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SMEC INTERNAL REF. 3002795

Albury Regional Job Precinct

Infrastructure Assessment – Utilities Technical Report

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Important Notice

This Report considers current infrastructure network constraints and potential augmentation required to support land use intensification and master planning as it relates to electrical power supply, water supply, sewer, telecommunications, traffic and transport and hydrogeology and water demand. This report is generally qualitative in nature and design has not been undertaken to inform the study findings. Future studies will be necessary to provide a detailed demand analysis and to provide additional clarity around the infrastructure needs of the study area.

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Executive Summary

The objective of the Regional Job Precincts (RJP) program is to provide a more streamlined planning process to drive investment and development in regional NSW. The RJP program focuses specifically on targeted locations that are ready for development and will support thriving industries and job creation. SMEC has been engaged by Department of Regional NSW (DRNSW) to prepare an assessment of infrastructure needs to help attract new business to the regions, and support job growth.

The Albury RJP investigation area is a 1,190 ha area approximately 10km north of the Albury CBD. The site surrounds the Ettamogah Rail Hub and the existing "NEXUS" industrial subdivision. Albury is located on the banks of the Murray River in the Riverina region of south-eastern NSW, approximately 300km north-east of Melbourne and 570km south-west of Sydney.

Given the size of the Albury RJP (1,190 ha), consideration of the expected future uses, staging and delivery is critical to understanding the required infrastructure upgrades, associated costs and the trigger points to ensure infrastructure is provided 'just in time'. SMEC has been engaged by the Department of Regional NSW (DRNSW) to prepare an assessment of infrastructure needs to help attract new businesses to the Albury region, and support job growth. With the existing presence of the Ettamogah Rail Hub, former paper mill and early movers into the NEXUS Industrial Subdivision such as Circular Plastics, the Albury region shows enormous potential for regional growth and investment.

According to the Albury City Council Local Strategic Planning Statement (2020), the Albury Local Government Area is predicted to see a population increase of 13,074 residents by 2036. Land identified for urban expansion is located east of the site in Thurgoona. This area is targeted for approximately 20,000 dwellings or 50,000 residents over the next 50 years. Infrastructure considerations for the RJP must also consider the planned urban expansion in Thurgoona, to ensure sufficient capacity for both industry and residential expansion. The Albury RJP master plan has been developed by Ethos Urban as part of the RJP project for DRNSW. The master plan is aspirational and includes indicative land uses across three stages: 2026, 2036 and beyond 2036.

This report commences with an introduction to the project site and the master plan, and then provides a baseline analysis of utilities infrastructure currently servicing the Albury RJP investigation area. This report then considers how infrastructure will need to be modified over time to accommodate the growth anticipated by the master plan. The recommended upgrades are provided to coincide with the anticipated sequencing and staging of development.

The electrical load requirements of industrial utilisation could vary significantly depending on development uptake and composition of uses. The proposed growth of heavy industry on the west of Hume Highway (as contemplated in Stages 1 and 2 of the master plan) would place the biggest burden upon an augmented network. Industrial and residential development to the east of the Hume Highway will also require a considerable load. Our theoretical demand across the three stages of the master plan assumes an ultimate demand at Stage 3 of 141MVA (Megavolt-amperes) based on a mixture of high energy uses, warehousing, offices and general industries. This is a significant increase in demand considering the Union Road substation which currently feeds all of Albury, is rated at 86-95MVA.

This report presents options for expanding the electricity network, including an option to utilise a microgrid and community scale battery storage to defer the construction of a new zone substation. However, ultimately, a new zone substation will be required, and recommendation is made to work closely with Essential Energy to undertake a feasibility study to confirm the most suitable location within the RJP.

This report also includes modelling of the assumed potable water demand from the RJP and recommends a series of upgrades to the network to support growth in the region. To support the expected growth in Stage 1, an upgrade (beyond the capacity already planned by Council) to the Table Top Reservoir will be required as well as new supply mains and transfer mains. The extent of development that can occur prior to these upgrades would be dependent on the types of industries and their specific needs, and it is recommended that Council begin planning to increase capacity and closely monitor new industries seeking to locate in the area to maintain sufficient supply and service standards. Subsequent upgrades to water pumping stations and ring mains will also be needed in later stages.

The additional wastewater flows from the RJP and residential development in Thurgoona will also require upgrades to the Council's trunk sewer infrastructure and wastewater treatment facilities. Modelling using theoretical flows from the staged uptake of the master plan confirms that augmentation of trunk pipework will be required to support the growth predicted in Stage 1 and 2, even during dry weather. It is recommended that Council investigate duplication with a parallel pipeline between Jelbart Road and Hartigan Street as a priority.

Wastewater modelling also demonstrates that the anticipated wastewater flows from the RJP, and from residential development in Thurgoona, will require additional treatment capacity within Albury. This could be in the form of duplication of the Waterview Wastewater Treatment Plant (WWTP) and/or construction of a new Northern WWTP. The composition of flows between WWTPs would determine other upgrades that may be needed throughout the network, for example to trunk mains and sewer pump stations.

When developing these recommendations, we have sought to limit overcapitalisation of unnecessary infrastructure prior to the establishment of industries and build flexibility into the network so that the Albury RJP can be more responsive to the needs of future businesses. The infrastructure recommendations in this report are intended to guide Council in the preparation of a site specific Albury RJP Development Contributions Plan and it is hoped that the studies undertaken for the Albury RJP can be used to support business cases for funding for future infrastructure upgrades.

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1. Introduction

The objective of the Regional Job Precincts (RJP) program is to provide a more streamlined planning process to drive investment and development in regional NSW. The RJP program focuses specifically on targeted locations that are ready for development and will support thriving industries and job creation. SMEC has been engaged by Department of Regional NSW (DRNSW) to prepare an assessment of infrastructure needs to help attract new business to the regions, and support job growth. SMEC has been engaged by the Department of Regional NSW (DRNSW) to prepare an assessment of infrastructure needs to help attract new business to the regions, and support job growth.

The Albury RJP is a 1,190 ha area of industrial and undeveloped land in Ettamogah, north of Albury. The Albury RJP investigation area is adjacent to the Melbourne to Sydney rail corridor and the Hume Highway, which provide excellent locational attributes to drive investment in freight and logistics, and access to national and international markets.

This report commences with an introduction to the project site and the master plan, and then provides a baseline analysis of utilities infrastructure currently servicing the Albury RJP investigation area. This report then considers how infrastructure will need to be modified over time to accommodate the growth anticipated by the master plan. The recommended upgrades are provided to coincide with the anticipated sequencing and staging of development.

The Albury RJP investigation area has had a history of industry with the Norske Skog paper mill operating in the area for almost 40 years prior to its closure in 2019. The site includes an ANM substation as part of the TransGrid 132Kv (Kilovolt) High Voltage network. The site and substation are privately owned by Visy Industries Australia Pty Ltd (Visy) while telecommunications and potable and raw water supply interface with the site. In addition, the site has an existing bore, water treatment and water reuse and recharge system in place. Excess capacity of this private bore has historically been shared with Albury City Council (ACC), however other infrastructure has been privately owned and operated.

Overall Forge is an open die forge that has been manufacturing in Albury for over 100 years. It is situated south of the paper mill site, with a frontage to RW Henry Drive. The RJP investigation area also contains the Ettamogah Rail Hub (ERH), an intermodal facility moving freight via rail and road primarily within the Riverina Region. The ERH has been operating at its current location since 2009 and is appropriately serviced by road and utility infrastructure. It is understood that the owners of the ERH are ambitious to grow their service offering for the region. Most recently the initial stage of the NEXUS industrial precinct has been completed. This has seen road and utility infrastructure installed west of Gerogery Road.

With increasing investor interest in the area, there is a need to understand the capacity of utility infrastructure in the region, and plan for augmentation to provide certainty and confidence for private industry to relocate to the region.

2. Project Background

2.1 Project Objectives

The RJP program provides an opportunity to assist regional areas to attract investment through facilitating upfront strategic master planning. There is also an opportunity to streamline statutory planning to further drive agglomeration and reduce barriers to investment.

SMEC has been engaged by DRNSW to prepare an assessment of infrastructure needs to help attract new businesses to the Albury region, and support job growth. With the existing presence of the Ettamogah Rail Hub, former paper mill and early movers into the NEXUS Industrial Subdivision such as Circular Plastics, the Albury region shows enormous potential for regional growth and investment.

The focus of this report is on the supply and demand of utilities within the Albury RJP investigation area. This report includes an assessment of current (baseline) conditions and tests the master plan prepared by Ethos Urban to develop an understanding of infrastructure investment that may be required.

2.2 Report Objectives

The objective of this report is to disseminate a technical assessment of the infrastructure needs of the Albury RJP into plain English. This report integrates initial findings from the baseline assessments undertaken for the area and assesses the impacts that the uptake of development in accordance with the RJP master plan may have on infrastructure in the area. This report specifically:

- Identifies the required extensions, upgrades or new infrastructure or services needed to support the levels of growth envisioned in the RJP master plan
- Specifies options for the location of infrastructure, utilities and services, expected capacity and the indicative amount of land required
- Discusses staging of infrastructure
- Recommends concepts for the infrastructure network
- Provides recommendations for Development Control Plan (DCP) provisions for consideration by the relevant local council
- Provides recommendations for updates to existing infrastructure contributions plans to support the cost-effective, equitable and timely provision of key utilities infrastructure for the RJP.

2.3 Project Location and key features

The Albury RJP investigation area is a 1,190 ha area approximately 10km north of the Albury CBD. The site surrounds the Ettamogah Rail Hub and the existing “NEXUS” industrial subdivision. Albury is located on the banks of the Murray River in the Riverina region of south-eastern NSW, approximately 300km north-east of Melbourne and 570km south-west of Sydney.

The Albury RJP investigation area is adjacent to the Melbourne to Sydney rail corridor and the Hume Highway, which provide excellent locational attributes to drive investment in freight and logistics, and access to national and international markets. Proximity to productive agricultural land in the Riverina Murray region also provides a key attribute to support growth of the area for food manufacturing industries, freight and logistics.

Albury has a current population of 55,030 residents (ABS, 2021), and is forecasted to grow by another 13,074 residents by 2036 (Local Strategic Planning Statement, Albury City Council, 2020). Several new residential subdivisions are occurring south and east of the site, to accommodate the urban expansion of Albury. Land to the north and west of the Albury RJP investigation area is predominantly rural with some large lot residential development.

We understand that $32M in funding was successfully obtained for the NEXUS Industrial Precinct Stage 1 from ACC, the NSW and Commonwealth Governments. This has been used to fund roadworks, including the $15.8M upgrade of the

Davey Road interchange, gas, water and sewer augmentation, and to undertake the first stages of the NEXUS subdivision.

The location of the Albury RJP investigation area is provided in Figure 2-1, with reference to existing developed land within the region.

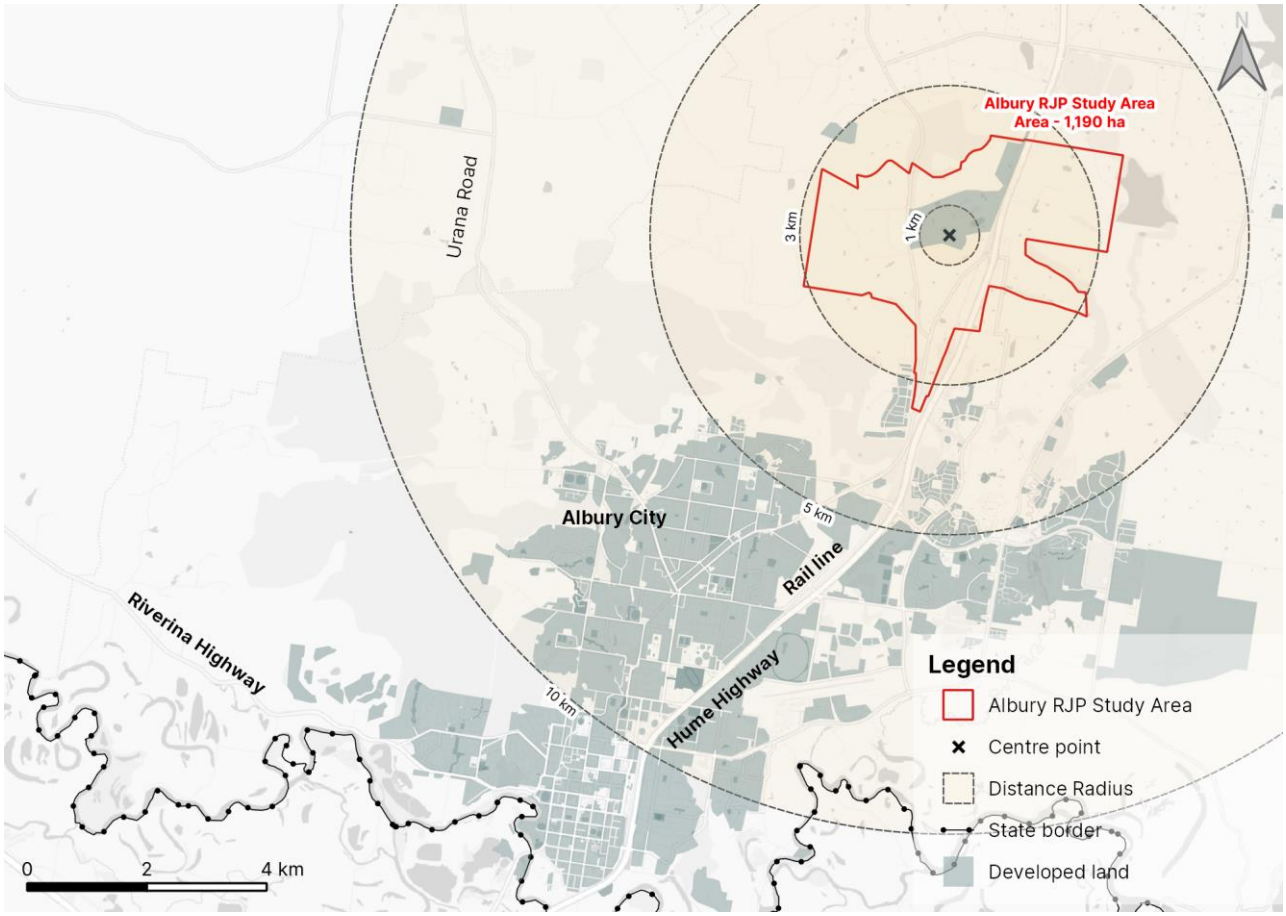

Figure 2-1 | Location diagram of study area and its proximity to Albury

The Albury RJP investigation area also contains the former Norske Skog paper mill, which is currently owned by Visy Industries. It is our understanding that the paper mill ceased operations in September 2019. The paper mill contains a rail siding and has vehicular access to Hume Highway via Wagga Road. Visy is a significant landowner within the RJP investigation area, as the paper mill previously operated a water reuse scheme with several fields containing centre pivots nearby, some vacant and some currently occupied by lucerne crops.

The existing presence of the paper mill and rail siding was the driving factor for the establishment of the ERH in 2009. The hub primarily manages import and export of goods through the Port of Melbourne and is operated as a Common User Terminal, which allows multiple rail and trucking companies to use the siding. The ERH has a fleet of trucks including a polymer vehicle enabling the movement of raw materials to and from the region. The ERH manages a range of raw materials and transport of goods for local operators such as beverage manufacturers, pet food manufacturers and has the potential to expand into recycling and e-waste.

Overall Forge, an open die forge, occupies a site to the south of the Visy papermill, with a frontage to Wagga Road. Overall Forge manufactures steel products for the Australian and South-East Asian mining and quarrying industries, and currently employs about 100 people.

Circular Plastics, a PET recycling plant developed as a joint venture partnership between Cleanaway Waste Management Ltd., Pact Group, Coca-Cola Euro pacific Partners and Asahi Beverages[1], recently opened within the NEXUS Industrial Precinct. The facility is anticipated to recycle approximately 1 billion PET plastic bottles each year, reducing Australia's reliance on virgin plastic, the amount of plastic waste sent overseas and the amount of recycled plastic Australia imports. The recycled plastic will be used as raw material to manufacture new bottles and food and beverage packaging in

[1] https://www.investregional.nsw.gov.au/news/australias-largest-pet-recycling-plant-opens-in-albury/

Australia. This is expected to result in a two-thirds increase in the amount of locally sourced and recycled PET produced in Australia, from around 30,000 tonnes to over 50,000 tonnes each year.

The Twin Cities Model Aero Club owns a large parcel of land on the southern side of the RJP investigation area and includes a club house and flying facilities for model aircraft. New residential blocks within the adjoining suburb of "Ettamogah Rise" are located to the south-west of the RJP investigation area, separated by a large parcel of Department of Defence owned land. Residential subdivision is also occurring on the eastern side of the Hume Highway in the suburb of Thurgoona. Land to the north of the RJP investigation area is predominantly rural with some large lot residential development. The Albury Local Strategic Planning Statement (2020) encourages the continuation of this rural and rural residential character.

An existing network of established roads are present within the RJP investigation area, with key collector Gerogery Road feeding into Wagga Road and onto the Hume Highway. The recent modification of the Davey Road interchange to provide a southern on-ramp has significantly improved efficiency of movement from the RJP investigation area south. It is understood that a recent Development Application has been lodged to facilitate the construction of a truck stop / service station on the southbound side of the Davey Road interchange.

Other established roads feeding into the Albury region include the Olympic Highway, which links key agricultural areas surrounding Wagga Wagga and as far north as Bathurst; and the Riverina Highway, which provides access to the south-western agricultural food bowl.

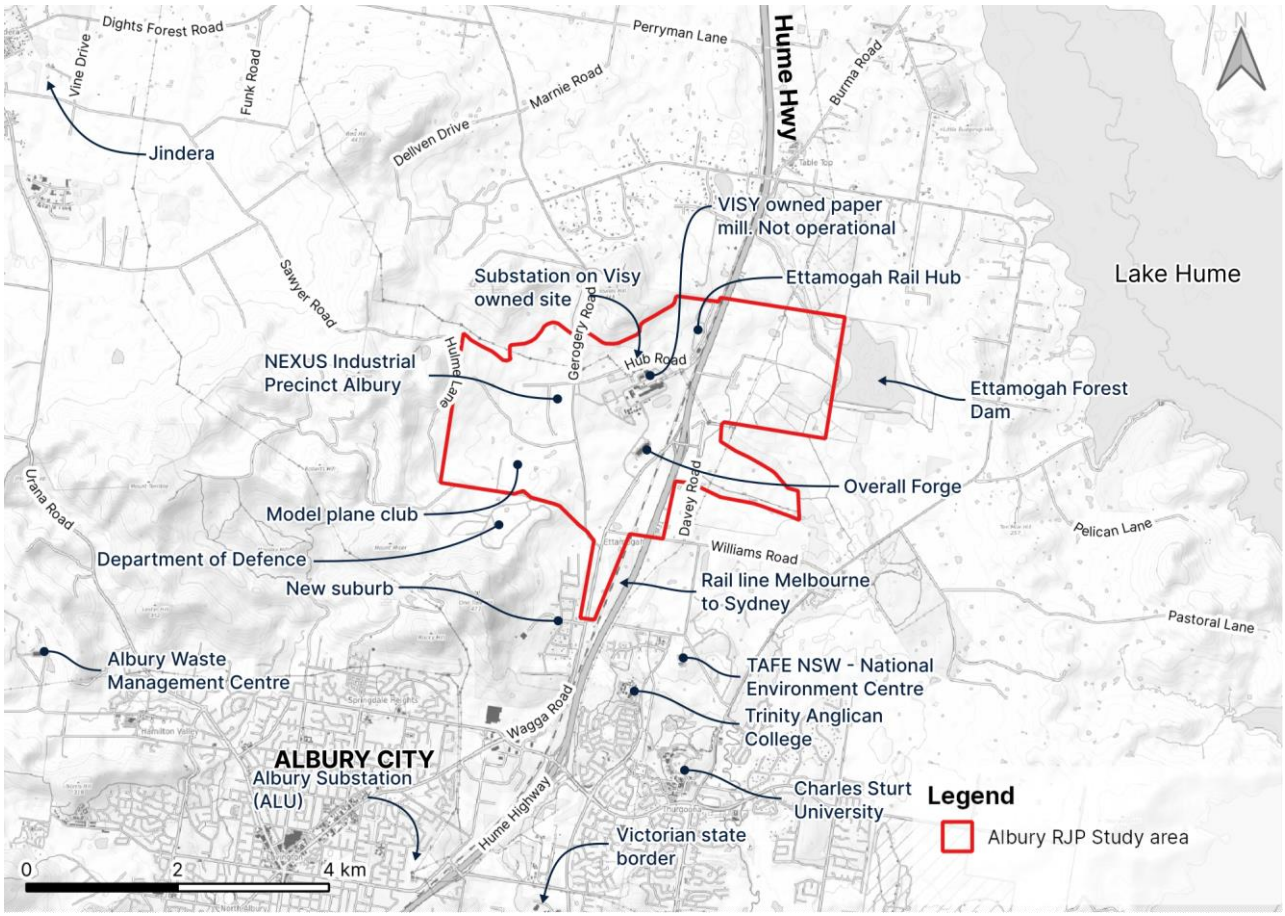

Figure 2-2 | Location diagram of study area

2.4 Key Attributes and Challenges

This section provides a high-level appraisal of key attributes and challenges of the RJP:

Attributes

- Relatively low fragmentation of land ownership
- Proximity of residential development to the south. May open opportunities for shared facilities or services within walking distance
- Topography and location within a small valley which helps to reduce visual impact of development
- Topography is basin in form, raised ground protects the areas outside of the precinct to the north, south and west
- Inland rail corridor and ERH providing access to Port of Melbourne and Port of Brisbane
- Original 3km rail siding at ERH[2] which has been extended to 5km
- The site has direct access to the Hume Highway which allows movement directly from the precinct onto the highway and a connection across the highway from the East to the West
- Established existing businesses and new investment
- Existing energy network has potential for upgrades
- Visy's private services infrastructure - substation and water supply / discharge provide opportunity to benefit the wider precinct
- Areas north, east and west are likely to be undeveloped, securing a perimeter with in-built buffers for industry to sensitive receptors.
- Housing availability and affordability

Challenges

- Capacity constraints presented by the existing electricity network to support new businesses
- Existing road pattern and impact on efficiency of movement
- Limited ability to expand rail connectivity to the east of the rail line
- Distance to nearest commercial centre to meet the needs of employees
- Accessibility by public transport, and active travel
- Access to wastewater facilities for trade-waste intensive industries
- Competition from similar industrial precincts locally
- Riparian pathways limiting movement and development through the site
- Steeper slopes not ideal for industrial development opportunities
- Areas with valued vegetation, some of which needs protection to preserve habitats
- Heavy quarry vehicle movement paths which run through and around the site
- Residential zoned neighbourhoods are located within potential land-use conflict areas
- Much of the land needs to be considered for heritage protection, these areas centre around the Eight Mile Creek area
- Bushfire risk, shown moderate to high risk
- Odour and noise concerns
- 100-year ARI flood risk and overland flow area

[2] https://infrastructuremagazine.com.au/2021/06/04/12-2-million-ettamogah-rail-hub-upgrade-complete/

2.5 Expected Residential Growth

In 2020 Albury had a population of 55,030 residents, which is larger than the adjacent city of Wodonga (42,660 residents). Population growth in Albury over the last 20-years has been moderate, averaging +580 persons per year or 1.1% per annum (Regional Population - 2021, and the Census of Population and Housing - 2016).

The Albury Local Government Area is predicted to see a population increase of 13,074 residents by 2036 (Local Strategic Planning Statement, 2020). Land identified for urban expansion is located east of the site in Thurgoona. This area is targeted for approximately 20,000 dwellings or 50,000 residents over the next 50 years. Infrastructure considerations for the RJP must also consider the planned urban expansion in Thurgoona, to ensure sufficient capacity for both industry and residential expansion.

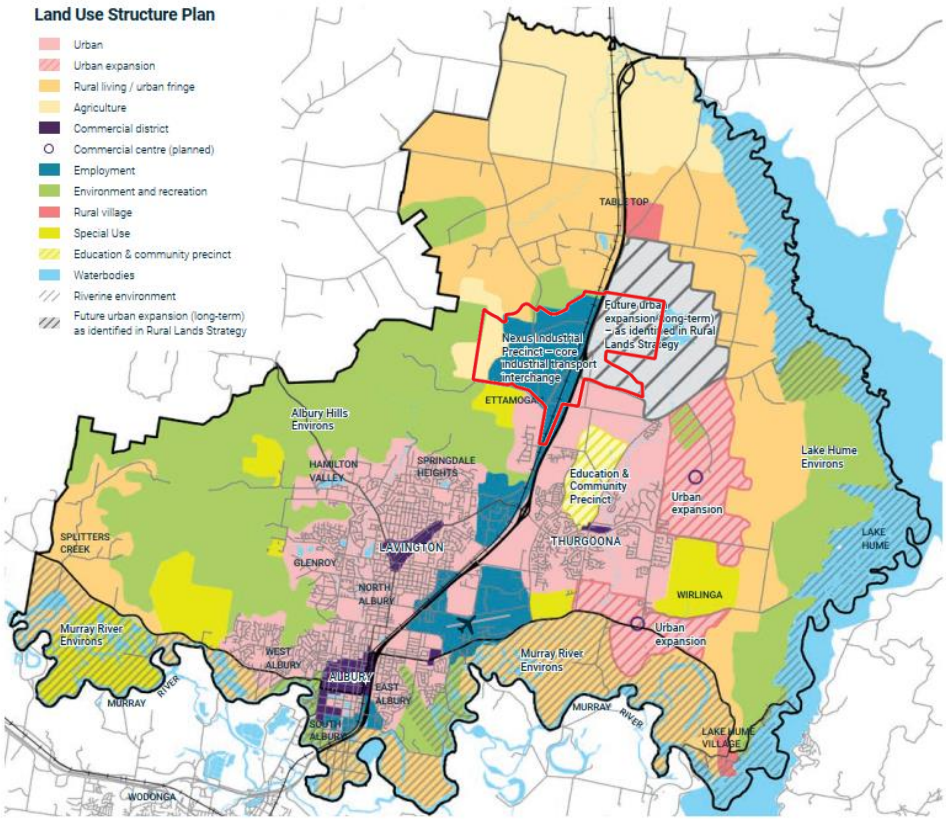

Figure 2-3 | Albury Land Use Structure Plan with approximate area of the Albury RJP investigation area outlined in red

3. Site Visit Summary

3.1 Observations

Members of the SMEC team attended the Albury RJP investigation area on 7 December 2021 to undertake a site reconnaissance and familiarisation exercise. This section provides some key observations of the local area:

- Topography – the RJP study area is reasonably flat however is bounded by hills to the north and west
- A water storage dam is located just east of the RJP investigation area. It is understood this was previously used in conjunction with the paper mill
- A quarry is located west of the site (operated by Burgess Earthmoving)
- The ERH is located in the northern section of the site and provides a 5km rail siding off the Melbourne to Brisbane rail line. The paper mill also has a private rail siding
- Access to the Hume Highway is provided by Wagga Road and Davey Road on ramps
- Residential development is occurring to the south in the "Ettamogah Rise" development and on the eastern side of the Hume Highway in Thurgoona
- Large centre pivots are located along the eastern and western side of the Hume Highway, some growing lucerne and others vacant. It is understood that this land is owned by Visy and provided a water reuse opportunity when the paper mill was operational.
- Council has a desire to establish a commercial precinct / local centre on Wagga Road to service employees and businesses and provide enhanced amenity
- Large parcel of land to the west of the model aeroplane club would provide additional north-south connectivity into the first stage of the NEXUS subdivision.

