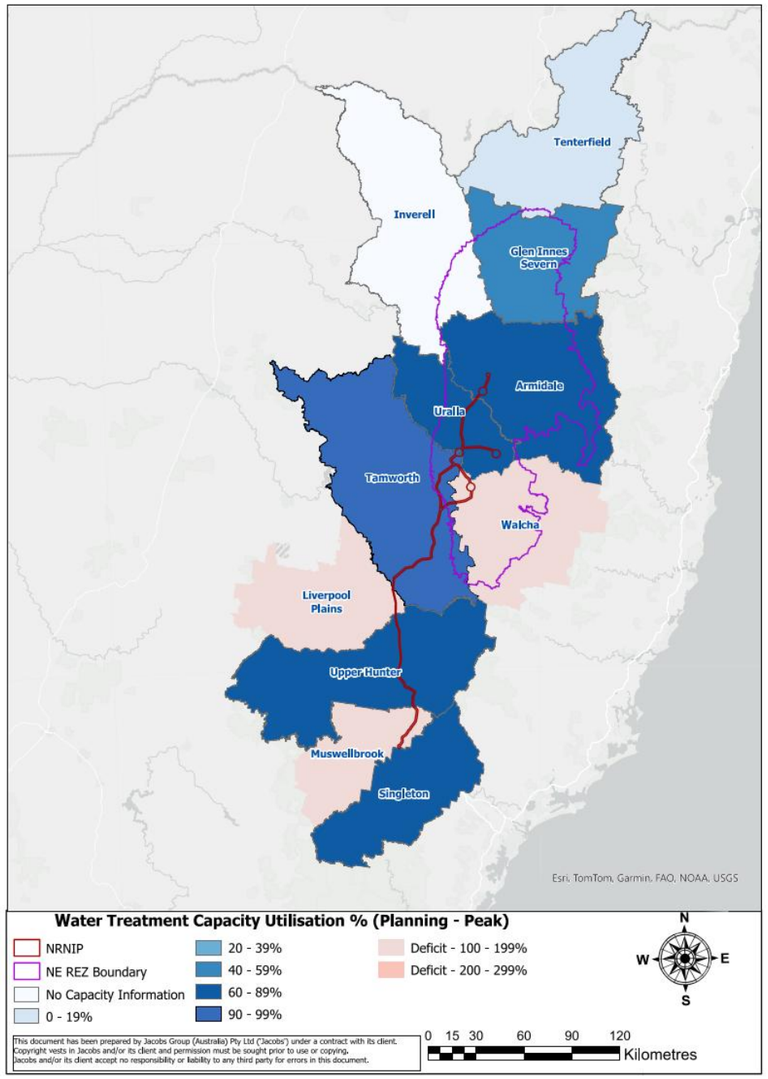


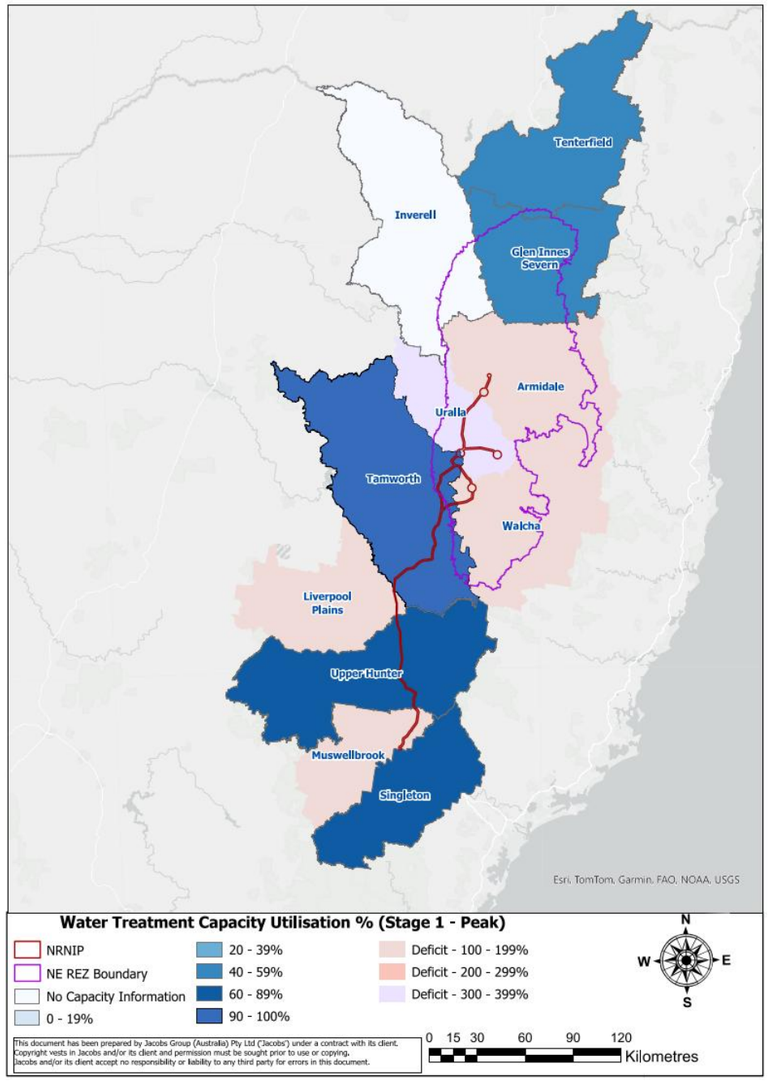
Figure 6-5: Percentage of water treatment infrastructure capacity utilised under projected annual average water demand (potable) (ML/d) across the NE REZ development region by LGA – NE REZ development case, three time horizons

Note: The analysis presented in Figure 6-5 reports the capacity assessment using average potable water demand figures which provides an indication of what the typical water demand load may be on water treatment infrastructure as an average across a year (average water demand (potable).

Planning Stage (Present day – 2026)



Stage 1: Construction (2027-2031)



Stage 2: Construction (2030-2033)

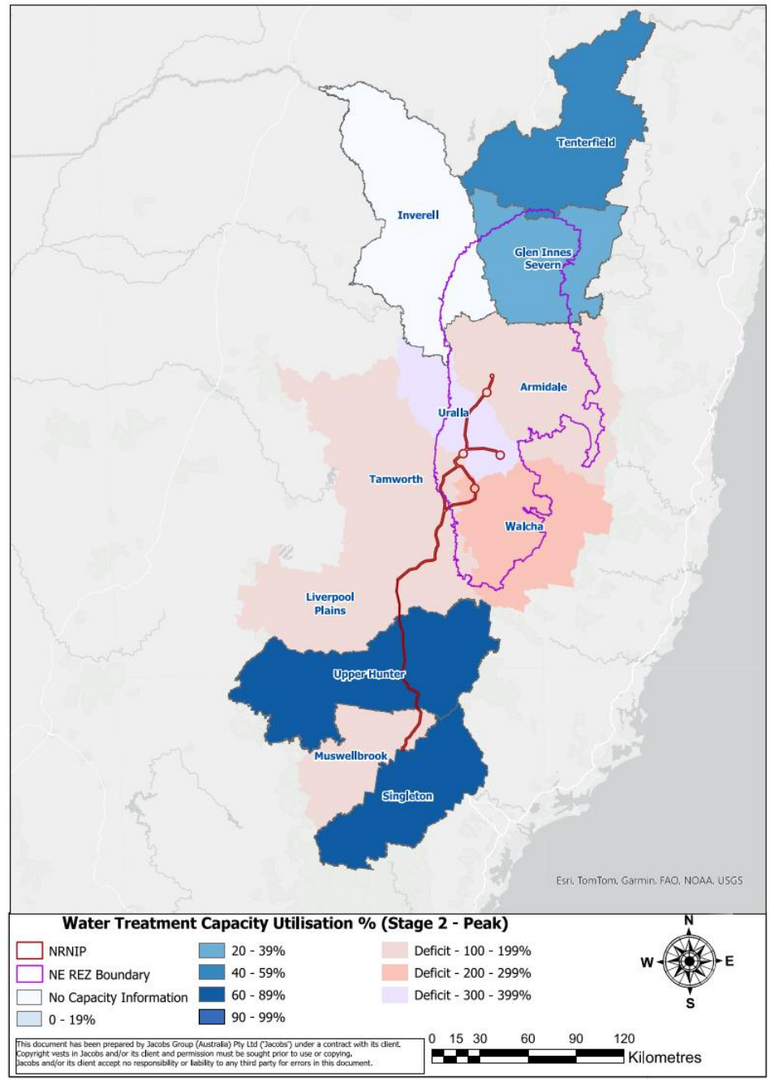


Figure 6-6: Percentage of water treatment infrastructure capacity utilised under projected annual peak water demand (potable) (ML/d) across the NE REZ development region by LGA – NE REZ development case, three time horizons

Note: The analysis presented in Figure 6-4 reports peak potable water demand figures which provides a conservative estimate of water requirements. By using peak demand values, the analysis accounts for periods of highest water demand. This approach may overestimate typical water needs, as actual water demand is likely to be lower as shown by the use of average water demand (potable) figures. Peak water demand (potable) provides a buffer for planning and decision-making, ensuring adequate capacity for peak demand periods.

6.2.4 Sensitivity test results

Table 6-10 presents a summary of how the water treatment infrastructure capacity assessment results for the NE REZ development case vary according to the supply and demand sensitivity tests.

- The supply sensitivity shows what may happen to demand if a repeat of the 2017-2020 drought were to occur.
- The water demand sensitivities are relevant to the water treatment infrastructure capacity assessment because a change in water demand will reduce the extent to which water treatment plants are utilised. As discussed in Section 4.4, the demand sensitivity tests reflect the reduced volumes of water to be treated from the respective sub-set of projects, based on an assessment of the likelihood that the project will proceed. The extent to which the results from the demand sensitivities tests is influenced by the proportion of projects categorised as low, medium and high likelihood to proceed.

Table 6-10: Summary of how the NE REZ development case water treatment infrastructure capacity results vary under the sensitivity tests

Sensitivity test		Summary
Water supply	Extremely dry, repeat of 2018-2020 conditions	▪ **Impact on NE REZ development case results.** ▪ When considering the NE REZ development case results in the context of water use trends in the most recent drought (2019-2020), there is an overall increase in peak water demand (potable) by approximately 14.3 ML/d across the LGAs in 2031 which is the projected year of highest water demand shown in Figure 6-1 and 6-2. ▪ This increase in peak water demand (potable) means that the utilisation of the water treatment infrastructure will also increase. This reinforces the inclusion of peak water demand analyses which demonstrate the water demand load treatment infrastructure may come under during consecutive days of high water demand. ▪ The LGAs with the largest increases in water demand (potable) under this sensitivity are Singleton and Tamworth because these are the largest population centres.
Water demand	Reduced demand: NE REZ projects with high and medium likelihood to proceed	▪ **Minor impact on NE REZ development case results.** ▪ Removing projects categorised as low likelihood to proceed decreases average water demand (potable) by approximately 6 ML/d across the LGAs in 2031 which is the projected year of highest water demand shown in shown in Figure 6-1 and 6-2. ▪ There are only 13 projects categorised as low across the 114 projects included in the Study (base case and NE REZ development case), so the reduction water demand (potable) is relatively modest compared to the water demand sensitivity that removes projects categorised as high and medium likelihood to proceed. ▪ This decrease in water demand (potable) means that the utilisation of the water treatment infrastructure will also decrease.
	Reduced demand: NE REZ projects with high likelihood to proceed	▪ **Significant impact on NE REZ development case results.** ▪ Removing projects categorised as low and medium likelihood to proceed decreases average water demand (potable) by approximately 53.6 ML/d across the LGAs in 2031 which is the projected year of highest water demand shown in shown in Figure 6-1 and 6-2. ▪ This larger decrease in water demand reflects the fact that there are 77 projects categorised as low and medium across the 114 projects included in the Study (base case and NE REZ development case). ▪ At an LGA scale, the largest decreases in average water demand (potable) generally occur in Uralla, Armidale, Muswellbrook and Tamworth. This reflects the fact that these LGAs have the highest proportion of projects categorised as low and medium likelihood to proceed. ▪ This decrease in water demand (potable) means that the utilisation of the water treatment infrastructure will also decrease.

7. Wastewater treatment infrastructure capacity assessment (Assessment 3)

This section presents the results from the wastewater treatment infrastructure capacity assessment. The capacity assessment was based on a simple comparison between the estimated wastewater to be treated and the total wastewater treatment capacity (or the wastewater treatment capacity within each LGA). The results presented in this section do not account for other constraints across the wastewater network. This is a simple approach based on the data that were available to the study (i.e., only wastewater treatment plant capacity data in ML/d). The results highlight key areas where issues may emerge, and further investigations are likely required. These are highlighted in the opportunities for consideration (Section 8).

First, the key findings from the assessment are presented using two tables:

- The first table highlights whether there is a deficit or surplus in capacity in each LGA within the NE REZ and along the NRNIP corridor.
- The second table then translates the surplus or deficit for each LGA into the extent to which the wastewater treatment capacity in each LGA is utilised.

The wastewater to be treated estimates focus on wastewater from human activities. This is because of the data that were available to the Study.[28] Wastewater generated from construction activities is an area for further investigation, including understanding the treatment required (e.g., chemicals) and on-site options for dealing with wastewater from activities such as vehicle washdown. These opportunities could be material, significantly influencing the extent to which existing wastewater treatment infrastructure (or other solutions need to be identified) may need to support NE REZ development (see Section 8).

Following the key findings, Section 7.2 presents the supporting evidence and analysis.

7.1 Key findings from wastewater treatment infrastructure capacity assessment

The wastewater treatment capacity assessment highlights the extent to which the wastewater treatment capacity available in the LGAs in the NE REZ and along the NRNIP corridor is utilised due to NE REZ development. Under the NE REZ development, there is a small surplus in wastewater treatment capacity. However, the results vary across the LGAs.[29]

Under the NE REZ development case, Table 7-1 shows in which LGAs there may be a potential surplus or deficit in wastewater treatment capacity. This summary shows that:

- In most LGAs, there is a projected surplus in wastewater treatment infrastructure capacity under the projected Average Dry Weather Flow (ADWF) of wastewater to be treated under NE REZ development in both Stage 1 and Stage 2.
- The LGA that has a large change in the wastewater treatment capacity that is utilised is Uralla. This increases from 52% in the Planning Stage to 105% in Stage 1 and Stage 2 under the NE REZ development case. Liverpool Plains shows a current deficit in wastewater treatment capacity which is shown under the base case (Planning Stage), and under NE REZ development. These results are based on the wastewater treatment infrastructure capacity data available to the Study (see Appendix I). Based on the capacity estimates available for Liverpool Plains, it indicates that the wastewater treatment plants in this LGA may already be operating at capacity and have management mechanisms in place (e.g., use of

[28] The Constructability data provided by EnergyCo also only included water demand (20250117 NE REZ Construction Water Demand 2.0.xlsx)

[29] While included in these 11 LGAs, treatment capacity data for Inverell was unavailable at the time of this Study.

storage ponds).[30] However, further consultation and verification with Liverpool Plains Shire Council in relation to the wastewater treatment infrastructure is required (see Section 8).

Under the NE REZ development case, Table 7-2 shows the surplus or deficit in wastewater treatment capacity as a percentage of the wastewater treatment capacity available within the respective LGA. This summary shows that:

- The potential utilisation of wastewater treatment capacity for Liverpool Plains is 195% in the Planning stage and up to 199% in Stage 2 based on the wastewater treatment capacity information available to the project (see above), meaning there is a deficit of approximately 95% - 99%.
- The wastewater to be treated estimates mean that for most LGAs, wastewater treatment capacity is close to being fully utilised under ADWF conditions (i.e., between 80 and 98%). The percentage of treatment capacity does not vary much across the base case and sensitivities because this is influenced by the number of projects in the base case versus the NE REZ development case, and the proportion of projects categorised as high or medium likelihood of proceeding (see Section 7.2.4).
- The only LGA where project likelihood materially alters the wastewater treatment infrastructure capacity assessment results is Uralla. This is because a relatively high proportion of projects are categorised as medium, so there is a 36% difference in utilisation between the results that include all NE REZ development in Uralla and the demand sensitivity that only includes NE REZ projects categorised as having a high likelihood to proceed.

The wastewater treatment infrastructure capacity assessment results shown in Table 7-1 and Table 7-2 are based on ADWF wastewater to be treated estimates. This demonstrates what the typical wastewater load may be on wastewater treatment infrastructure as an average across a year.

Wastewater treatment infrastructure is typically under the highest load during extreme wet weather events. Peak wet weather wastewater to be treated estimates were beyond the scope of the Study as this involves more complex analyses, including integration of rainfall data. However, unlike water treatment infrastructure, there are management mechanisms available to operators of wastewater treatment plants. This includes holding wastewater in storage ponds and / or emergency relief provisions that enable discharge of partially treated water under specific events or conditions, albeit not treated to the typical standards.

In the context of the wastewater treatment infrastructure capacity assessment results whereby under the NE REZ development case, most LGAs in the NE REZ and / or impacted by the NRNIP, are nearing capacity of the wastewater treatment plants (under ADWF conditions), further consultation with local councils will be required to understand the mechanisms they have available to manage increased volumes of wastewater to be treated during wet weather events and the extent to which these mechanisms are considered effective in the context of NE REZ development. There may also be options for NE REZ projects and the NRNIP to include onsite management of the small volumes of wastewater from human use. This will marginally reduce any additional pressure on wastewater treatment infrastructure from NE REZ development.

[30] As noted elsewhere throughout this Report, the wastewater treatment infrastructure capacity information was highly variable, generally without efficiency information. This statement is made in the context of the results showing a potential deficit in wastewater treatment capacity in Liverpool Plains.