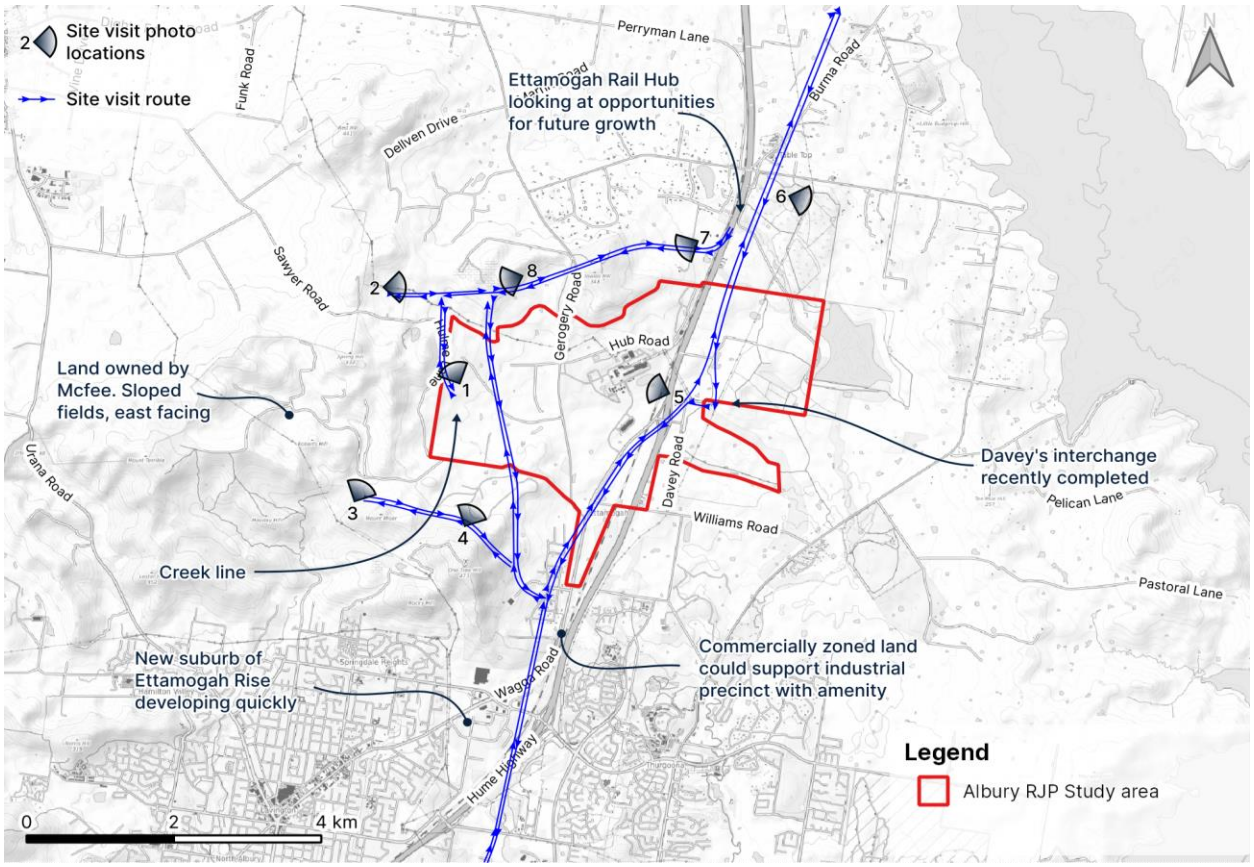

Figure 3-1 | Site visit observations

3.2 Images

Figure 3-2 | A view looking north at the new Plastic Recycling centre

Figure 3-3 | A view looking north towards the model aeroplane club headquarters

Figure 3-4 | A view looking west from the Hume Hwy

Figure 3-5 | A view looking south-west at the Visy owned site

Figure 3-6 | A view looking East at the north boundary of the study area

Figure 3-7 | A view looking north across the field to the Visy owned site.

4. Precinct Master Plan

4.1 Overview

The Albury RJP master plan has been developed by Ethos Urban as part of the RJP project from the Department of Regional NSW. The master plan has been developed based on site visits, preliminary technical studies, options development process and information gathered from stakeholder workshops.

4.2 Vision and Principles

The vision of the Albury RJP is to differentiate itself as an industrial hub of the future, focusing on highly sustainable production, circular economies and value-add industries. The proposed master plan has been developed and tested using the following six urban design principles:

- **Protect biodiversity and high value vegetation** – The aim of this principle is to prioritise protection and enhancement of the natural environment, the most significant of which is the Eight Mile Creek riparian corridor.
- **Protect, enhance and support sensitive receptors** – This principle aims to prioritise the protection of internal and external receptors. Internal receptors include the existing habitats, higher order creeks, water sources and valued vegetation. External receptors include existing and future residential neighbourhoods.
- **Prioritise easy connection to transport corridors and intermodal** – Prioritise connectivity to the existing transport infrastructure within and crossing the precinct - the Hume Highway, the National Rail and the Ettamogah Intermodal (Ettamogah Rail Hub).
- **Maximise the potential of Eight Mile Creek** – Eight Mile Creek, which runs through the centreline of Albury RJP, west to east, has been identified as a high hazard flow during the flood study. This creek acts as potential habitat for wildlife, a location with indigenous value and potential heritage artefacts. The aim is to combine the biodiversity corridors with recreational corridors to foster and prioritise public interaction with this valuable area.
- **Design to suit existing topography** – Some areas of the site in particular are affected by existing slopes of greater than 8% or 10% which present challenges for development and in particular for typologies such as large-footprint industrial buildings or sheds. This principle aims to reduce the requirements for large-scale earth moving at industrial developments by allowing the master plan to consider alternative uses for these areas such as small-footprint light industry, small-footprint productivity areas, and conservation areas.
- **Plan with embedded flexibility, resilience and robustness** – The precinct should consider existing ownership, operations, existing property structures and infrastructure and be designed to accommodate changes to existing conditions and manage changes in ownership and operations.

Figure 4–1 | Albury master plan (Ethos Urban 2022)

Legend

- Albury RJP Boundary
- Existing Lot Subdivision
- Proposed Cycle Paths
- Existing Cycle Paths
- National Rail
- Heritage items
- Crown Land, Australian Government, NSW Government
- Creeks, Rivers
- Water Bodies

Masterplan Infrastructure

- Waste Water Treatment
- Proposed Zone Substation
- Existing Zone Substation

Proposed Land Use

- Productivity Support
- Conservation
- General Industry
- Heavy Industry
- Rail Intermodal
- Service Station
- Rail Intermodal (for Future Consideration)

Thurgoona Wirilinga Structure Plan

- Centres - Neighbourhood & Village Centres including Commercial and Residential
- Future Proposed Schools
- Movement Network (Roads)

Existing Zones Within Precinct

- Highway Corridor
- Conservation

Existing Zones Outside Precinct

- E2
- E3
- E4
- R1
- R2
- R3
- R5
- RE1
- RE2
- RU5

(1) Adaptive re-use existing rural historic homestead

(2) Possible location for transport and logistics land uses

S1 Stage 1

S2 Stage 2

S3 Stage3

Note:

1. Renewable Solar Energy Generation is proposed to be located on all possible warehouse rooftops.
2. Potential new substation location to be determined by Essential Energy and Transgrid.

Albury Regional Job Precinct

1 0 1 2 km

Crown Land

Lake Hume

Table Top

Crown Land

Op1

Op2

Item I310: Maryvale

Ettamogah Dam

Op3

Op4

Op5

Item I316: Ettamogah Vineyard Ruins

Thurgoona-Wirlinga

Crown Land

Crown Land

Springdale Heights

Lavington

Scale 1:30,000 @ A3

Figure 128. Preferred Masterplan

4.3 Land Uses and Target Industries

A key goal of the Albury RJP and investment attraction plan is to establish a circular economy ecosystem with new operators establishing and using outputs from existing industries. Figure 4-2 provides a graphical depiction of the circular economy process and how it might apply to the Albury RJP investigation area. This concept has been a key consideration in the upgrades to utilities infrastructure that will be required to support the growth of the RJP.

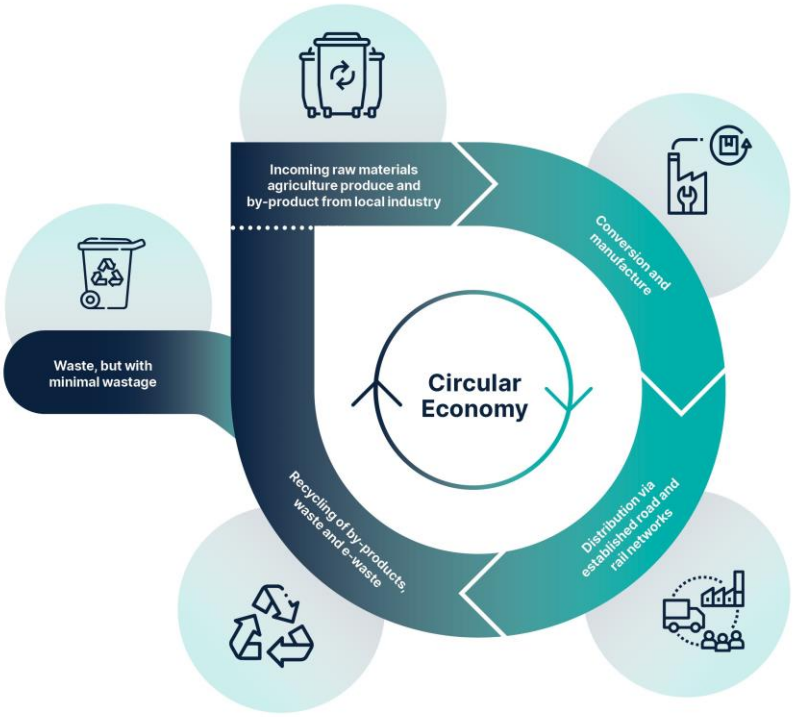

Figure 4-2 | Circular economy within the context of the Albury RJP

The Albury RJP Investment Attraction Plan, prepared by the Office of Regional Economic Development in collaboration with ACC, has been used to guide the preparation of the master plan. Based on locational attributes, existing skillsets and existing infrastructure, the following key industry groups targeted in the master plan are:

- Plastic product manufacturing (utilising PET)
- E-waste processing
- Food processing/manufacturing
- Outdoor recreational equipment metal fabrication e.g., boats, trailers, caravans

Following on from this, the master plan adopts the following eight land use zones:

1. **Conservation** – including riparian corridors and conservation land, based on biodiversity assessments undertaken as part of the RJP project.
2. **General Industry** – providing opportunity for industries with low or limited amenity impacts. We have assumed industries and have distributed the land use within the zone as follows:
   - Microgrids ~ 5%
   - Light industry ~ 10%
   - Freight, logistics and distribution centres ~ 15%
   - Agricultural value-add processing and manufacturing ~ 25%
   - Waste and resource recovery ~ 30%
   - Plant and parts manufacturing ~ 5%

- Ancillary office space ~ 10%

3. **Heavy Industry** – providing suitable land for industries with higher noise, odour, air quality or traffic emissions such as:
   - Chemical manufacturing and mixing ~ 25%
   - Heavy manufacturing e.g., steel forge ~ 30%
   - Heavy industrial storage establishment ~ 30%
   - An abattoir ~ 5%
   - Ancillary office space ~ 10%
4. **Heritage** – for the protection of homestead heritage areas to the east of the highway with future opportunities for adaptive reuse.
5. **Intermodal** – for improved connection from Intermodal through the site with extension of Hub Road to Central Reserve Rd and facilitation of expansion of the existing ERH. Specific nature of uses considered include:
   - Intermodal terminal ~ 30%
   - Warehousing ~ 30%
   - Refrigeration storage (approx. 3,000 sqm) ~ 25%
   - Dangerous goods and chemicals storage ~ 10%
   - Ancillary office space ~ 5%
6. **Productivity** – for improved flexibility and suitability for both low-impact industrial or warehouse uses and to facilitate types of developments which support larger industrial uses, such as:
   - IT and business support services ~ 30%
   - Retail ~ 30%
   - Commercial ~ 20%
   - Low impact supporting industries ~ 15%
   - Education and childcare ~ 5%
   - Recreation Space
   - Service Station

Given the size of the Albury RJP (1,190 ha), consideration of the expected future uses, staging and delivery is critical to understanding the required infrastructure upgrades, associated costs and the trigger points to ensure infrastructure is provided 'just in time'.

Table 4–1 and Table 4–2 confirm the anticipated uptake of land by area and indicative gross floor area of buildings across the three stages. These figures have informed the demand modelling for infrastructure upgrades that will be required to support the growth of the Albury RJP.

Table 4–1 | Assumed uptake of land by industry type

Land Use	Stage 1 (ha)	Stage 2 (ha)	Stage 3 (ha)
General industrial	73	86	172
Heavy industrial use	67	175	0
Rail intermodal	17	0	0
Productivity support	40	0	46
Service station	3	0	0
Total	**200**	**261**	**218**

Table 4–2 | Anticipated Gross Floor Area (GFA) by stage

GFA	Stage 1 (m^2)	Stage 2 (m^2)	Stage 3 (m^2)	TOTAL
General industrial	182,500	215,000	430,000	827,500
Heavy industrial use	167,500	437,500	0	605,000
Rail intermodal	42,500	0	0	42,500
Productivity support	100,000	0	115,000	215,000
Service station	2,500	0	0	2,500

5. Electricity and Gas

5.1 Baseline Assessment

Essential Energy is the responsible authority for the provision of electrical supply services in the Albury region, including within the RJP and the Thurgoona Wirlinga growth corridor areas. Essential Energy operate and maintain one of Australia's largest electricity networks, providing electricity network services to more than 865,000 homes and businesses across 95 per cent of NSW (Essential Energy, 2021).

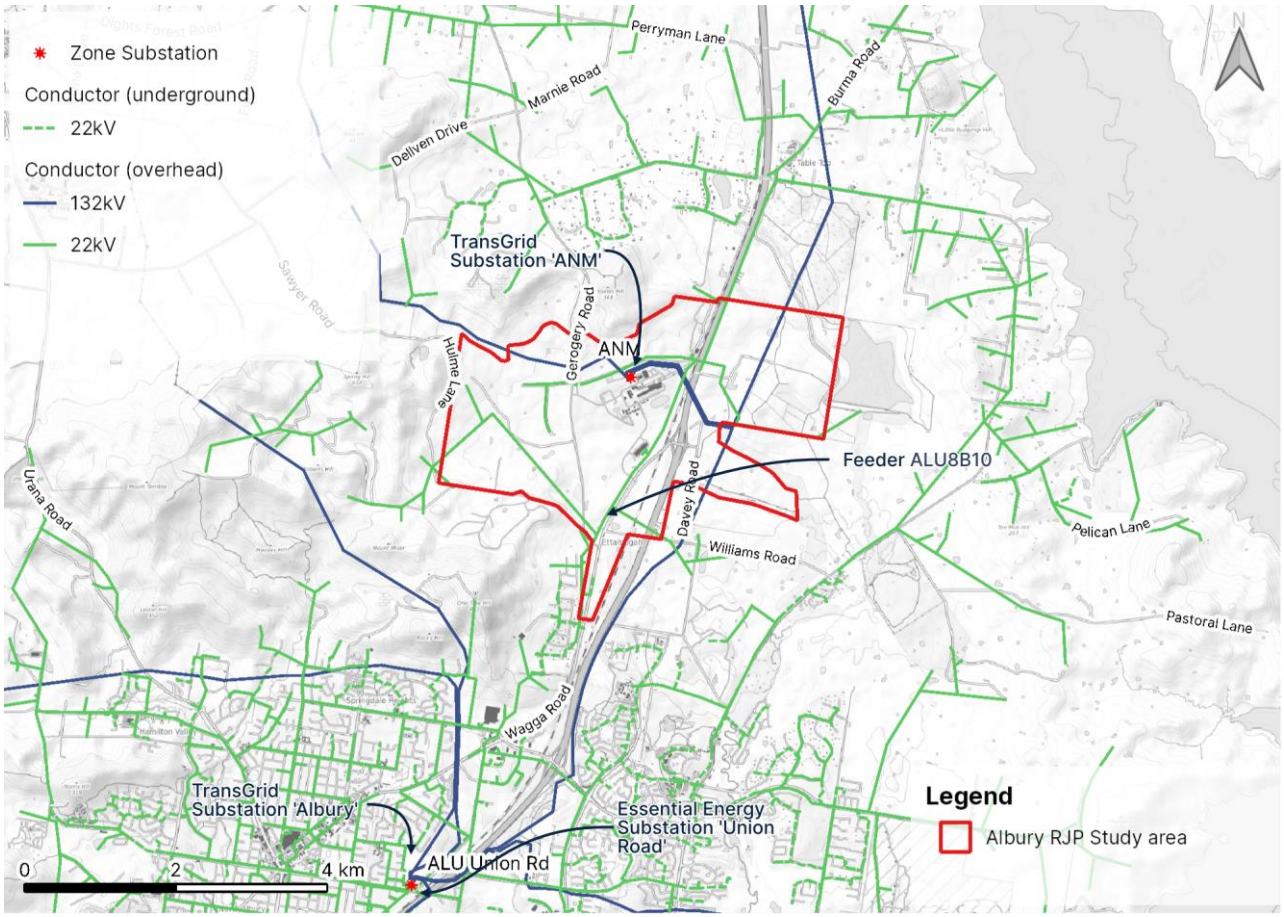

Figure 5-1 | Electricity and Power infrastructure (note: only the network relevant to the study area is shown on the figure)

Essential Energy have a network of overhead and underground electricity feeders servicing Albury. This includes operation of the 22kV network interface with the RJP investigation area, as shown in Figure 5-1. Essential Energy has advised that the RJP investigation area is supplied mainly by the 22kV feeder ALU8B10, from the Albury Substation (ALU) located at Union Road, approximately 5km south of the RJP investigation area. The Union Road substation operates at 86MVA summer and 95MVA winter. Currently, Essential Energy is considering augmenting the feeder out of Union Road substation, as there is limited additional capacity to support growth. This feeder is limited to delivering 7.6MVA. Essential Energy have stated that upgrading this feeder may be able to provide some additional capacity, however, a new Essential Energy operated Zone Substation would likely be required to support further development associated with the RJP and residential growth within Thurgoona Wirlinga.

The Union Road Substation is a shared asset between Essential Energy and TransGrid. TransGrid is responsible for the 132kV network. A private substation at the Visy owned Paper Mill is fed from this network which continues North West to Jindera.

There are four 132kV TransGrid feeders in close proximity to the precinct:

- Feeder 99B Jindera - Albury

- Feeder 99Z ANM - Albury
- Feeder 996/1 Morven - ANM
- Feeder 99H Jindera - ANM
- The Jindera Feeders 99B and 99H, are the most efficient and decentralised points of connection for new substations to the upstream network.

The existing load of near 8MVA supplied to the NEXUS precinct by the Essential Energy 22kV Feeder out of the Union Rd substation, is evidence of the existing level of demand for low to medium impact industry. The load requirements of industrial utilisation could vary significantly depending on development uptake and composition of uses. The proposed growth of heavy industry on the west of Hume Highway (as contemplated in Stages 1 and 2 of the master plan) would place the biggest burden upon an augmented network. Whilst industrial and residential development to the east of the Hume Highway will also require a considerable load; comparatively smaller infrastructure would be required to distribute connected power to future customers.

Crossing the Hume Highway either underground via boring, or overhead via poles will come with an inherent cost, regardless of the selected location of the new substation. It is suggested that any roadway crossing be kept to the 22kV level, as a crossing of higher voltages is more complex and costly.

The Essential Energy – TransGrid shared substation at Union Road is a three transformer 132kV/33kV substation with a firm rating of between 85 and 95MVA, seasonally analysed (Figure 5-2 and Figure 5-12). Industry standard for an outdoor zone substation site this size, including major plant and electrical equipment, amenities and accessibility, requires a land area of approximately 2 hectares. Alternatively, an indoor substation could be constructed on an area of about 1 hectare, however this would attract a significantly higher cost.

Figure 5-2 | Existing Union Road substation (Source: Essential Energy DAPR – Rosetta Data Portal)

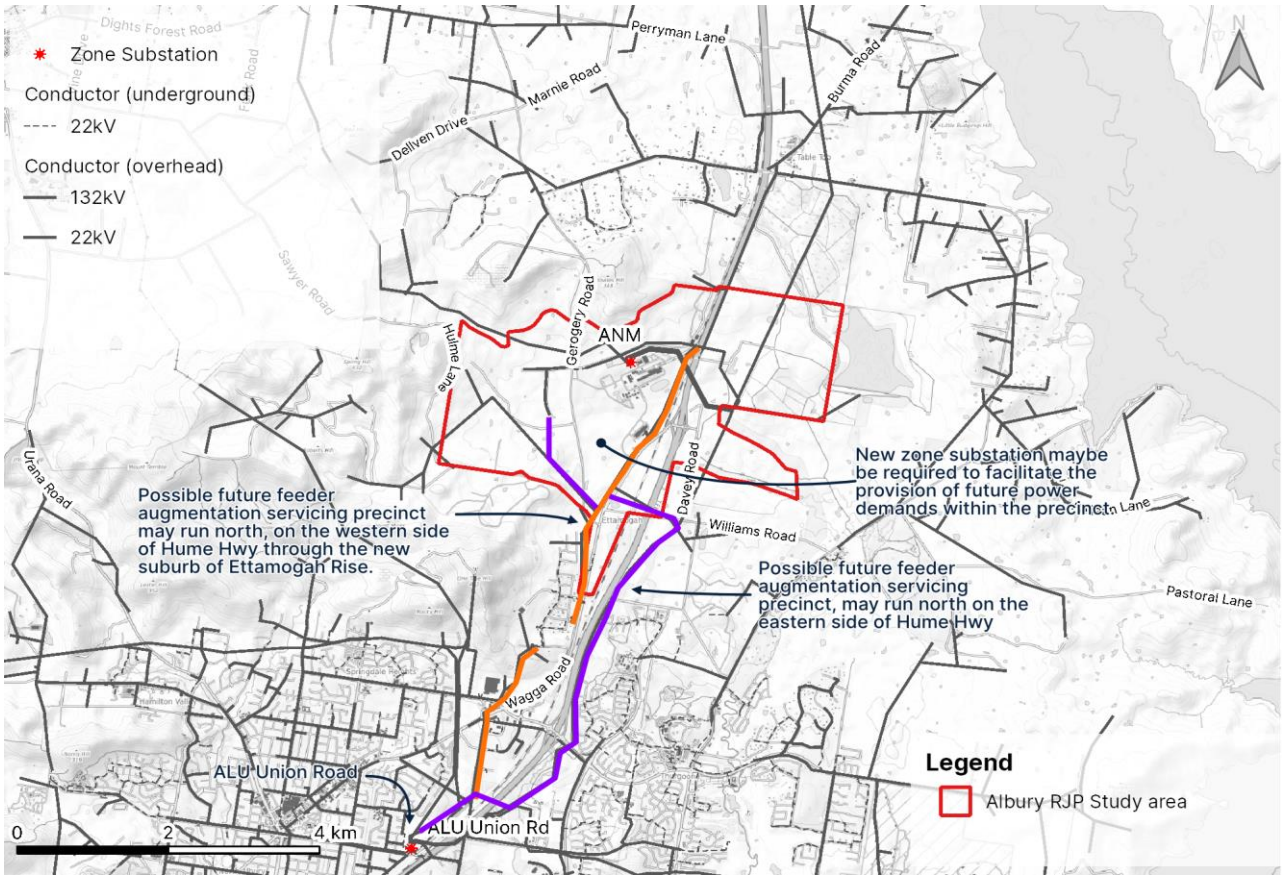

Figure 5-3 | Possible expanded electricity network

5.2 Network Upgrades

Electrical Utilities are bound by regulation and procedures as set out in the National Electricity Rules (NER) by the Australian Energy Market Commission (AEMC). The rules are specific sets of guidelines which govern the operation of the National Energy Market (NEM). As such, each Electrical Utility has standard procedures for the connections to the electrical network and planning for future upgrades.

Essential Energy has advised that ordinarily the standard procedure for connections is the submission of a 'Preliminary Enquiry' with responses standardised at 60 days across the majority of electrical utilities in Australia on a site-by-site basis. on a site-by-site basis. However, for wide scale strategic planning, such as the case of the Albury RJP investigation area, Essential Energy encourages government authorities and consultants to work with them to fully comprehend the scale of project and allow an efficient and holistic approach to the delivery of the required network upgrades.

ACC have been in preliminary negotiations with Essential Energy to augment short term supply in the area, in response to investor interest in the first stage of the NEXUS subdivision. Whilst these augmentation works would go some way to addressing short term concerns, the assumed demand from the RJP will likely require larger upgrades in the medium to long term. Possible locations for future feeder lines that could service the RJP are shown in Figure 5-4.

To this effect, Essential Energy have confirmed that a new zone substation would likely be required in the area, however the actual location of the future substation is unknown at this time. It is expected that the new substation would be located within 5km from the centralised load, however a feasibility study and detailed investigation would be required to confirm the preferred location.

Constructing a new zone substation presents a 'business as usual option' and may be unavoidable in the long-term based on the expected demand from both industries within the RJP and residents in the nearby Thurgoona Wirlinga growth area. There may be opportunity to defer the investment in a new zone substation through the use of micro-grid technologies and community scale batteries. This is discussed further below.

5.3 Gas

It is widely recognised in Australia that gas supply, particularly the establishment of new networks, is on the decline. The Australian Energy Market Operator (AEMO) 2022 Gas Statement of Opportunities[3] forecasts that based on existing, committed and anticipated future gas supply (including anticipated Liquified Natural Gas (LNG) imports), there will be a decline in gas consumption until 2033. The report also shows the pathway for gas reticulation is uncertain as Australia transitions to a net-zero emissions economy by 2050.

It is understood that APA has critical natural gas assets in the vicinity of the Albury RJP investigation area as shown in Figure 5-4. A 180mm high-pressure gas main traverses the study area, running east-west from a transmission main connecting into the NEXUS industrial development. The 200mm steel pipe transmission main connects the Paper Mill and Steel Forge to a supply of natural gas.

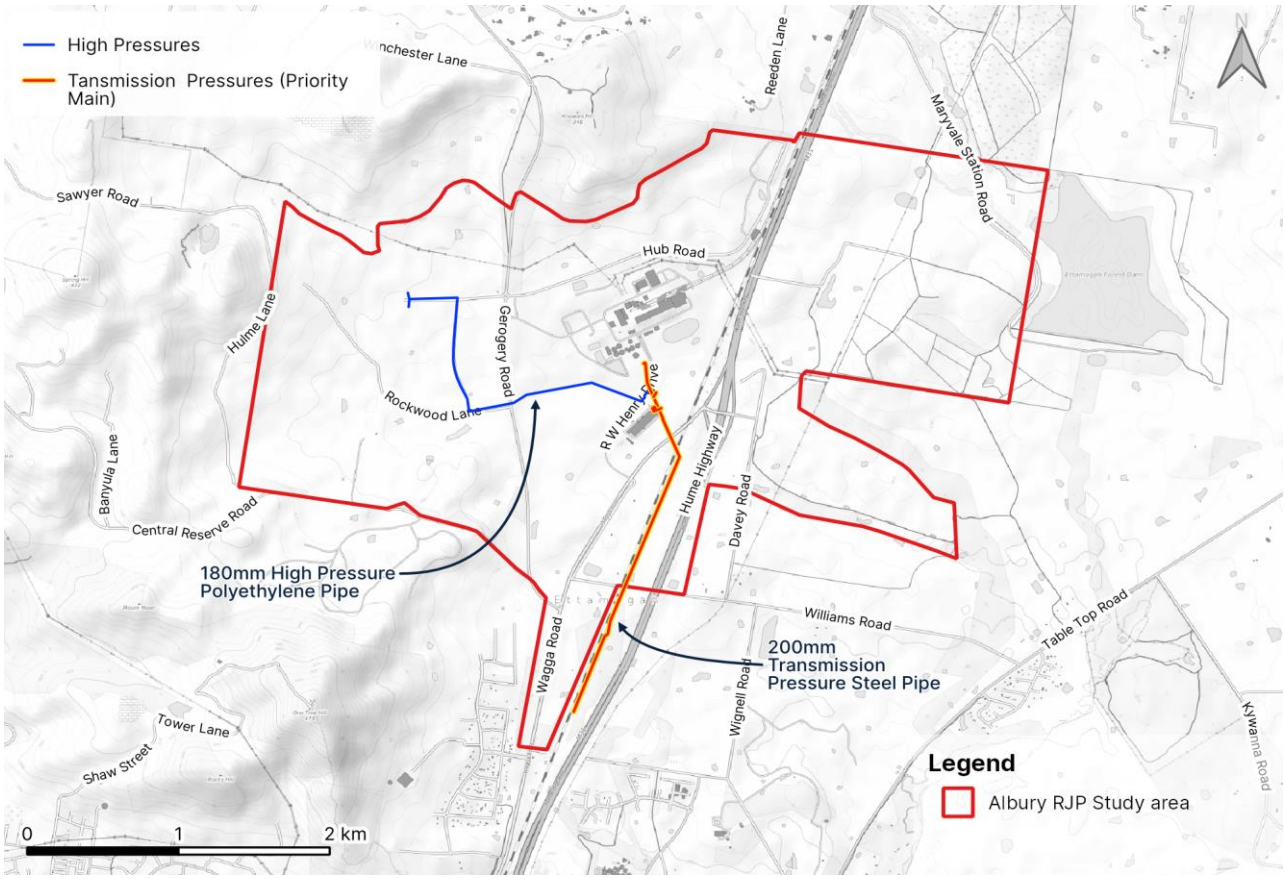

Figure 5-4 | Critical natural gas assets in the vicinity of the study area

With proposed residential development in the area and the push for cleaner Hydrogen blended gas, it is reasonably expected there may be further gas network infrastructure development in the wider Albury region. The industrial precinct is assumed to have less dependency upon the use of gas as the nation continues to push towards net zero carbon emissions, particularly in production and manufacturing. However, if gas dependent industries were to locate to the area there is an existing supply available, or there may be an opportunity to use Hydrogen blended gas in the precinct, as discussed further below.

[3] https://aemo.com.au/-/media/files/gas/national_planning_and_forecasting/gsoo/2022/2022-gas-statement-of-opportunities.pdf?la=en&hash=7E0084BA4D0BC9C60FA851081F876625

5.4 Renewable Energy Opportunities

Enabled by the *Electricity Infrastructure Investment Act* 2020, the Electricity Infrastructure Roadmap is the NSW Government's plan to provide cheap, clean and reliable energy. The Electricity Infrastructure Roadmap seeks to attract private investment in regional energy infrastructure through the coordination of investment in transmission, generation and energy storage.

There are limited opportunities to connect into the South-West Renewable Energy Zone (REZ), as is located near Hay, approximately 300km north-west of the Albury RJP investigation area. However, opportunities have been identified to support the energy needs of the RJP through renewable cogeneration, battery energy storage systems and other technologies, which could supplement the region's power needs and also may be used to defer the cost of constructing a new zone substation and provide improved access to renewable energy. There are opportunities to seek funding from ARENA should renewable technology be implemented. The Regional Australia MicroGrid Pilots Program (RAMPP) is open until 2026 and provides support for demonstrations of microgrids in regional and remote areas. These renewable options are discussed further below.

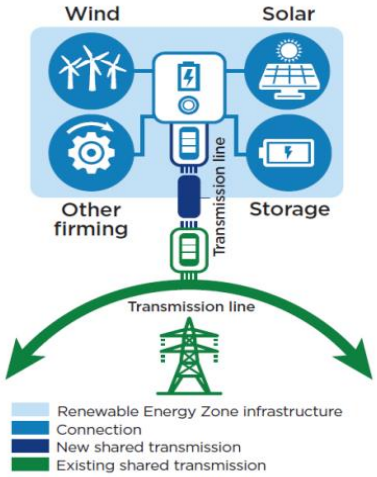

Figure 5-5 | Renewable Energy Zones combine energy generation from sources such as wind, solar and storage such as batteries to deliver to consumers

5.5 Hydrogen

Hydrogen is an innovative energy solution that is currently picking up momentum in Australia and is likely to be further developed over the next several decades. When hydrogen is produced using renewable energy or processes, it becomes a way of storing renewable energy for use at a later time, when it is needed. Hydrogen can be stored as gas, liquid or embedded within other materials. The use of hydrogen is predicted become as commonplace as solar, wind and other renewable sources of energy in the future.

Renewable hydrogen presents an opportunity for high-temperature industries to reduce their reliance on natural gas and make a clean energy transition. There are also opportunities to use hydrogen as a fuel for transport to help Australia's freight and logistics sector transition to a low carbon future.

Hydrogen is produced by splitting water using electrolysis, to create hydrogen and oxygen. A key input into the processing of hydrogen is power. The method used to separate the hydrogen and oxygen atoms determines the 'type' of hydrogen. Whilst hydrogen is an invisible and colourless gas, different types of hydrogen are differentiated by colour descriptions. The main hydrogen colours are:

- **Grey Hydrogen:** This is when hydrogen is made using natural gas in a process called 'steam reforming'. This uses natural gas to create steam, which splits the hydrogen and oxygen. As this process uses natural gas, and doesn't capture any of the created carbon, it is not considered a form of renewable energy.
- **Blue Hydrogen:** Similar to grey hydrogen, blue hydrogen uses natural gas to create steam. However, by capturing the carbon dioxide produced in the process it has a low-carbon footprint.
- **Green Hydrogen:** When hydrogen is made using renewable energy, it is commonly referred to as 'green hydrogen'. It is anticipated that the majority of green hydrogen production in Australia will be co-located with renewable energy hubs. The Hunter Valley and Illawarra regions in NSW have been earmarked as major hydrogen production hubs due to the availability of renewable energy and water for processing[4].
- **Black or Brown Hydrogen:** This is fossil fuel intensive, using coal to produce liquified hydrogen.
- **Pink Hydrogen:** This is when hydrogen is produced through electrolysis which is power by nuclear energy
- **Yellow Hydrogen:** This is when hydrogen is produced using solar power.

[4] https://www.environment.nsw.gov.au/news/4-billion-industry-response-to-hydrogen-hubs

The Hume Hydrogen Highway is an initiative joint-funded by the NSW and Victorian Governments to create a hydrogen refuelling network[5]. The program seeks to promote the use of renewable hydrogen in the heavy transport sector through grant funding for at least four refuelling sites on the freight corridor between Sydney and Melbourne, which will support a fleet of at least 25 hydrogen-powered linehaul trucks and help the heavy transport sector meet the goal of net zero by 2050. Given the location of the Albury RJP adjacent to the Hume Highway, and the desire to meet the needs of freight and logistics operators, the site could present a good location for a hydrogen refuelling depot. The feasibility of Hydrogen Production at a commercial level is an unknown, however there may be an opportunity in the future to incorporate hydrogen refuelling into service stations alongside other sources such as charging stations.

Figure 5-6 | Hydrogen refuelling presents a unique opportunity for the Albury RJP (source: Invest Regional NSW)

The Hydrogen Park Murray Valley is an innovative project in Wodonga which utilises treated water and renewable energy to create green hydrogen. The proximity of Hydrogen Park Murray Valley to the Albury RJP may provide future opportunities for industries to leverage off local hydrogen production or for an alternate reticulated fuel source for the wider region (10% hydrogen/90% natural gas blend). A schematic of the Hydrogen Park Murray Valley is in Figure 5-7, and shows inputs of recycled water from the West Wodonga Wastewater Treatment Plant (WWWTP) being separated via a 10MW electrolyser to create hydrogen that can then be used via industry or blended with natural gas and distributed to customers.

Whilst there is opportunity for the Albury RJP to leverage off the Hume Hydrogen Highway and the Hydrogen Park Murray Valley projects, due to constraints on the availability of water and power within the RJP and the distance from renewable energy sources, it is unlikely that the RJP would be an appropriate location for the manufacture of green hydrogen. However, other opportunities for renewable energy within the precinct have been identified and are discussed further in this report.

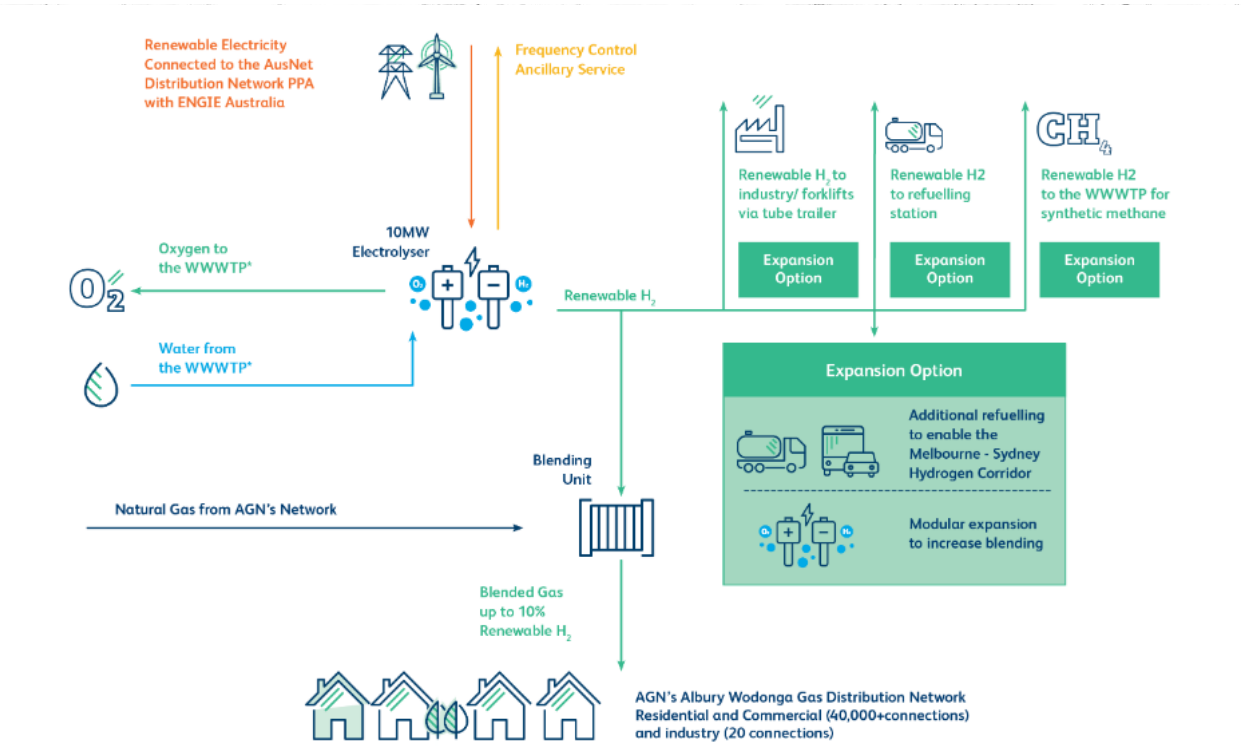

Figure 5-7 | Hydrogen Park Murray Valley Schematic (source: Australian Gas Networks)

[5] https://www.energy.nsw.gov.au/renewables/renewable-generation/hydrogen#accordion-7311

5.6 Recommended Upgrades

5.6.1 Overview

This section provides a summary of the recommended upgrades to the electricity and gas network to support the Albury RJP master plan. This strategy is intended to be aspirational and should be flexible to the changing needs of the RJP as development progresses. It is also highly likely that the land use composition will change over time, as businesses establish in the area.

As the composition of development (industries) and thus demand is somewhat unknown at this stage, a number of assumptions have been made to estimate the likely demand for power. If different types of industries choose to establish in the RJP, the energy demands may be higher or lower than what has been anticipated by our assessment.

Options for the uptake of electrical and gas infrastructure are highly dependent on the utility provider. Energy providers generally require confirmation of customer investment in order to develop and deliver the required energy solutions. Network providers are heavily regulated and need to satisfy their own modelling and forecasting to justify investment, with upstream constraints as to how they are able to distribute transmitted energy. Major infrastructure investment, such as a new zone-substation, comes with long legislative lead times and design timeframes. To plan such investment, energy providers need certainty of likely demand from customers.

When developing these recommendations, we have sought to limit overcapitalisation of unnecessary infrastructure prior to the establishment of industries and build flexibility into the network so that the Albury RJP can be more responsive to the energy needs of future businesses. The infrastructure recommendations in this report are intended to guide ACC in the preparation of a site specific Albury RJP Development Contributions Plan and it is hoped that the studies undertaken for the Albury RJP can be used to support business cases for funding for future infrastructure upgrades.

5.6.2 Assumed Demand

An assumed energy demand for the staged delivery of the Albury RJP has been prepared based on the master plan prepared by Ethos Urban. Given the flexible nature of the land use designations, a mixture of potential land uses has been adopted to provide a theoretical demand for power. If development was to occur out of sequence, or if specific industries with high energy needs were to relocate to the Albury RJP, additional augmentation to the network may be required. This more detailed assessment would occur on a case-by-case basis, in close consultation with the specific business, Essential Energy and ACC.

For the purpose of this assessment, the following example users have been considered based on the information in the master plan as potential tenants in the ultimate (stage 3) RJP:

- Heavy industry to include uses such as non-energy intensive chemical manufacture and mixing at an assumed rate of 2.5MVA per hectare (e.g., paint mixing)
- Heavy industry uses that may also be energy intensive such as paper manufacturing, value added food manufacturing, production of agricultural chemicals or resins at an average rate of 2MVA per hectare.
- Potential for an Abattoir which would ordinarily have high energy needs due to operational needs for steam, hot water, refrigeration for up to 100 cattle per day, with assumed energy demand of approximately 5MVA per hectare per day.
- A restricted amount of refrigeration (cold) storage at the intermodal terminal (approximately 3,000 sqm). We assume 6MVA per day (total) for this use.
- Specific needs of the potential future use, for example cold storage or temperature-controlled warehousing, could increase demand for power beyond the assumptions used in this modelling.

Table 5–1 provides our assessment of theoretical demand across the three stages of the precinct. Our assessment assumes a theoretical demand at Stage 3 of 141MVA, based on a mixture of high energy uses, warehousing, offices and general industries. This is a significant increase in demand considering the Union Road substation is rated at 86-95MVA.The approach has been to distribute energy demand pro-rata with the staging of industry type / zoning identified in the master plan. To this end, our assessment assumes 40MVA would be required for Stage 1, an additional 60MVA for Stage 2 and an additional 37MVA for Stage 3. An expected 20,000 extra dwellings in the Thurgoona Wirlinga

growth area, would likely increase power demand in the area by an additional 18MVA, however the staging and speed of uptake has not been comprehended at this stage.

Table 5–1 | Anticipated staging and energy requirements

Staged Demand	Stage 1 2026		Stage 2 2036		Stage 3 2036+		Total	
	GFA	MVA	GFA	MVA	GFA	MVA	GFA	MVA
General industrial	167,553	11.73	197,370	13.81557264	394,740	27.6311453	759,663	53.18
Heavy industrial use	153,765	18.30	401,625	47.79445248	0	0	555,390	66.09
Intermodal	39,015	3.80	0	0	0	0	39,015	3.80
Productivity support	91,800	8.49	0	0	105,570	9.765225	197,370	18.26
Service Station	2,295	0.06	0	0	0	0	2,295	0.06
TOTAL	**454,428**	**42**	**598,995**	**62**	**500,310**	**37**	**1,553,733**	**141**

ACC has been in discussion with Essential Energy in parallel to the RJP project, seeking to develop an appropriate solution to the electricity constraints in the area. As part of this project, SMEC have continued to engage with Essential Energy and have developed options for expansion of the traditional network via a new zone substation, or for supplementation of supply via battery storage systems. These options are discussed below.

5.6.3 Stage 1

The load growth of 42MVA that is predicted within Stage 1 of the master plan would exceed the current capacity of the Union Road substation. In order to defer the construction of a new substation and meet the immediate power needs of the RJP (i.e., to 2026), it is recommended that a localised micro-grid with battery energy storage system be considered.

Behind the meter technology is available to power users which utilise solar, battery, inverter and Electric Vehicle (EV) charging capabilities in order to:

- Prevent thermal limits of the network being reached
- Create a two-way grid for the purposes of provision of power in peak generation and peak demand periods
- Widen the voltage envelope due to voltage rise at peak times of peak solar output
- Remove utility restrictions and limitations upon customer generation or “clipping” of generation export

The points above signify the technical aspects to be considered in the installation of a micro-grid.

Also, protection and network stability need to consider all power quality measurements of the embedded systems that form the microgrid and set limits by the generation standards as per DNSP & AEMO requirements. This will ensure the protection of the network by regulating the voltages, as well as improve power factor efficiency.

This technology leverages off the existing grid and surrounding infrastructure to absorb excess power and deliver it as required by the distribution network. This means that consumers can have the reliability of still being connected to the grid while remaining self-sufficient for much of the day. Although designed to operate at its optimised capabilities when combined with solar generation at a local and precinct level, these systems are capable of delivering demand and load management through distribution stations at very little cost, relative to an investment in a substation.

For the Albury RJP, this technology could support immediate uptake of development opportunities by establishing a local community scale battery which manages excess demand in the network, then stores energy for use at other times. When accompanied with rooftop solar panels on industrial warehouses, this becomes a microgrid, which allows businesses to benefit from onsite renewable energy generation whilst also being able to rely on the grid. This system is scalable and has the potential to defer major investment in the network by Essential Energy until additional local demand is established, a preferred site for a zone substation is acquired and the infrastructure is designed and constructed.

Figure 5-8 | Schematic of micro-grid with battery storage (source: eleXsys and Planet Ark Power)

Some benefits of a micro-grid with battery storage include:

- Could be installed in the productivity zones of the RJP, as well as in industrial areas
- Opportunity to develop infrastructure on the eastern and western sides of the Highway
- Timely installation when development uptake occurs
- Scalability as customer growth becomes apparent
- Applicable as self contained or networked product
- Ease of constructability compared to a substation
- Integration with other industrial solutions related to co-generation at a future wastewater treatment site or with the Hydrogen Super Highway.

5.6.4 Stage 2

By Stage 2 we predict there to be an additional 62MVA demand from industry. Demand of this scale is not expected to be able to be managed by a community scale battery or microgrid and would require larger investment in the form a new Essential Energy owned zone substation. This could be adopted through a proportionately customer funded substation, through the collection of development contributions as development opportunities are taken up within the RJP. The funding of this future zone substation is a critical consideration to provide business certainty and drive development within the RJP. The timeline of Stage 2 is 5 to 10 years based upon forecasted load growth from the master plan.

A feasibility study for a suitable location for a future Essential Energy substation would be required. It is assumed an appropriate location would be within 5km of the centralised load demand. Some potential locations are suggested in Figure 5-11. A key consideration will be the availability of upstream power supply from TransGrid 132kV feeders.

A staged approach, using private or community battery storage, could help to stage the size of the substation and therefore the scale of investment required. If accompanied by a high uptake of rooftop solar generation, there would be a lower demand on the grid.

As shown in Figure 5-11, additional network capacity could be supported by a grid battery or Battery Energy Storage System (BESS). The typical parts of a utility scale BESS are depicted in Figure 5-10with nominal electrical parameters outlined. A BESS could be used as a staging mechanism to negate the requirement of major capital and plant involved

in a Zone Substation. Though this is discussed in Stage 1, this is at a larger scale than previously mentioned and would be a concerted effort to a precinct wide solution to power. It is noted that there is a heavy reliance upon the uptake of customer solar generation for this option.

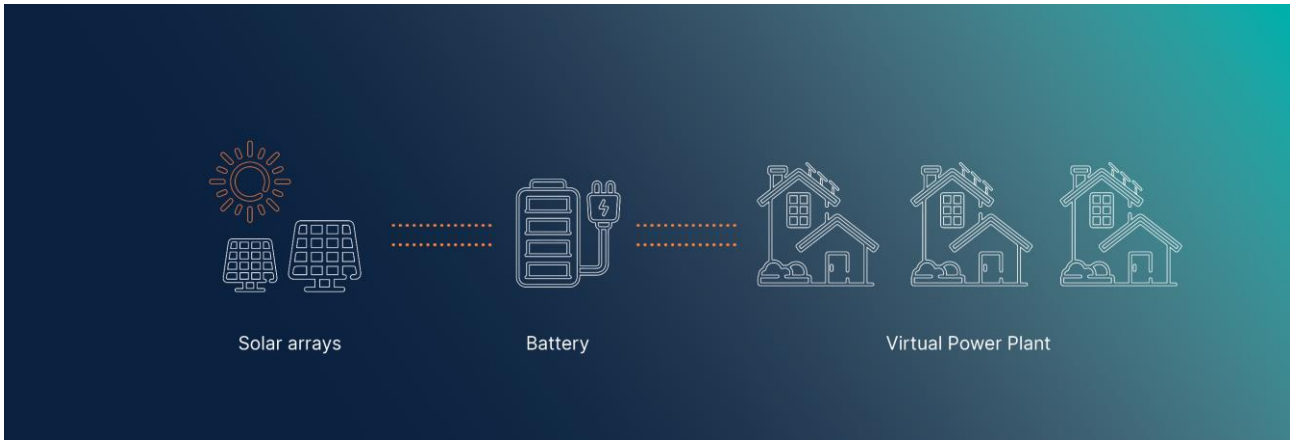

Figure 5-9 | Integrated network example

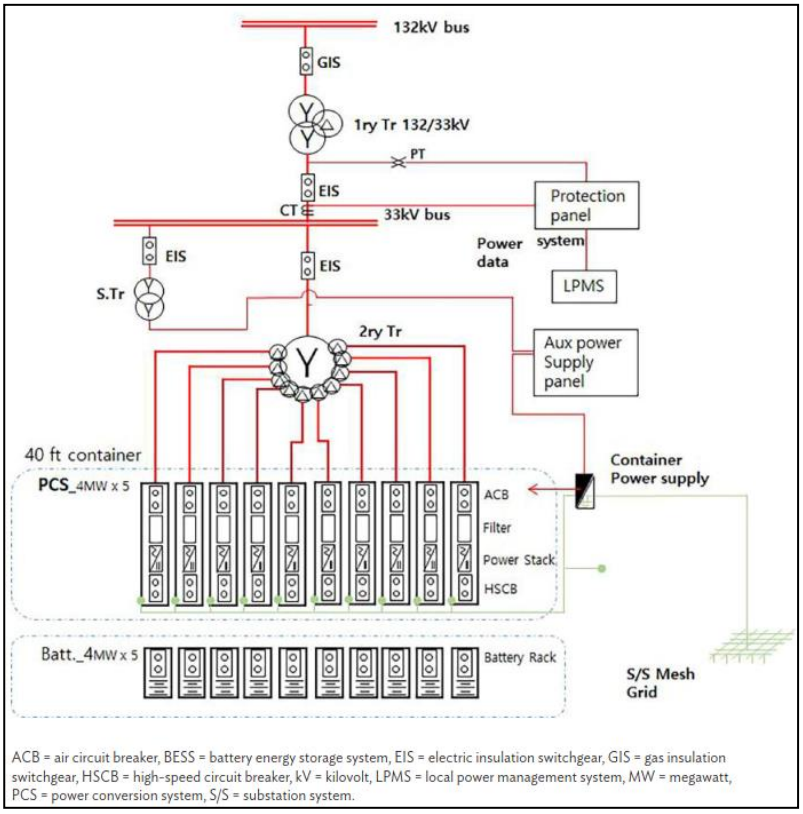

Figure 5-10 | Components of a Utility Scale BESS (Source: Handbook on Battery Energy Storage Systems, 2018)

Given the rural/industrial setting of the Albury RJP, it is recommended that provisions be made in the master plan for a nominal 2 hectare site for an outdoor substation. The design specifications for this outdoor substation would be subject to the uptake of more innovative approaches to energy supply, however a 2 hectare site is expected to be sufficient. Essential Energy will decide on the optimal location of the substation after their technical assessment.

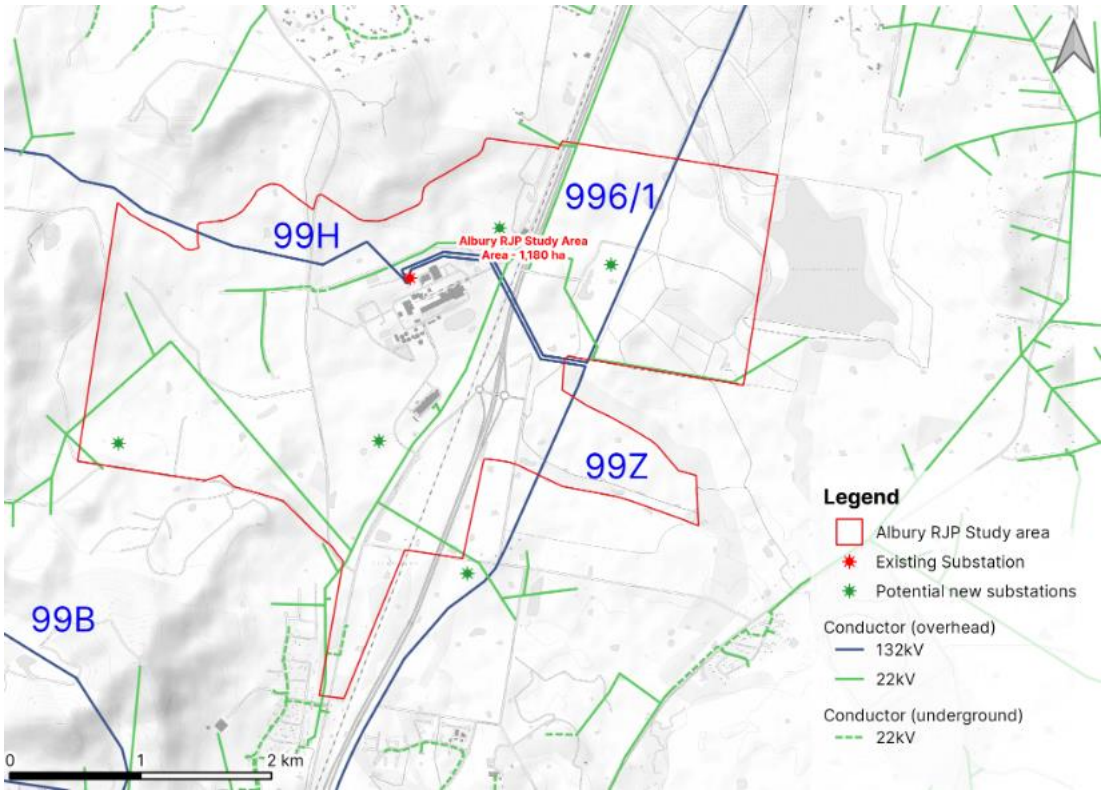

Figure 5-11 | Potential new substation locations.

5.6.5 Stage 3

Stage 3 brings an additional 37MVA into the network, to a total of 141 MVA plus a potential 18MVA from residential growth. It is expected that the new zone substation would be designed to provide an opportunity to augment supply with additional transformers in response to growing demand. The Stage 3 timeline is beyond 2036.

Alternatively, an additional BESS could be constructed within the precinct, providing localised energy distribution networks. This could potentially overcome the constraints of crossing the railway line and the Hume Highway. In conjunction with the energy systems developed in earlier stages, this could be developed as a regional microgrid as shown in Figure 5-12.

Due to the volume of wastewater demand that is likely to be generated by Stage 3, a northern wastewater treatment plant (WWTP) has been recommended to service the RJP and residential growth in north Albury. The construction of a new WWTP presents an opportunity for co-generation through methane gases and storage of energy via an onsite battery. This could be networked with other uses in the region, within the virtual power plant. A schematic of energy generation associated with a WWTP is provided in Figure 5-13.

Even if a virtual power option were preferred, it is likely that backup to the Essential Energy network will be required to support network reliability. The Firm Rating of a substation under N-1 conditions needs to allow for excess load to avoid network failure and thermal regulatory standards.

The firm rating is specified for all network assets covering each type of element in the network. The firm rating is an operating rating assigned to a network element based on the network asset configuration and the load type. The firm ratings of the assets are adjustable and set at specific levels to ensure the required supply security and network performance is achieved.

It understood that under N-1 conditions, the forecast demand is not to exceed the thermal capacity for more than 1 per cent of the time. Considering this, direct discussion with Essential Energy is needed to interpret the required contribution towards electrical augmentation.

It is advised that the following matters be considered in the master plan and development of the Albury RJP:

- Ensure a site is reserved for the construction of a new zone substation to service demands from Stage 1 and Stage 2 with good access to existing upstream power supply

- Encourage rational staging and sequencing of development alongside investment in new infrastructure, to create a load use density which is easier to feed
- Look to uprate any feeders for development east of Hume Highway, delaying large expenditure on a new substation as long as possible, or seek to use BESS and a microgrid.
- Look to mandate or encourage rooftop solar generation and battery storage to reduce load applications and electrical demand, deferring the need for a new substation as long as possible.