Table 7-1: Key findings summary from the wastewater treatment infrastructure capacity assessment – surplus or deficit under Average Dry Weather Flow (ADWF)

	Base case	NE REZ development case		NE REZ development case – sensitivities			
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only							
Inverell	No treatment capacity data to enable capacity assessment						
Tenterfield	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Glen Innes Severn	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Intersects with the NE REZ and impacted by the NRNIP							
Armidale	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Uralla	Surplus	Deficit	Deficit	Deficit	Deficit	Surplus	Surplus
Walcha	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Tamworth	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Outside of NE REZ, but impacted by the NRNIP							
Liverpool Plains	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit	Deficit
Upper Hunter	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Muswellbrook	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus
Singleton	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus	Surplus

Source: All wastewater treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The wastewater treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, wastewater treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Table 7-2: Key findings summary from the wastewater treatment infrastructure capacity assessment – wastewater to be treated as a percentage of wastewater treatment capacity

	Base case	NE REZ development case		NE REZ development case – sensitivities			
				Reduced demand: NE REZ projects with high and medium likelihood to proceed		Reduced demand: NE REZ projects with high likelihood to proceed	
LGA	Planning Stage	Stage 1	Stage 2	Stage 1	Stage 2	Stage 1	Stage 2
Intersects with the NE REZ only							
Inverell	No treatment capacity data to enable capacity assessment						
Tenterfield	92%	92%	92%	92%	92%	92%	92%
Glen Innes Severn	89%	90%	90%	90%	90%	89%	90%
Intersects with the NE REZ and impacted by the NRNIP							
Armidale	89%	91%	91%	91%	91%	89%	89%
Uralla	52%	105%	105%	105%	105%	72%	69%
Walcha	24%	26%	26%	26%	26%	25%	25%
Tamworth	98%	99%	99%	99%	99%	98%	98%
Outside of NE REZ, but impacted by the NRNIP							
Liverpool Plains	195%	197%	199%	198%	199%	198%	199%
Upper Hunter	97%	98%	98%	98%	98%	98%	98%
Muswellbrook	80%	80%	78%	80%	78%	78%	78%
Singleton	89%	90%	91%	90%	91%	90%	90%

Source: All wastewater treatment capacity information was sourced from local councils either via direct consultation or publicly available documents. See Appendix I for all data sources.

Note: The wastewater treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, wastewater treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

7.2 Evidence and analysis

7.2.1 Wastewater to be treated estimates

Figure 7-1 shows the ADWF wastewater to be treated results for the base case compared to the NE REZ development case.

Based on the estimates of ADWF wastewater to be treated, under the:

- Base case, wastewater to be treated could decrease by 0.1 ML/d between 2026 (end of Planning Stage) and 2033 (end of Stage 2) across the LGAs in the NE REZ and along the NRNIP corridor.
- The NE REZ development case shows a 1.1 ML/d increase at the end of Stage 2 compared to the base case due to the additional demand attributed to NRNIP and REZ project development.
- Under the NE REZ development case, wastewater to be treated could decrease by 0.5 ML/d between the end of the 2026 (end of Planning Stage) and 2033 (end of Stage 2). While a nominal difference between these two years, it is important to consider that volumes of wastewater to be treated increase across Stage 1.

These results reflect ADWF wastewater to be treated. This demonstrates what the typical wastewater load may be on wastewater treatment infrastructure as an average across a year. While wastewater to be treated will increase under wet weather conditions, wastewater treatment plant operators have a range of management tools available to manage these events. These tools include storage of wastewater in ponds, and emergency relief provisions (e.g., discharge of wastewater that is treated to a lower standard).

The relatively small difference between the projected volumes of wastewater to be treated between the base case and NE REZ development case reflect the fact that data were only available for wastewater generated by human activities.[31] Wastewater generated from construction activities is an area for further investigation, including on-site options for dealing with wastewater from activities such as vehicle washdown (see Section 8).

The change in projected volumes of wastewater to be treated between the base case and NE REZ development case vary slightly across the LGAs (Figure 7-2). For example:

- Tamworth Regional Council is the dominant council in both the base case and NE REZ development case, generating approximately 40% of wastewater to be treated each year. In the NE REZ development case, the total volumes of wastewater to be treated in Tamworth range from 20.3 ML/d to 20.7 ML/d over the years. Armidale also consistently holds a significant proportion, around 13% of the total volume of wastewater to be treated. Uralla shows significant growth (86%) in the NE REZ development case, growing from 0.7 ML/d to 1.3 ML/d, peaking in 2031. This reflects the intensity of NE REZ development in this LGA. LGAs like Liverpool Plains and Tenterfield show consistent wastewater to be treated volumes across both cases.

[31] The Constructability data provided by EnergyCo also only included water demand (20250117 NE REZ Construction Water Demand 2.0.xlsx)

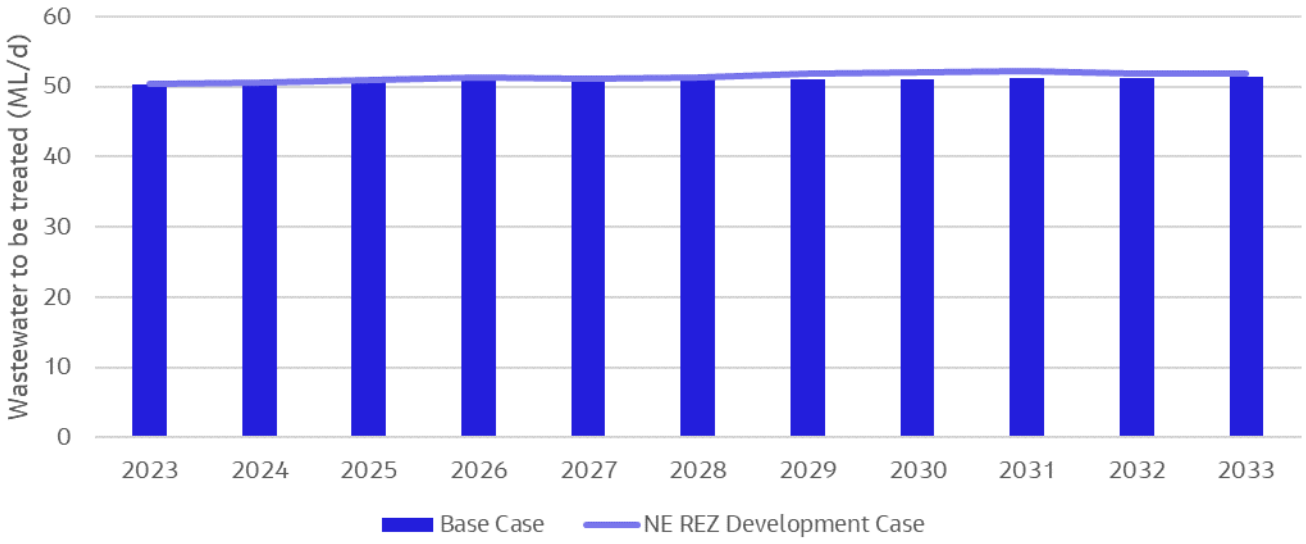


Figure 7-1: Projected average dry weather wastewater to be treated (ML/d) across the NE REZ development region, base case v NE REZ development case

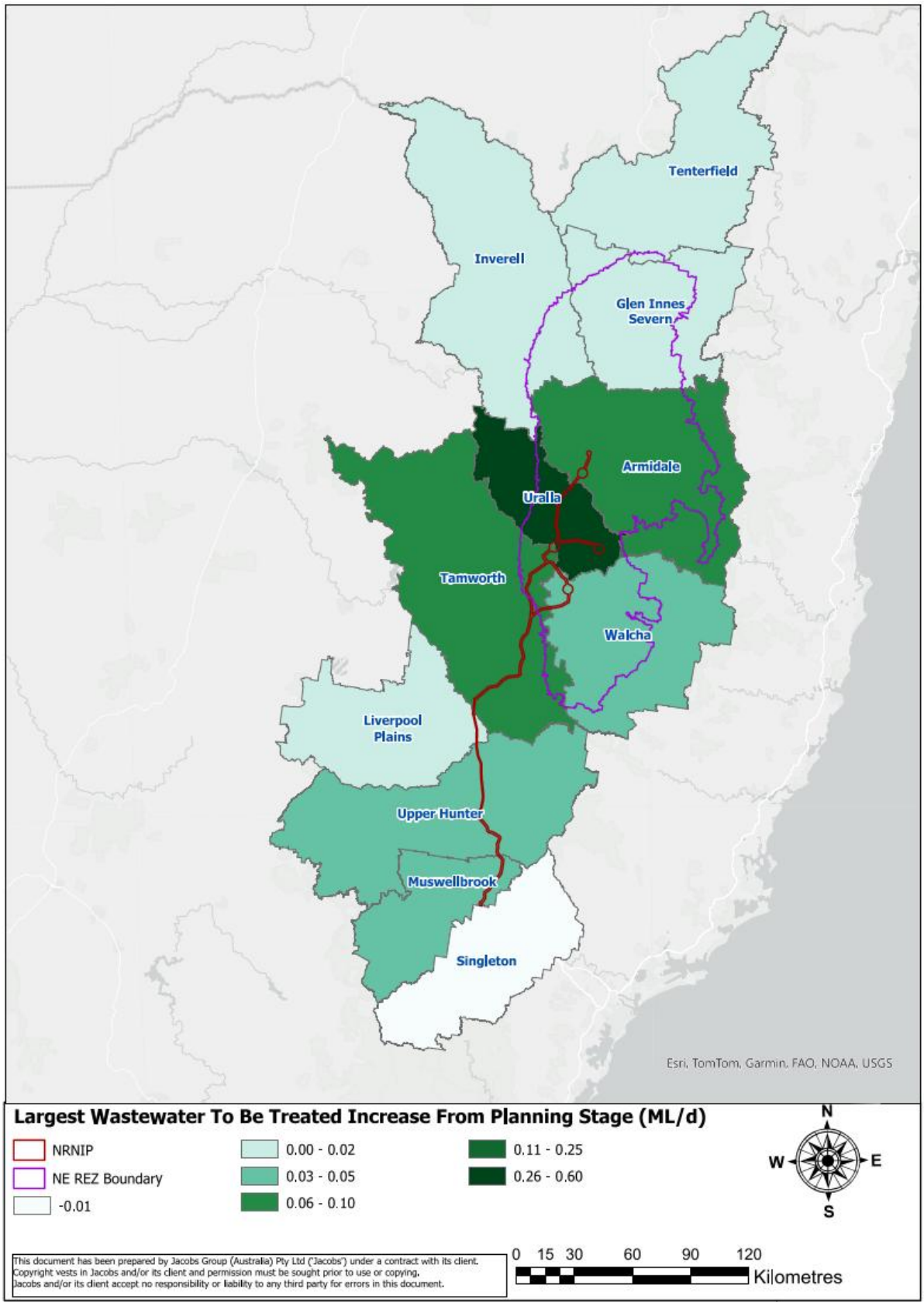


Figure 7-2: Change in average dry weather wastewater to be treated (ML/d) across the NE REZ development region by LGA between the Planning Stage and highest value of wastewater to be treated (Stage 1 and Stage 2)

7.2.2 Wastewater treatment capacity estimates

Table 7-3 confirms the wastewater treatment infrastructure capacities that were used in the capacity assessment (Section 7.2.3) for each time horizon.

Based on the estimates of wastewater treatment infrastructure capacity, under the:

- Base case, wastewater treatment infrastructure capacity remains constant between 2024 and 2033.
- NE REZ development case, wastewater treatment infrastructure capacity also does not change between the end of the planning stage and the end of Stage 2.

The estimates of wastewater infrastructure treatment capacity shown here will be an underestimate of the total capacity across the LGAs in the NE REZ and along the NRNIP. This is because no wastewater treatment plant capacity information was available for Inverell at the time of the Study.

While several local councils expressed interest in expanding or upgrading the existing wastewater treatment facilities, at the time of the Study (late 2024 / early 2025) none of these upgrades had formal approvals, confirmed capacities or committed funding in place. Wastewater treatment plant expansions and new facility developments typically involve substantial capital investments and extensive planning periods, often spanning several years. Given these factors, coupled with the early stages of development for NE REZ projects, changes in wastewater treatment capacity are not yet reflected in current plans. This means that no projected capacity increases were included in the analysis.

See Section 3.7 for the breakdown of wastewater treatment capacity by LGA and wastewater treatment plant.

Table 7-3: Estimated wastewater treatment infrastructure capacity at the end of each time horizon under the base case and NE REZ development case (ML/d)

Scenario	Planning Stage (Present day – 2026)	Stage 1: Construction (2027 – 2031)		Stage 2: Construction (2030 – 2033)	
	Capacity (ML/d)	Capacity (ML/d)	% difference compared to planning stage	Capacity (ML/d)	% difference compared to planning stage
Base case	52.3	52.3	0%	52.3	0%
NE REZ development case	52.3	52.3	0%	52.3	0%
Difference in wastewater treatment capacity	-	-	-	-	-

Note 1: The treatment capacities are based on information from local councils or desktop research. No wastewater treatment plant capacity information was available for Inverell at the time of the Study. The wastewater treatment plant capacity information available to the Study was highly variable and limited to treatment capacity and / or estimated population data. In instances where only estimated population data were available, wastewater treatment capacity was back calculated. No information about plant efficiency was available. Treatment capacity was assumed to be fully available.

Note 2: This analysis is limited to planned or approved projects to establish additional facilities or expand current facilities. No planned or approved projects were provided by local councils.

7.2.3 Wastewater treatment infrastructure capacity assessment

Table 7-4 shows the wastewater treatment infrastructure capacity assessment results for all the LGAs in the NE REZ and NRNIP corridor, combined.

Based on the estimates of ADWF wastewater to be treated and the wastewater treatment infrastructure capacity presented above, across the NE REZ development region under the:

- Base case, there is a wastewater treatment infrastructure capacity surplus of between 1.1 ML/d (Planning Stage) and 1ML/d (Stage 2).
- NE REZ development case there is also a projected surplus in wastewater treatment capacity, albeit smaller than under the base case. In the Planning Stage the surplus is 1 ML/d; this reduces to 0.1 ML/d in Stage 2.

As noted in Section 7.2.2, wastewater treatment infrastructure capacity remains constant at 52.3 ML/d throughout all stages in both the base case and NE REZ development case. Thus, the deficits and surpluses shown reflect changes in the projected wastewater to be treated. As also noted in Section 7.2.2, the capacity assessment is likely conservative because no wastewater treatment capacity information from Inverell was available for the Study.

Table 7-4: Wastewater treatment infrastructure capacity assessment results – all LGAs in NE REZ and along NRNIP corridor

Scenario	Planning Stage (Present day to 2026)			Stage 1: Construction (2027-2031)			Stage 2: Construction (2030-2033)		
	Wastewater to be treated (ML/d)	Wastewater treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)	Wastewater to be treated (ML/d)	Wastewater treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)	Wastewater to be treated (ML/d)	Wastewater treatment infrastructure capacity (ML/d)	Capacity surplus or deficit (ML/d)
Base case	51.2 (in 2026)	52.3	1.1	51.1 (in 2027)	52.3	1.2	51.3 (in 2033)	52.3	1
NE REZ development case	51.3 (in 2026)	52.3	1	52.2 (in 2031)	52.3	0.1	52.2 (in 2031)	52.3	0.1

Note 1: The wastewater to the treated data shown are the highest values across the sequence of years in each stage. The respective year is shown in brackets.

Note 2: The estimates of wastewater infrastructure treatment capacity on which the capacity assessment is based likely underestimate the total capacity across the LGAs in the NE REZ and along the NRNIP. This is because no wastewater treatment plant capacity information was available for Inverell at the time of the Study.

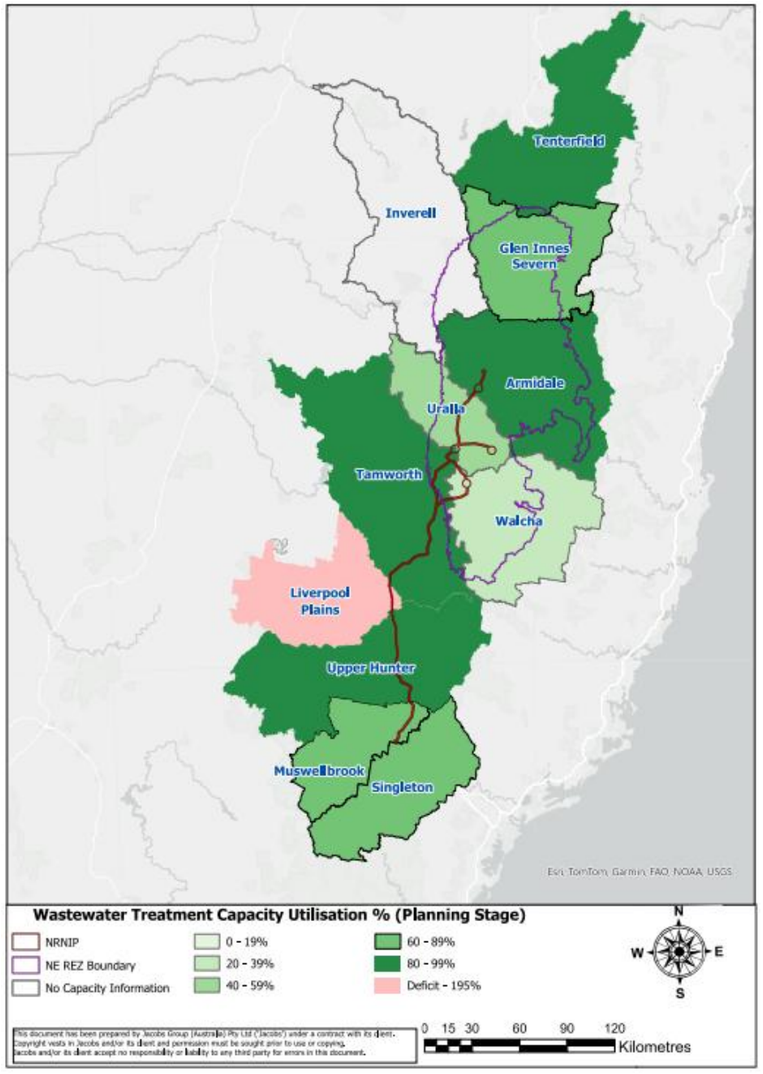
The wastewater treatment infrastructure capacity results vary by LGA. Figure 7-3 shows the percentage of the wastewater treatment infrastructure capacity that is utilised in each LGA across the three time horizons under the NE REZ development case. These maps show that:

- In most LGAs, there is a surplus in wastewater treatment capacity when compared to ADWF, and this remains largely unchanged over time. This reflects the relatively small changes in the volumes of wastewater to be treated. As noted in Section 7.2.1, these estimates reflect wastewater generated from human activities. Data for the volumes of wastewater generated from construction activities (e.g., vehicle washdown etc) were not available to the Study. However, there are options for installing wastewater management facilities on site at NE REZ projects and along the NRNIP. This issue is discussed in the context of the options and next steps (Section 8).
- The wastewater to be treated estimates mean that for most LGAs, these volumes are close to the available wastewater treatment capacity (i.e., between 80 and 99%) based upon the ADWF.