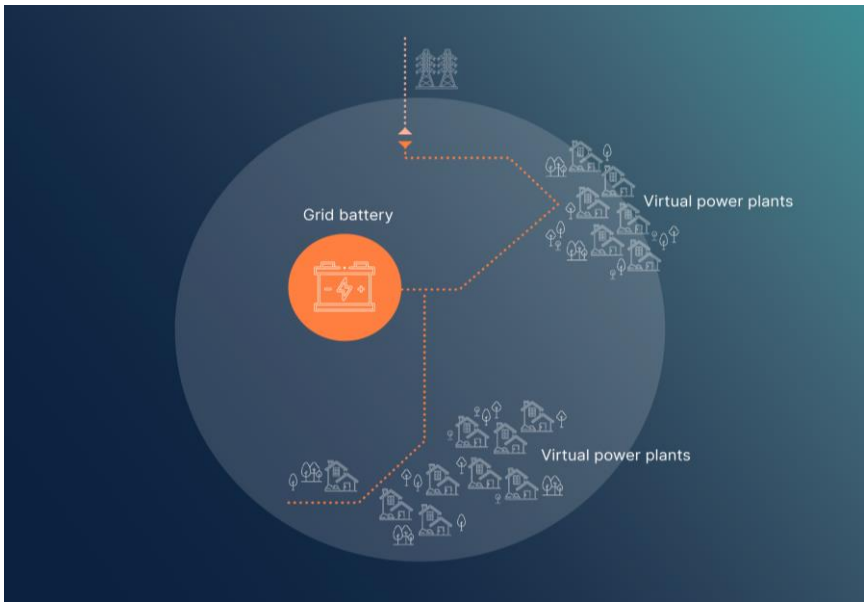

Figure 5-12 | Example of a microgrid of multiple virtual power plants and a grid BESS

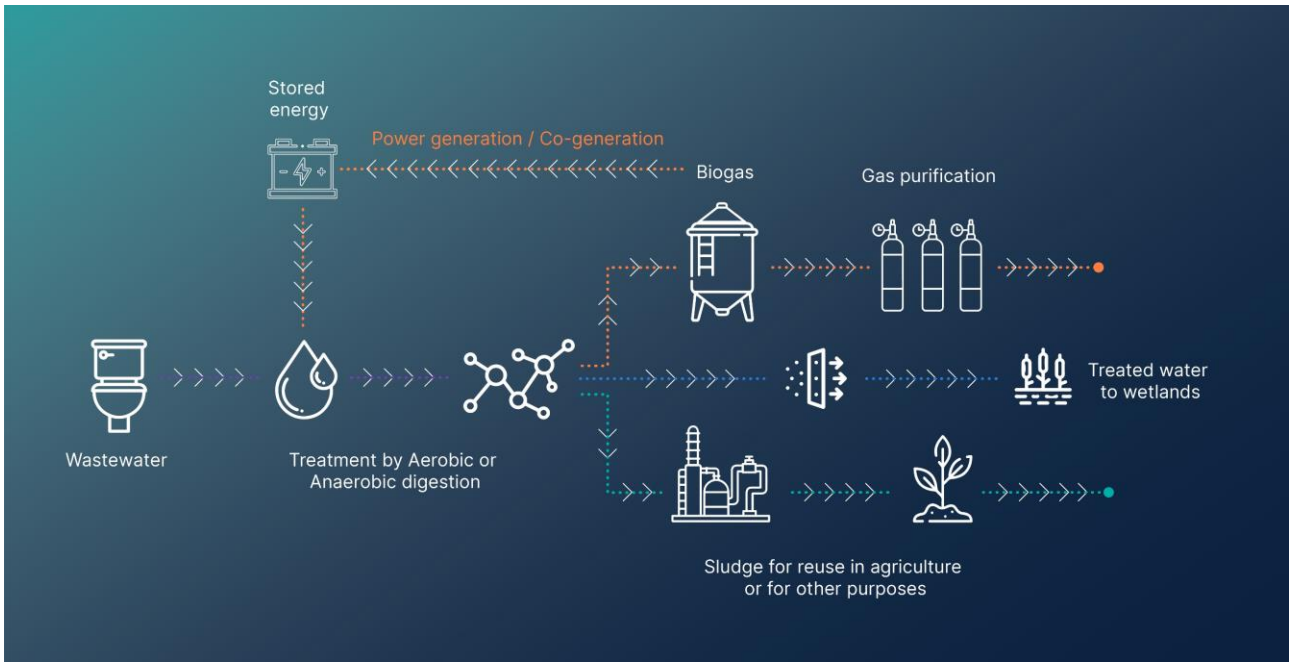

Figure 5-13 | Example of co-generation at a wastewater treatment plant

5.7 Suggested Funding Mechanisms

Our option for Stage 1 presents a good opportunity to overcome the immediate needs of the area, without requiring upfront investment in the network by Essential Energy, Council or businesses. The costs incurred in providing reliable power to the precinct will occur at Stage 2, when a new zone substation is required, and at Stage 3 when the substation is augmented to provide additional capacity.

Essential Energy would be best placed to confirm infrastructure cost estimates for options out of the Union Rd Zone Substation, inclusive of Transformer upgrades, and options for a new Zone Substation. For example, the recent Energex substation 25MVA 33/11kV Pimpama, and Coomera East Substation to be completed in 2023 is estimated to be $13 million ± 40%. It is noted that in addition to demand from the RJP, our power supply strategy considers residential growth of 20,000 dwellings in the Thurgoona area over the 20 year horizon, accounting for an additional approximate 18MVA.

It is recommended that Council's Section 7.11 Development Contributions Plan be updated to share a portion of the cost associated with improved power supply to the region. Under the Essential Energy Connection Policy – Connection Charges 2018, the type of connection required to support the growth of the RJP is likely to be a "negotiated connection offer". The apportionment of this contribution between Council (on behalf of future occupants) and Essential Energy would need to be assessed and negotiated and would be within the scope of a feasibility study for the network master plan. In considering the apportionment of the cost of delivering the new electricity infrastructure, Essential Energy considers a number of matters including:

- The number of new customers that can be reasonably expected
- The number of existing properties / connections that would benefit from the upgrade
- The current zoning of the area, development applications and planning proposals
- Historic patterns of use in similar areas
- Options for common funding of works (sharing the cost between customers)

By embedding cost recovery for the electricity infrastructure within a Section 7.11 Development Contributions Plan, the Council will be able to be reimbursed for the upfront contribution made to Essential Energy to fund the new zone substation. Whilst Essential Energy do have a cost share refund scheme, this is restricted to a seven year period only and comes with a number of qualifications. Given the anticipated staging and uptake of development beyond 2036, a Section 7.11 Development Contributions Plan would provide a longer period of time over which Council can levy contributions and would provide more surety in recovering funds.

Further information regarding the recommended upgrades, timing and funding mechanisms is provided in Chapter 9.

6. Telecommunications and internet services

6.1 Baseline Assessment

6.1.1 Existing Mobile Network

Telstra and Optus both have good coverage across the area of the Albury RJP investigation area. According to their publicly available coverage data, Telstra have 5G coverage across the investigation area.

6.1.2 Existing Internet Network

The NBN currently provides a mix of Fixed Line and Fixed Wireless connections to the Albury RJP investigation area. The Fixed Line network is Fibre-to-the-node (FTTN) with additional areas being constructed to increase local coverage. These additional areas are primarily adjacent to Gerogery Road and Hub Road. The coverage of FTTN is limited to the portion of the Albury RJP on the western side of the Hume Highway. This coverage is shown in Figure 6-1. Within the Albury RJP investigation area, there is also infrastructure from Nextgen Cable and Uecomm NSW.

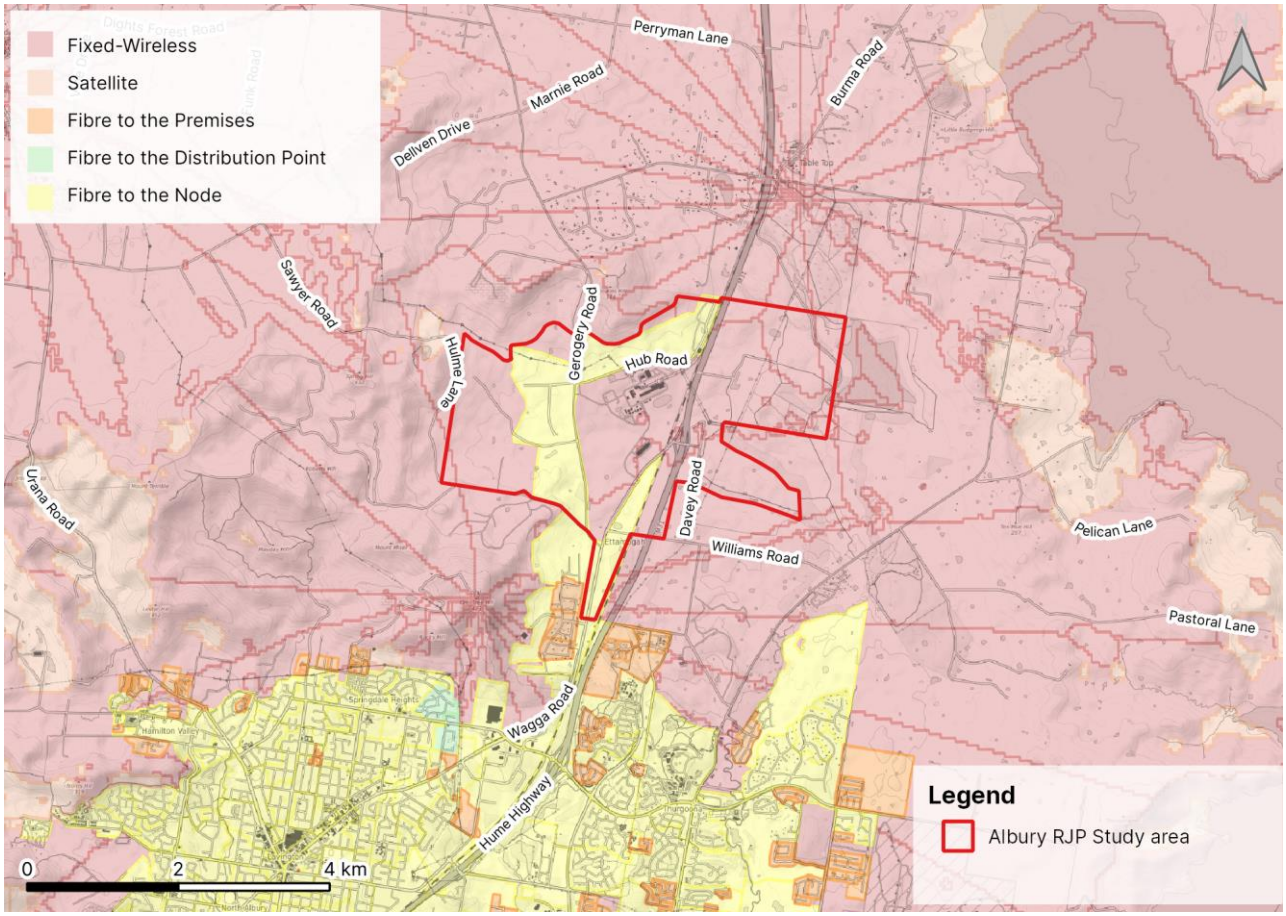

Figure 6-1 | NBN Rollout – Current & Future Coverage

6.2 Planned infrastructure works and upgrades

Investigations have confirmed that NBN are expanding their Fixed Line network within the Albury area. It is understood that the installation of this infrastructure is currently underway[6].

In 2021 Edge Centres, in conjunction with Albury City Council, have developed their EC5 data centre site as part of the Albury Airport precinct. This data centre has the potential to provide an improvement in the speed, reliability and cost-

6 https://www.nbnco.com.au/learn/rollout-map

effectiveness of the Albury region. Edge Data Centres have also established their EC5 site in Kiewa St within the Albury CBD. There were associated network upgrades with the establishment of the Albury Airport precinct, however such upgrades have not extended to the Albury RJP area.

6.3 Recommended Upgrades

6.3.1 Overview

Telecommunications and Internet infrastructure considerations are essential to meet stakeholder expectations of modern industrial and business precincts. Intelligent traffic management, responsive grids, smart lighting, and intelligent irrigation systems all require a common communications platform to allow the transfer of information that make services 'smart'. This infrastructure allows efficiencies and benefits to be shared across a range of stakeholders and will support integration between businesses and the environment in ways that are yet to be imagined. By making telecommunications and internet essential "infrastructure of infrastructures" available, stakeholders can proceed straight to implementing systems that add value.

This base connectivity is a key enabler for NSW Smart Places Strategy and Albury and Wodonga's Smart Community Framework which focuses on 18 Smart Community Services, including smart power, smart water, and smart transport. Any new smart infrastructure should comply with the state level Smart Infrastructure Policy which sets the minimum requirements for smart technology to be embedded in all new and upgraded infrastructure from 2020 onwards.

The presence of base connectivity will provide a driver for businesses to choose to locate within the Albury RJP. Internet systems can allow local talent to be exported from the region without the employees physically leaving, expanding the opportunities and potential market share of future industries. Opportunities include growing high-value jobs in the local economy and showing young people that they do not need to migrate elsewhere to find opportunities.

Telecommunication carriers in Australia are under constant pressure to improve productivity and streamline their process. Understanding planning requirements, having a dedicated Council contact and ensuring timely approvals are key to attracting carriers to a new area.

Council can take an active role in encouraging expansion of telecommunications infrastructure into the Albury RJP by streamlining approvals and processes for the deployment of additional networks.

The following actions are suggested to help Council attract new carriers to the Albury RJP:

- Document procedures for required installation permits of new telecommunications networks (such as Development Applications and Works Applications) and make sure they are easily discovered on Council's website via an internet search
- Provide a single point of contact at Council for telecommunication carriers to seek information on the RJP and equip them with the authority and knowledge to resolve queries and requests efficiently
- Avoid levying multiple costs beyond an initial charge, to clarify the total project cost upfront
- Broker and facilitate communications between stakeholders and utilities – this might be as simple as the Council concierge summarising Dial Before You Dig (DBYD) requests in the project area and collating via a GIS portal
- Identify and remove any obstacle to carriers implementing 5G and Fibre capacity in the precinct
- Install a public Wi-Fi network to support today's high-tech infrastructure
- Build "Internet of Things" (IoT) capability to support sensor networks and encourage experimentation
- Work with carriers or infrastructure providers to improve 5G capacity to the precinct
- Choose technology that allows all data collection and decision-making functions to be performed remotely via an Internet Protocol (IP) network

Upgrades to the existing network that support the above suggestions are outlined further below.

6.3.2 Identified Upgrades

6.3.2.1 Mobile Network

5G capacity will be necessary for innovation to thrive in the precinct. The present network coverage in the Albury RJP will support mobile phones as expected, but is unlikely to be suitable for applications such as:

- Fixed Broadband
- Video applications
- Portable broadband devices
- Temporary or staged office connectivity

To ensure future provision is appropriate, the master plan should allocate land for lease to the three major mobile operators or a shared tower operator. Ideally this land will be:

- Near existing fibre and power assets
- Centrally located to maximise 5G capacity
- Set back from areas intended to have aesthetic appeal
- Away from childcare centres and schools to avoid conflict
- Have suitable access and operating areas for heavy vehicles including multiple cranes

All mobile phone base stations must stay within the safe limits of electromagnetic energy (EME) set by the Australian Radiation Protection and Nuclear Safety Agency's (ARPANSA) Radiation Protection Standard for Limiting Exposure to Radiofrequency Fields – 100 kHz to 300 GHz. Construction of new mobile phone towers must follow Industry Code C564: 2020 mobile phone base station deployment, and relevant state planning laws. A limited range of facilities may also be subject to Commonwealth approval processes under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999. Code C564: 2020 mobile phone base station deployment requires telecommunication carriers to:

- Notify Councils and the local community about proposals for installation of all mobile phone base stations prior to construction.
- Have regard to community sensitive sites.
- Design and operate mobile phone base stations to minimise EME exposure.
- Develop a consultation plan for the deployment of infrastructure that is not subject to Development Approval in accordance with state or local planning laws.
- Turn off out-of-service transmitters.
- Test their decisions about the deployment of infrastructure against a range of important factors; and
- Document their decision-making processes about the deployment of infrastructure.

An area suitable for supporting a tower and ground leases for the three major mobile operators and their setup cranes would be around 400 square meters. Current practice is to continue to use cranes for maintenance of tower equipment, rather than maintain and certify a ladder safety system.

For efficiency, we would recommend co-locating telecommunications infrastructure with other infrastructure recommended to support the RJP. For example, a new reservoir is recommended near Table Top to support the anticipated water demand from the precinct. Given that a suitable site for a new reservoir would require a location with sufficient height (for pressure) it is likely that such a site may also be suitable for a telecommunications facility. A more detailed feasibility study would be required to consider suitable sites for both a reservoir and the recommended telecommunications tower. A future feasibility study should consider benefits of co-location of infrastructure (such as telecommunications), which could help to partially fund the acquisition of land and site establishment such as vehicular access and power.

Figure 6-2 | A crane and an elevated work platform assembling a mobile tower

6.3.2.2 Independent Network Testing

5G operators have no way of knowing if their network builds are successful unless they perform testing.

To support the growth of the region and incentivise modern industrial uses, it is recommended that Council take a lead role in testing the coverage and capacity claims of 5G operators. A neutral third-party testing company can be engaged to produce a report on coverage and capacity that can be used as part of a prospectus for potential early movers. When published, such a report will provide business with the information that they need to reliably choose a mobile carrier, without having to resort to dated anecdotes or unreliable sales information. It will also provide important and verified data to confirm the telecommunications capacity of the RJP.

6.3.2.3 Public Wi-Fi

A public Wi-Fi network will provide the precinct with connectivity independent of carrier contracts with individuals. Regardless of how much this network is used, the presence of a public Wi-Fi network signals to visitors and residents that the precinct is innovative and focused on technology. It can also be used to measure movement and growth in the precinct, which can aid in decision making or provide valuable feedback on which policies are effective.

Installing a public Wi-Fi system would bring the following benefits to the Albury RJP:

- Connectivity to people reluctant to use a mobile service, such as tourists or foreign business guests
- Inclusive access to people visiting the precinct who do not have access to a mobile service
- Extra bandwidth for those who have accessibility requirements that cannot be satisfied by normal voice services, particularly whilst the network is improved
- A backup network that can be used as a contingency by business

- A start-up network that will allow business to start operating on day zero before services are connected
- Realtime analytics about movement in the precinct, by observation of mobile devices
- Long term data on the growth in the precinct, including employment and visitor numbers
- The Wi-Fi network offloads some high-capacity usage from local mobile networks, allowing them to appear faster
- A public Wi-Fi network can also be shared with CCTV to access federal funding for community safety projects (discussed further below).
- Wi-Fi also provides excellent density to support smart city systems and an Internet of Things (IoT) systems.

6.3.2.4 Long Range IOT network

One of most consistent features of smart city plans is the presence of an IoT network. This allows stakeholders to have wireless connectivity to devices without the cost of a wired network or the commitment of a mobile plan.

While Wi-Fi has excellent characteristics for such a function, its range is usually limited to line of sight, and its power requirements are unsuitable for regular operation from batteries. Long range, or Narrowband IoT, allow for long range and low power connectivity for applications that do not require significant capacity.

In 2022, the pressures of 5G capital cost have seen mobile network operators focus on fixed broadband rather than the small revenue offered by IoT, limiting their offerings.

Long Range Wide Area Network (LoRaWAN) infrastructure is a 900Mhz IoT protocol that offered a lot of promise, but its community-oriented principles have made it difficult to commercialise. By using a low bandwidth 900Mhz spectrum from an unlicenced scientific band, it can reach into buildings where outdoor Wi-Fi cannot penetrate or cover long distances on long-life battery power making it suitable for agriculture applications.

More recently a new network offering called Helium has built on the LoRaWAN protocol by offering a reward mechanism for network operators. This network has proved much more popular than its predecessor, with more than 2000 base stations now deployed across Australia.

It is recommended that the precinct offer an accessible location, Internet connection and power source for a Helium node. This network can be introduced into the region to provide a self-sustaining IoT network that can be used by both industry and governments.

It is tempting to consider light poles or the future substation site and electrical transmission towers as a site to mount an IoT radio, but these structures might have safety and access requirements that will make the project difficult to maintain.

Instead, it is recommended to work with an existing operator such as Circular Plastics, to mount an antenna on the rooftop or fix a 4m mast to the side of an existing building. If a site is chosen with a view of the Hume Highway, the radio will provide valuable coverage for vehicle tracking systems that operate without a traditional mobile network.

The NSW IoT Policy[7] applies to all NSW Government agencies including relevant Smart Places programs and initiatives. The policy includes important principles such as interoperability, cyber security, competitive and flexible procurement, and data-driven decision making. This policy would support efforts to ensure the Albury RJP is 'digital-ready'.

6.3.2.5 Fibre Networks

It is recommended that new street conduit in developments should be constructed to the Communications Alliance specification G645:2017.

This will allow NBN Co or another fibre operator to easily deploy fibre in the neighbourhood. This conduit design will still be suitable for copper deployment if NBN decides to proceed with its FTTN plan.

Two runs of P100 conduit should be installed along main roads, including the new east-west connector roads between Wagga Road and Gerogery Road, and through the southern portion of the NEXUS precinct. One conduit can be delegated to a primary fibre provider such as NBN. The second conduit will be used to support smart city or CCTV activities, such as fibre connections to hubs and light poles. By using a P100 diameter PVC pipe, maintenance and changes to the

[7] https://www.digital.nsw.gov.au/policy/internet-things-iot#:~:text=The%20IoT%20Policy%20consists%20of,of%20Things%20projects%20and%20systems.

cabling infrastructure will be simpler and reduce operational risk. The pipe network will be able to support additional services such as carrier enterprise fibre without coming into conflict with the primary fibre provider.

Figure 6-3 | "9 Pit" with multiple P100 conduits being installed

Underground networks will require a “backbone” of sorts to aggregate connections back to a principal node. The route taken by this backbone should be chosen in such a way that it will not conflict with other services or be vulnerable to natural disasters.

Future carriers may wish to use horizontal directional drilling (underboring) to create their own new conduit. This might happen due to a future subdivision, or where carrier policy discourages shared ducts. Typically, horizontal bores will require at least 1m of separation from other utilities including other Telco conduits. If verge areas are narrow or have large trees, it may be difficult to retrofit additional conduit by horizontal drilling.

A dense fibre network will usually require large P6 or P9 pits with a joint. Such joints are configured and maintained by splicing vans, which will require a suitable driving space to setup and safely access the joint without having to seek access. Ensuring roads are provided with suitable shoulders that can be used for maintenance is important for future safety.

Figure 6-4 | Splicing Van Accessing a roadside pit

6.3.2.6 Copper Networks

If a copper FTTN network is deployed to match existing NBN infrastructure, splicing pits may not be as critical, but there will still be a need for the network to aggregate to low impact cabinet infrastructure, with cabinets up to 2 square meters in area. Such locations will also need to be safely accessible and have access to power. Cabinets will support 48, 192 or 384 premises using Digital Subscriber Line Access Multiplexer (DSLAM) technology and are usually placed adjacent to pillars for copper distribution. The cabinets can be placed on the verge. Designers can influence the locations of such cabinets by providing open, flat areas adjacent to power and conduits.

Cabinets should not be deployed in locations that are subject to flooding or may have access restricted during a natural disaster. It is recommended that the future road design for new and widened roads, and active travel, in the RJP also consider suitable locations for splicing pits or cabinets. Avoiding areas within the 1 in 100 year flood extent will be critical.

6.3.3 Staging Recommendations

This section outlines the staging of upgrades recommended to support the telecommunications needs of the Albury RJP.

Stage 1

- Allow NBN to take the lead on fixed telecommunications and expand their existing FTTN network in the precinct
- Allocate land for at least one mobile tower, potentially co-located with the future site of a Council-owned reservoir at Table Top
- Meet with tower operators to seek their proposals for shared tower or infrastructure deployment
- Install IoT sensors where a definitive business case can be made (i.e., smart metering, lighting). Seek grant funding to support roll out of IoT and CCTV within the precinct
- Update Council's engineering design standards to require any new subdivision to make provision for dual conduit along all major roads

Stage 2

- Construct dual conduit along major routes, and in any road augmentation or upgrade projects associated with the precinct
- Design suitable locations for telecommunications infrastructure into future road, active travel and public domain projects
- Influence NBN to install fibre infrastructure throughout the precinct in a timely manner
- Install public Wi-Fi capability at high traffic locations, such as the Productivity zoned land
- Install Long Range IoT capability
- Perform independent 5G network testing to demonstrate the RJP is digital ready
- Install smart lighting in Council public domain upgrade projects

Stage 3

- Provide public Wi-Fi and use location analytics reporting to identify actionable data. Develop an understanding of how people are using the precinct to make improvements and drive connection.
- Deploy an IoT sensor network and publish non-identifying data
- Perform regular 5G and Wi-Fi testing and publish findings
- Mark footpaths, signs and roads with patterns that assist autonomous vehicles to demonstrate that the precinct is digital ready
- Partner with a smart pole provider to provide a small cell 5G capability

6.3.4 Suggested Funding Mechanisms

6.3.4.1 5G Mobile Services Funding

Telecommunications providers will fund their own 5G networks to improve coverage and maintain a competitive advantage. Local stakeholders are advised to own 5G compatible devices on all major carriers and regularly use them as much as possible in the target area, so that some demand is represented in decision-making statistics to encourage telecommunications carriers to invest further in the area.

With a new regional development, the business case is speculative for telecommunications providers, making it difficult to attract significant investment in 5G upgrade requirements of metropolitan locations. This may create delays in availability of upgrades, particularly from major carriers. An alternative is shared infrastructure providers, which can access infrastructure funding for long-term opportunities, such as the Albury RJP. These providers are often excluded from metropolitan locations as they require the construction of additional towers where infrastructure is already well established.

Shared infrastructure providers fund infrastructure themselves and then provide an attractive business case to mobile operators to have them establish high-capacity services sooner rather than later. These infrastructure operators may also build or attract fibre assets to support their cause.

Such operators in Australia include:

- Axicom
- Major shareholders include Macquarie Infrastructure and Real Assets
- ENE-HUB
- Major shareholder is Brookfield Group
- Stilmark Group
- Major shareholder is ATN International (NASDAQ:ATNI)

Fibre networks will typically require an anchor customer to cause them to establish assets. Council should work with prospective businesses that are committed to locating in the RJP and telecommunications providers to ensure infrastructure is delivered just-in-time and to avoid a lag between new businesses relocating and infrastructure improvements.

Major carriers will often subsidize network build if they are able to offset the cost against winning business in other parts of Australia. This is usually achieved by attracting national businesses that have a large number of branches with a high-quality connectivity requirement. Examples of such tenants include:

- Banks
- Australia Post
- Radiology Services
- Call Centres
- Datacentres
- Large Retail shops
- Supermarkets
- Professional Services Firms
- University Campus’

6.3.4.2 Local Fibre Network Funding

Local governments can access “Safer Communities Fund” to build CCTV services. This fund has most recently been administered by the Department of Home Affairs. By establishing a CCTV network with this fund, and carefully ensuring compatibility, a fibre optic network can be built that can later be extended to smart city services.

6.3.4.3 City Deals Funding

The approach recommended aligns the project well with the requirements for the Australian Government’s “City Deals” funding. By carefully aligning other components of the new precinct with this Federal strategy and capitalising on the

historic function of the Albury RJP in delivering Australia's newsprint, the precinct could be well placed to attract additional federal funding.

The Department of Treasury has announced an additional $83.2 million over 5 years from 2022-23 to support projects under the Albury Wodonga Regional Deal to unlock economic benefits and opportunities in the region. This could present a key opportunity for making the Albury RJP a 'smart' city and securing its future growth.

7. Water Supply

7.1 Baseline Assessment

The ACC water supply to the Albury RJP investigation area consists of a raw water and potable water supply. A simplified schematic of the system is shown in Figure 7-1, with the RJP investigation area in Zone C and Zone X1.