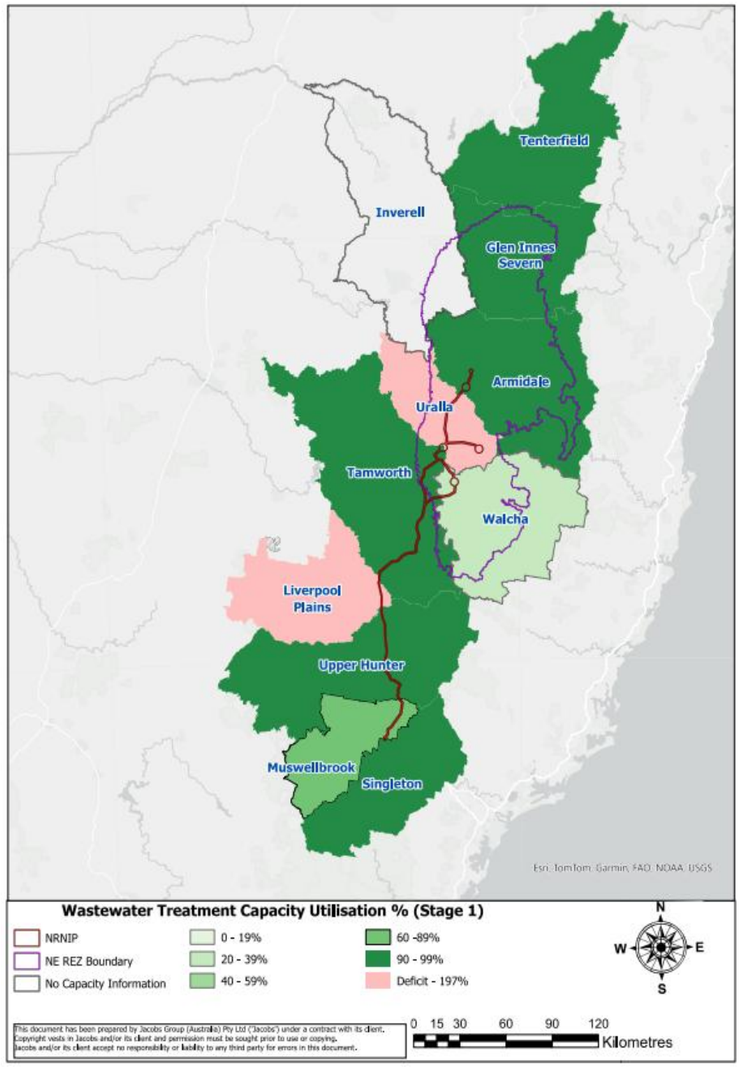
- The only LGA that has a large change in the wastewater treatment capacity that is utilised is Uralla. This increases from 52% in the Planning Stage to 105% in Stage 1 and Stage 2 under the NE REZ development case.
- There is a deficit in wastewater treatment capacity in Liverpool Plains in all three-time horizons. These results are based on the wastewater treatment infrastructure capacity data available to the Study (see Appendix I). Based on these capacity estimates, it indicates that the wastewater treatment plants in Liverpool Plains may already be operating at capacity and have management mechanisms in place (e.g., use of storage ponds).[32] This is an area for further consultation and verification with Liverpool Plains Shire Council. Alternatively, there may be other wastewater treatment capacity in Liverpool Plains for which data were not available to the Study.

[32] As noted elsewhere throughout this Report, the wastewater treatment infrastructure capacity information was highly variable, generally without efficiency information. This statement is made in the context of the results showing a potential deficit in wastewater treatment capacity in Liverpool Plains.

Planning Stage: (Present day to 2026)



Stage 1: Construction (2027-2031)



Stage 2: Construction (2030-2033)

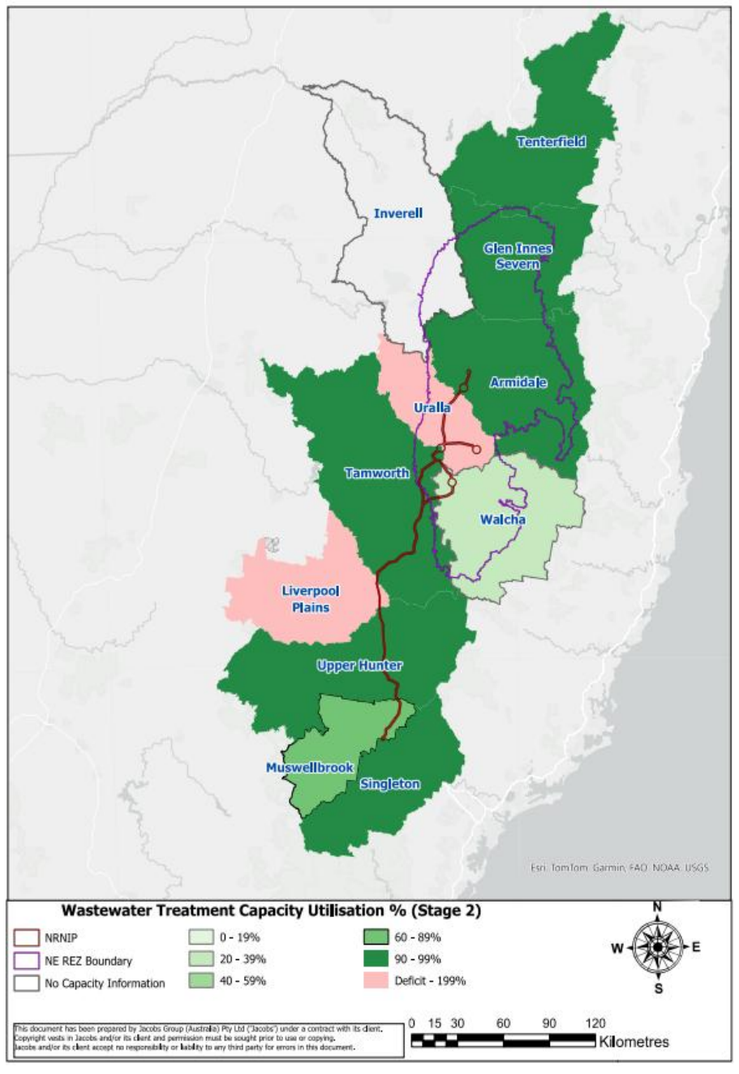


Figure 7-3: Percentage of wastewater treatment infrastructure capacity utilised under projected average dry weather wastewater to be treated (ML/d) across the NE REZ development region by LGA – NE REZ development case, three time horizons

Note: The wastewater to the treated data used in the capacity assessment are the highest values across the sequence of years in each stage.

7.2.4 Sensitivity test results

Table 7-5 presents a summary of how the wastewater treatment infrastructure capacity assessment results for the NE REZ development case vary according to the two demand sensitivity tests. The water demand sensitivities are most relevant to the wastewater infrastructure capacity assessment because a change in water demand is reflected in a change to the volumes of wastewater that needs to be treated.

As discussed in Section 4.4, the demand sensitivity tests reflect the reduced volumes of wastewater produced by the respective sub-set of projects, based on an assessment of the likelihood that the project will proceed. The extent to which the results from the demand sensitivities tests is influenced by the proportion of projects categorised as low, medium and high likelihood to proceed.

Table 7-5: Summary of how the NE REZ development case wastewater treatment infrastructure capacity assessment results vary under the demand sensitivity tests

	Sensitivity test	Summary
Water demand	Reduced demand: NE REZ projects with high and medium likelihood to proceed	▪ **Minimal impact on NE REZ development case results.** ▪ Removing projects categorised as low likelihood to proceed reduces total volumes of wastewater to be treated by less than 0.1 ML/d across the LGAs. ▪ This very minor reduction in wastewater to be treated reflects the fact that only 2 NE REZ projects were categorised as having a low likelihood to proceed.
	Reduced demand: NE REZ projects with high likelihood to proceed	▪ **Notable impact on NE REZ development case results.** ▪ Removing projects categorised as low and medium likelihood to proceed reduces projected total volumes of wastewater to be treated by approximately 5.4 ML/d. ▪ Wastewater to be treated volumes reduce in the following LGAs: Uralla, Tamworth, Armidale, Muswellbrook, Walcha, Upper Hunter, Glen Innes and Inverell . ▪ Given the high proportion of low and medium likelihood projects in Uralla, this sensitivity shows a significant decrease in the volumes of wastewater to be treated in Uralla. For example, under the NE REZ development Case, wastewater to be treated in Uralla could increase by 86% from 0.7 ML/d to 1.3 ML/d. Under this sensitivity the increase in wastewater to be by 2031 is more moderate (14%). This reflects the fact that most (11) projects in Uralla are categorised as medium or low likelihood, with only one project identified as high likelihood in Uralla. ▪ Given this sensitivity excluded NE REZ projects with a medium or low likelihood, this equated to 24 of the 26 NE REZ projects.

8. Opportunities to address water and wastewater impacts from NE REZ development

This process for assessing water and wastewater impacts from NE REZ development was designed to provide:

- a strategic overview of water- and wastewater-related risks that could be considered and investigated further based on the analysis presented in this Report, and
- a list of opportunities that could support management of the risks.

The following steps were implemented to identify water and wastewater risks and issues related to NE REZ development, and to identify options for addressing those impacts:

1. **Summarise key water and wastewater-related risks and potential impacts**

- Review assessments of:
  - water resources assessment (Section 5)
  - water treatment infrastructure capacity assessment (Section 6)
  - wastewater treatment infrastructure capacity assessment (Section 7).
- Identify key risks across time horizons, including any geographic hotspots.
- Consider potential consequences for the NE REZ development, local communities, local industries and the environment.

2. **Step 2: Mitigation opportunities and funding mechanisms**

- Consider opportunities that could mitigate the water- and wastewater-related risks identified.
- Provide an overview of potential funding mechanisms that could be explored to support risk mitigations.

8.1 Summary of water and wastewater risks and potential impacts

The following table (Table 8-1) presents a summary of the water and wastewater risks and issues under the NE REZ development case. The risks and issues are organised according to the three capacity assessments undertaken during the study.

Water and wastewater challenges from NE REZ development have the potential to significantly impact businesses, communities, the environment, and the overall NE REZ development. Understanding these impacts is essential for effective planning and risk mitigation in the NE REZ context. Examples of potential impacts are also outlined in Table 8-1 below.

Table 8-1: Summary of water and wastewater risks attributed to NE REZ development potential impacts

Key risk categories	Key risks attributed to NE REZ development	Estimated level of risk based on available data	Potential cumulative impacts	Opportunities
Water resources assessment				
Water supply	▪ **Large demand for potable water is driven by construction requirements for NRNIP and NE REZ projects.** ▪ While there is generally sufficient available water in existing systems in an 'average' year, there may be risks associated with water availability during dry years. This particularly applies to the Peel Regulated River source and groundwater sources that supply communities in the LGAs in the eastern part of the NE REZ. ▪ Water may also be available through groundwater sources. While historical data at the groundwater source level indicates that there may be sufficient volumes in many sources, groundwater impacts are assessed at a bore scale (including impacts on third party bores, connected surface water sources and aquifers,	High	▪ Insufficient water to construct or operate NE REZ infrastructure, or specific projects/infrastructure within the NE REZ development. ▪ Potential for water restrictions or conservation measures. ▪ Possible localised shortages during peak demand periods or drought conditions.	▪ WS 1: Understand the potential volume of water access licences held by LWUs with access to regulated river sources. ▪ WS 2: Understand the potential volume of water access licences held by LWUs with access to groundwater sources. Explore supply network capacity. ▪ WS 3: Collaborate with those local councils that are currently preparing or updating IWCM strategies and support integration of NE REZ development water and wastewater requirements. ▪ WS 4: Explore the feasibility of increasing the volume of alternative water sources to support the NRNIP and NE REZ projects. ▪ WS 5: Investigate potential barriers to/limitations on use of alternative water sources, including regulations ▪ WS 6: Embed recycled water capability in NRNIP projects and enabling infrastructure. ▪ WS 7: Incentivise GDPs to include sustainable water management into their project designs.
Water demand		High	▪ Potential for increased water costs due to the need for additional sources/treatment infrastructure or transportation to/from other nearby sources/treatment infrastructure.	▪ WD 1: Understand the potential volume of water required to support NE REZ development for water uses that were not included in the Study.

Key risk categories	Key risks attributed to NE REZ development	Estimated level of risk based on available data	Potential cumulative impacts	Opportunities
	and groundwater dependent ecosystems), so more granular investigations of impacts may be required once more certain information about project locations is available.		▪ Potential for increased operational costs due to higher water prices. ▪ Potential conflicts between local communities and industries over water resources. ▪ Some disruption to normal water usage patterns for businesses and residents. ▪ Reduced production capacity in water-dependent industries (e.g. agriculture, manufacturing). ▪ Heightened stakeholder scrutiny on water management practices. Increased disclosure and reporting requirements related to water usage.	▪ WD 2: Engage with the EnergyCo Team leading the early stages of planning for the Hunter-Central Coast Renewable Energy Zone to understand cumulative construction and operational water use demands from the Hunter Regulated River Source. ▪ WD 3: Plan and sequence NE REZ development to support management of existing water resources, especially potable water demand. Investigate possible use of lower grade water in concrete production i.e. Class A Recycled water. ▪ WD 4: Undertake a critical assessment of the alternative delivery pathways through negative wellbeing valuations and targeted stakeholder engagement. ▪ WD 5: Partner with agencies who are advocating for sustainable and on-going behaviour change related to water efficiency across all water users. ▪ WD 6: Explore potential for temporary storage dams for construction water for: earthworks compaction and dust suppression and concrete production. ▪ WD 7: Update water and wastewater security assessments based on additional data.
Water treatment infrastructure capacity				
Water treatment infrastructure capacity	**The NE REZ development could place considerable strain on water treatment capacity.** Based on potable demand estimates that includes demand	High	▪ Potential for increased water costs due to the need for additional sources/treatment infrastructure or transportation to/from other nearby sources/treatment infrastructure.	▪ WC 1: Undertake a strategic assessment of the location of the workers accommodation camps for the NRNIP in the context of the location of the existing WTPs. ▪ WC 2: Determine the most cost-effective solutions for treating potable water volumes required to support NRNIP and NE REZ

Key risk categories	Key risks attributed to NE REZ development	Estimated level of risk based on available data	Potential cumulative impacts	Opportunities
	from concrete production, average water demand shows potential projected water treatment deficits in Uralla and Walcha across Stages 1 & 2 of NE REZ development, and Muswellbrook in Planning and Stage 1. Peak water demand estimates reveal potential projected water treatment deficits in six LGAs: Uralla, Walcha, Liverpool Plains, Muswellbrook, Tamworth and Armidale.		▪ Construction of additional infrastructure or upgrades to existing infrastructure (e.g., water treatment plants) will create greenhouse gas emissions. ▪ Tankering of water has potential to cause disruption to local communities along existing transport routes.	projects, which may include on site treatment of bore sources where an access license can be obtained. ▪ WC 3: Assessing the most cost and time effective transportation of potable water to NRNIP and NE REZ sites not currently connected to the network infrastructure. This may include comparison of vehicular transport against the installation of linear infrastructure. ▪ WC 4: Incentivise GDPs to include on-site WTPs for potable water, especially to meet concrete production requirements. ▪ WC 5: Engage with Uralla and Walcha councils to identify effective solutions to accommodate increased demand for water treatment. ▪ WC 6: Consider the viability of establishing new local council-operated WTPs.
Wastewater treatment infrastructure capacity				
Wastewater treatment infrastructure capacity	**The NE REZ development results in a small surplus in wastewater treatment capacity overall, but results vary across LGAs.** Wastewater treatment capacity in most LGAs is close to full utilisation (80-98%) under ADWF conditions. Liverpool Plains shows a consistent deficit in wastewater treatment	Further investigation required	▪ Potential for increased water costs due to the need for additional sources/treatment infrastructure or transportation to/from other nearby sources/treatment infrastructure. ▪ Construction of additional infrastructure or upgrades to existing infrastructure (e.g., water treatment plants) will create greenhouse gas emissions.	▪ WWC 1: Undertake a strategic assessment of the location of the workers accommodation camps for the NRNIP in the context of the location of the existing WWTPs. ▪ WWC 2: Understand the potential volume of wastewater generated during construction of the NRNIP and NE REZ projects. ▪ WWC 3: Understand the extent to which the WWTPs identified in the Study as nearing or exceeding their capacity under NE REZ development have effective management in place to manage wastewater flows during wet weather events i.e. lagoons or Emergency Relief consent / structures.

Key risk categories	Key risks attributed to NE REZ development	Estimated level of risk based on available data	Potential cumulative impacts	Opportunities
	capacity, operating at 195% utilisation, indicating a 95% deficit. Uralla shows a deficit in wastewater treatment capacity in Stages 1 & 2, operating at 105% utilisation, indicating a 5% deficit.		▪ Tankering of wastewater has potential to cause disruption to local communities along existing transport routes.	▪ WWC 4: Determine the most cost-effective solutions for treating wastewater volumes from NRNIP and NE REZ projects. ▪ WWC 5: Assessing the most cost and time effective transportation of wastewater or biproducts of onsite treatment facilities to WWTPs. ▪ WWC 6: Engage with Liverpool Plains Shire Council to understand WWTP capacity. ▪ WWC 7: Further analysis to understand impact of extreme wet weather events on flow in the NE REZ and surrounds.

8.1.1 Cumulative impacts

This study identifies key water and wastewater risks and associated potential impacts attributed to NE REZ development within the geographical scope of the Study. To gain a comprehensive understanding of water and wastewater impacts across the New England and Hunter-Central Coast (HCC) regions, these findings should be evaluated in conjunction with other related studies conducted in these areas. This integrated approach ensures a more holistic assessment of the potential effects on water resources and wastewater management in the broader region.

EnergyCo is collaborating with GDPs, local councils, government agencies and other key stakeholders to identify potential cumulative impacts associated with the NE REZ to safeguard that these are adequately managed and coordinated. Alongside the water and wastewater impacts outlined in this study, EnergyCo is assessing impacts on NE REZ development on waste, training and employment, roads and traffic, social infrastructure, accommodation and local supply chains. To understand potential cumulative impacts associated with the NE REZ, the findings presented in this Study should be considered collectively with other related studies. This can guide a broader appreciation of the environmental, economic and social impacts attributed to NE REZ development.

It is important to note that water and wastewater impacts may extend beyond the Study's geographical boundaries, potentially affecting LGAs that share the same water systems. For example, for regulated surface water, Upper Hunter, Muswellbrook, and Singleton (Hunter Regulated River Source), and for groundwater Uralla, Walcha and Armidale. For groundwater sources in particular, the NSW Aquifer Interference Policy[33] requires consideration of cumulative impacts for each new State Significant Development or Infrastructure project. This means that each of these significant projects must consider its own potential impacts on aquifers but also the combined effect of all previously approved projects in the area.

Cumulative impacts may also be amplified in regions where multiple REZs are planned, such as the areas between the NE REZ and the HCC REZ. This underscores the need for broader consideration of water management planning throughout the broader development regions. Section 8.2 outlines opportunities that could mitigate the identified water and wastewater risks. These could be considered alongside opportunities identified through other supporting studies.

8.2 Opportunities to mitigate identified water and wastewater risks

This section presents opportunities that could be used to address the water and wastewater risks identified in sections 5, 6 and 7. These opportunities have been identified to guide further investigations and consultation with stakeholders throughout the planning stage for the NE REZ development.

To ensure alignment with existing policies and strategies focused on addressing water and wastewater issues in the LGAs in the NE REZ and along the NRNIP corridor, the following documents have been reviewed:

- the NSW Water Strategy.
- regional water strategies relevant to the NE REZ.
- the *New England North West Regional Plan 2041*. This Plan supports initiatives from four of the relevant regional water strategies (Border Rivers, Gwydir, Namoi and North Coast) to improve surface and groundwater security and reliability, by addressing regulatory barriers, improving policies and processes and investing in new infrastructure.[34]

The opportunities for consideration are organised into the following four categories:

[33] Department of Industries, Office of Water. 2012. *NSW Aquifer Interference Policy*. Available at: NSW Aquifer Interference Policy

[34] New England North West Regional Plan 2041 | Planning

- Water supply.
- Water demand.
- Water treatment infrastructure capacity.
- Wastewater treatment infrastructure capacity.

A spectrum of opportunities has been considered, including conventional methods and more innovative solutions. Opportunities have been categorised as follows:

- **Stakeholder engagement.** This includes engaging with key local or state government stakeholders to gather further information and data surrounding NE REZ water requirements and future management plans.
- **Subsequent analyses and investigations.** This includes further detailed analysis that may be required, either to explore particular areas, or to remedy data gaps.
- **Alternative water sources.** This includes further exploration of alternative water sources, including recycled water, to supplement existing water sources.
- **NE REZ planning and procurement.** This involves exploring alternative NE REZ delivery, procurement and planning approaches to better manage NE REZ water related impacts.
- **Coordination of REZ interfaces.** This involves reviewing regional REZ developments to assess and manage cumulative impacts.
- **Community engagement and awareness.** This involves community engagement approaches to change water behaviours.
- **Regulatory.** This involves exploration of existing regulatory barriers and /or enablers.

8.2.1 Opportunities focused on water supply

There are seven opportunities that focus on addressing issues with water supply identified in the Study (Table 8-2).

Table 8-2: Opportunities to consider to address water supply risks from NE REZ development

Category	Opportunity	Description
Stakeholder engagement	**WS 1:** Understand the potential volume of water access licences held by LWUs with access to regulated river sources and in which there is intensive NE REZ development.	Through this Study, the two regulated systems likely to be a source of water for the NE REZ development are the Peel Regulated River Source and the Hunter Regulated River Source. In both sources there are LWU access licences. Further information is required to understand the specific volumes of these licences held by the LWUs through which potable water could be supplied for the NE REZ development, more detailed information on supply capacity, including during periods of low surface water availability (especially in the Peel Regulated River Source). Immediate next steps could be: ▪ Engage with the following local councils that have NE REZ projects and NRNIP projects and have access to regulated river sources. This is **Tamworth Regional Council** as it relates to the Peel Regulated River Source. In relation to the Hunter Regulated River Source it is **Muswellbrook Shire, Singleton Council** and **Upper Hunter Shire**. Key issues for discussion are the volume of water access licences available for potable water, and the key findings from completed IWCM strategies.

Category	Opportunity	Description
		▪ Share information and knowledge about the order of magnitude increase in potable water demand from NE REZ projects and the NRNIP, and determine next steps. Note: This opportunity is related to WD 2 for Muswellbrook Shire, Singleton Council and Upper Hunter Shire as it relates to the Hunter Regulated River Source.
Stakeholder engagement	**WS 2:** Understand the potential volume of water access licences held by LWUs with access to groundwater sources and in which there is intensive NE REZ development.	Through this Study, groundwater sources on which communities in Armidale, Uralla and Walcha may be reliant, especially during dry periods, may come under pressure. Within these LGAs, NE REZ development could require an additional 25.3 ML/d (average water demand (potable)), which is 9,234.5 ML per year. Further information is required to understand the specific volumes of these licences held by the LWUs through which potable water could be supplied for the NE REZ development, more detailed information on supply capacity, including during extended dry periods when unregulated sources are likely not available (or constrained) and storages may have been drawn down. Immediate next steps could be: ▪ Engage with the following local councils that have NE REZ projects and NRNIP projects and have access to groundwater sources (**Armidale Regional Council, Uralla Shire, and Walcha Council**). Key issues for discussion are the volume of water access licences available for potable water (groundwater and unregulated river sources), storage of any water access from unregulated river sources to support potable water supplies during drought, the key findings from completed IWCM strategies and existing supply network capacity. ▪ Share information and knowledge about the order of magnitude increase in potable water demand from NE REZ projects and the NRNIP, and determine next steps. Note: This opportunity is related to WD 1 related to understanding the extent to which potable water may be required for concrete production.
Stakeholder engagement	**WS 3:** Collaborate with those local councils that are currently preparing or updating IWCM strategies and support integration of NE REZ development water and wastewater requirements.	During this Study, several local councils shared that they were preparing / updating their IWCM strategies and understanding the impact of the NE REZ development would be helpful to inform those strategies. Collaboration with those councils that will be impacted by NE REZ projects and the NRNIP will benefit both local water resource planning and planning for the NE REZ development Immediate next steps could be: ▪ Engage with the following local councils that have NE REZ projects and NRNIP projects and are preparing IWCM strategies in 2025 with support from NSW Public Works Advisory, including **Uralla Shire**. ▪ Share information and knowledge about the order of magnitude increase in potable water demand from NE REZ projects and the NRNIP, and determine next steps. Note: This opportunity is related to WD 1 related to understanding the extent to which potable water may be required for concrete production.
Alternative water sources	**WS 4:** Explore the feasibility of increasing the volume of alternative water sources to support the NRNIP and NE REZ projects.	Through this Study, several recycled water plants operated by the LWUs were identified. Most recycled water supplied across the LGAs supports a range of non-urban uses such as agriculture, environmental flows or on site uses. Several of the LWUs expressed interest in expanding their recycled water plants (e.g., in Muswellbrook), but none had firm plans to do so. No other additional alternative water sources were identified that could support water supply for the NE REZ development (e.g.,

Category	Opportunity	Description
		rainwater harvesting). This partly reflects the fact that NE REZ projects were insufficiently developed for GDPs to know if they would incorporate recycled water plants or rainfall harvesting into their designs. However, alternative water sources could offer a solution to provide water for construction and operational uses such as vehicle washdown, cleaning of solar modules and wind turbines. This could reduce pressure on raw water supplies and reduce the need for tankering. Immediate next steps could be: ▪ Engage with the local councils that currently operate recycled water plants and will have NE REZ development (**Muswellbrook Shire, Tamworth Regional Council, Armidale Regional Council** and **Upper Hunter Shire**). Key issues to explore are the potential capacity of the recycled water plants, any supply shortfall based on existing demand, local councils' ambitions for increasing recycled water production, and options to repurpose existing infrastructure. ▪ Continue engaging with GDPs to understand the extent to which their designs may include small, recycled water plants and rainwater harvesting facilities, and the extent to which this can support operational uses that do not require potable water (e.g., solar module cleaning, wind turbine cleaning, vehicle washdown).
Regulatory	**WS 5:** Investigate potential barriers to/limitations on use of alternative water sources, including regulations.	Alternative water sources can provide an alternative supply of water and alleviate current pressures on potable and non-potable water demand. However, this Study identified constraints in implementing alternative water sources to supply NRNIP and NE REZ projects. For example, local councils identified that there may be an opportunity to treat generated wastewater to Class A recycled water standards and use it for dust suppression on NRNIP and NE REZ projects. However, there are currently regulations that limit these additional uses. Immediate next steps could be: ▪ Complete WS 4. ▪ Engage with the NSW Government department responsible for water policy and regulation to understand how recycled water is regulated and identify opportunities to expand uses of recycled water that could benefit NRNIP and NE REZ project construction and operation.
NE REZ development procurement options	**WS 6:** Embed recycled water capability in NRNIP projects and enabling infrastructure.	There is an opportunity to evaluate alternative water sources to supply water to the NRNIP by embedding alternative water sources into project design and procurement processes. This opportunity differs from WS 4 because it focuses on the ways to incentivise alternative water sources into NE REZ development. WS 4 focuses on understanding broader opportunities for supporting water reuse (i.e., collaborating with LWUs). It also differs from WS 7 because it focuses on the NRNIP versus the NE REZ projects. Immediate next steps could be: ▪ Seek advice about optimal ways to embed sustainable water management into tender documentation for the NRNIP, including in evaluation criteria. ▪ Action advice received.

Category	Opportunity	Description
NE REZ development and procurement	**WS 7:** Incentivise GDPs to include sustainable water management into their project designs.	As with the NRNIP, inclusion of sustainable water management into NE REZ project design could reduce pressure on raw water supplies. This could be achieved by implementing a scoring system in tender evaluations to reward proposals demonstrating advanced water conservation technologies, innovative recycling solutions (wheel wash down units), rainwater harvesting, water sourced from alternative water sources and integration of Water Sensitive Design principles. Immediate next steps could be: ▪ Engage with GDPs who are still in the early planning stages of their projects to discuss options for sustainable water management. ▪ Develop a tender evaluation process to reward proposals that demonstrate advanced water conservation technologies, innovative recycling solutions (wheel wash down units), rainwater harvesting, water sourced from alternative water sources and integration of Water Sensitive Design principles.

8.2.2 Opportunities focused on water demand

There are seven opportunities that focus on addressing issues with water demand identified in the Study (Table 8-3).

Table 8-3: Opportunities to consider to address water demand risks from NE REZ development

Category	Opportunity	Description
Subsequent analyses and investigations	**WD 1:** Understand the potential volume of water required to support NE REZ development for water uses that were not included in the Study.	This Study generated water demand estimates based on a range of water uses related to NE REZ development (see Appendix K). However, there were some data limitations and not all potential water uses could be included in the analysis. For example, water requirements in the construction of hydroelectricity projects and other operational water uses (e.g., cleaning of solar modules and wind turbine blades). A strategic approach to subsequent investigations could be taken. That is, focusing on those water uses that are likely to be most material. See Table 8-4 for a list of water uses and details about the extent to which these water uses may increase the water demand estimates presented in this Report. As more information about the water demand requirements of the NE REZ projects become available, consider updating the demand estimates for concrete production based on concrete grades required. Immediate next steps could be: ▪ For NE REZ projects, regularly engage with GDPs as they develop their projects to understand increased detail about their construction and operational water requirements. ▪ Undertake an assessment of the water requirements for hydroelectric projects. This is because these projects are highly water intensive (see Table 8-4). On the project list available for this Study, there were five potential projects. ▪ Once revised water demand estimates are available, re-evaluate impacts on water treatment infrastructure and water resources.

Category	Opportunity	Description
REZ interfaces	**WD 2:** Engage with the EnergyCo Team leading the early stages of planning for the Hunter-Central Coast Renewable Energy Zone to understand cumulative construction and operational water use demands from the Hunter Regulated River Source.	The Hunter Regulated River Source is a potential water source for both the NE REZ and the Hunter-Central Coast REZ. This Study included consideration of projects around the southern end of the NRNIP planned for construction that may draw on water from the Hunter Regulated River Source (e.g., Muswellbrook and Singleton LGAs). However, projects and the associated transmission infrastructure in the Hunter-Central Coast REZ may also draw on this water source further downstream. Thus, development and energisation of the Hunter-Central Coast REZ has the potential to create cumulative impacts on the Hunter Regulated River Source. This requires coordination between the two REZs because the NRNIP construction and energisation will commence in 2027, and if there are cumulative impacts from subsequent Hunter-Central Coast REZ development, these need to be understood soon. Key issues for consideration are: ▪ the extent to which Hunter-Central Coast REZ development will draw on the Hunter Regulated River source ▪ the timing of the Hunter-Central Coast REZ development relative to the NE REZ development. This is because the water requirements during the construction period are the most material. If the Hunter-Central Coast REZ commences after the peak construction period of the NE REZ, impacts may be less than if there was overlap in the delivery schedules. Immediate next steps could be: ▪ Engage early with the EnergyCo team leading the planning for the Hunter-Central Coast REZ and align on key milestones for the planning of both REZs where information and knowledge sharing would be useful. ▪ Consider whether a comparable water and wastewater study for the Hunter-Central Coast REZ should be commenced in the near term so cumulative impacts can be understood well ahead of commencement of the NRNIP in 2027.
NE REZ development procurement options	**WD 3:** Plan and sequence NE REZ development to support management of existing water resources, especially potable water demand.	This Study generated water demand estimates for the NRNIP and the NE REZ projects. These results showed that demand for potable water was more than 50% of the additional water demand from NE REZ development. This reflects the use of potable water for concrete production in the footings of wind turbine towers and the transmission line towers in the NRNIP, for example. Given the existing information about the timing of the construction of the NRNIP and NE REZ projects, this creates a large additional demand for potable water over a short period of 3-4 years (2028-2032). Once projects transition into operations, potable water demand materially reduces. This spike in the demand for potable water could be smoothed either temporally or geographically by exploring: ▪ alternative NE REZ development timelines ▪ alternative locations for some NE REZ projects, pending access considerations ▪ options for sequencing particular types of renewable energy projects. For example, wind farm projects could be staggering throughout the timeline. ▪ possible use of 'lower class' water or Class A recycled water in concrete production.

Category	Opportunity	Description
		Once water requirements for the hydroelectric projects are known (see opportunity WD 1), the timing of their construction should be carefully considered in the context of the latest timing information for broader NE REZ development. The extent to which this opportunity is effective, will be constrained based on the status of the planning approvals and investment timelines for project proponents. Immediate next steps could be: ▪ Engage with GDPs to understand their latest timing of construction and operations, including completing current gaps in timing information. ▪ Collaborate with key stakeholders (GDPs, AEMO) to understand options for alternative delivery.
Subsequent analyses and investigations	**WD 4:** Undertake a critical assessment of the alternative delivery pathways through negative wellbeing valuations and targeted stakeholder engagement.	Opportunity WD 3 focuses on engaging with GDPs and other stakeholders about alternative delivery pathways to manage potable water demand. This opportunity (WD 4) focuses on gathering opinions and perspectives from local councils and communities about the impacts of the delivery pathways. Immediate next steps are: ▪ Complete WD 3 ▪ Undertake a critical assessment of the alternative delivery pathways through negative wellbeing valuations and targeted stakeholder engagement.
Community engagement and awareness	**WD 5:** Partner with agencies who are advocating for sustainable and on-going behaviour change related to water efficiency across all water users.	Given the large volumes of potable water required to support NE REZ development, overall improved water efficiency will benefit the NE REZ development and all water users. There are a range of water efficiency programs aimed at incentivising sustainable and on-going behaviour change and reduces pressure on water resources. There are likely opportunities to support these current initiatives such as the NSW Water Efficiency program and asset renewal programs being undertaken by LWUs (e.g., Muswellbrook Shire). Immediate next steps are: ▪ Engage with central agencies, including the NSW Government department responsible for water management, and LWUs, to understand their existing communication programs and how EnergyCo can support these.
Subsequent analyses and investigations	**WD 6:** Explore potential for temporary storage dams for construction water for: earthworks compaction and dust suppression and concrete production.	Temporary storage dams can be a valuable option for managing water resources during construction of the NRNIP and NE REZ projects, particularly for onsite water uses such as earthworks compaction, dust suppression, and concrete production. When properly designed and managed, temporary storage dams can enhance water efficiency and overall project sustainability in construction. They can offer a reliable source of water on-site, reducing the need for constant draw down from other shared local water sources. Temporary storage dams also have the potential to capture and store rainwater or runoff, helping to minimise demand on local water networks and the environment. Immediate next steps are: ▪ Action opportunities that consider refining demand estimates for concrete production.