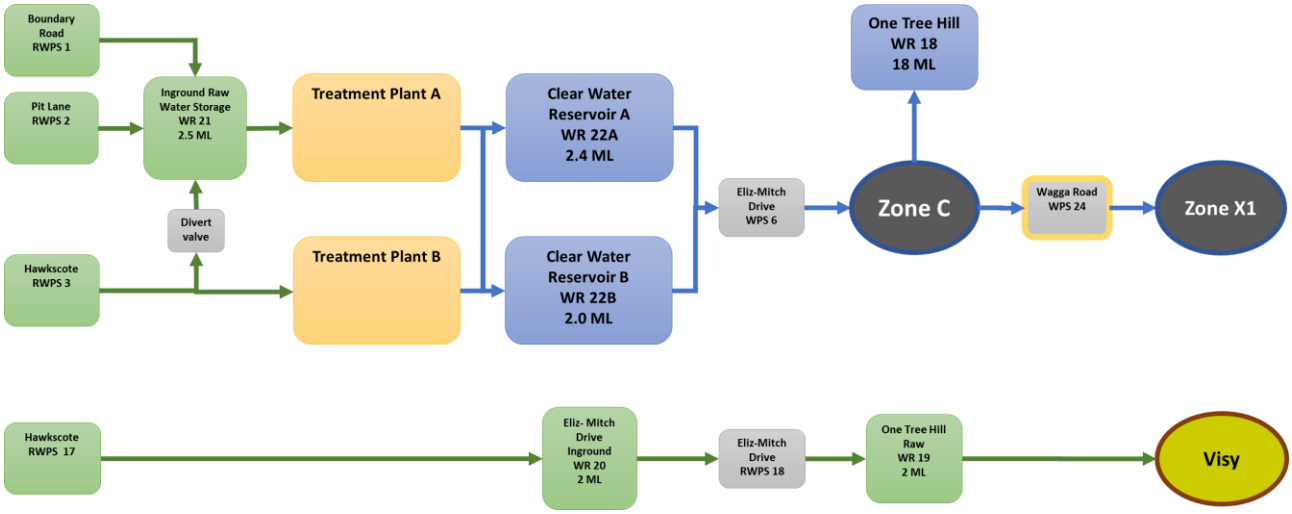

Figure 7-1 | Albury Water Schematic Existing Water Network (based on Albury W&WW Network Schematic - Jan 2022.XLSX, supplied by ACC)

The potable water supply consists of three pump stations in the Murray River that supply water to the two water filtration plants located in East Albury. Following treatment, the water is distributed through the Council's network. Zone C is supplied via pump station (WPS 6) on Elizabeth Mitchell Drive with a new pump station (WPS24) on Wagga Road boosting the supply to Zone X1.

Based on discussions with ACC there is sufficient capacity in the potable water distribution system to service the RJP investigation area if it is developed by predominantly dry industries. A high proportion of wet industries could limit the ability to develop further lots. It is likely this constraint would be due to the network supplying the area rather than available water.

A pump station on the Murray River supplies Visy with a raw water supply via the Elizabeth Mitchell Drive Reservoir (WR 20) and pump station (RWPS 18), and One Tree Hill Raw Water Reservoir (WR 19). This raw water licence is discussed further in the *Albury Regional Job Precinct Hydrogeology, Water Demand and Water Quality Technical Report* (SMEC, 2022). The Visy site contains the former Norske Skog paper mill and has its own major water treatment plant. When the plant was in operation it serviced the paper mill's demand and had potential spare system capacity to supply third parties. The site also has a return water pipeline for transferring cooling water plus treated process water (under certain conditions) to the Murray River. Details on how this system will be operated in the future by Visy are not known.

Figure 7-2 shows the existing water network, as per ACC records. The key items are:

- Pink – Raw Water main to VISY site, 525mm
- Red – Return water line from VISY to Murray River, 500mm
- Beige – Headworks main from Murray River to WTP, 150mm to 750mm
- Blue – Trunk and Delivery mains, 50mm to 750mm

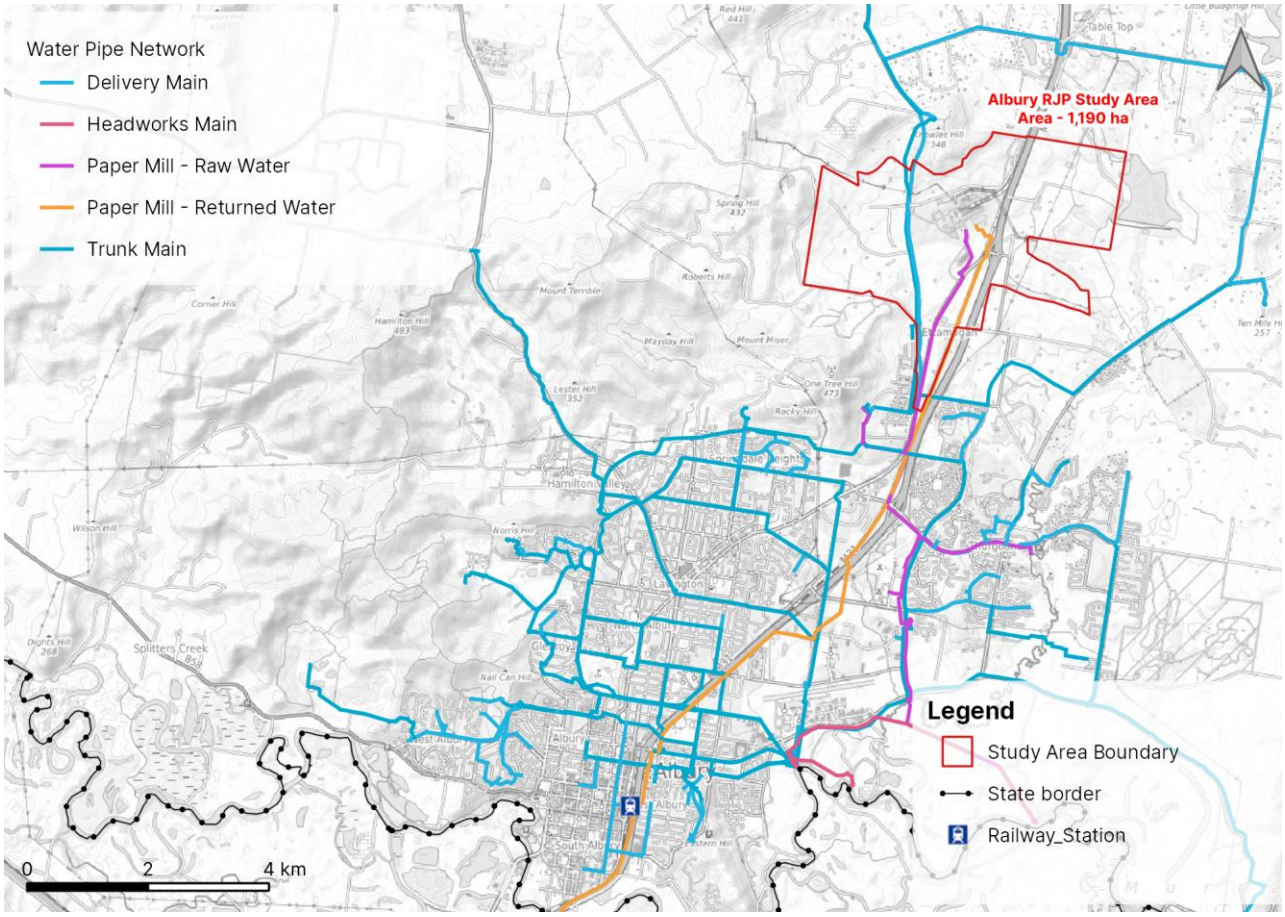

Figure 7-2 | Existing Water Network (Water_Mains.shp, Albury City Council)

A recent Integrated Water Cycle Management, Draft Issues Paper, by the NSW Public Works Advisory listed several water supply issues for Albury City. This included the following:

Water security due to licensed entitlement:

- 'In the event of a repeat of the millennium drought and a 50% reduction in allocation for a whole year, there will be a significant shortfall in meeting the unrestricted dry year extraction requirements from the Murray River.'
- 'For the aspirational growth forecast, the unrestricted annual extraction will exceed the license entitlement by 2034.'

Reliability of supply during peak day due to capacity of WTP B:

- 'In the event of an algal bloom in the Murray River, only Plant B can be used as it has a DAF clarification system. If Plant B is not operational, Plant A will neither have the capacity to produce nor the ability to treat the water required to meet the system demand.'
- 'The capacity of Plant B is sufficient to meet the peak day demand for the baseline forecast 30- growth. For the aspirational growth the capacity of Plant B will be exceeded in 2039.'

These issues are considered in the testing of the master plan (Section 7.3).

7.2 Planned infrastructure works and upgrades

Appendix I of the Council's Water Supply Strategy (Albury City Council, 2017) details a number of proposed major capital works that were planned within the region. The upgrades are shown in Figure 7-3, with items relevant to the RJP investigation area summarised in Table 7–1.

Based on discussions with ACC, this infrastructure has been sized to support the NEXUS development and general dry industry development in the vicinity of the Albury RJP investigation area. The strategy assumed the NEXUS development would be a water smart development utilising onsite water, such as rainwater, and wastewater treatment and reuse to minimise its demand on the network.

The water supply to the NEXUSs development is currently planned to cater for dry industries. The presence of a wet industry (such as an Abattoir or wet food manufacturing use) would constrain further development unless supplemented by additional water sources. Depending on the needs of the wet industry, this could be alternative water sources such as raw water, recycled water, stormwater and/or rainwater as part of an integrated water cycle management plan for the RJP investigation area. Alternatively, ACC has indicated there may be available water in the system but constraints on the network. This will be checked in the testing of the master plan against the water network model (Section 7.3).

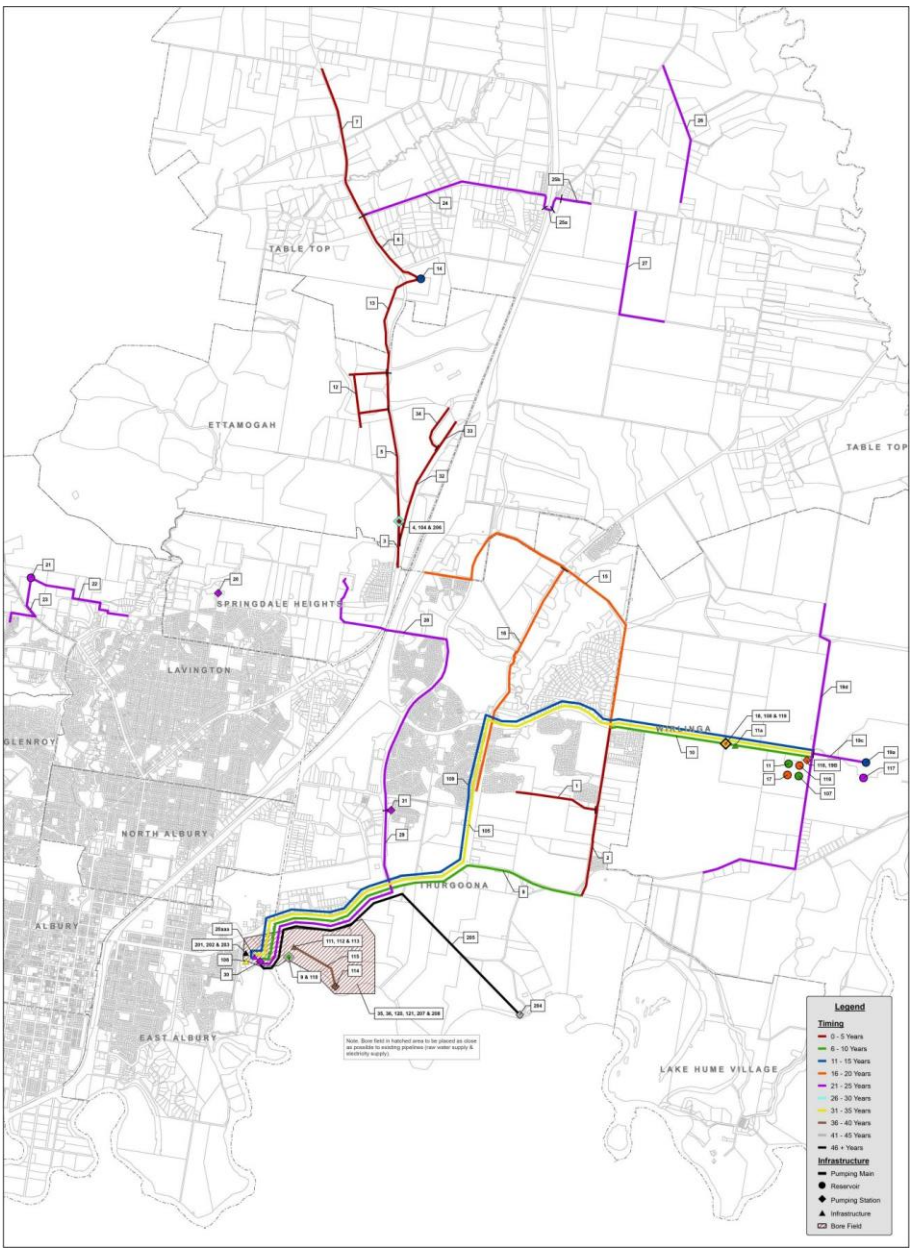

Figure 7-3 | Proposed Major Capital Works – Water (source: Albury City Council's Water Strategy Report, 2017)

Table 7–1| Proposed Major Capital Works of relevance to the RJP, 0 – 50 yrs (Albury City Council – Water Supply Strategy 2017, Appendix I)

Item	Description	Programming – Financial Years	Pipe Size	Pump Duty	Status
3	Supply main from the One Tree Hill (OTH) Reservoir Pipeline to Table Top WPS24	2016/17	450mm	-	Constructed
4	New WPS24 – 2 x 110 kW pumps (Includes civil for future upgrade to 2 x 200 kW)	2016/17	-	55 L/s @ 115m head	Constructed
5	Rising main from WPS24 to NEXUS Subdivision (Hub Road)	2016/17	300mm	-	Constructed
6	Pipeline Gerogery Road from Table Top Reservoir to Tynan Road	2016/17	250mm	-	Constructed
12	NEXUS subdivision internal water main	2016/17	250mm	-	Partially Constructed
13	Pipeline from NEXUS subdivision (Hub Road) to Table Top Reservoir	2016/17	300mm	-	Constructed
14	2.5 ML reinforced concrete reservoir Table Top	2026/27 & 2027/28	-	-	Future
28	Replacement of OTH AC Rising Main from Corrys Road WPS to OTH Reservoir	2026/27 & 2027/28	750mm	-	Future
29	Replacement of OTH AC Main from WFP CWPS to Corrys Road WPS	2039/40 & 2040/41	750mm	-	Future
30	Upgrade WFP CWBPS for OTH Pumps to Corrys Road 315kW to 355kW and change out impeller Pump 6 to install Standby pump	2039/40 & 2040/41	-	550 L/s @ 51m head	Future
31	Upgrade Corrys Road CWBPS from 2 x 185kW D/S to 3 x 200 kW D/D/S	2040/41	-	275 L/s @ 57.5m head 120 L/s @ 72.5m head	Future
32	Pipeline Wagga Road from new supply main to WPS24 to R.W. Henry Drive	2016/17 & 2017/18	250mm	-	Constructed
33	Pipeline Wagga Road from corner Wagga Road and R.W. Henry Drive	2016/17 & 2017/18	150mm	-	Not yet Constructed
34	Pipeline R.W. Henry Drive from Wagga Road to Mill	2016/17 & 2017/18	200mm	-	Constructed

Item	Description	Programming – Financial Years	Pipe Size	Pump Duty	Status
104	Upgrade WPS24 from 2 x 110 kW D/S to 2 x 160 kw D/S	2041/42	-	90 L/s @ 126m head	Future
206	Upgrade WPS24 from 2 x 160 kW D/S to 2 x 200 kw D/S	2067/68 – 2071/72	-	120 L/s @ 138m head	Future

7.3 Recommended Upgrades to Support the Master Plan

7.3.1 Overview

This section provides a summary of the recommended upgrades to the potable water network to support the Albury RJP master plan. This strategy is intended to be flexible to the changing needs of the RJP as development progresses and land use composition changes. We have adopted the three staged approach from the RJP master plan (as detailed in Section 4.3), which will allow Council to monitor the uptake of development in the RJP and residential growth in Thurgoona to ensure infrastructure is planned and delivered in a timely manner.

A future expansion to the north of the Ettamogah Rail Hub intermodal area has also been included to ensure the infrastructure sizing is suitable.

7.3.2 Basis of Assessment

The basis of assessment of the water supply for the master plan consists of:

- Determination of demands
- Infrastructure Sizing
- Modelling of network
- Consideration of upgrades

7.3.2.1 Demands

The Albury City Water Reticulation Design Guidelines[8], Water Supply Code of Australia WSA 03[9] and the Water Directorate Section 64 Determinations of Equivalent Tenements Guidelines[10] were referenced to estimate the water demand for the development and are outlined in Table 7–2 and Table 7–3.

Table 7–2 | Water Demand Unit Assumptions – Water Directorate Section 64

Classification	Demand Units	Demand Rate
WATER		
COMMERCIAL: GENERAL		
Offices	ET/Floor Area sqm	0.01
Retail	ET/Floor Area sqm	0.01
COMMERCIAL: SPECIFIC		
Service Station	ET/Lot	3.6
COMMERCIAL: COMMUNITY FACILITIES		
Education - College, University (tertiary)	ET/Floor Area sqm	0.0013

[8] Albury City Council, Engineering Guidelines for Subdivisions and Development Standards, Part 4: Water Reticulation Design, July 2009
[9] Water Services Association of Australia (WSAA), Water Supply Code of Australia WSA 03 – 2002 (previous version, as referenced in Albury City Council Guidelines) and WSA 03-2011 (current version)
[10] Water Directorate, Section 64 Determinations of Equivalent Tenements Guidelines, April 2017

Classification	Demand Units	Demand Rate
INDUSTRIAL GENERAL		
Light Industrial	ET/Gross ha	15
Future Unknown - Light	ET/Gross ha	15
Future Unknown - Medium	ET/Gross ha	30
Future Unknown - Heavy	ET/Gross ha	50
SEWER - Applied to Water		
INDUSTRIAL: USER		
Abattoir	ET/Built-up ha	1143

Demands from the Water Directorate were used as an alternative to WSA as it provided more specific land uses and enabled comparative demands to be used for water and sewer.

Table 7–3 | Water Demand Assumptions

Water Demand	Rate	Source / Calculation
Annual Demand	230 kL/ET/yr	Water Directorate: Section 64
Average Day	630 L/day/ET	Annual Demand / 365
PD/AD Ratio	2	WSA 03-2011, 2.3.4.2
Peak Day	1,260 L/day/ET	PD/AD x Average Day
PH/PD Ratio	1.28	ACC Model
Peak Hour	0.019 L/s/ET	PH/PD x Peak Day
Fire Flow	11 L/s at hydrant (Background 2/3 PH)	ACC Guidelines

These demands were applied to the RJP Zones, based on anticipated industries and site coverage, and are summarised in Table 7–4.

Table 7–4 | Water Demand Assumptions for RJP Zones

Zone	Unit Demand Rate ET/ha (developable)	PH Demand Rate L/s/ha (developable)
Existing Industry - Overall Forge Pty Ltd	10.4	0.19
NEXUS Stage 1 Including Circular Plastics Australia PET Recycling Plant	14 – 46.9	0.26 – 0.88
General Industry	11.1	0.21
Heavy Industry	46.9	0.88
Intermodal	16.9	0.32
Productivity	26.2 – 32.5	0.49 – 0.61
Service Station	8.3	0.15

The resulting peak hour demand at the completion of each stage are:

- Stage 1: 72 L/s
- Stage 2: 203 L/s
- Stage 3: 247 L/s
- Full Development: 250 L/s

Note that this includes the existing allowance for the Visy site for Stage 1.

Further information on the Zone classifications and the inclusion of an abattoir in the demand numbers is included in Section 8.3.2.2.2.

The inclusion of alternative water sources could reduce demand, however for security of supply it is recommended the system is designed to supply peak demand.

7.3.2.2 Infrastructure Sizing

The infrastructure sizing for the development is based on the guidelines summarised in Table 7–5.

Table 7–5 | Infrastructure Sizing Assumptions

Infrastructure	Design Assumption	Source
SURFACE RESERVOIR		
Capacity (ACC)	One day supply at Peak Day Demand	ACC Guidelines
Capacity (WSA)		WSA 03-2011
Useable reservoir capacity (including reserve capacity)	8 – 24 hrs consumption at Peak Day Demand	
Reserve Capacity	Typically 1/3 Peak Day Demand	
Modelling	No net depletion of the operating capacity over the system design period	WSA 03-2011
Level (ACC)	The reservoir should be located at an elevation such that the water level when the reservoir is 2/3 full provides not less than the minimum allowable service pressures at the customer's services under peak demand conditions	ACC Guidelines
PUMP STATION		
Pump Duty Flow	Able to transfer Peak Day over 18 hrs	Council (meeting 19/05/2022)
PIPELINES		
Minimum Size	150 mm for Commercial and Industrial Areas	ACC Guidelines
Velocity	Optimum: 0.8 m/s to 1.4 m/s Maximum: 2 m/s (may be higher for fire flow)	WSA 03-2011
Headloss	5m head/km for ≤ DN150 m head/km for ≥ DN200	WSA 03-2011

7.3.2.3 Supply Pressure

The following supply pressure guidelines (Table 7–6) have been considered as part of the assessment.

These supply pressures have been assumed to be applicable at the main in the street, however they have also been checked at the mid-point of each lot area as part of the modelling. There is a risk that these pressures would not be available at high points on steep lots, however it is expected that significant earthworks will occur to flatten these lots out for development.

Table 7–6 | Supply Pressure Guidelines

Pressure	Value	Source
Minimum Allowable Service Pressure (at Peak Hour)	30m head	ACC Guidelines
Desirable Maximum Service Pressure	50m head	WSA 03-2011
Maximum Allowable Service Pressure	60m head	WSA 03-2011
Fire Flow Supply Pressure	28m head	ACC Guidelines

7.3.2.4 Network Model

In conjunction with the RJP discussions, Council have developed and provided a water network model for the area to assist in assessing the effect of the increased demands on the network. A screen shot of the model is shown in Figure 7-4 and covers the One Tree Hill (WR18) Reservoir, Water Pump Station (WPS24) and the Table Top (WR28) Reservoir. The following scenarios were included in the model:

- 2022 – Peak Summer Day
- 2025 – Peak Summer Day
- 2030 – Peak Summer Day

It is noted that for the '2025 – Peak Summer Day' and '2030 Peak Summer Day' scenarios that modelled pump definition for WPS24 is for a design flow of 90 L/s at 95m head, which differs from the 55 L/s at 115m head listed in Table 7–1. Discussions with Council are that the pump station is currently running at approximately 35 L/s and can be turned up to 90 L/s.

To assess the effect of the RJP and potential upgrades, the model has been updated to include the new zoning lots (as shown in Figure 7-5). The scenarios were:

- 2025 – RJP Stage 1 (based on 2025 – Peak Summer Day)
- 2030 – RJP Stage 1 & 2 (based on 2030 – Peak Summer Day)
- 2030 – RJP Stage 1, 2 & 3 (based on 2030 – Peak Summer Day)

The results of the modelling are discussed in the following sections.

In regard to fire flows, Council guidelines require 11 L/s at hydrants at a background demand of 2/3 Peak Hour. In comparison to the peak hour demand, the fire flow is not likely to significantly reduce supply pressures. As a result, fire flow is not considered the governing design factor in the master plan. It is recommended that as the development is progressed, fire flow requirements are considered further before finalising sizing of infrastructure reticulation.

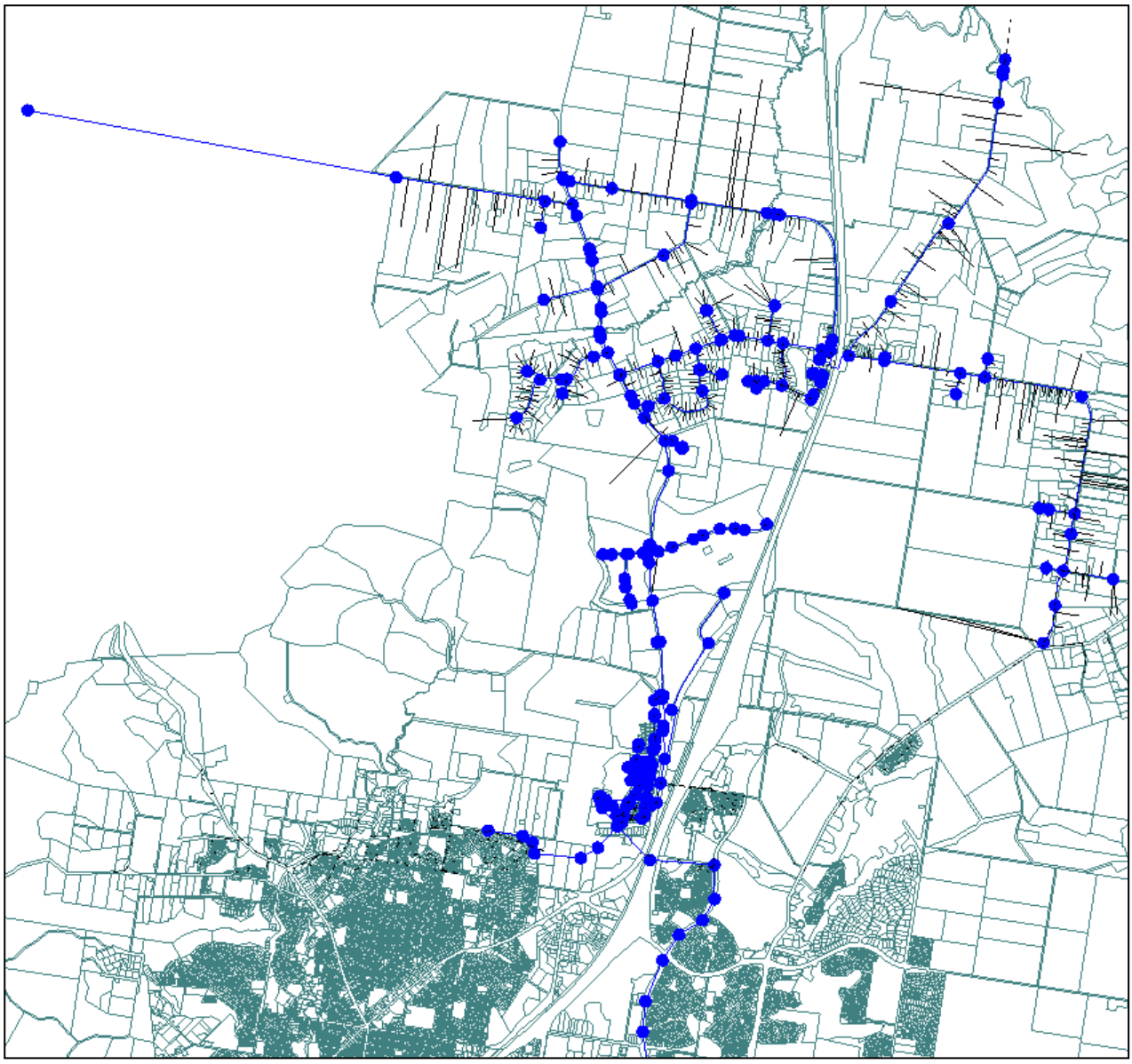

Figure 7-4 | Albury City Council Water Network Model for the Table Top (WR-28) Reservoir: 2022 – Peak Summer Day

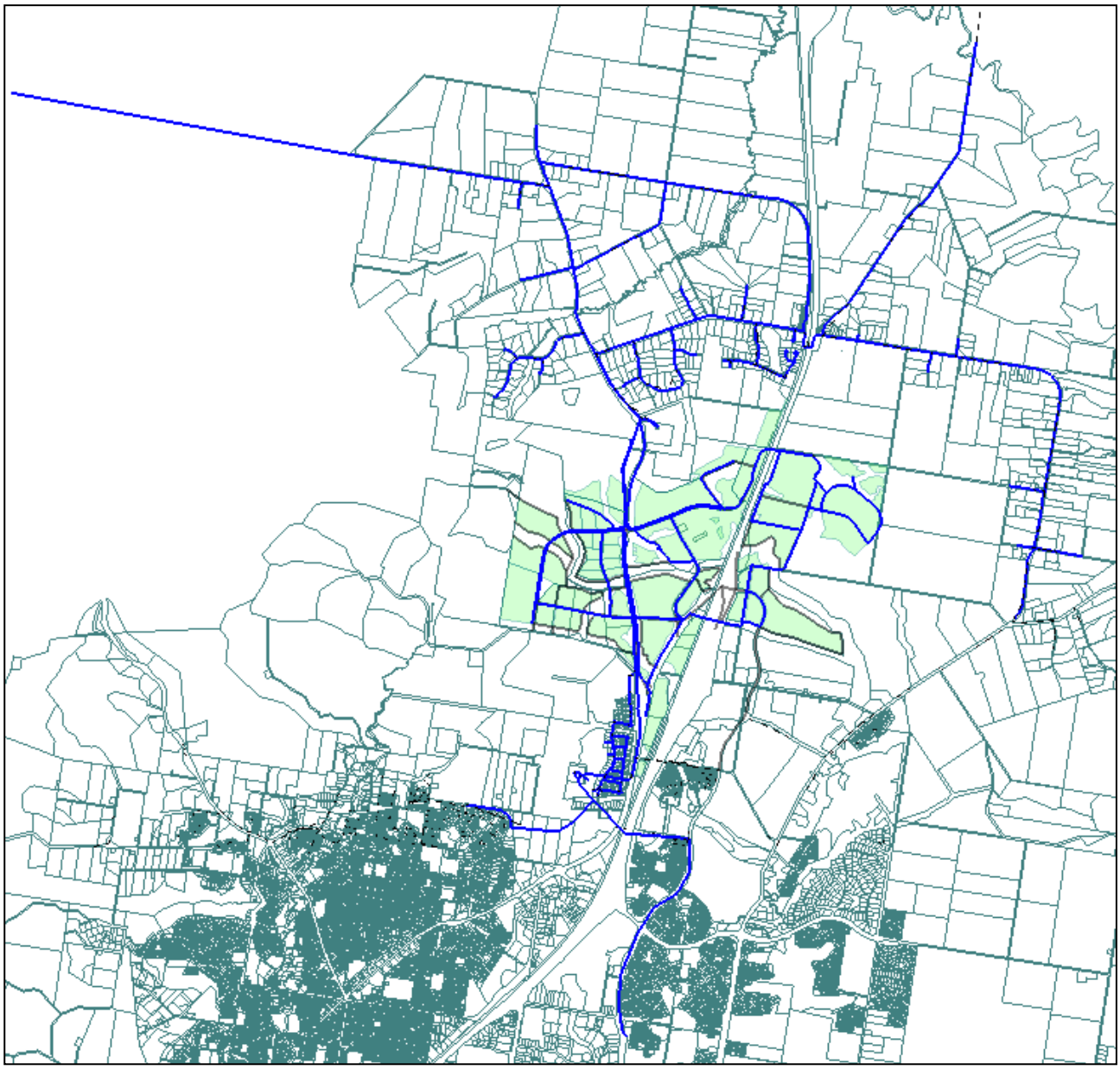

Figure 7-5 | Updated Water Network Model for the Table Top (WR-28) Reservoir: 2030 – RJP Stages 1, 2 & 3

7.3.3 Limitations of Existing Network

The current network capacity was considered by running the 2022 – Peak Summer Day and 2025 – Peak Summer Day scenarios. Limitations of the network in preparation for Stage 1 were identified as:

- Table Top Reservoir does not have enough storage to support the development of Stage 1
- The current arrangement of WPS24 operating as a transfer and supply pump station is not suitable for the development of Stage 1, as it reduces the security of supply
- Service pressures for properties along Wagga Road are too low, as they are currently serviced from WR-18 (One Tree Hill)

The extent of development that can occur prior to required upgrades to address these limitations has not been determined, as it is dependent on the industries that seek to begin operating during the first stage and the service standards Council wishes to provide. Council should begin planning for these upgrades and closely monitor new industries seeking to locate to the area.