Category	Opportunity	Description
Subsequent analyses and investigations	**WD 7:** Update water and wastewater security assessments based on additional data.	Based on additional data and information gathered (opportunities WS 1-7 and WD 1-6), the water and wastewater study estimates provided in this report could be updated to re-assess risks and identify any emerging risks. By conducting this update, state and local governments can better understand water and wastewater impacts to NE REZ communities and better anticipate and accommodate expected NE REZ demands. As outlined in WD 2, a comparable water and wastewater study for the Hunter-Central Coast REZ should be commenced in the near term so cumulative impacts can be understood well ahead of commencement of the NRNIP in 2027. Immediate next steps are: ▪ Action opportunities focused on refining key data inputs, including water demand, project timing, project location and the extent to which tankering may be used. ▪ Based on the extent to which data and information improves, consider updating the Water and Wastewater Security Study.

Table 8-4: Summary of water uses not included in this Study and potential impact on water demand estimates

Type of infrastructure	Construction water use	Operational water use	Potential order of magnitude based on number of projects
Renewable energy infrastructure			
Hydro	▪ Earthworks ▪ Concrete production ▪ Road construction ▪ Hydraulic testing	▪ Primary resource for energy generation ▪ Fire prevention	5 projects, but significant water requirements associated with construction[35]
Solar	▪ Soil compaction and site preparation	▪ Solar module cleaning (cleaned 1-2 times per year) ▪ Upkeep of access roads	40 projects[36]
Wind	▪ Earthworks ▪ Road construction	▪ Cleaning of wind turbines	23 projects[37]
Battery	▪ Earthworks ▪ Road construction	▪ Fire prevention	11 projects[38]
Other non-renewable energy infrastructure			
Coal mining	▪ Dust suppression ▪ Earthworks ▪ Road construction	▪ Fire prevention ▪ Upkeep of access roads	18 projects

[35] All identified projects are categorised as low – medium likelihood.

[36] From these identified projects, 34 projects are categorised as low – medium likelihood.

[37] From these identified projects, 19 projects are categorised as low – medium likelihood.

[38] From these identified projects, 7 projects are categorised as low – medium likelihood.

Type of infrastructure	Construction water use	Operational water use	Potential order of magnitude based on number of projects
Extractive industries	▪ Dust suppression ▪ Earthworks ▪ Road construction	▪ Washing sand, gravel and aggregates ▪ Dust suppression ▪ Equipment cleaning ▪ Fire prevention	4 projects
Education	▪ Dust suppression ▪ Earthworks ▪ Road construction	▪ Heating and cooling ▪ Food preparation ▪ Fire prevention	3 projects
Roads	▪ Mixing concrete and asphalt ▪ Dust suppression ▪ Earthworks ▪ Road construction	▪ Road maintenance	1 project
Livestock	▪ Dust suppression ▪ Earthworks ▪ Road construction	▪ Heating and cooling ▪ Fire prevention ▪ Cleaning and maintenance	1 project
Waste	▪ Not applicable, identified project in operation	▪ Moisture content ▪ Waste management and monitoring	1 project

8.2.3 Opportunities focused on water treatment infrastructure capacity

There are six opportunities that focus on addressing issues with water treatment capacity identified in the Study (Table 8-5).

Table 8-5: Opportunities to consider to address water treatment infrastructure capacity risks from NE REZ development

Category	Opportunity	Description
Stakeholder engagement and analysis	**WC 1:** Undertake a strategic assessment of the location of the workers' accommodation camps for the NRNIP in the context of the location of the existing WTPs.	This Study did not include a capacity assessment of the water network infrastructure because most projects and the NRNIP are located more than 5km from the WTPs. However, there are four WTPs where there are a small cluster of NE REZ projects and within commuting distance of the NRNIP corridor. This presents an opportunity for the NE REZ development to leave a legacy of improved infrastructure, especially if the locations of the workers accommodation camps align with the respective locations in councils residential land use plans. The potential locations where this could occur include (see Appendix B): ▪ **Muswellbrook** (Muswellbrook WTP) ▪ **Armidale** (Armidale WTP) ▪ **Upper Hunter** (Scone WTP) ▪ **Uralla** (Uralla WTP) Immediate next steps could be: ▪ Engage with local councils in **Muswellbrook, Armidale, Upper Hunter** and **Uralla**. Key areas for exploration include understanding residential land use plans, and the local water

Category	Opportunity	Description
		network infrastructure, including existing capacity and future planned capacity. ▪ Identify workers' accommodation locations that offer mutual benefits to the NRNIP and the local communities. ▪ Assess the cost benefit for augmenting the existing infrastructure versus tankering from workers' accommodation sites located closer to the NRNIP.
Subsequent analyses and investigations	**WC 2:** Determine the most cost-effective solutions for treating potable water volumes required to support NRNIP and NE REZ projects	Following opportunity WD 1, consider options for meeting water treatment requirements. Overarching options could include: ▪ Installation of temporary WTPs for managing increased volumes of potable water demand. ▪ Installation of temporary WTP extensions on existing plants, for example, installing ultraviolet disinfection systems, or pre-made bladders for additional storage. ▪ Augmentation of existing WTPs through a range of low and medium investment options that could include: Low investment, such as installation of monitoring systems, such as integration of smart systems and AI controls. - Medium investment, such as enhanced biological nutrient removal processes. - Co-ordinate large scale treatment facilities for the region that benefit the NE REZ development and leave an infrastructure legacy to support the Hunter-Central Coast REZ and future social and economic prosperity. This particularly applies to **Muswellbrook** and **Singleton**. ▪ In addition to capital development funding, development of new infrastructure or upgrades to existing infrastructure are likely to require additional knowledge transfer and upskilling of personnel. Where possible, these workforce requirements should be considered alongside local capability and capacity (see NE REZ Training and Skills Study (October 2024) for an initial assessment of the local workforce). Depending on the results of these investigations, consideration of the extent to which constraints on water availability may influence the need for treatment capacity could also be explored. Immediate next steps could be: ▪ Complete opportunity WD 1. ▪ Engage with relevant local councils (**Armidale Regional Council, Uralla Shire, Walcha Council**) about augmentation options suited to the respective plants. ▪ Undertake strategic assessment of all the options identified via engagement with local councils.
Subsequent analyses and investigations	**WC 3:** Assessing the most cost and time-effective transportation of potable water to NRNIP and NE REZ sites not connected to the network infrastructure.	Following WD 1 and WC 2, if tankering is determined to be a viable option for transporting potable water from the WTPs to the sites where it is needed, explore enabling infrastructure that is required, such as on-site storage. Immediate next steps: ▪ Complete opportunities WD 1 and WC 2 ▪ Undertake study to determine impact of additional traffic required to meet site needs.
NE REZ development	**WC 4:** Incentivise GDPs to include on-site WTPs for	Given the large volumes of potable water required to support NE REZ development, especially those required for concrete production,

Category	Opportunity	Description
and procurement	potable water, especially to meet use in concrete production.	consider whether project proponents can be incentivised to include WTP facilities in their project designs. Incentives could include financial or streamlined planning approvals for proponents that meet the requirements. Immediate next steps: ▪ Engage with GDPs to gather up to date data on potential potable water demand requirements for concrete production. ▪ Engage with the NSW Government department responsible planning and environmental approvals[39] about how incentives for NE REZ project design can be implemented.
Stakeholder engagement and analysis	**WC 5:** Engage with Uralla and Walcha councils to identify effective solutions to accommodate increased demand for water treatment.	When considering average water demand (potable), the water demand (potable) from NE REZ development potentially exceeds treatment capacity in three out of the 11 LGAs, Muswellbrook, Uralla and Walcha, each of which have intensive NE REZ development planned. Most of the projects planned to occur in these LGAs are categorised as high or medium likelihood to proceed. When removing projects categorised as low from the analysis, the water treatment capacity assessment results for Uralla and Walcha are unchanged. This indicates that engagement with the respective local councils should be a high priority to identify effective solutions. Immediate next steps: ▪ Share information with **Uralla Shire** and **Walcha Council** about potential additional volumes of water to be treated from NE REZ development. Key issues to explore include understanding opportunities, barriers and enablers to accommodating additional water to be treated. These discussions and information could then inform the extent to which temporary treatment plants may be required along the NRNIP and at NE REZ project sites.
Subsequent analyses and investigations	**WC 6:** Consider the viability of establishing new local council-operated WTPs.	Consider options for meeting water treatment requirements by establishing new WTP infrastructure. It is important to note that these complex infrastructure projects require long planning horizons and substantial capital investment. For example, indicative timelines for design and construction may be: ▪ Design (approx. 1 year) ▪ Construction and mobilisation (approx. 1 year) ▪ Funding, approvals and purchasing (approx. 1 year) These timeframes exclude time required to obtain relevant regulatory and planning approvals, and any co-funding agreements. The construction of the NRNIP is scheduled to commence in 2027 and be complete by 2033. Many of the NE REZ projects are also scheduled for construction during this time. It is the construction of these projects that contribute most to increased water demand. Once the projects are in operation, on-going water demand is relatively modest. Given this timing, construction of any water and wastewater treatment plants may not benefit the NE REZ development. Immediate next steps:

[39] No specific NSW Government department is named here to accommodate potential future machinery of government changes.

Category	Opportunity	Description
		▪ Engage with key stakeholders to validate timeframes and cost to establish new council-operated WTP infrastructure.

8.2.4 Opportunities focused on wastewater treatment infrastructure capacity

There are seven opportunities, signified by WWC, that focus on addressing issues with wastewater treatment capacity identified in the Study (Table 8-6).

Table 8-6: Opportunities to consider to address wastewater treatment infrastructure capacity risks from NE REZ development

Category	Opportunity	Description
Stakeholder engagement and analysis	**WWC 1:** Undertake a strategic assessment of the location of the workers accommodation camps for the NRNIP in the context of the location of the existing WWTPs.	This Study did not include a capacity assessment of the wastewater network infrastructure because most projects and the NRNIP are located more than 5km from the WWTPs. However, there are four WWTPs where there are a small cluster of NE REZ projects and within potential commuting distance of the NRNIP corridor. This presents an opportunity for the NE REZ development to leave a legacy of improved infrastructure, especially if the locations of the workers' accommodation camps align with the respective councils' residential land use plans. The potential locations where this could occur include (see Appendix B): ▪ **Muswellbrook** (Muswellbrook WWTP) ▪ **Armidale** (Armidale WWTP) ▪ **Upper Hunter** (Aberdeen WWTP) ▪ **Tamworth** (Tamworth WWTP) Immediate next steps could be: ▪ Engage with local councils in **Muswellbrook, Armidale, Upper Hunter and Tamworth**. Key areas for exploration include understanding residential land use plans, and the local wastewater network infrastructure, including existing capacity and future planned capacity. ▪ Identify workers' accommodation locations that offer mutual benefits to the NRNIP and the local communities. ▪ Assess the cost benefit for augmenting the existing infrastructure versus tankering from workers accommodation that were closer to the NRNIP.
Subsequent analyses and investigations	**WWC 2:** Understand the potential volume of wastewater generated during construction of the NRNIP and NE REZ projects	This Study included wastewater estimates for construction activities related to on-site and off-site worker requirements. This reflects the availability of data as well as the potential nature of wastewater from construction activities. To fully understand the wastewater generated by the NE REZ development, more information is needed on the volumes of wastewater generated during construction of the NRNIPs and the NE REZ projects, including the necessary treatment. Examples include generated surface water run off contaminated by diesel and chemicals, wheel washes, cleaning from solar modules and other water uses that involves additives. The volumes and necessary treatment will determine the types of solutions required. For example, some types of construction wastewater cannot be treated through the existing WWTPs because the construction process has changed the mineral composition and

Category	Opportunity	Description
		could interrupt the WWTP biological processes. If this is the case, alternative wastewater treatment will be required. Immediate next steps could be: ▪ For the NRNIP, generate estimates of the wastewater that will be generated from construction. ▪ For NE REZ projects, regularly engage with GDPs as they develop their projects to understand the construction wastewater volumes. ▪ In both cases, understand the extent to which the wastewater volumes can be treated on-site versus tankering to the WWTPs. ▪ Once the volumes of construction wastewater are known and how they need to be treated, consider whether a comprehensive network capacity assessment is required.
Stakeholder engagement	**WWC 3:** Understand the extent to which the WWTPs identified in the Study as nearing or exceeding their capacity under NE REZ development have effective management in place to manage wastewater flows during wet weather events.	Under NE REZ development, and based on average dry weather flow, many WWTPs are nearing capacity (i.e., between 80 and 99%) and Uralla is modelled as exceeding capacity (i.e., 105% utilisation). However, wastewater treatment infrastructure is typically under the highest load during extreme wet weather events. During these events, WWTP operators have a range of management mechanisms available to them. This includes holding wastewater in storage ponds and / or emergency relief provisions that enable discharge of partially treated water under specific events or conditions, albeit not treated to the typical standards. To fully understand the pressure that the NE REZ development may place on the wastewater treatment plant capacity, information on how effective these management mechanisms are is required. Immediate next steps could be: ▪ Engage with local councils and the WWTP operators to understand the current state of the wastewater treatment plants. Key local councils are **Uralla Shire, Armidale Regional Council, Tamworth Regional Council, Liverpool Plains Shire, Upper Hunter Shire** and **Singleton Council**. ▪ Key areas for exploration include any differences in the operational versus design capacity of the plants, and how they currently manage wastewater volumes during wet weather events. ▪ Share with the local councils the potential additional demand on their wastewater treatment plants. Note: Glen Innes Severn, Tenterfield and Inverell are not mentioned above because these LGAs do not have any planned NE REZ projects.
Subsequent analyses and investigations	**WWC 4:** Determine the most cost and time-effective solutions for treating wastewater volumes from NRNIP and NE REZ projects	Following opportunity WWC 2, consider options for meeting wastewater treatment requirements. Overarching options could include: ▪ Installation of temporary WWTPs for managing increased volumes of trade waste from construction activities. This would require a strategic assessment of suitable locations. ▪ Augmentation of existing WWTPs through a range of low and medium investment options that could include: - Low investment, such as installation of monitoring systems, such as integration of smart systems and AI controls. - Medium investment, such as enhanced biological nutrient removal processes.

Category	Opportunity	Description
		- While noted as low and medium investments, these augmentations may involve knowledge transfer and upskilling of personnel. ▪ Co-ordinate large scale treatment facilities for the region that benefit the NE REZ development and leave an infrastructure legacy to support the Hunter-Central Coast REZ and future social and economic prosperity. This particularly applies to **Muswellbrook** and **Singleton**. Immediate next steps could be: ▪ Complete opportunity WWC 2. ▪ Engage with relevant local councils (**Armidale Regional Council, Uralla Shire, Walcha Council, Tamworth Regional Council, and Liverpool Plains Shire**) about augmentation options suited to the respective plants. ▪ Undertake strategic assessment of all the options identified via engagement with local councils.
Subsequent analyses and investigations	**WWC 5:** Assessing the most cost and time-effective transportation of wastewater to WWTPs.	Following WWC 2, if tankering is determined to be a viable option for transporting wastewater to the WWTPs, explore enabling infrastructure that is required, such as on-site septic tanks that increase on-site storage and reduce the frequency of tankering. Part of this Study could include determining the impact of additional traffic required to meet site needs. Should tankering be established as a viable option, a cost and logistics assessment should be completed to optimise available capacity. This is likely to involve collaboration across LGAs where tankering across the border may be required. Any impacts attributed to tankering should also be considered in this assessment. Immediate next steps could be: ▪ Action opportunities WWC 1-4.
Stakeholder engagement	**WWC 6:** Engage with Liverpool Plains Shire Council to understand WWTP capacity.	In the Study, the wastewater treatment capacity assessment showed that the WWTP capacity in **Liverpool Plains** was exceeded in the Planning Stage. Clarification of the current ability of these plants to treat wastewater volumes is required, alongside an understanding of any redundant capacity. As discussed in Section 7, management mechanisms may already be utilised. Immediate next steps could be ▪ Engage with Liverpool Plains Shire Council to discuss and verify their WWTP capacity. ▪ Share information with Liverpool Plains Shire Council about potential additional volumes of wastewater from NE REZ development.
Subsequent analyses and investigations	**WWC 7:** Further analysis to understand impact of extreme wet weather events on flow in the NE REZ and surrounds.	Given that most LGAs in the NE REZ and along the NRNIP corridor are nearing capacity of their wastewater treatment plants under ADWF conditions, further studies may be required to understand volumes of excess flow during such wet weather events for the different NE REZ project phases. This step would contribute further analysis to opportunities WWC2, WWC3 and WWC4 to inform suitable management.

8.3 Funding mechanisms

This section identifies funding mechanisms that could be strategically leveraged to deliver the opportunities identified in Section 8.2 to mitigate water impacts attributed to the NE REZ development. These funding mechanisms have been identified through a desktop review.

8.3.1 Government funding

Water supply and treatment opportunities in the NE REZ could be delivered through existing federal, state and local government funding programs and grants. For example:

- **Australian Government**, through programs such as the National Water Grid Fund, provides substantial investment for significant water projects that enhance water security and agricultural productivity. The National Water Grid Fund requires co-contributions from state or local government.
- **NSW Government** offers targeted funding through grant programs such as the Safe and Secure Water Program, which supports regional communities in addressing key water and wastewater risks. This Program is focused on supporting towns with the highest risks and is only intended to meet minimum requirements to address the risk, not to accommodate future growth. At the time of writing (April 2025), the Program was fully allocated.

Local councils play a crucial role in identifying specific water infrastructure needs within their jurisdictions and often contribute funds through rates and special levies. They frequently apply for state and federal grants to supplement their budgets for essential water projects, and can also access subsidised loans to address infrastructure backlogs, including improvements to water and sewerage systems. Key government funding programs and examples of where this funding has support water and wastewater management are summarised in Table 8-7.

Table 8-7: Examples of government funding for options to address water- and wastewater-related risks from NE REZ development

Funding program or initiative	Funder	Overview	Available funding	Case study examples
Future Drought Fund	Australian Government	Provides secure and continuous funding for drought resilience initiatives, helping Australian farmers and communities prepare for the impacts of drought.	$100 million per year)	**Project: Tamworth Regional Landcare Association capacity building** ▪ Location: Tamworth, NSW ▪ Funding: $18,955 ▪ Scope: to enable capacity building activities where local people and communities have opportunities to develop the skills and knowledge to face the unique challenges caused by drought in remote, rural and regional Australia. **Project: Armidale and Uralla Regional Drought Resilience Plan** ▪ Scope: Armidale Regional Council and Uralla Shire Council are collaborating to develop a Regional Drought Resilience Plan (RDRP) to advance the region's focus on its resilience to the impacts of drought. The NSW RDRP program is jointly funded through the Commonwealth Government's Future Drought Fund and the NSW Government.
National Water Grid Fund	Australian Government	Aimed at enhancing water security and promoting economic growth across the nation. Established to support the planning and construction of water infrastructure projects, the fund plays a crucial role in Australia's water management strategy.	$197.1m (allocated in FY24)	**Project: Urbenville Water Treatment Plant** ▪ Location: Tenterfield, NSW ▪ Funding: $3.5 million (including a $1.42 million contribution from the NWGF) ▪ Scope: Expansion of the existing Urbenville Water Treatment Plant. Raw water treatment infrastructure has been installed to improve raw water quality. The existing jetty has also be upgraded. This has improved water quality and reliability for the communities of Urbenville, Muli Muli and Woodenbong. **Project: Walcha off-stream water storage** ▪ Location: Walcha, NSW ▪ Funding: $11 million Scope: Construction of a new 300 megalitre (ML) off-stream storage dam. This has improved water reliability to the Walcha community and agricultural users.

Funding program or initiative	Funder	Overview	Available funding	Case study examples
Low interest loans	Local Government	Mechanism for NSW Treasury to provide NSW councils with low-interest loans for infrastructure projects	Variable	
Water Pricing Reforms	NSW Government	NSW has implemented pricing reforms that better reflect the true cost of water services, helping to fund infrastructure improvements and encourage water conservation.	Variable	During drought periods, higher user charges have been implemented to encourage conservation and fund water security solutions.
Green Bonds	NSW Government	NSW has issued green bonds to finance environmentally sustainable projects, including water infrastructure. These bonds attract investors interested in supporting climate-resilient water systems	Variable	Sydney Water issued a green bond to fund sustainable water and wastewater projects across Greater Sydney.
Safe and Secure Water Program	NSW Government	The program is designed to prioritise projects to address the highest risks and issues for regional NSW water ensure a minimum level of service in smaller towns where the cost of critical infrastructure outweighs economic benefit, and provide more flexibility by including cost effective non-infrastructure options.	$1b (total)	**Project: Armidale Water Security Package** ▪ Location: Armidale, NSW ▪ Funding: The first component of this project was funded through the Safe and Secure Water Program. Funding options for future stages of this project are under exploration. ▪ Scope: Armidale Regional Council and the NSW Government have invested in detailed studies to identify and assess options and develop staged plans to improve water security in the region. This includes a two-stage water security strategy. Stage 1 includes restoration of Oaky River Dam and development of a water transfer system from Oaky River Dam to the Armidale Water Treatment Plant. Stage 2 includes raising Malpas Dam wall by 6.5 metres to increase storage capacity and drought resilience. Future stages are expected to involve Environmental Impact Study (EIS) and further detailed assessments. **Project: Uralla 30-year water strategy**

Funding program or initiative	Funder	Overview	Available funding	Case study examples
				▪ Scope: Uralla Shire Council has also received a $855,315 grant to develop a comprehensive 30-year water strategy funded under the Safe and Secure Water Program.
Restart NSW Fund, which includes the Regional Water and Wastewater Backlog Program	NSW Government	Designed to fund critical water infrastructure projects to improve water security and quality in regional NSW	$2.47 billion (2011-ongoing)	**Project: Bundarra Sewerage Scheme** ▪ Location: Uralla, NSW ▪ Funding: The project was originally funded from Restart NSW under the Regional Water and Wastewater Backlog Program, based on a total estimated cost of $5,447,000, of which 33% would be funded by Council. ▪ Scope: The key objective of the project was the upgrade of the Bundarra on-site sewer systems to a standard equal to other towns in the region, minimising health and environmental issues both to the community and the Gwydir River catchment.
Value Creation and Capture, including land value uplift	NSW Government, Local council	Government can capture the increased value resulting from improved water infrastructure. For example, government may coordinate with private developers to ensure new developments contribute to the cost of water infrastructure upgrades.	Variable	Value creation and capture mechanisms have been used to fund water infrastructure and solutions in NSW. For example: **Project: Central Park, Sydney** ▪ Location: Sydney ▪ Funding: A proportion of infrastructure cost was offset through reduced water utility charges, sale of recycled water to neighbouring buildings and lower stormwater management costs.

8.3.2 Private funding

Private funding mechanisms can also be leveraged to support delivery of options for addressing NE REZ water challenges. These private funding mechanisms can include collaborative arrangements between government and private entities, contributions from the development sector, and direct private investment in suitable projects. These approaches can be tailored to different project types and scales, and market conditions. Private sector involvement can range from partial funding support to full project financing, offering flexibility in addressing diverse infrastructure needs. Examples are provided in Table 8-8.

Table 8-8: Examples of private funding for options to address water- and wastewater-related risks from NE REZ development

Funding mechanism	Description	Applicable option categories
Private	Private investment to support water infrastructure, technology, and services.	▪ Infrastructure development ▪ Policy and planning
Public-private partnership (PPP)	PPPs in water infrastructure involve collaboration between government entities and private companies to design, finance, build, operate, and maintain water-related facilities and systems.	▪ Infrastructure development ▪ Policy and planning
Special Infrastructure Contributions (SICs) and Developer Charges	These are charges levied on new developments to help fund essential infrastructure, including water services.	▪ Infrastructure development ▪ Policy and planning

Appendix A. Overview of NE REZ development process

This appendix describes the key stages within the NE REZ development process, including guidance on activities within each stage and current progress.

Table 8-9: Overview of NE REZ development process

Development phase	Activities	Status
Early planning and site selection	▪ **Site selection:** Identify suitable locations for the REZs based on renewable energy potential, existing infrastructure, and environmental considerations. ▪ **NE REZ Declaration:** NE REZ declared a critical state significant infrastructure (CSSI) project by the NSW Minister for Planning and Public Space.	Completed
Planning, engagement and approvals	▪ **Stakeholder engagement:** EnergyCo NSW has been engaging with landowners and local communities to refine the study corridor for the transmission project to gather feedback and understand local constraints and opportunities. ▪ **Environmental assessments and planning approvals:** Complete environmental impact assessments and obtain necessary approvals. ▪ **Network Design:** Design the network infrastructure, including transmission lines and connection points. Work with industry participants to refine project plans and ensure alignment with project requirements. ▪ **Community Benefits:** Explore opportunities, plan for and develop benefit-sharing arrangements to ensure local communities benefit from the REZ.	Present day to the anticipated start of construction of the NE REZ Network Infrastructure Project (estimated 2027) *(equivalent to Planning stage in this Report)*
Development and construction	▪ **Construction of network infrastructure:** Begin construction of new transmission lines and energy hubs to connect renewable energy sources to the grid, ensuring compliance with safety and environmental standards. The infrastructure will transfer power generated to consumers. ▪ **Construction of generation projects:** Commence construction of generation projects, including solar and wind farms, and the associated transmission lines. This stage is expected to create thousands of construction jobs. ▪ **Integration:** Integrate the new infrastructure with the existing grid and ensure it is ready for operation. ▪ **Testing and Commissioning:** Test and commission the infrastructure to ensure it meets operational requirements.	Stage 1 Construction: commencing in 2027 and completed by 2031 Stage 2 Construction: commencing in 2030 and completed by 2033
Operation	▪ **Operational phase:** Once the infrastructure is in place, the NE REZ will begin providing clean and reliable electricity to consumers. This phase will also create ongoing operational jobs. ▪ **Monitoring and Maintenance:** Continuously monitor and maintain the infrastructure to ensure reliable operation.	2033 onwards

Appendix B. Proximity of projects to water and wastewater treatment infrastructure

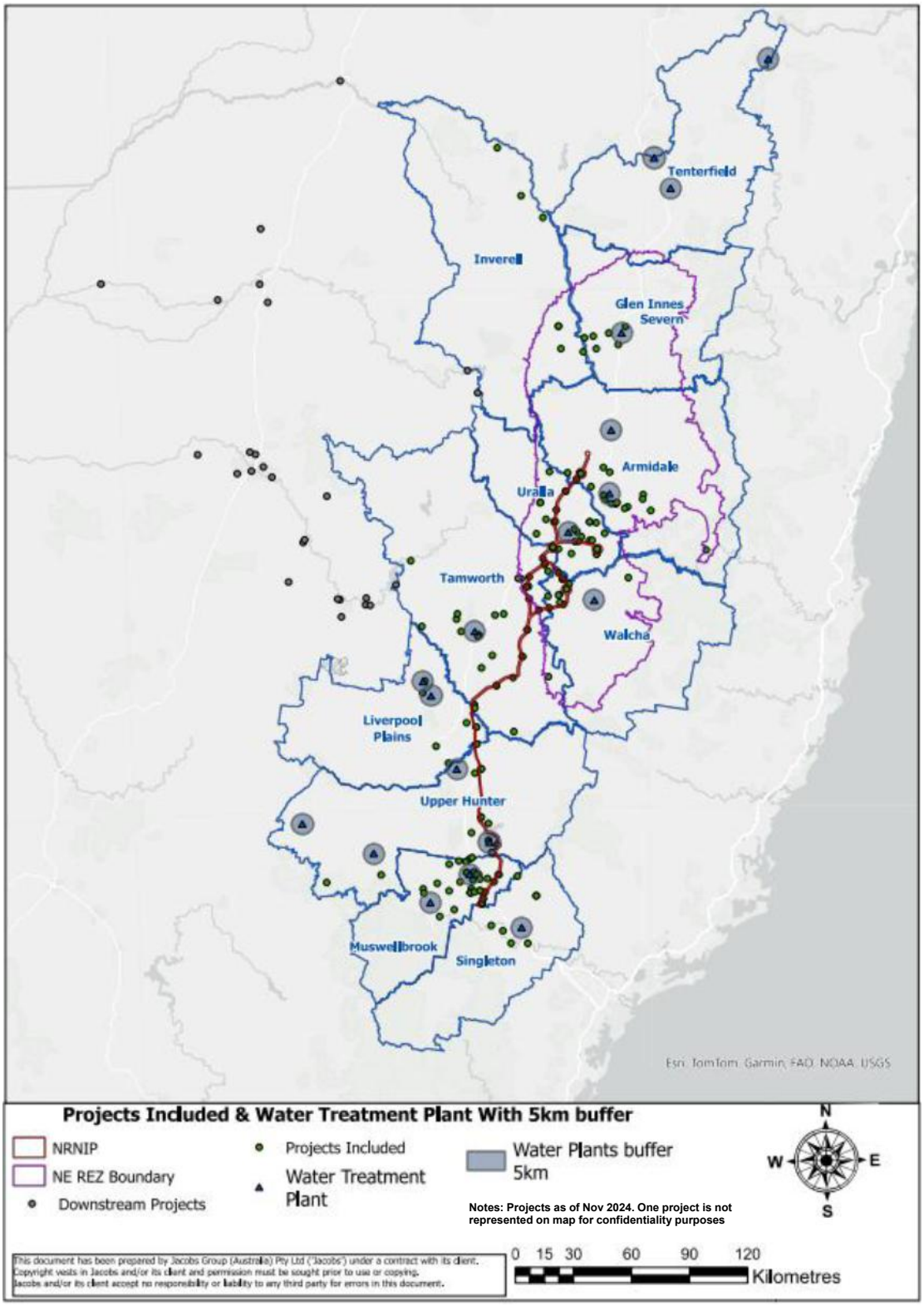


Figure 8-1: Overview of NRNIP and NE REZ projects in relation to water treatment infrastructure

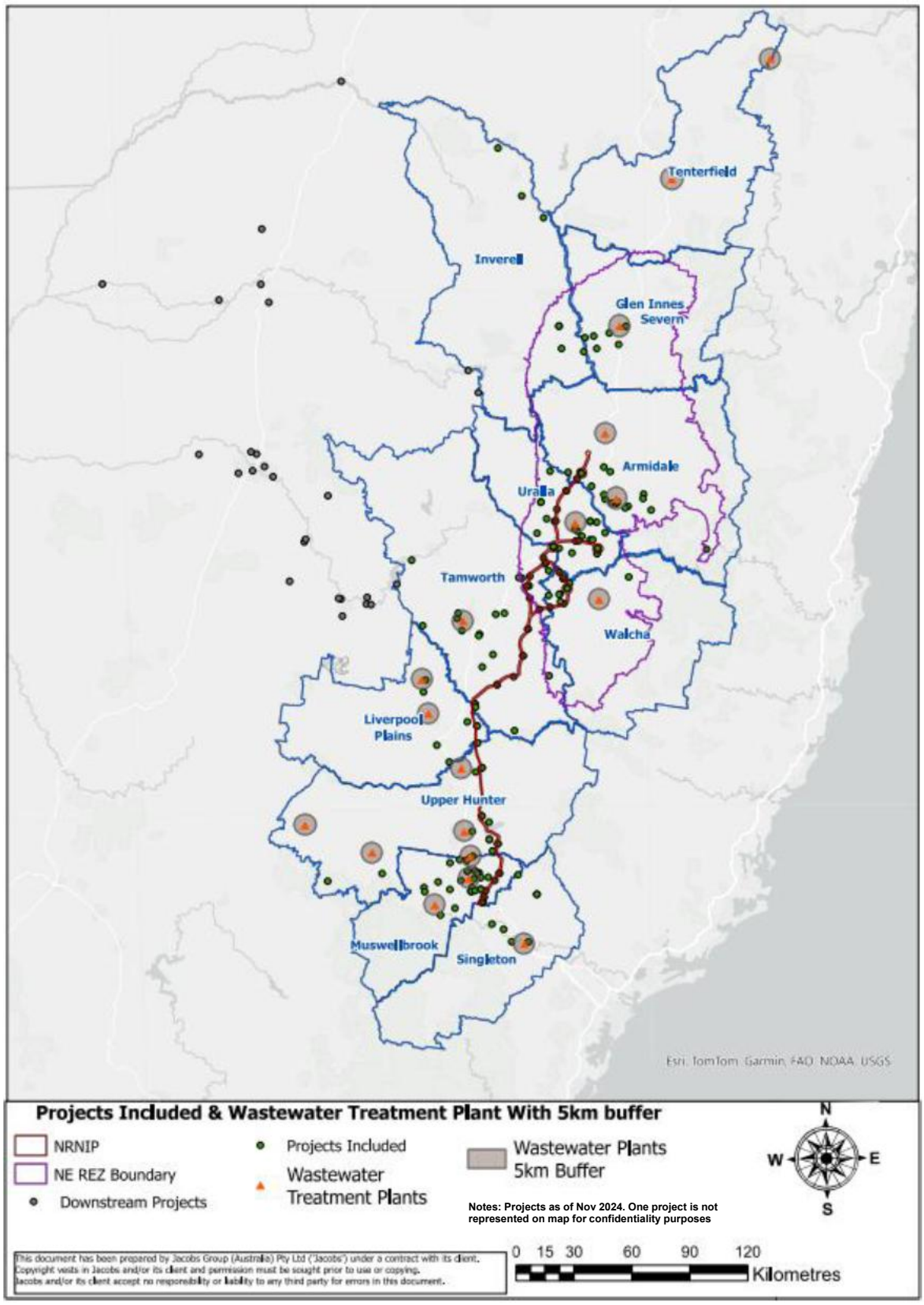


Figure 8-2: Overview of NRNIP and NE REZ projects in relation to wastewater treatment infrastructure

Appendix C. Data sources and assumptions – Water supply

Table 8-10: Data sources and assumptions applied to generate estimates of water supply for the Study

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Baseline water availability: Current to 2027				
Volume of water allocated to and available from entitlements in regulated surface water systems near the NE REZ development	NSW Water Register Utilisation dashboard | NSW Government Water	28/10/2024 June 2025	▪ Included water systems are those that intersect with LGA boundaries.	▪ Data extract provided by DCCEEW ▪ Subsequent studies may need to consider more specifically which water systems are accessible to the NE REZ development ▪ Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs.
Volume of water allocated to and available from entitlements in groundwater systems near the NE REZ development	NSW Water Register Utilisation dashboard | NSW Government Water	28/10/2024 June 2025	▪ Included water systems are those that intersect with LGA boundaries.	▪ Data extract provided by DCCEEW ▪ Subsequent studies may need to consider more specifically which groundwater systems are accessible to the NE REZ development ▪ Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs.
Volume of recycled water produced	Recycled water supplied data from NSW Local Water Utility Performance Monitoring Database[1]	29/10/2024	▪ Volume produced in 2022-23	▪ Based on the purposes provided in the data source, the recycled water estimates include recycled water supplied for the following purposes: ○ Bulk water exports ○ Non-Urban - agriculture, environmental, on-site ○ Urban - commercial, industrial, municipal, managed aquifer, other, residential