7.3.4 Stage 1

Under the current master plan, staging the full development of Stage 1 will require significant upgrades to be constructed in line with the full development. The reasons for these upgrades are summarised in Section 7.3.3 above.

An upgrade of Table Top Reservoir is earmarked for 2026/27 (Table 7–1), however it will not provide sufficient storage for this development. Following discussions with Council and consideration of the site elevations it was determined that rather than upgrading the Table Top site, a new reservoir site at a lower elevation to Table Top would be recommended for this development. Land located adjacent to the quarry at approximately RL 290 m AHD was highlighted as a potential location for a new reservoir by Council. At this elevation the reservoir can service the majority of the development, with a few areas above approximately RL 255 m AHD needing to be supplied by the existing Table Top reservoir.

To supply the reservoir, a new transfer main is required. The existing main servicing Table Top is not large enough, but may be repurposed as part of the supply system for the RJP.

Service pressure to the properties on Wagga Road can be improved by transferring them to the new reservoir zone by constructing a pipeline along Gerogery Road and/or the new east-west connector road, and disconnecting from the WR-18 (One Tree Hill) zone.

A summary of the proposed supply arrangement is shown below in Figure 7-6

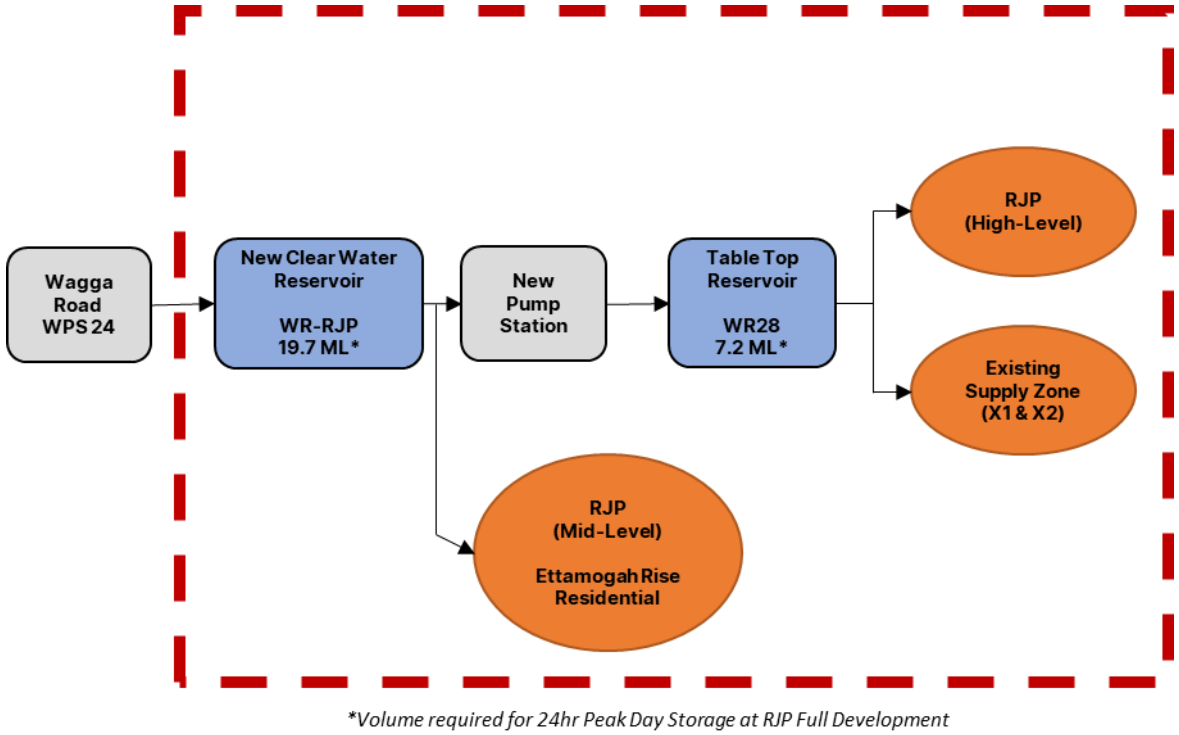

Figure 7-6 | Proposed Supply Arrangement

The network model has been used to determine the infrastructure requirements to service Stage 1. The peak day demands under Stage 1 are shown in Table 7–7 and the proposed infrastructure for Stage 1 is shown in Figure 7-7and Table 7–8 below.

Table 7–7 | Stage 1 – Peak Day Demands

Zone	RJP	Other Areas	Combined
New Reservoir, WR-RJP: - RJP (Mid-Level) - Ettamogah Rise Residential	4,536 kL/day	597 kL/day	5,133 kL/day
Table Top, WR28 - RJP (High-Level) - Existing Supply Zone	1,331 kL/day	1,184 kL/day	2,515 kL/day

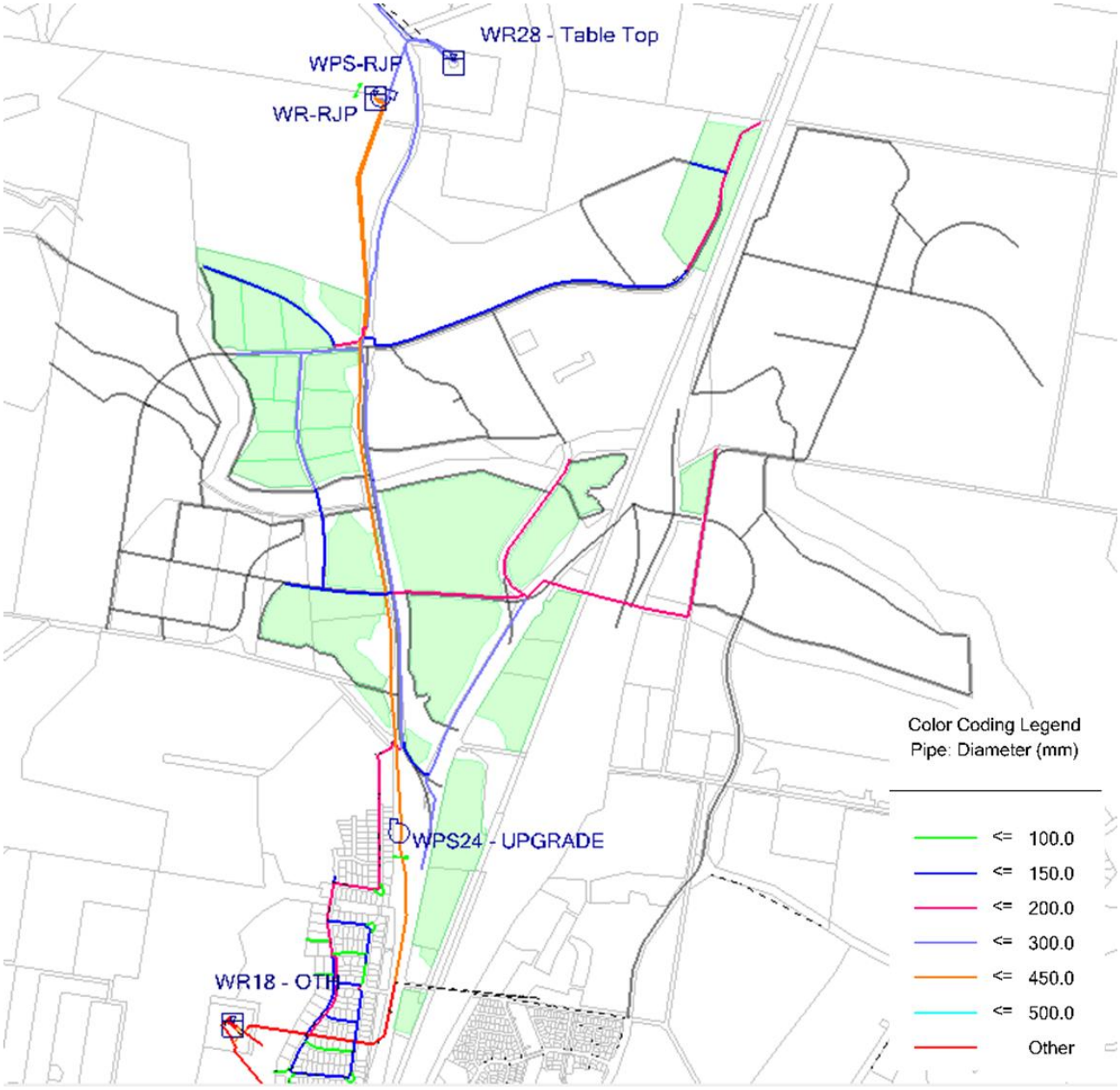

Figure 7-7 | RJP Stage 1 Water Supply Infrastructure

Table 7–8 | RJP Stage 1 Infrastructure

Infrastructure	Size	Note
WPS24	118 L/s 55m head (70 kW)	Note this is based selecting pumps for the proposed new system at the completion of Stage 1. However, depending on the current pump size, the installed pumps may be suitable for Stage 1. This needs to be confirmed with Council.
Transfer Main: WPS24 to WR-RJP	450mm	Sized for full development
WR-RJP	PD Storage : Volume 8 hrs : 2.5 ML	Modelled at 7.5 ML (assumed to be 3 x 2.5 ML)

Infrastructure	Size	Note
	16 hrs : 5.1 ML 24 hrs : 7.6 ML	
Supply Main: WR-RJP to RJP	450mm	Sized for full development
RJP Eastern Ring Main (Initial stages)	200mm to 250mm	Sized for full development. Includes southern highway crossing in Stage 1
WPS-RJP	39 L/s 33m head (7 kW)	Sized for Stage 1 only, consideration of future stages/upgrades need to be considered prior to final sizing.
Transfer Main: WR-RJP to WR28 – Table Top	300mm	Sized for full development
WR28 – Table Top	PD Storage : Volume 8 hrs : 0.8 ML 16 hrs : 1.7 ML 24 hrs : 2.5 ML	Modelled at 1.66 ML (existing)
Supply Main from Table Top	200mm	Existing

With the nominated infrastructure and a 48hr model run, the supply pressure for all sites meets the 30m requirement at the main.

The network model was run with WR18 – One Tree Hill reservoir operating. The levels of the reservoir in comparison to the Council supplied scenarios are shown in Figure 7-8 below. This shows that the levels are dropping over the run period and are slightly lower than the 2030 scenario. Initial discussions with Council suggest this is an issue that they will be looking at as part of the full network from an operational perspective.

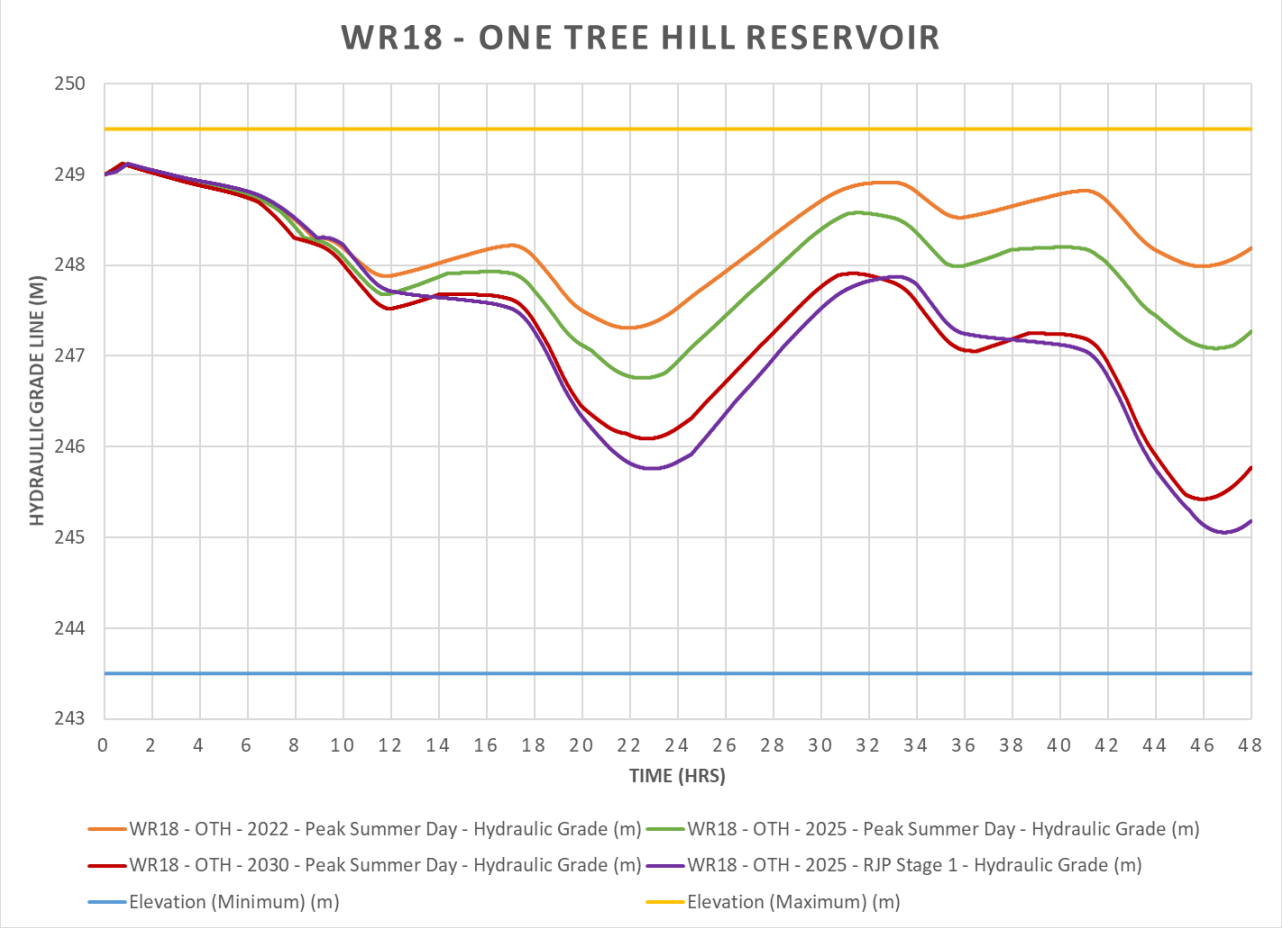

Figure 7-8 | WR18 One Tree Hill Reservoir Levels

7.3.5 Stage 2

Stage 2 of the development can be serviced from an expansion of the Stage 1 network with further upgrades to reservoirs and pump stations. Development of Stage 2 will exceed the supply available from the existing WR18 (Table Top) reservoir. Council has indicated this will be addressed as part of the full network approach as they address supply requirements for the Thurgoona development area.

The network model has been used to determine the infrastructure requirements to service Stage 2. The demands under Stage 2 are shown in Table 7–9 and the proposed infrastructure for Stage 2 is shown in Figure 7-9 and Table 7–10 below.

With the nominated infrastructure and a 48hr model run, the supply pressure for all sites meets the 30m requirement at the main.

Table 7–9 | Stage 2 – Peak Day Demands

Zone	RJP	Other Areas	Combined
New Reservoir, WR-RJP: - RJP (Mid-Level) - Ettamogah Rise Residential	8,671 kL/day	597 kL/day	9,268 kL/day
Table Top, WR28 - RJP (High-Level) - Existing Supply Zone	4,951 kL/day	2,246 kL/day	9,268 kL/day

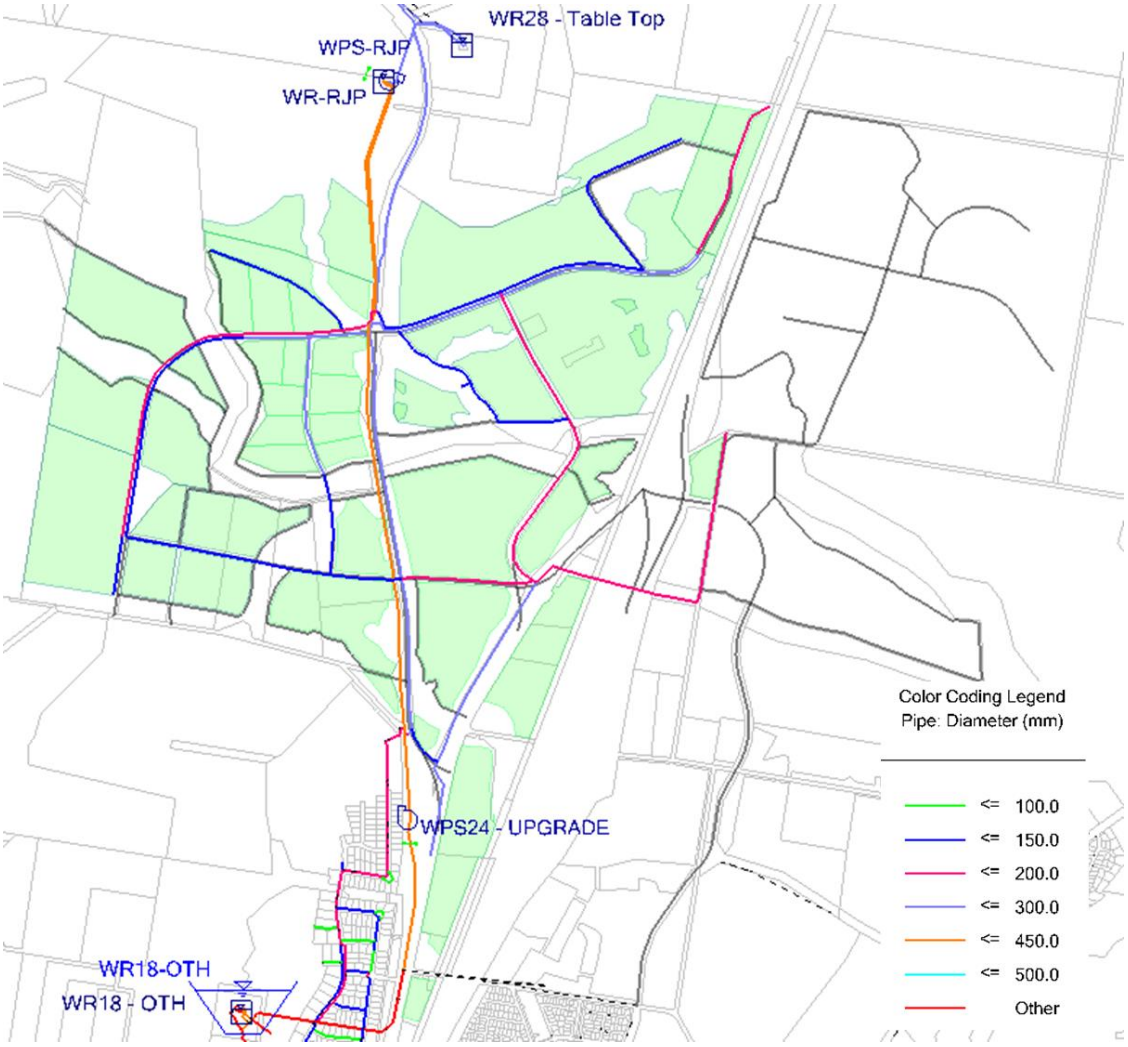

Figure 7-9 | RJP Stage 2 Infrastructure

Table 7–10 | RJP Stage 2 Infrastructure

Infrastructure	Size	Note
WPS24	254 L/s 76m head (198 kW)	Sized for Stage 1 and 2 only, consideration of future stages/upgrades need to be considered prior to final sizing.
Transfer Main: WPS24 to WR-RJP	450mm	Developed in Stage 1 and sized for full development
WR-RJP	PD Storage : Volume 8 hrs : 5.5 ML 16 hrs : 11.0 ML 24 hrs : 16.5 ML	Modelled at 15.7 ML (assumed to be 6 x 2.5 ML)
Supply Main: WR-RJP to RJP	450mm	Developed in Stage 1 and sized for full development
RJP Eastern Ring Main (Initial stages)	200mm to 250mm	Sized for full development. Upgrade of main along Hub Road required during Stage 2
WPS-RJP	111 L/s 38m head (81 kW)	Sized for full development
Transfer Main: WR-RJP to WR28 – Table Top	300mm	Developed in Stage 1 and sized for full development
WR28 – Table Top	PD Storage : Volume 8 hrs : 2.4 ML 16 hrs : 4.8 ML 24 hrs : 7.2 ML	Modelled at 3.5 ML
Supply Main from Table Top	200mm	Existing

7.3.6 Stage 3 & Future Expansion (Full Development)

Stage 3 of the development can be serviced from an expansion of the Stage 2 network, including a second highway crossing to development on the eastern side, and further upgrades to reservoirs and pump stations.

A small future extension to intermodal site had been considered for post Stage 3 and has therefore been included in the 'Full Development' scenario.

The network model has been used to determine the infrastructure requirements to service the full development. The demands under Full Development are shown in Table 7–11 and the proposed infrastructure for the development is shown in Figure 7-10 and Table 7–12 below.

With the nominated infrastructure and a 48hr model run, the supply pressure for all sites meets the 30m requirement at the main.

Table 7–11 | Full Development – Peak Day Demands

Zone	RJP	Other Areas	Combined
New Reservoir, WR-RJP: - RJP (Mid-Level) - Ettamogah Rise Residential	12,016 kL/day	597 kL/day	12,460 kL/day
Table Top, WR28 - RJP (High-Level) - Existing Supply Zone	4,951 kL/day	2,247 kL/day	7,350 kL/day

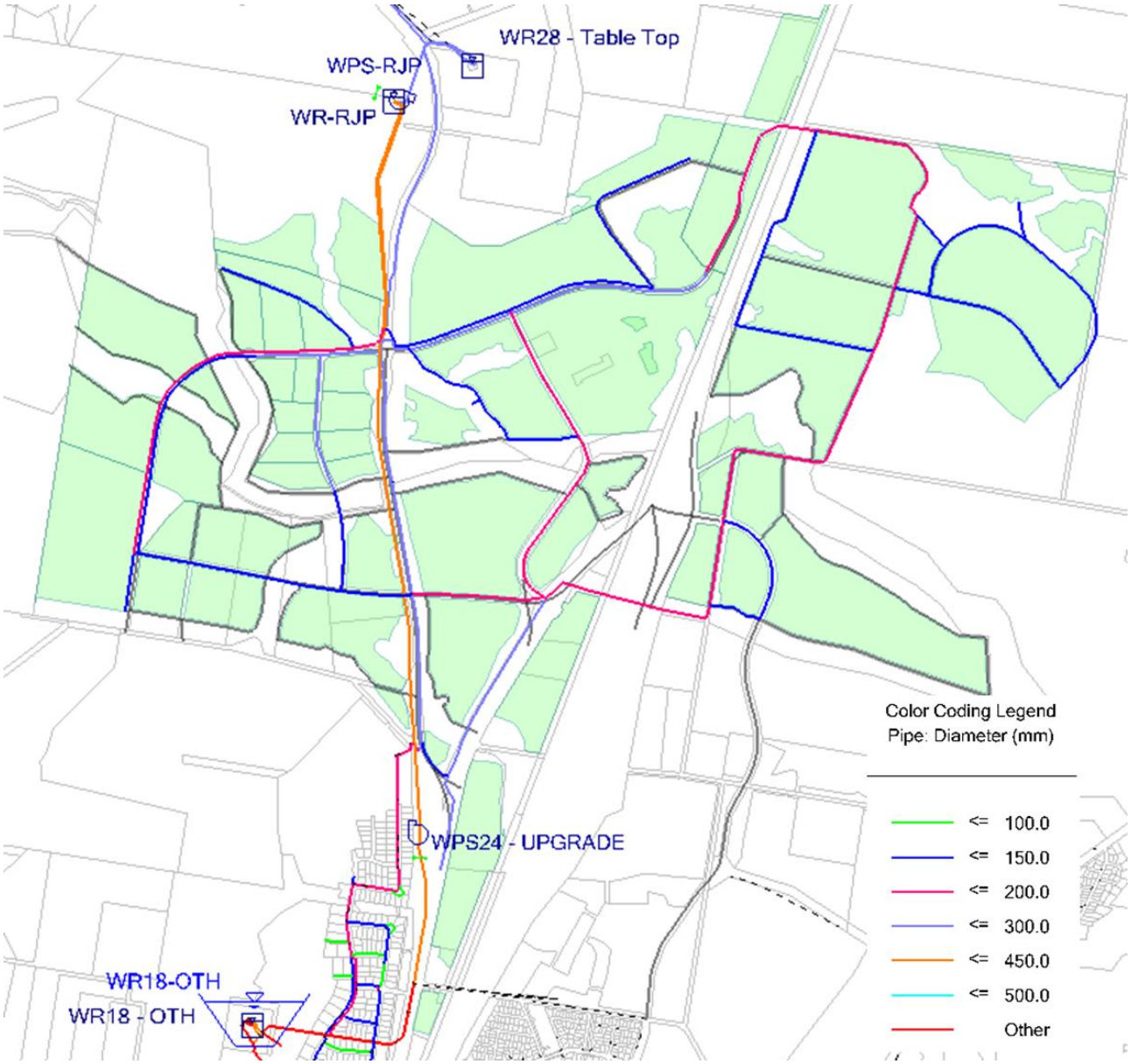

Figure 7-10 | RJP Water Infrastructure – Full Development

Table 7–12 | RJP Water Infrastructure – Full Development

Infrastructure	Size	Note
WPS24	Flow: 304 L/s Head: 86m head (242 kW)	Sized for full development
Transfer Main: WPS24 to WR-RJP	450mm	Developed in Stage 1 and sized for full development
WR-RJP	PD Storage : Volume 8 hrs : 6.6 ML 16 hrs : 13.1 ML 24 hrs : 19.7 ML	Modelled at 20 ML (assumed to be 8 x 2.5 ML)
Supply Main: WR-RJP to RJP	450mm	Developed in Stage 1 and sized for full development
RJP Eastern Ring Main	200mm to 250mm	Sized for full development

Infrastructure	Size	Note
WPS-RJP	111 L/s 38m head (81 kW)	Sized for full development
Transfer Main: WR-RJP to WR28 – Table Top	300mm	Developed in Stage 1 and sized for full development
WR28 – Table Top	PD Storage : Volume 8 hrs : 2.4 ML 16 hrs : 4.8 ML 24 hrs : 7.2 ML	Modelled at 3.6 ML
Supply Main from Table Top	200mm	Existing

7.3.7 Visy Option

As previously noted, the Visy owned former paper mill could present an opportunity to provide the RJP with established infrastructure to service additional demand via the existing raw water supply line and onsite water treatment facility.

The return water line from Visy also presents an opportunity either as an alternative water source or as a potential main to increase supply to the area if it is no longer required for the operation of the Visy site.

This would be dependent on Visy's plans for the site and the requirements of their discharge license, and conversations with ACC and future RJP investment partners. The use of this infrastructure should be considered further if a suitable industry seeks to locate in the RJP.

7.4 Identified Upgrades

7.4.1 Water Pump Station, WPS24

The existing WPS24 pump station is designed to have a duty point of 55 L/s at 115m head, as per Table 7–1, but is currently operating at a lower flow. Council's model shows a slightly different duty point of 90 L/s at 95m head, but it is not clear if this is an upgrade or adjustment to the existing pumps.

As covered in Section 7.3.3 to Section 7.3.6, and outlined in Table 7–8, the pump station will need to be upgraded as the development progresses. These approximate pump duties are based on the pump station delivering Peak Day Demand over 18 hours (Table 7–5). The staging of the pump station upgrades will need to be discussed and confirmed with Council.

If alternative water sources can be secured to reduce the peak potable demand, these flow rates could be reduced.

Table 7–13 | WPS24 Approximate Pump Duties

Completed Stage	Approximate Pump Duty		
	Flow	Head	Power
RJP Stage 1	118 L/s	55m	70 kW
RJP Stage 2	254 L/s	76m	198 kW
RJP Full Development (Stage 3 & 4)	304 L/s	86m	242 kW

7.4.2 Transfer Main – WPS24 to WR-RJP

As part of the upgrade system to support the development of the RJP a new transfer main is required from WPS24 to WR-RJP. This main has been sized at 450mm (Section 7.3.3 to Section 7.3.6), to transfer Peak Day Demand over 18 hrs (refer to the infrastructure sizing requirements in Table 7–5).

This pipe size was initially chosen as it is the current feed pipe size to the pump station. Under Stage 1 and Stage 2 flows, the velocity, headloss and pipe size are appropriate with maximum velocities ranging from 0.78 m/s to 1.63 L/s and maximum headloss ranging from 1.4 m/km to 5.2 m/km, which are close to the preferred range. At full development

the velocity and headloss increase further to 1.95 m/s and 7.3 m/km. While the velocity is acceptable, the headloss is high and will increase pump size and energy costs. Increasing the pipe size results in low velocities in Stage 1 (0.5 m/s). Removing a high demand user, such as an abattoir, would significantly reduce the flow and headloss.

Given the uncertainty of the demand loads, uptake of users and extended time frame for the development, the pipe size was left at 450mm.

With further information on anticipated users and uptake timing, Council may choose to reassess this pipe size as part of further design.

7.4.3 New Reservoir, WR-RJP

Prior to the completion of Stage 1 a new reservoir (WR-RJP) will be required. The reservoir will be used as a supply reservoir to service a 'mid-level' zone and an intermediate transfer reservoir for WPS-RJP to WR28 (Table Top). The size of this reservoir is covered in Section 7.3.3 to Section 7.3.6, and is outlined in Table 7–14 below.

As per the infrastructure sizing requirements in Table 7–5, surface reservoirs are required to have a capacity of a minimum of 8 – 24 hours consumption at Peak Day Demand. However, this generally applies to supply reservoirs with a smaller volume required for transfer storage. Therefore, there is a potential to reduce the capacity required in WR-RJP for the transfer to WR28. If only a quarter of this volume is required, the storage capacity of WR-RJP at full development for 24 hrs could be reduced by 5.5 ML to 14.3 ML. The storage volume requirement will need to be discussed and confirmed with Council.

If alternative water sources can be secured to reduce the peak potable demand, these flow rates could be reduced.

Table 7–14 | WR-RJP (New) Storage Requirements

Consumption at Peak Day Demand	Storage Volume (ML)		
	Stage 1	Stage 2	Full Development
8 hrs			
Mid-level Supply	1.7	3.1	4.2
WR28 Transfer	0.8	2.4	2.4
TOTAL	**2.5**	**5.5**	**6.6**
16 hrs			
Mid-level Supply	3.4	6.2	8.3
WR28 Transfer	1.7	4.8	4.9
TOTAL	**5.1**	**11.0**	**13.2**
24 hrs			
Mid-level Supply	5.1	9.3	12.5
WR28 Transfer	2.5	7.2	7.3
TOTAL	**7.6**	**16.5**	**19.8**

7.4.4 WR-RJP (Mid Level) Supply Network

7.4.4.1 Supply Main: WR-RJP to RJP

The supply main from the new WR-RJP (mid-level) reservoir is required prior to the completion of Stage 1. This main has been sized at 450mm and runs from the reservoir to Hub Road. At Hub Road the existing 250mm main that runs along Gerogery Road can be reused as a supply main to the RJP and the Ettamogah Rise residential development.

7.4.4.2 RJP Eastern Ring Main

Branching off the supply main is an eastern ring main that runs from Gerogery Road, under the highway, loops through Stage 3, back under the highway and connecting back into the supply main of Gerogery Road. This main had been sized at 200mm, with a section of 250mm running along Hub Road from Gerogery Road to the Rail Intermodal site.

7.4.4.3 Reticulation Network

A reticulation network, in addition to the supply main and ring main, is required to service the RJP. The indicative layout is shown in Figure 7-11. A pipe size of 150mm is generally suitable for the reticulation network, however the sizing should be confirmed as the development uptake increases. The size of these pipes will need to be determined through further modelling, considering both peak hour and fire flow demands once actual demands are known.

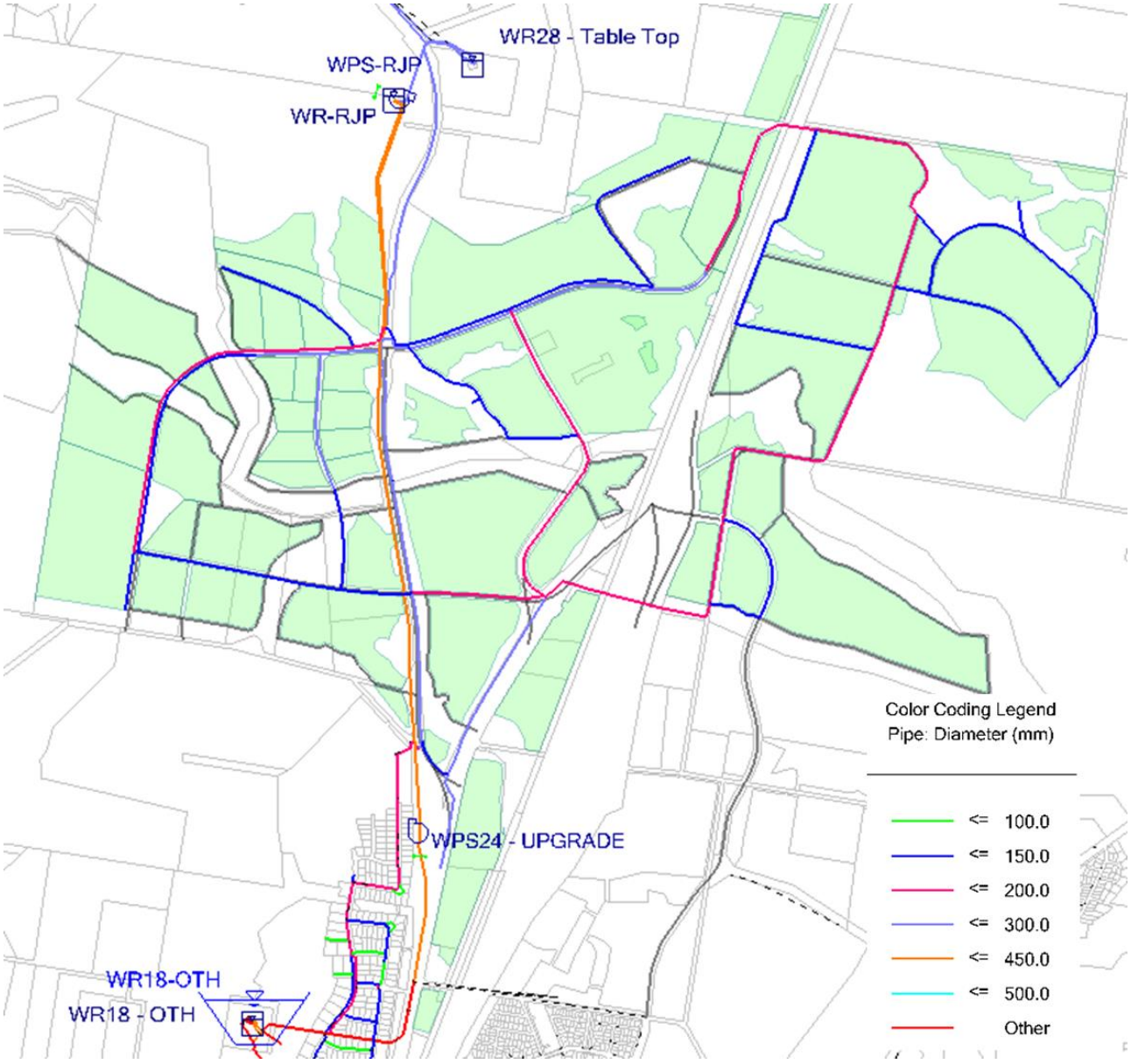

Figure 7-11 | Proposed Water Reticulation Network – New & Existing Pipes

7.4.5 New Water Pump Station, WPS-RJP

A new pump station (WPS-RJP) is required to transfer water from WR-RJP to WR-28 (Table Top).

As per Section 7.3.3, the pump station will be required prior to the completion of Stage 1. These approximate pump duties are based on the pump station delivering Peak Day Demand over 18 hours (refer to the infrastructure sizing requirements in Table 7–5). The staging of the pump station upgrades will need to be discussed and confirmed with Council.

Table 7–15 | WPS-RJP Approximate Pump Duties

Completed Stage	Approximate Pump Duty		
	Flow	Head	Power
RJP Stage 1	39 L/s	33m	7 kW
RJP Stage 2	111 L/s	38m	81 kW
RJP Full Development (Stage 3 & 4)	111 L/s	38m	81 kW

7.4.6 Transfer Main – WPS-RJP to WR28

As part of the upgrade system to support the development of the RJP, a new transfer main is required from WPS-RJP to WR28 (Table Top). This main has been sized at 300mm (Section 7.3.3 to Section 7.3.6) to transfer Peak Day Demand over 18 hrs (refer to the infrastructure sizing requirements in Table 7–5).

This pipe size was initially chosen as it is the current supply main size to the reservoir. Under Stage 1 the velocity and headloss in the pipe are low, 0.6 m/s and 1.3 m/km. However, under Stage 2 and full development the velocity and headloss increase to 1.7 m/s and 9.1 m/km. While the velocity is acceptable the headloss is high and will increase pump size and energy costs. Increasing the pipe size results in even lower velocities in Stage 1. Removing a high demand user, such as an abattoir which is less likely to develop in the steep section of the high level zone, would significantly reduce the flow and headloss.

Given the uncertainty of the demand loads in the RJP high-level zone, the pipe size was left at 300mm.

With further information on anticipated users and uptake timing Council may choose to reassess this pipe size as part of further design.

7.4.7 Table Top Reservoir, WR28

As the demand within the RJP increases, additional storage will be required at Table Top Reservoir. This is covered in Section 7.3.3 to Section 7.3.6, and is outlined in Table 7–16 below.

As per the infrastructure sizing requirements in Table 7–5, surface reservoirs are required to have a capacity of a minimum of 8 – 24 hours consumption at Peak Day Demand. The storage volume requirement will need to be discussed and confirmed with Council.

If alternative water sources can be secured to reduce the peak potable demand, these flow rates could be reduced.

Table 7–16 | WR28 (Table Top) Future Storage Requirements

Consumption at Peak Day Demand	Storage Volume (ML)		
	Stage 1	Stage 2	Full Development
8 hrs	0.8	2.4	2.4
16 hrs	1.7	4.8	4.9
24 hrs	2.5	7.2	7.3

7.4.8 WR28 (High Level) Supply Network

7.4.8.1 Reticulation Network

The existing network acts as the supply main for the high level zone to the RJP, while also still servicing the areas north of the WR28 (Table Top). The reticulation network for the high level zone of the RJP consists of two pipelines, a proposed

150mm main extending east from Gerogery Road along Hub and a proposed 200 mm main extending west from Gerogery Road through NEXUS to the high lots on the western side of Stage 2.

This network can be constructed as development occurs, with the pipe sizes determined through further modelling, considering both peak hour and fire flow demands once actual demands are known.

7.4.9 Pressure Reducing Valve

7.4.9.1 Back-up Supply

There is an opportunity to install a Pressure Reducing Valve (PRV) on Gerogery Road (north of Hub Road) to create a second supply to the mid-level zone from WR28 (Table Top) that can be used during network outages. This has not been modelled at this stage but should be considered further during network design.

7.4.9.2 Reticulation Network

Elevations in the RJP mid-level zone range from 211 m AHD to 250 m AHD, with the top water level of the proposed reservoir being 297 m AHD. Lower elevations will be subjected to high pressures. If these pressures are considered too high, a Pressure Reducing Valve (PRV) or series of PRVs could be installed. The location of any required PRVs should be discussed without and determined as the internal network is designed.

7.4.10 Further Network Upgrades

To achieve full development of the RJP particularly after Stage 2, further upgrades to the wider network will be required to improve water availability to WR-18 (One Tree Hill). The extent of these is not yet known and are dependent on the residential development in Thurgoona. These upgrades will need to be determined in collaboration with Council, who are currently investigating servicing strategies in this area.

7.5 Suggested Funding Mechanisms

To support the timely provision of new infrastructure within the Albury RJP, it is recommended that Council prepare a feasibility study and concept design for the location and sizing of new bulk water supply, water reticulation and reservoir infrastructure. This concept should then be costed and incorporated into a local infrastructure contributions policy and revised Section 64 Development Servicing Plan.

As much of the RJP is outside of the designated sewer area in the current Development Servicing Plan (DSP) which forms part of the Albury Infrastructure Contributions Plan 2014, a revised DSP will need to be prepared in order to levy contributions from development toward the provision of water upgrades associated with the RJP.

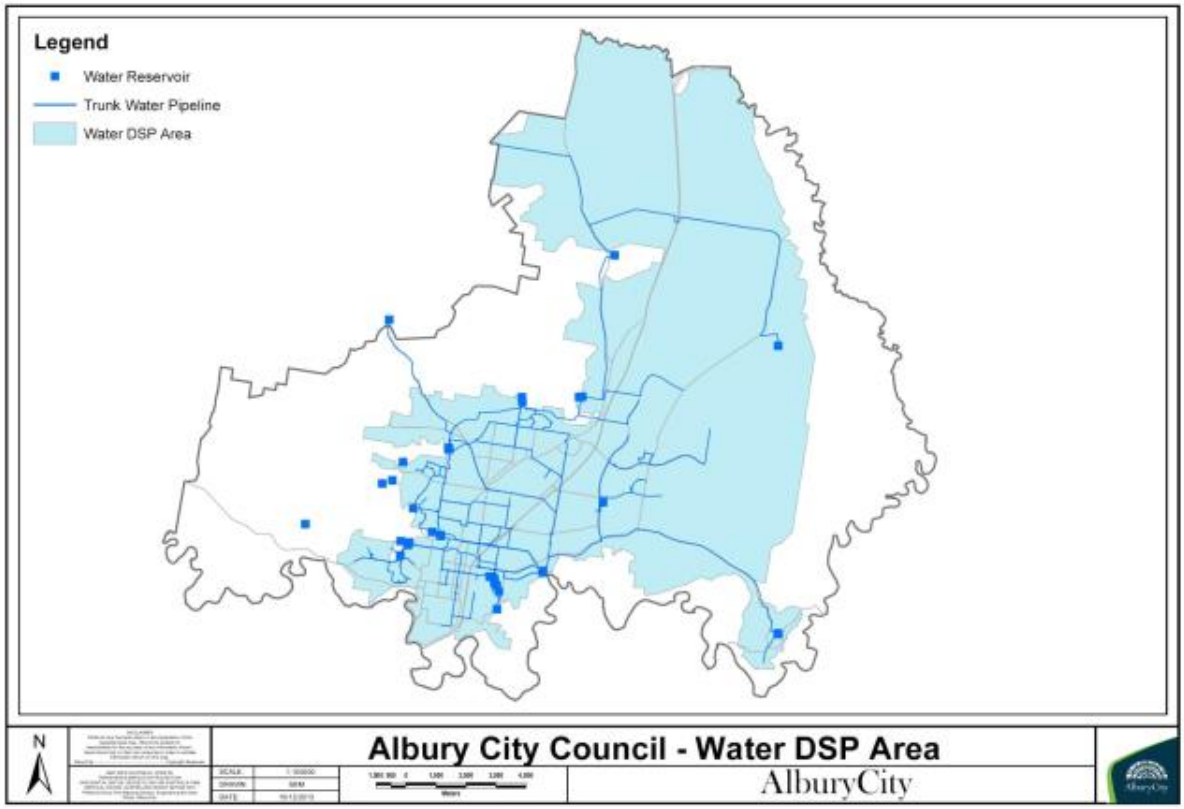

Figure 7-12 | Land Subject to Developer Charges for Water Infrastructure under the Albury Infrastructure Contributions Plan 2014

8. Sewerage

8.1 Baseline Assessment

The topography of the RJP study area is reasonably flat but is bounded by hills to the north and west, forming a basin around the investigation area. The RJP is located some 14km from the nearest Wastewater treatment plan (WWTP) at Waterview. An extension of the existing sewer network has been completed to provide a new DN450 sewer to the RJP study area, which was provided specifically to service the NEXUS subdivision, and was sized to accommodate anticipated flows for approximately 50% of the developable area of the RJP. Noting that the RJP investigation area is much larger than the NEXUS subdivision, the demand for wastewater servicing and treatment has been reassessed to consider what augmentation may be required. The new sewer exits the study area via the lowest point; however, invert levels for the new sewer will represent a constraint on the project for tie-in of new reticulation infrastructure from the development.

Wastewater loads will be dependent on the nature of industries within the new development. It is understood current modelling for the sewer network undertaken to support the NEXUS subdivision has assumed dry industries only, with approximated anticipated loads.

It has been noted by the Council that Albury is experiencing a higher than anticipated growth in the new eastern land release areas, which has caused a review of current sewer strategy and is currently driving infrastructure requirements to accommodate increasing loads. Specific consideration is required to appropriately balance infrastructure requirements for the current high growth in the new eastern growth corridor and potential future anticipated load from the Albury RJP investigation area, whilst also avoiding overcapitalisation on new infrastructure.

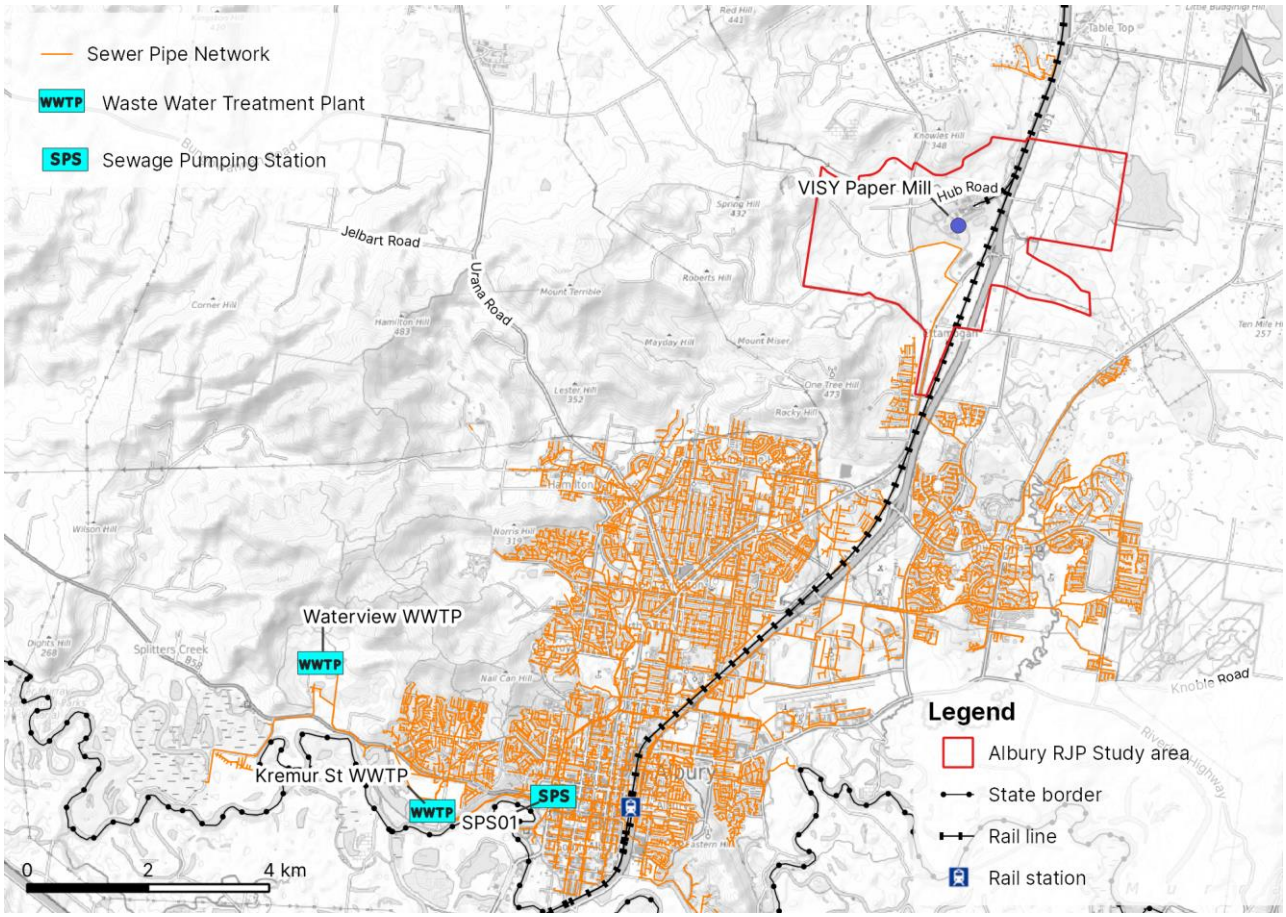

Figure 8-1 | Existing Sewer Network

As shown in Figure 8-1, the existing sewer network comprises approximately 500km of combined gravity and pressurised sewers with six large pumps stations. The general topography across the catchment slopes from north to south towards the two treatment plants located in the south western area of the catchment: Waterview WWTP and Kremur Street

WWTP. Whilst this topography supports the flow of wastewater towards the existing wastewater network, it is noted that existing treatment infrastructure is located south west of the Albury CBD representing the longest run for sewer from this area.

The majority of flows across the network are collected at Wodonga Place SPS (SP01) on the corner of Wodonga Place and Smollett Street where flows are pumped to the Kremur Street WWTP. Inflows can be further pumped to the Waterview WWTP located approximately 3km northwest of the Kremur Street Treatment Plant near Splitters Creek.

The Kremur Street WWTP was constructed in 1916 with the last major upgrade works occurring in the late-1980's. The Kremur Street WWTP provides secondary treatment through a Biological Nutrient Removal (BNR) activated sludge process and has a nameplate treatment capacity of 12 ML/d. Disinfection is achieved through 30-day maturation ponds. The Kremur St WWTP includes two maturation ponds which make up part of Horseshoe Lagoon in West Albury. During wet weather, flows that cannot be treated are screened and transferred to Horseshoe Lagoon for later treatment at Waterview WWTP. The Kremur Street WWTP has backup alum dosing to remove phosphorus. Biosolids are currently disposed at the Albury Landfill and it is understood there are no minimum chemical or biological standards for the disposal of biosolids at the landfill.

The Waterview WWTP was constructed in 2000 and also utilises a BNR process. The plant has a nameplate capacity of 8 ML/d. However, it is understood that ACC have plans to augment it to service the whole catchment, which would allow decommissioning of the Kremur Street WWTP. The Waterview WWTP also incorporates a tertiary treatment process utilising sand filtration and sodium hypochlorite for disinfection and has backup alum dosing to remove phosphorus.

One hundred percent of treated effluent across both treatment plants is reused as part of a reclaimed water re-use system. Treated effluent is either discharged to the nearby Wonga Wetlands, used as irrigation for nearby timber plantations and/or utilised by residents for irrigation purposes. It is acknowledged that the existing WWTPs in Albury do not provide trade waste services, and future industries would either need to similarly treat wastewater on site, or an upgrade to Council's treatment facilities may be required.

The Albury RJP investigation area is situated approximately 10km north of the Albury CBD and is located at the upstream extent of the existing sewer network. It is noted the Visy owned paper mill is located within the boundary of the study area and includes connection to a reticulation sewer. The Visy site also contains an onsite treatment plant that was utilised (when the plant was operational) to treat wastewater produced from paper mill processes. It is understood the Visy wastewater treatment plant provided treated effluent to a Class B standard, which was then distributed to the Ettamogah irrigation scheme for reuse.

If the paper mill were to become operational again, there could be opportunities to utilise the treated effluent from Visy as part of the eventual Integrated Water Cycle Management (IWCM) Plan for non-potable purposes, such as process water, etc. This would be dependent on the discharge license and treated effluent quality associated with the Visy WWTP. Potentially if there are opportunities to utilise either produced effluent and/or returned water from the Visy processes, this could offset potable water supply in the area.

Wastewater loads from the new development will be dependent on the specific industries that occupy the RJP and associated process water requirements; however, consideration will be required on the impact new wastewater demands have on existing infrastructure and possible cascading effects, such as sewer augmentations, given the long travel path anticipated for wastewater flows to existing WWTPs.

8.2 Planned infrastructure works and upgrades

A summary of the planned infrastructure works associated with the sewer network as defined in the *Albury City Council, Sewerage Supply Strategy 2017* (GHD) is provided in Figure 8-2 below.