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Additional water availability: Stage 1 and Stage 2				
Additional volume of recycled water produced LGAs	▪ Data request to local councils about plans for increasing recycled water production	Sept - Nov 2024	▪ No additional recycled water production in Stage 1	▪ Based on responses from local councils to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.
Additional volume of recycled water produced REZ projects and NRNIP	▪ Discussions with and data requests to selected GDPs ▪ Constructability data provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	Oct-24-Jan-25	▪ Data used as provided by GDPs and EnergyCo	▪ For consideration during subsequent studies. ▪ EnergyCo facilitated contact with selected GDPs. GDPs included solar, wind and BESS projects. ▪ Based on discussions with GDPs, projects are insufficiently advanced for there to be any certainty regarding plans for on-site rainwater harvesting.
Additional volume of recycled water produced by non-REZ projects	▪ No data provided	Not applicable	▪ No recycled water production in Stage 1 no Stage 2	▪ For consideration during subsequent studies
Additional volume of rainwater harvesting by REZ projects and NRNIP	▪ Discussions with and data requests to selected Generation Design Partners ▪ Constructability data provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	Oct-24-Jan 25	▪ Data used as provided by GDPs and EnergyCo ▪ No additional rainwater harvesting in Stage 1 nor Stage 2	▪ For consideration during subsequent studies. ▪ EnergyCo facilitated contact with selected GDPs. GDPs included solar, wind and BESS projects. ▪ Based on discussions with GDPs, projects are insufficiently advanced for there to be any certainty regarding plans for on-site rainwater harvesting.
Additional volume of rainwater harvesting produced by non-REZ projects	▪ No data provided	Not applicable	▪ No additional rainwater harvesting in Stage 1 nor Stage 2	▪ For consideration during subsequent studies

References

[1] Local water utility performance | NSW Government Water

Appendix D. Data sources and assumptions – Water demand

Table 8-11: Data sources and assumptions applied to generate estimates of water demand in the Study

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Baseline water demand: Current to 2027				
Volume of water used in regulated surface water systems near the NE REZ development	▪ NSW Water Register ▪ Utilisation dashboard | NSW Government Water	28/10/2024 June 2025	▪ Included water systems are those that intersect with LGA boundaries.	▪ Data extract provided by DCCEEW Subsequent studies may need to consider more specifically which water systems are accessible to the NE REZ development ▪ Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs.
Volume of water used in groundwater systems near the NE REZ development	▪ NSW Water Register ▪ Utilisation dashboard | NSW Government Water	28/10/2024 June 2025	▪ Included water systems are those that intersect with LGA boundaries.	▪ In NSW, not all usage from groundwater bores is metered. Therefore, usage data from the NSW Water Register may not be complete. ▪ Data extract provided by DCCEEW Subsequent studies may need to consider more specifically which water systems are accessible to the NE REZ development
Volume of potable water demand	▪ Potable water supplied data from NSW Local Water Utility Performance Monitoring Database[1] ▪ NSW Government: 2022 NSW Population, Housing and Implied Dwelling Projections[2]	29/10/2024	▪ The volume of water supplied to residential uses was estimated using an annual average peak day potable water supplied (10 years to 2022-23) ▪ Then, the water demand to the end of Current day (i.e., 2027) was projected forward from 2024-25 using the growth rate from the NSW Government: 2022 NSW Population, Housing, and Implied Dwelling Projections ▪ Water demand from commercial, industrial, institutional, public parks and	▪ Based on the purposes provided in the water supplied data from the NSW Local Water Utility Performance Monitoring Dashboard, the water demand estimates include potable water supplied for the following purposes: ○ Commercial ○ Industrial ○ Institutional ○ Public parks and gardens ○ Residential ○ Rural

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
			gardens, and rural was assumed to be constant.	
Additional water demand: Stage 1 and Stage 2				
Additional volume of potable water demand (projected population change)	▪ Potable water supplied data from NSW Local Water Utility Performance Monitoring Database[1] ▪ NSW Government: 2022 NSW Population, Housing, and Implied Dwelling Projections[2]	29/10/2024	▪ By the end of Stage 1, all properties within the respective LGAs are connected to the water network. ▪ Residential water demand was projected forward from 2024-25 using the growth rate from the NSW Government: 2022 NSW Population, Housing, and Implied Dwelling Projections ▪ Average water consumption per property was estimated based upon the volume of water identified as residential, divided by the number of connected residential properties, then averaged over the past 10 years. ▪ Water demand from commercial, industrial, institutional, public parks and gardens, and rural was assumed to be constant.	▪ Based on the purposes provided in the water supplied data from the NSW Local Water Utility Performance Monitoring Dashboard, the water demand estimates include potable water supplied for the following purposes: ○ Commercial ○ Industrial ○ Institutional ○ Public parks and gardens ○ Residential ○ Rural
Non-REZ Projects				
Additional volume of water demand from on-site workers during construction and / or operations: Non-REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of jobs generated by non-REZ projects multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of water demand from workers (outside of temporary accommodation camps)	▪ EnergyCo Data and Assumptions Workbook ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of jobs generated by non-REZ projects multiplied by relevant water use assumptions from WaterFix Residential	

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
living off-site: Non-REZ projects				
Additional volume of water demand from construction and / or operations: Non-REZ projects	▪ No data provided	Data & Assumptions Book v2.1	▪ Peak number of jobs generated by non-REZ projects multiplied by relevant water use assumptions from WaterFix Residential	▪ For consideration during subsequent studies
REZ projects				
Additional volume of water demand from on-site workers during construction and / or operations: REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ EnergyCo data was cross referenced with data obtained from selected Generation Design Partners. ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of workers during construction and operations multiplied by relevant water use assumptions from WaterFix Residential	▪ EnergyCo facilitated contact with selected GDPs. GDPs included solar, wind and BESS projects.
Additional volume of water demand from workers living (outside of temporary accommodation camps) off-site: REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ EnergyCo data was cross referenced with data obtained from selected GDPs. ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of workers during construction and operations multiplied by relevant water use assumptions from WaterFix Residential	▪ EnergyCo facilitated contact with selected GDPs. GDPs included solar, wind and BESS projects.
Additional volume of water demand from construction and / or operations: REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ EnergyCo data was cross referenced with data obtained from selected GDPs. ▪ Jacobs senior environmental engineer advising on suitable	Data & Assumptions Book v2.1	▪ See details of the assumptions applied to concrete production in Section 6.2.1 ▪ See Appendix J for a list of the construction and operations water uses included in the assessment	▪ EnergyCo facilitated contact with selected GDPs. GDPs included solar, wind and BESS projects and provided information on suitable assumptions for water demand in concrete production.

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
	assumptions for dust suppression and concrete use activities			
NE REZ Network Infrastructure Project				
Additional volume of water demand from on-site workers during construction and / or operations: NRNIP	▪ Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	▪ Data used as provided by GDPs and EnergyCo	▪ See the relevant Workers Accommodation Study Report for all underlying assumptions related to these estimates noting the date at which data were provided to the Water and Wastewater Security Study
Additional volume of water demand from workers (outside of temporary accommodation camps) living off-site: NRNIP	▪ Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	▪ Data used as provided by GDPs and EnergyCo	
Additional volume of water demand from construction and / or operations: NRNIP	▪ Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	Constructability water use estimates provided by EnergyCo: 20250117 NE REZ Construction Water Demand 2.0.xlsx	▪ Data used as provided by GDPs and EnergyCo	

References

[1] Local water utility performance | NSW Government Water

[2] https://www.planning.nsw.gov.au/research-and-demography/population-projections/explore-the-data

[3] https://www.sydneywater.com.au/your-home/helping-you-save-water/waterfix-residential.html

Appendix E. Data sources and assumptions – Water treatment infrastructure capacity

Table 8-12: Data sources and assumptions applied to generate estimates of water treatment infrastructure capacity in the Study

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Baseline water treatment capacity: Current to 2027				
Capacity of water treatment plants / facilities in or near the NE REZ development	▪ Local councils: See Appendix I for more details.	Sept 24 - Jan 25	▪ Water treatment plant capacity information was limited to treatment capacities and or estimated population data. ▪ In instances where only estimated population data were available, water treatment capacity was back calculated. ▪ No information about plant efficiency was available. Treatment capacity was assumed to be fully available and utilised.	
Location of water treatment plants / facilities in or near the NE REZ development	▪ Local councils: See Appendix I for more details.	Sept 24 - Jan 25	▪ Approximate locations integrated into spatial data	
Additional water treatment capacity: Stage 1 and Stage 2				
Additional capacity of water treatment plants / facilities in or near the NE REZ development: LWU owned / operated	▪ Local councils: See Appendix I for more details.	Sept 24 – Jan 25	▪ In instances where forward work plans from local councils had not commenced as scheduled, the forward work plan was adjusted to assume its commenced from January 2025.	
Additional capacity of water treatment plants / facilities in or near the NE REZ development: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP	▪ Discussions with and data requests to selected GDPs and EnergyCo ▪ EnergyCo Data and Assumptions Workbook	Sept 24 – Jan 25 Data & Assumptions Book v2.1	▪ No on-site water treatment facilities at non-REZ projects, NE REZ projects or NRNIP.	▪ EnergyCo facilitated contact with selected GDPs. ▪ GDPs included solar, wind and BESS projects. ▪ Based on discussions with GDPs, projects are insufficiently advanced for there to be any certainty regarding plans for on-site water treatment facilities.

Appendix F. Data sources and assumptions – Wastewater to be treated

Table 8-13: Data sources and assumptions applied to generate estimates of wastewater to be treated in Study

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Baseline wastewater to be treated: Current to 2027				
Volume of wastewater to be treated	▪ Sewage collected data from NSW Local Water Utility Performance Monitoring Database[1] ▪ NSW Government: 2022 NSW Population, Housing and Implied Dwelling Projections[2]	29/10/2024	▪ The data source provides the total sewage collected in volumetric terms and the sewage collected from different categories in percentage terms. ▪ The volumes of sewage collected from different categories were estimated using the total volume collected and the relevant percentages. ▪ Then, the annual average peak volume collected was generated over 10 years (2013-14 to 2022-23). ▪ Then, the wastewater to be treated to the end of current day (i.e., 2027) was projected forward from 2024-25 using the growth rate from the NSW Government: 2022 NSW Population, Housing and Implied Dwelling Projections ▪ Wastewater from non-residential, trade waste and other sources was assumed to be constant	▪ Sewage collected categories are based on those available from the NSW Local Water Utility Performance Monitoring Database as follows: ○ Non-residential ○ Residential ○ Trade waste ○ Other
Additional wastewater to be treated in Stage 1 and Stage 2				
Additional volume of wastewater to be treated (projected population change)	▪ Sewage collected data from NSW Local Water Utility Performance Monitoring Database.[1] ▪ See current wastewater treated > Volume of sewage collected ▪ NSW Government: 2022 NSW Population, Housing, and Implied Dwelling Projections[2]	29/10/2024	▪ By the end of Stage 1, all properties within the respective LGAs are connected to sewerage network. ▪ Residential wastewater was projected forward from 2024-25 using the growth rate from the NSW Government: 2022 NSW Population, Housing, and Implied Dwelling Projections ▪ Wastewater from non-residential, trade waste and other sources was assumed to be constant	▪ Sewage collected categories are based on those available from the NSW Local Water Utility Performance Monitoring Database as follows: ○ Non-residential ○ Residential ○ Trade waste ○ Other

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Non-REZ projects				
Additional volume of wastewater to be treated from on-site workers during construction and / or operations: Non-REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of jobs generated by non-REZ projects multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of wastewater to be treated from workers living off-site: Non-REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of jobs generated by non-REZ projects multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of wastewater from construction and / or operations: Non-REZ projects	▪ No data provided	Not applicable	▪ No wastewater production in Stage 2 from non-REZ projects	For consideration during subsequent studies
REZ projects				
Additional volume of wastewater to be treated from on-site workers during construction and / or operations: REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ EnergyCo data was cross referenced with data obtained from selected GDPs ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of workers during construction and operations multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of wastewater to be treated from workers living off-site: REZ projects	▪ EnergyCo Data and Assumptions Workbook ▪ EnergyCo data was cross referenced with data obtained from selected GDPs ▪ WaterFix Residential from Sydney Water[3]	Data & Assumptions Book v2.1	▪ Peak number of workers during construction and operations multiplied by relevant water use assumptions from WaterFix Residential	

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Additional volume of wastewater from construction and / or operations: REZ projects	No data provided	N/A	N/A	For consideration during subsequent studies
NE REZ Network Infrastructure Project				
Additional volume of wastewater to be treated from on-site workers during construction and / or operations: NRNIP	▪ Workers Accommodation Study commissioned by EnergyCo ▪ WaterFix Residential from Sydney Water[3]	New England REZ Workforce Accommodation Study - Working Draft 18/10/24	▪ Peak number of workers in workers accommodation multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of wastewater to be treated from workers living off-site: NRNIP	▪ Workers Accommodation Study commissioned by EnergyCo ▪ WaterFix Residential from Sydney Water[3]	New England REZ Workforce Accommodation Study - Working Draft 18/10/24	▪ Peak number of workers in workers accommodation multiplied by relevant water use assumptions from WaterFix Residential	
Additional volume of wastewater from construction and / or operations: NRNIP	No data provided	N/A	N/A	For consideration during subsequent studies

References

[1] Local water utility performance | NSW Government Water

[2] https://www.planning.nsw.gov.au/research-and-demography/population-projections/explore-the-data

[3] https://www.sydneywater.com.au/your-home/helping-you-save-water/waterfix-residential.html

Appendix G. Data sources and assumptions – Wastewater treatment infrastructure capacity

Table 8-14: Data sources and assumptions applied to generate estimates of wastewater treatment infrastructure capacity in the Study

Metric	Data source/s	Date extracted / received	Assumptions applied	Notes
Baseline wastewater treatment capacity: Current to 2027				
Capacity of wastewater treatment plants / facilities in or near the NE REZ development	▪ Local councils: See Appendix I for more details.		▪ Muswellbrook Shire Council: data used as ▪ Wastewater treatment plant capacity information was limited to treatment capacities or estimated population. ▪ In instances where only estimated population data were available, wastewater treatment capacity was back calculated. ▪ No information about plant efficiency was available. Treatment capacity was assumed to be full available and utilised.	
Location of wastewater treatment plants / facilities in or near the NE REZ development	▪ Local councils: See Appendix I for more details.		Approximate locations integrated into spatial data	
Additional wastewater treatment capacity: Stage 1 and Stage 2				
Additional capacity of wastewater treatment plants / facilities in or near the NE REZ development: LWU owned / operated	▪ Local councils: See Appendix I for more details.	Sept 24 – Jan 25	▪ In instances where forward work plans from local councils had not commenced as scheduled, the forward work plan was adjusted to assume its commenced from January 2025.	
Additional capacity of wastewater treatment plants / facilities included in: ▪ Non-REZ projects ▪ REZ projects (GDP projects) ▪ NRNIP	▪ Discussions with and data requests to selected GDPs ▪ EnergyCo Data and Assumptions Workbook	Sept 24 to Jan 25 Data & Assumptions Book v2.1	▪ No on-site wastewater treatment facilities at non-REZ projects, NE REZ projects or NRNIP.	▪ EnergyCo facilitated contact with selected GDPs. ▪ GDPs included solar, wind and BESS projects. ▪ Based on discussions with GDPs, projects are insufficiently advanced for there to be any certainty regarding plans for on-site water treatment facilities.

Appendix H. Data sources and assumptions – Sensitivity tests

Table 8-15: Data sources and assumptions applied to the sensitivity tests used in the Study

Sensitivity	Data source/s	Date extracted / received	Assumptions applied	Notes
Extremely dry / very low water availability conditions	▪ NSW Water Register	28/10/2024	▪ Repeat of the 2019-20 water year when water availability was very low. ▪ Included water systems are those that intersect with LGA boundaries. ▪ See relevant demand assumptions in Appendix D.	▪ Data extract provided by DCCEEW. ▪ Subsequent studies may need to consider more specifically which water systems are accessible to the NE REZ development. ▪ Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs.
Relevant projects that are highly likely to proceed	▪ EnergyCo Data & Assumptions Workbook Book v2.1	Data & Assumptions Book v2.1	▪ Likelihood was specified by EnergyCo as recorded in EnergyCo's NE REZ Data and Assumptions book ▪ See all relevant water supply (Appendix C), water demand (Appendix D) and wastewater (Appendix F) assumptions.	▪ Projects categorised as medium or low likelihood were removed from the analysis.
Relevant projects that are categorised as either a high or medium likelihood of proceeding		Data & Assumptions Book v2.1		▪ Projects categorised as low likelihood were removed from the analysis.

References

[1] Local water utility performance | NSW Government Water

[2] https://www.planning.nsw.gov.au/research-and-demography/population-projections/explore-the-data

Appendix I. Data sources and assumptions – Summary of data available to generate water and wastewater estimates by LGA

The following tables show the data that were used to generate the estimates for those metrics relevant to each LGA.

- Table 8-16 shows the data sources used for the 8 LGAs impacted by the NRNIP
- Table 8-17 shows the data sources used for the 3 LGAs within the NE REZ but not in vicinity of NRNIP

Table 8-16: Summary of data used to generate water and wastewater estimates by LGA used in the Study | LGAs impacted by NE REZ Network Infrastructure Project

	Armidale Regional Council	Liverpool Plains Shire Council	Muswellbrook Shire Council	Tamworth Regional Council	Upper Hunter Shire Council	Uralla Shire Council	Singleton Council	Walcha Council
Water supply								
Baseline water availability: Present day to 2026								
Volume of water allocated to entitlements in regulated surface water systems in or near the NE REZ development	Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs. See approach outlined in Appendix C							
Volume of water allocated to entitlements in groundwater systems in or near the NE REZ development	Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs. See approach outlined in Appendix C							
Volume of recycled water produced by LWUs	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix C							
Additional water availability: Stage 1 and Stage 2								
Additional volume of recycled water produced in Stage 1 by LWUs	Based on responses from local councils to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.							
Water demand								
Baseline water demand: Present day to 2026								
Volume of surface water used in regulated surface water systems in or near the NE REZ development	Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs. See approach outlined in Appendix D							

	Armidale Regional Council	Liverpool Plains Shire Council	Muswellbrook Shire Council	Tamworth Regional Council	Upper Hunter Shire Council	Uralla Shire Council	Singleton Council	Walcha Council
Volume of water used in groundwater systems in or near the NE REZ development	Qualitative commentary on water supply because NSW Water Register data available based on hydrological units. Geographic unit of analysis for the Study was LGAs. See approach outlined in Appendix D							
Volume of potable water demand	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix D							
Additional water demand: Stage 1 and Stage 2								
Additional volume of potable water demand in Stage 1 / Stage 2 (projected population change)	Estimates generated using a consistent, publicly available data source. See approach outlined in Appendix D							
Water treatment capacity								
Baseline water treatment capacity: Present day to 2026								
Capacity of water treatment plants in or near the NE REZ development	Based on LGA responses to data requests via email in December 2024.	General capacity information based on public reporting from Liverpool Plains Shire Council.[40]	Muswellbrook Shire Council: Integrated Water Cycle Management Strategy prepared by Public Works Advisory (July 2021)[1]	Approx. capacity based upon 2020-2022 Blueprint 100 Part 1. (May 2020)[41]	Based on LGA responses to data requests via email in March 2025. Upper Hunter Shire Council: Integrated Water Cycle Management: Issues Paper - Update prepared by	General capacity information based on public reporting from Uralla Shire Council. [42]	Based on LGA responses to data requests via email in February 2025. General capacity information based on public reporting from Upper	General capacity information based on public reporting from Walcha Council.[44]
Location of water treatment plants in the NE REZ and along the NRNIP corridor[45]								

[40] Home | LPSC Water Quipolly Water Project, Quirindi NSW

[41] Tamworth Regional Blueprint 100 | Tamworth Regional Council

[42] Managing our Water Supplies Uralla Shire Council

[44] Microsoft Word - IWCM Part 1 - Evaluation Study - March 2010 Final

[45] Note: no spatial locations have been provided. Where this is the case, an estimate of the plant location has been developed based on publicly available information.

	Armidale Regional Council	Liverpool Plains Shire Council	Muswellbrook Shire Council	Tamworth Regional Council	Upper Hunter Shire Council	Uralla Shire Council	Singleton Council	Walcha Council
					Public Works Advisory (April 2024)[2]		Hunter Council.[43]	
Additional water treatment capacity: Stage 1 and Stage 2								
Additional capacity of water treatment plants in the NE REZ and along the NRNIP corridor in Stage 1 / Stage 2	Based on LGA responses to data requests via email in December 2024.	Based on LGA responses to data requests.	Forward work plans in: - Muswellbrook Shire Council: Integrated Water Cycle Management Strategy prepared by Public Works Advisory (July 2021)[1]	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Forward work plans in: - Upper Hunter Shire Council: Integrated Water Cycle Management: Issues Paper - Update prepared by Public Works Advisory (April 2024)[2]	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Based on LGA responses to data requests.	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.
Wastewater to be treated								
Baseline wastewater to be treated: Stage 1 and Stage 2								
Volume of wastewater to be treated	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix F							
Additional wastewater to be treated: Stage 1 and Stage 2								
Additional volume of wastewater to be treated in Stage 1 / Stage 2 (projected population change)	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix F							
Wastewater treatment capacity								
Baseline wastewater treatment capacity: Present day to 2026								

[43] 12554712-REP_UHWUA Drought Management Plan_current.docx

	Armidale Regional Council	Liverpool Plains Shire Council	Muswellbrook Shire Council	Tamworth Regional Council	Upper Hunter Shire Council	Uralla Shire Council	Singleton Council	Walcha Council
Capacity of wastewater treatment plants in or near the NE REZ development	Local council response to data requests via email in December 2024.	General capacity information based on public reporting from Liverpool Plains Shire Council.[46]	- Muswellbrook Shire Council: Integrated Water Cycle Management Strategy prepared by Public Works Advisory (July 2021)[1]	Approx. capacity of based upon 2020-2022 Blueprint 100 Part 1. (May 2020)[47]	Based on LGA responses to data requests via email in March 2025. Upper Hunter Shire Council: Integrated Water Cycle Management: Issues Paper - Update prepared by Public Works Advisory (April 2024)[2]	Local council response to data requests	Based on LGA responses to data requests via email in February 2025. General capacity information based on LGA responses to data and public reporting from Singleton Council.[48]	General capacity information based on public reporting from Walcha Council.[49]
Location of wastewater treatment plants in the NE REZ and along NRNIP corridor[50]								
Additional wastewater treatment capacity: Stage 1 and Stage 2								

[46] Werris Creek WWTP - EPA Report - 2022 (5).xlsx; Quirindi STP Pollution Monitoring Data 4 year history.xls

[47] Tamworth Regional Blueprint 100 | Tamworth Regional Council

[48] What We Do | Singleton Council

[49] Microsoft Word - IWCM Part 1 - Evaluation Study - March 2010 Final

[50] Note: no spatial locations have been provided. Where this is the case, an estimate of the plant location has been developed based on publicly available information.

	Armidale Regional Council	Liverpool Plains Shire Council	Muswellbrook Shire Council	Tamworth Regional Council	Upper Hunter Shire Council	Uralla Shire Council	Singleton Council	Walcha Council
Additional capacity of wastewater treatment plants in the NE REZ and along NRNIP corridor in Stage 1 / Stage 2	Local council response to data requests via email in December 2024.	Based on LGA responses to data requests.	Forward work plans in: - Muswellbrook Shire Council: Integrated Water Cycle Management Strategy prepared by Public Works Advisory (July 2021)[1]	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Forward work plans in: - Upper Hunter Shire Council: Integrated Water Cycle Management: Issues Paper - Update prepared by Public Works Advisory (April 2024)[2]	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Based on LGA responses to data requests.	Based on LGA responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.

Notes:

[1] Muswellbrook Shire Council: Integrated Water Cycle Management Strategy prepared by Public Works Advisory (July 2021). Provided to Jacobs, via EnergyCo, by Muswellbrook Shire Council.

[2] Upper Hunter Shire Council: Integrated Water Cycle Management: Issues Paper - Update prepared by Public Works Advisory (April 2024). Provided to Jacobs, via EnergyCo, by Upper Hunter Shore Council.

Table 8-17: Summary of data used to generate water and wastewater estimates by LGA used in the NE REZ water and wastewater study area | LGAs within NE REZ but not impacted by the NE REZ Network Infrastructure Project

	Glenn Innes Severn Shire Council	Tenterfield Shire Council	Inverell Shire Council[3]
Water supply			
Baseline water availability: Present day to 2026			
Volume of water allocated to entitlements in regulated surface systems in or near the NE REZ development	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix C		
Volume of waster allocated to entitlements in ground systems in or near the NE REZ development	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix C		
Volume of recycled water produced by LWUs	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix C		
Additional water availability: Stage 1 and Stage 2			
Additional volume of recycled water produced in Stage 1 by LWUs	Based on local council responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.		*Data unavailable*
Water demand			
Baseline water demand: Present day to 2026			
Volume of water used in regulated surface water systems relevant in or near NE REZ development	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix D		
Volume of water used in groundwater systems in or near the NE REZ development	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix D		
Volume of potable water demand	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix D		
Additional water demand: Stage 1 and Stage 2			
Additional volume of potable water demand in Stage 1 / Stage 2 (projected population change)	Estimates generated using a consistent, publicly available data source. See approach outlined in Appendix K		
Water treatment capacity			
Baseline water treatment capacity: Present day to 2026			
Capacity of water treatment plants in or near the NE REZ development	Based on local council responses to data requests via email in December 2024.	Tenterfield Shire Council: Development Servicing Plan - Water Supply prepared by Cardno (14 July 2020)[1]	Data unavailable at the time the Study was completed.
Capacity of water treatment plants in or near the NE REZ development			
Location of water treatment plants in the NE REZ and along the NRNIP corridor			
Additional water treatment capacity: Stage 1 and Stage 2			
Additional capacity of water treatment plants in or near the NE REZ development in Stage 1 / Stage 2	Based on local council responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Forward work plans in: - Tenterfield Shire Council: Development Servicing Plan - Water Supply prepared by Cardno (14 July 2020)[1]	Data unavailable at the time the Study was completed.
Wastewater to be treated			
Baseline wastewater to be treated: Present day to 2026			

	Glenn Innes Severn Shire Council	Tenterfield Shire Council	Inverell Shire Council[3]
Volume of wastewater to be treated	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix F		
Additional wastewater to be treated: Stage 1 and Stage 2			
Additional volume of wastewater to be treated in Stage 1 / Stage 2 (projected population change)	Estimates generated using consistent, publicly available data sources. See approach outlined in Appendix F		
Wastewater treatment capacity			
Baseline wastewater treatment capacity: Present day to 2026			
Capacity of wastewater treatment plants in or near the NE REZ development	Based on local responses to data requests via email in December 2024.	- Tenterfield Shire Council: Development Servicing Plan - Sewerage Services prepared by Cardno (14 July 2020)[2]	Data unavailable at the time the Study was completed.
Location of wastewater treatment plants in the NE REZ and along NRNIP corridor			
Additional wastewater treatment capacity: Stage 1 and Stage 2			
Additional capacity of wastewater treatment plants in or near the NE REZ development in Stage 1 / Stage 2	Based on local council responses to data requests and the discussions during the workshops held in Uralla and Scone in October 2024.	Forward work plans in: - Tenterfield Shire Council: Development Servicing Plan - Sewerage Services prepared by Cardno (14 July 2020)[2]	Data unavailable at the time the Study was completed.

[1] Tenterfield Shire Council: Development Servicing Plan - Water Supply prepared by Cardno (14 July 2020). Provided to Jacobs, via EnergyCo, by Tenterfield Shire Council.

[2] Tenterfield Shire Council: Development Servicing Plan - Sewerage Services prepared by Cardno (14 July 2020). Provided to Jacobs, via EnergyCo, by Tenterfield Shire Council.

Appendix J. Data sources and assumptions – Specific assumptions on worker and construction and operational activities related to water use and wastewater to be treated

The following assumptions (and data sources) were used to inform the water and wastewater estimates for a range of metrics. These assumptions were used only when more specific data could was not available at the time of the Study. For example, for water demand relating to on-site workers for the NRNIP, the NE REZ Construction Water Demand data[51] provided by EnergyCo was used. However, this data set did not contain equivalent data for wastewater to be treated from on-site workers, so the assumptions from the table below were used. The NE REZ Construction Water Demand data also did not include wastewater estimates from NRNIP construction.

Table 8-18: Data sources and assumptions applied to estimates of future water use and wastewater to be treated from workers and construction activities (non-REZ projects, NE REZ projects and NRNIP where relevant)

Concept	Water Use	Development stage	Specific water use or wastewater source	Specific assumption(s)	Data source
Water Demand	**Potable use by personnel on site** From on-site workers during construction and / or operations of NE REZ projects, Transmission Project or non-REZ projects	Construction and Operations	Drinking	3 litres / person / day	Sydney Water[1]
Water Demand	**Sanitation facilities**	Construction and Operations	Toilet flushes	4.5 litres per use 3 uses / day 13.5 litres / person / day	Sydney Water[1]
Water Demand	**Sanitation facilities**	Construction and Operations	Basin Flush	7.5 litres per use 0.5 mins duration 5 uses per day 18.75 litres / person / day	Sydney Water[1]
Water Demand	**Sanitation facilities**	Construction and Operations	Shower	7.5 litres per use 5 mins duration 1 use per day	Sydney Water[1]

[51] 20250117 NE REZ Construction Water Demand 2.0.xlsx

Concept	Water Use	Development stage	Specific water use or wastewater source	Specific assumption(s)	Data source
				37.5 litres / person / day	
Water Demand	Total water demand from on-site workers	Construction and Operations	Total usage	72.75 litres / person / day	Sydney Water[1]
Water Demand	Total water demand from off-site workers accommodation	Construction and Operations	Total usage	145 litres / person / day	Sydney Water[1]
Water Demand	**Concrete production**	Construction	Concrete Mix Requirements	158 litres / m3 Assuming M30 Grade Concrete	Civil Synergy[2]
Water Demand	**Concrete production**	Construction	Cure	250 litres / m3	Civil Synergy[2]
Water Demand	**Concrete production**	Construction	Total concrete / cure usage	410 litres / m3	Civil Synergy[2]
Water Demand	**Concrete production**	Construction	Wind mill concrete footing	580 litres / m3	Civil Synergy[2]
Water Demand	**Concrete production**	Construction	Solar Farm concrete requirements (Dust suppression)	0.25 ML/Day	Jacobs senior environmental engineer advising on suitable assumptions for dust suppression and concrete use activities
Wastewater to be treated	**Wastewater to be treated volumes** From on-site workers during construction and / or operations of NE REZ projects, Transmission Project or non-REZ projects, and off site water usage	Construction and Operations	Total usage	80% of water used on site / off site	Industry standard

References

[1] https://www.sydneywater.com.au/your-home/helping-you-save-water/waterfix-residential.html

[2] https://civilsynergy.wordpress.com/2020/07/28/mix-design-calculation-for-m30-grade-concrete/

Appendix K. Water uses by infrastructure type included / excluded from the Study

This appendix presents the water uses by infrastructure type and development stage that were included and excluded in the Study. Several water uses have been excluded from the analysis presented in this Report because data were not readily available from GDPs. This reflects the early stages of planning for most projects.
See Section 8 for qualitative commentary of the order of magnitude for water uses that are not included in this Study.

Table 8-19: Water uses that have been considered in the Study

	Construction water uses		Operational water uses	
Type of infrastructure	**Included**	**Excluded**	**Included**	**Excluded**
NE REZ Network Infrastructure Project, including Transmission line, support sites and hubs 	Concrete Earthworks Dust suppression Cleaning of roads Road construction Vehicle wash down Sanitation facilities		Dust suppression Cleaning of roads Sanitation facilities	Fire prevention
NE REZ workforce camp sites	Personnel use[52] Concrete production Construction, including earthworks		Personnel use Camp site maintenance	Fire prevention
Other renewable energy infrastructure				
Solar 	Concrete production Sanitation facilities/Potable use by personnel on site	Soil compaction and site preparation	Sanitation facilities/Potable use by personnel on site	Fire prevention[53] Upkeep of access roads Solar module cleaning

[52] Including shower, dishwasher, washing machine, brush teeth, drinking/cleaning/cooking, hand basin use, toilet flush, toilet half flush

[53] Note: several GDPs provided data in relation to fire prevention for renewable infrastructure. This has not been included in this analysis as this is reliant on a gas-based suppression system. Gas based suppression systems (CO2 / inert gas) are the commonly used fire suppression systems due to their ability to protect electrical equipment without causing damage.

	Construction water uses		Operational water uses	
Type of infrastructure	**Included**	**Excluded**	**Included**	**Excluded**
Wind 	Concrete production for turbine footing Personal use in LGA Sanitation facilities/Potable use by personnel on site	Earthworks Road construction	Sanitation facilities/Potable use by personnel on site	Fire prevention Upkeep of access roads Cleaning of wind turbines
Battery[54] 	Personal use in LGA Sanitation facilities/Potable use by personnel on site Concrete production[55]	Earthworks Road construction	Sanitation facilities/Potable use by personnel on site	Fire prevention
Hydro 	Personal use in LGA Sanitation facilities/Potable use by personnel on site	Earthworks Concrete production Road construction Hydraulic testing	Sanitation facilities/Potable use by personnel on site	Primary resource for energy generation Fire prevention
Other non-renewable energy infrastructure				
Waste	Not applicable – no new waste facilities identified in EnergyCo Data and Assumptions workbook v2.1		Dust control Sanitation facilities/Potable use by personnel on site	Water management and monitoring Moisture content
Extractive industries	Personal use in LGA Sanitation facilities/Potable use by personnel on site	Dust suppression Earthworks Road construction	Sanitation facilities/Potable use by personnel on site	Washing sand, gravel and aggregates Dust suppression Equipment cleaning Fire prevention

[54] GDPs proposing BESS facilities provided information that indicated water is not required for cooling.

[55] Note: There was insufficient information available from GDPs to support assumptions on concrete production water use requirements. EnergyCo provided assumptions to support water use estimates for BESS concrete production.

	Construction water uses		Operational water uses	
Type of infrastructure	**Included**	**Excluded**	**Included**	**Excluded**
Roads (other projects not related to NRNIP)	Dust control Sanitation facilities/Potable use by personnel on site	Earthworks Curing Mixing concrete and asphalt Dust control		Road maintenance
Coal mining	Sanitation facilities/Potable use by personnel on site	Dust suppression Earthworks Road construction	Sanitation facilities/Potable use by personnel on site	Fire prevention Upkeep of access roads
Education	Sanitation facilities	Dust suppression Earthworks Road construction	Sanitation facilities/Potable use by personnel on site	Heating and cooling Food preparation Fire prevention
Livestock	Sanitation facilities/Potable use by personnel on site	Concrete production Dust suppression Earthworks	Sanitation facilities/Potable use by personnel on site	Heating and cooling Fire prevention Cleaning and maintenance