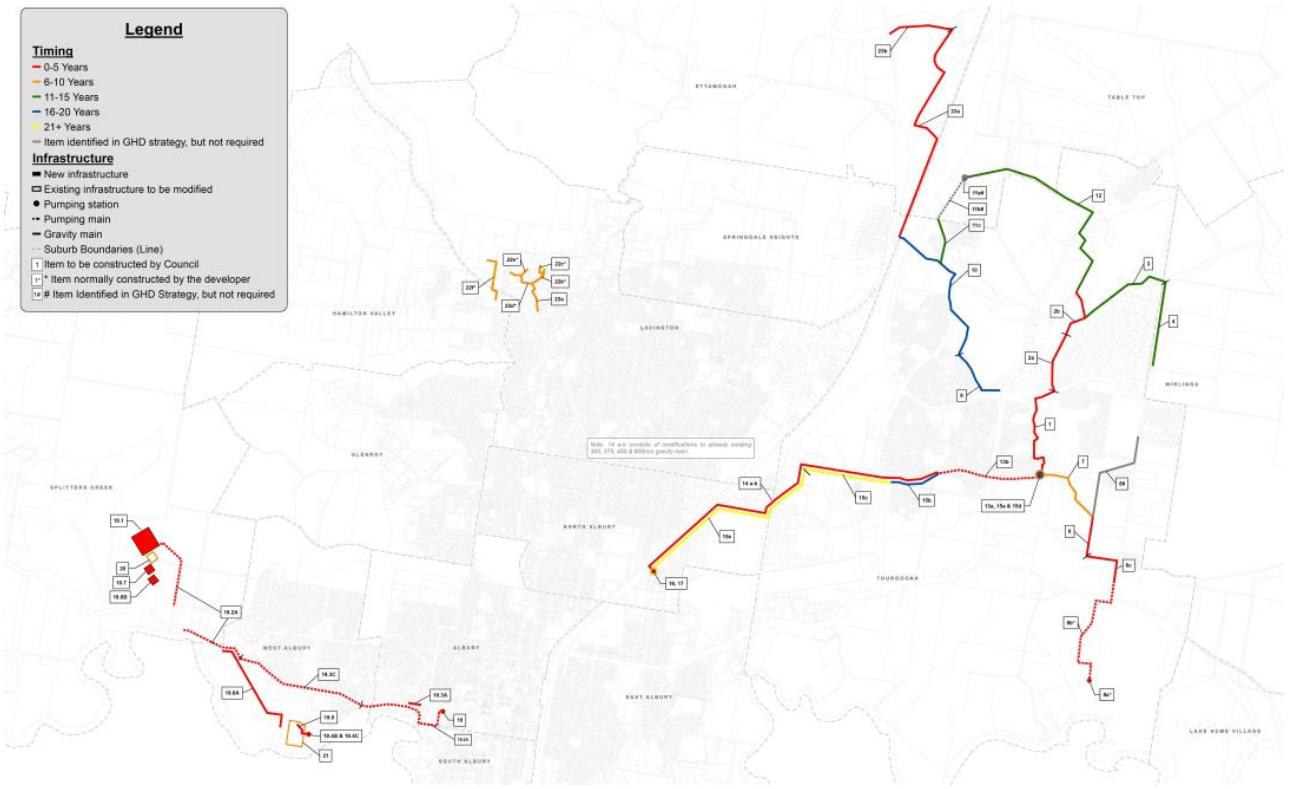

Figure 8-2 | Proposed Major Capital Works – Wastewater (Albury City Council, Sewerage Supply Strategy 2017 - Appendix F)

Recent discussions with ACC have confirmed that the works proposed under the previous sewer strategy are under constant review and overarching strategies are being updated to reflect actualised population growth. It is noted that review of the current sewer strategy and commitment to projects has been primarily driven by higher than anticipated growth in new residential developments, specifically the Thurgoona Wirlinga Residential Area.

Of the projects identified in Figure 8-2, the sewer extension to the Albury RJP investigation area has been constructed and is a DN450mm gravity main. Capacity of this main is anticipated to be sufficient for approximately 50% of the anticipated developed area for the Albury RJP investigation area. ACC have advised there is sufficient space available to duplicate the main to meet ultimate wastewater flows from the Albury RJP investigation area.

Immediately downstream of the identified DN450 trunk sewer is a proposed upgrade to the existing DN300 sewer between Wagga Road and Slattery Place to a DN375. Works are anticipated to be required along this section to accommodate flows from the RJP as well as residential growth in the Springdale Heights area. It is proposed this section be augmented within 15-20yrs.

The other major trunk sewer works directly impacted by flows from the Albury RJP are proposed upgrades and augmentations to the trunk main between Corrys Rd and Jelbart Rd SPS (SP37), refer items 14 and 15 in Figure 8-2 above. This sewer varies in size between DN375-DN600 and is estimated to have a hydraulic capacity of 200 L/s due to the relatively flat grade. Augmentation of the sewer primarily comprises construction of a new DN450 parallel sewer along the length of sewer between Corrys Rd and Jelbart Rd SPS (SP37). Jelbart Rd SPS (SP37) is also identified for an augmentation within 5 years. It is understood Council are currently implementing an upgrade from the current duty point of 440L/s to a new flow rate of 550L/s.

As noted earlier, it is also understood the Kremur Street WWTP will eventually be decommissioned and augmentation of the Waterview WWTP will be undertaken to service the full catchment. Discussions with ACC have advised the current timing of decommissioning is 2028 and augmentation of the Waterview WWTP would likely comprise duplication.

The current sewer strategy directs the majority of flows in the eastern catchment, including Albury RJP and Thurgoona Wirlinga, towards a new major pump station which would comprise upgrading existing pump station SPS59, located along Lindisfarne Ct. Council have advised this strategy is currently under review and an alternative strategy is now likely, due to construction limitations required for the necessary upgrade.

It is understood a revised strategy is preferencing construction of a new Northern WWTP to treat flows from the eastern portion of the catchment, including flows from the Albury RJP. Preliminary location of a new Northern WWTP is within the North Eastern area of the Albury RJP, which would allow diversion of flows from the study area. It is noted any revision to the current strategy is still in development and subject to change.

8.3 Recommended Upgrades

8.3.1 Overview

This section provides a summary of the recommended options for wastewater infrastructure that will be required to support the Albury RJP Master Plan. Consideration has been provided for network assets (sewers and pump stations), wastewater treatment and effluent management, including recycled water reuse.

This strategy is intended to be flexible to the changing needs of the RJP as development progresses and land use composition changes. We have adopted the three staged approach from the RJP master plan (as detailed in Section 4.3), aligning augmentations with increased demand associated with the RJP. Council will need to monitor growth from the RJP and Thurgoona to ensure appropriate timing of the required upgrades, so that infrastructure is provided in a timely manner.

8.3.2 Basis of Assessment

Consideration of identified upgrades to manage new sewage loads from the RJP has considered the following elements:

- Determine estimated wastewater loads based on proposed land use and staging in accordance with the master plan layout
- Determine new infrastructure for sewering of the RJP with consideration of the following:
    - Utilisation of existing sewer assets
    - Topography of the RJP and downstream constraints of existing sewer infrastructure
    - Appropriate staging of infrastructure in line with proposed staging of the master plan
    - Appropriate alignment for new network infrastructure to align with proposed master plan layout
    - Consideration of possible pump station locations (if required)
- Assess capacity of existing sewer network to receive new wastewater demands from the RJP, including:
    - New or upgraded infrastructure within the existing sewer network
    - Staging or trigger points associated with possible upgrades or new infrastructure
    - Consideration of demands (current and future) within the receiving sewer network
- For the purposes of this assessment, the existing Albury SewerGEMS Network Model has been utilised to assess existing infrastructure capacity for new water loads from the RJP.

8.3.2.1 Extent of study

For the purposes of this study, network modelling has been limited to infrastructure directly impacted by flows from the RJP upstream of the existing Jelbart Rd SPS (SP37). This pump station is identified as the second largest pump station within the Albury wastewater network and is a primary asset for the facilitation of wastewater flows from the eastern and northern catchments of Albury towards treatment infrastructure in the south west. A visual representation of the sub-catchment is provided in Figure 8-3, including the travel path for wastewater from the RJP to Jelbart Rd SPS (SP37). The existing sewer along the travel path is approximately 12.2km in length and varying in diameter from DN300–DN600.

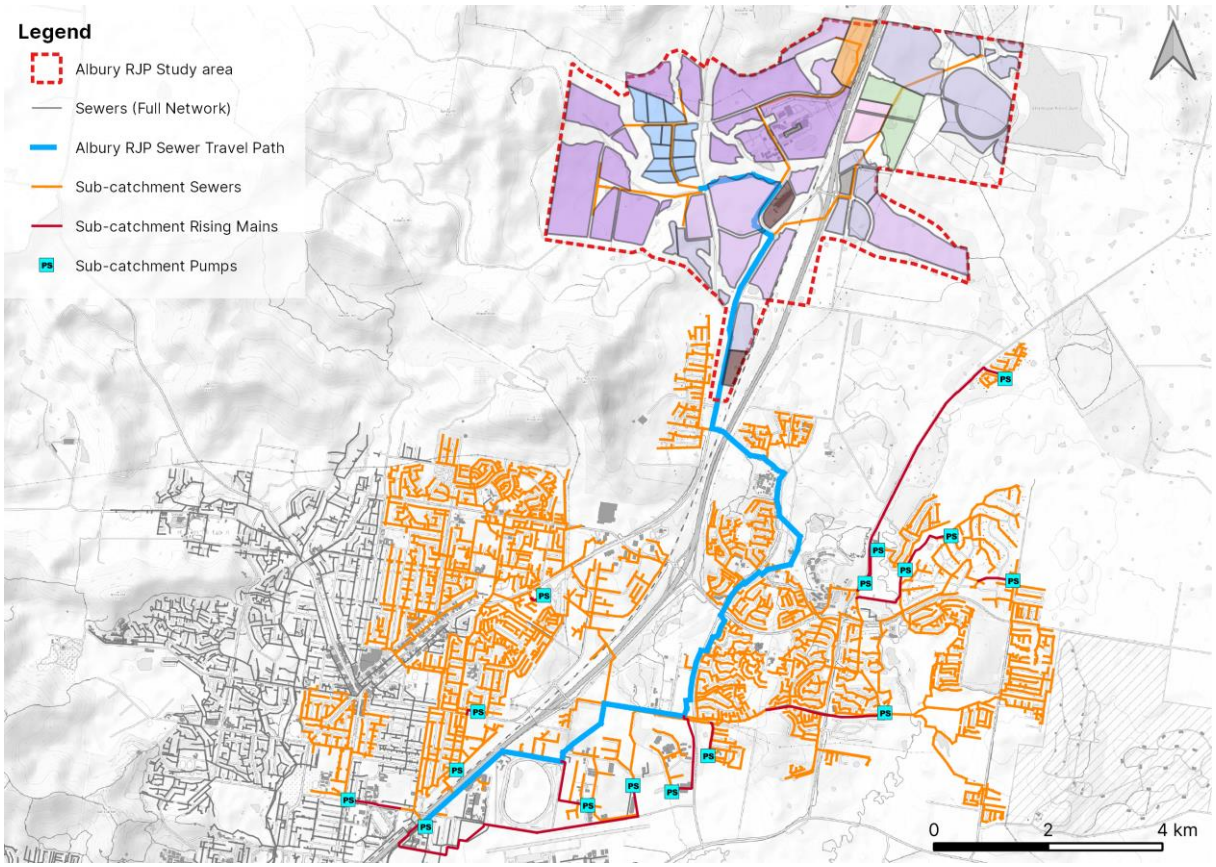

Figure 8-3 | Overview of adopted sub-catchment for Albury RJP (travel path for RJP loads shown in blue)

8.3.2.2 Demand Assessment

8.3.2.2.1 Existing Demands (Residential and Non-Residential)

Existing and forecasted residential and non-residential loads outside the RJP are assumed to be as per existing loading within the provided model. It is understood existing loads have been calibrated based on SCADA data and are as follows:

- ADWF = 0.008 L/s per ET (~691 L/d per ET) – assumes 2.35 EP/ET; provided by Council
- PDWF = ~2x ADWF (varies as per diurnal patterns within provided SewerGEMS model)
- PWWF = ~8x ADWF (calibrated peaking factor for diurnal patterns provided by Council)

A summary of the anticipated demands from the existing and forecasted residential loads are provided in Table 8–1 below, including anticipated population and loading from the Thurgoona Residential Development.

As noted earlier the Thurgoona Wirlinga Residential Area is currently experiencing higher than anticipated growth in new developments. Discussions with ACC have advised the development is expected to comprise 20,000 total dwellings and having an estimated total EP of 45,160 (2.26 EP/ET) based on ultimate loading in the provided model. Based on discussions with Council it has been assumed growth for the Thurgoona Wirlinga Residential Area is in the order of 300 dwellings per year or approximately 700 residents per year.

Based on discussions with ACC, growth for existing catchment within Albury is assumed to be approximately 0.50%, equating to approximately ~100 dwellings per year (400 total including Thurgoona Wirlinga Residential Area). Under these assumptions total population growth for Albury varies between 1.7-1.9% p.a. which is considered conservative for the region, but suitable for possible staging of required infrastructure.

Ultimate loads from the remaining Albury catchment have been extracted from the provided SewerGEMS model and equate to approximately 18.4 ML/d (62,464 EP for 294L/EP per day). The existing residential and non-residential flows across Albury have been represented in Table 8–1 below for the Jelbart Rd SPS sub catchment and remaining Albury.

A figure of the sub catchments considered for this assessment is provided in Figure 8-4 to represent the model extents for Albury RJP, Thurgoona Residential, Jelbart Rd sub catchment and remaining Albury catchment.

Table 8–1 | Summary of Estimated Wastewater Demands for Albury RJP

Catchment	Existing – 2022		Stage 1 – 2026		Stage 2 – 2036		Stage 3 – Ultimate	
	EP	ADWF (ML/d)	EP	ADWF (ML/d)	EP	ADWF (ML/d)	EP	ADWF (ML/d)
Thurgoona Wirlinga Residential	0	0.00	2,710	0.80	9,484	2.79	45,160	13.3
Jelbart Rd Sub catchment (excluding Albury RJP and Thurgoona Wirlinga)	19,972	5.87	20,375	5.99	21,417	6.30	29,494	8.7
Remaining Albury Catchment	27,925	8.21	28,488	8.38	29,945	8.81	33,749	9.9
TOTAL	**47,897**	**14.1**	**51,572**	**15.2**	**60,845**	**17.9**	**108,403**	**31.9**

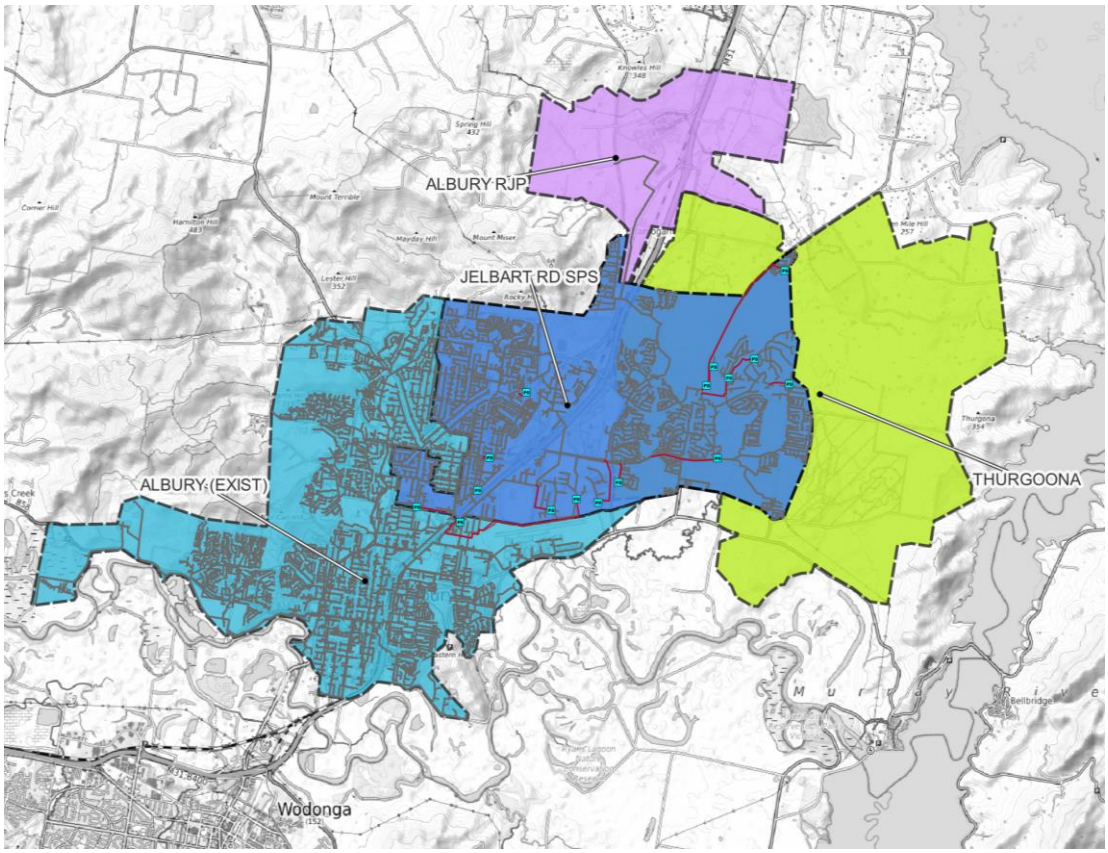

Figure 8-4 | Overview of adopted sub catchments

8.3.2.2.2 RJP Demands

Wastewater demands for the RJP have been estimated based on the land uses and staging proposed in the master plan.

The generalised land uses for the Albury RJP, as defined in the master plan, and a summary of composition and potential uses has been provided below:

- **General industrial**, comprising; microgrid (solar energy), service / light industry, freight, logistics and distribution centres, agriculture value-add processing & manufacturing, waste or resource management facilities, office, plant and parts manufacture
- **Heavy Industry**, comprising; chemicals manufacture / mixing, waste to energy, circular energy production, heavy manufacturing (e.g., overall forge), heavy industrial storage establishment, office space, abattoir

- **Intermodal**, comprising; intermodal terminal (public access), warehouse, refrigeration storage, dangerous chemical storage & office space
- **Productivity**, comprising; commercial, low impact small footprint support industries, IT and business support services, education, retail
- **Service Station**, including electrical charging

As per above it is noted that the Heavy Industry land use type includes a component for an abattoir. Inclusion of an abattoir within the RJP represents a high water user and will therefore produce a high volume of wastewater. For the purposes of this assessment an approximate ET for the abattoir component of the Heavy Industry will be estimated using Section 64 Determinations of Equivalent Tenements Guidelines (Water Directorate, April 2017). A nominal 10% of the proposed Heavy Industry area has been allocated for an abattoir with a loading rate of 1,143 ET per Built-up Ha.

Whilst it is still yet to be determined whether an abattoir will be included in the final development, it is considered beneficial to include a high demand industry within the modelling to provide guidance on possible infrastructure requirements if a high water user is included in the eventual development.

Table 8–2 | Summary of Contributing EP per land use type

Land Use Type	Development Area (Ha)	Contributing EP	Average EP Loading Rate (EP/Ha)
General industrial	253.2	6,605	26.1
Heavy Industry	185.1	20,403	110.2
Intermodal	13.0	424	32.6
Productivity	35.2	1,900	54.0
Service Station	2.3	13	5.5

A summary of the anticipated ADWF wastewater flows for each land use type is provided in Table 8–3 below, and the associated PDWF and Design Flows are provided in Table 8–4.

Table 8–3 | Summary of Albury RJP ADWF for nominated land use types

Land Use Type	Existing (L/s)	Stage 1 – 2026 (L/s)	Stage 2 – 2036 (L/s)	Stage 3 – Ultimate (L/s)
General industrial	0.00	3.70	8.01	16.67
Heavy Industry	1.64	14.17	51.48	51.48
Intermodal	0.00	0.65	0.65	1.07
Productivity	2.48	5.44	5.44	10.24
Service Station	0.00	0.03	0.03	0.03
TOTAL	**4.12**	**23.99**	**65.62**	**79.48**

Table 8–4 | Summary of Estimated Wastewater Demands for Albury RJP

Master Plan Staging	ADWF (L/s)	PDWF (L/s)	Design Flow (L/s)
Existing	4.1	8.2	19.1
Stage 1	24.0	47.5	123.6
Stage 1 & 2	65.6	129.8	315.5
Stage 3 (Full Development)	79.5	157.3	416.3

8.3.2.3 Performance Criteria

8.3.2.3.1 Dry Weather

The following general performance criteria has been adopted for peak dry weather scenarios based on WSA 02:

- Flow depth at PDWF for existing sewers to be no more than 100% full

- No overflows from constructed overflow structure or maintenance holes
- Existing pump stations not considered for performance criteria under dry weather flows

8.3.2.3.2 Wet Weather

The following general performance criteria has been adopted for design flow scenarios based on WSA 02:

- Pump station capacity exceeds design flows
- Existing treatment plant capacity exceeds 3x ADWF (nominal) to 8x ADWF (PWWF as advised by Albury City Council)

8.3.2.3.3 New Infrastructure

The following assumptions have been adopted in accordance with the master plan for the sizing of any new infrastructure with general performance criteria adopted for design flow scenarios based on WSA 02: New gravity sewers to achieve the following at the existing 'as-constructed' pipe grade:

  - Flow depth at Ultimate PDWF to be no more than 60% full
  - Flow depth under Ultimate design flows does not exceed the pipe soffit i.e., 100% pipe full
- Pump Stations:
  - Duty flow rate no less than design flow rate
  - Nominal rising main velocity of 1.0-1.5 m/s. Pending pump head requirements
  - Emergency storage equivalent to 4hr at ADWF from combined wet well and emergency storage
- Wastewater Treatment Plants to have a nominal treatment capacity of 3x ADWF

8.3.2.4 Network Modelling Scenarios

The existing network will be assessed against the above performance criteria to identify possible upgrades associated with each stage. For the purposes of this assessment staging will be assumed as follows:

- Base Case - 2022: Existing network with no additional flows from RJP
- Stage 1 - 2026: Base Case + Stage 1 flows from RJP
- Stage 2 - 2036: Base Case + Stage 2 flows from RJP
- Stage 3 (Ultimate): Base Case + Stage 3 flows from RJP

The SewerGEMS model provided includes 2022, 2023 and Ultimate scenarios with appropriate representation of residential and non-residential loads, including additional loads to represent Ultimate conditions for the Thurgoona Wirlinga Residential Area. ADWF and PDWF flows are determined in the model via Diurnal Patterns, which have been designated Residential, Industrial, Business, etc. As noted earlier, a preliminary calibration of the model has been undertaken by Council and estimates the PWWF to be approximately 8x ADWF at peak flows. For the purposes of this modelling these assumptions have been retained; however, it is understood Council will complete further investigations and calibration of the model as part of reviewing the existing sewer servicing strategy, including infiltration and inflow investigations to determine peak wet weather flows.

8.3.3 Performance Assessment

8.3.3.1 Existing Gravity Network

8.3.3.1.1 Base Case

A summary of the dry and wet weather performance for the Base Case scenario is provided in Figure 8-5 and Figure 8-6 below respectively. In accordance with assessment criteria outlined earlier, occurrences of surcharging pipework and overflow locations have been identified.

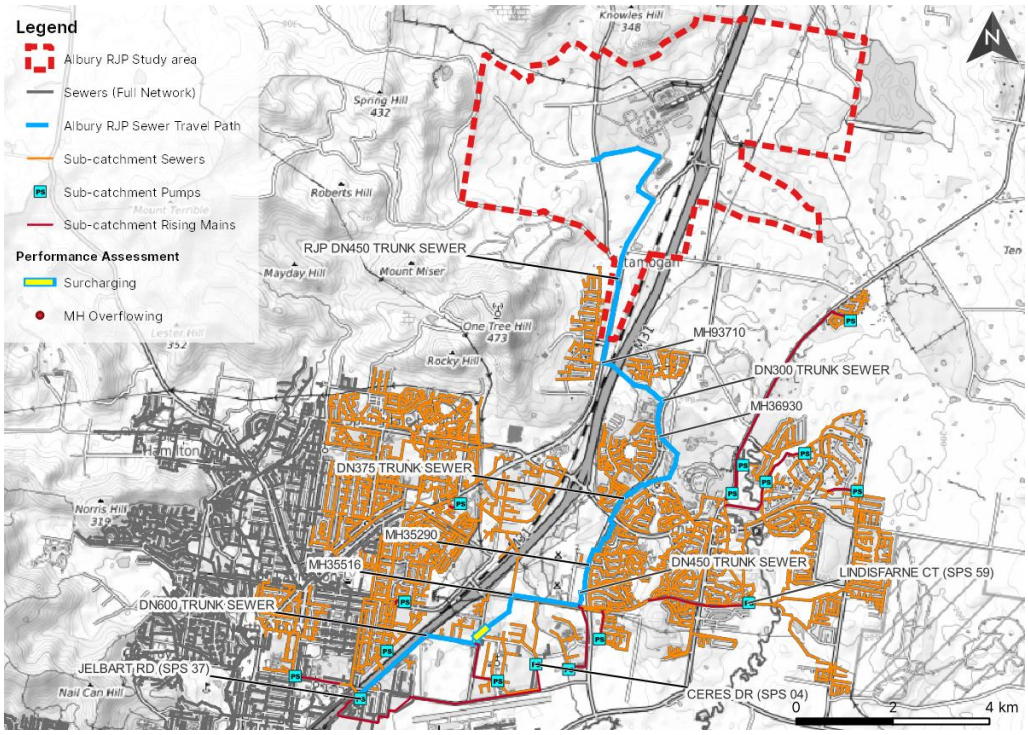

Figure 8-5 | Summary of Network Dry Weather Performance for Base Case scenario

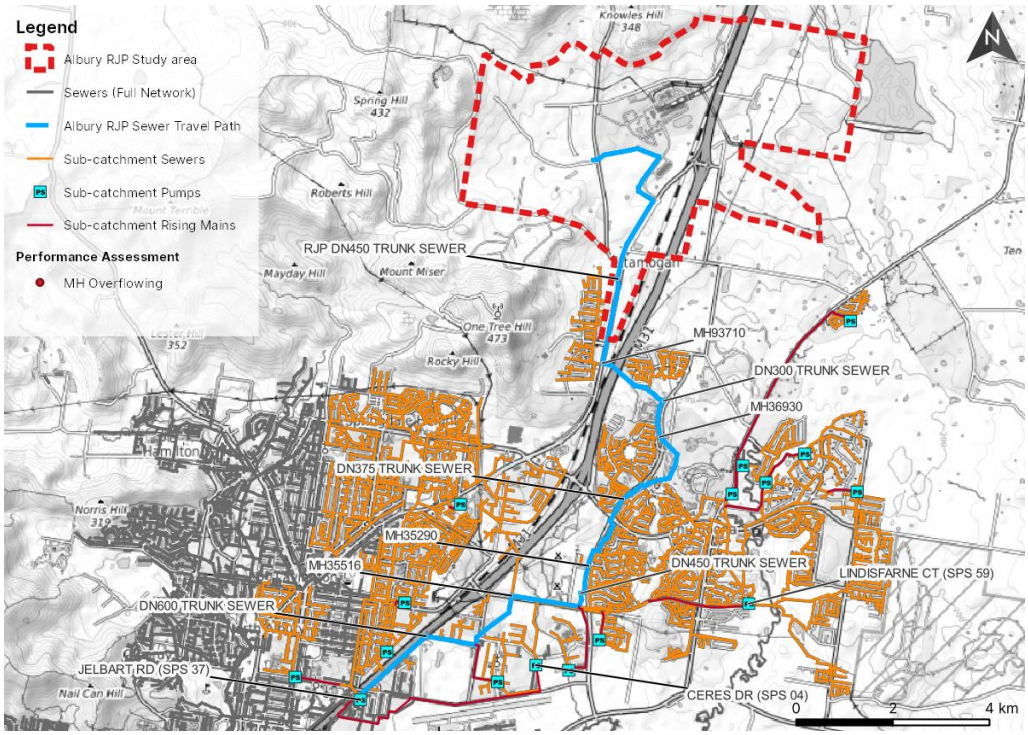

Figure 8-6 | Summary of Network Wet Weather Performance for Base Case scenario

Observations regarding the dry and wet weather performance of the gravity sewer network are as follows:

- Existing development of the RJP is currently minimal with only a few NEXUS lots occupied
- Gravity sewers downstream of the RJP are not anticipated to experience overflows under the existing wastewater demands
- The majority of gravity sewers downstream of the RJP are not anticipated to experience surcharging under peak dry weather flows excluding localised surcharging within the common DN600 trunk sewer

- DN600 trunk sewer (between MH35276 and Jelbart Rd SPS):
    - Localised surcharging of sewers between MH34125 and MH32008 is anticipated under Base Case dry weather flows. This sewer is noted as being capacity restricted due to very flat grading and receives additional flows from residential lots in Thurgoona and minor flows from Terry Ct SPS (SP42).
    - It is also noted that flows from Lindisfarne Ct SPS (SP59) can be discharged to this sewer; however, Council have advised that these flows area currently being diverted to Ceres Dr (SP04) at MH37953 due to capacity issues. This arrangement has also been replicated in modelling for this project.

8.3.3.1.2 Stage 1

A summary of the dry and wet weather performance for the Stage 1 scenario is provided in Figure 8-7 and Figure 8-8 respectively. In accordance with assessment criteria outlined earlier, occurrences of surcharging pipework and overflow locations have been identified.

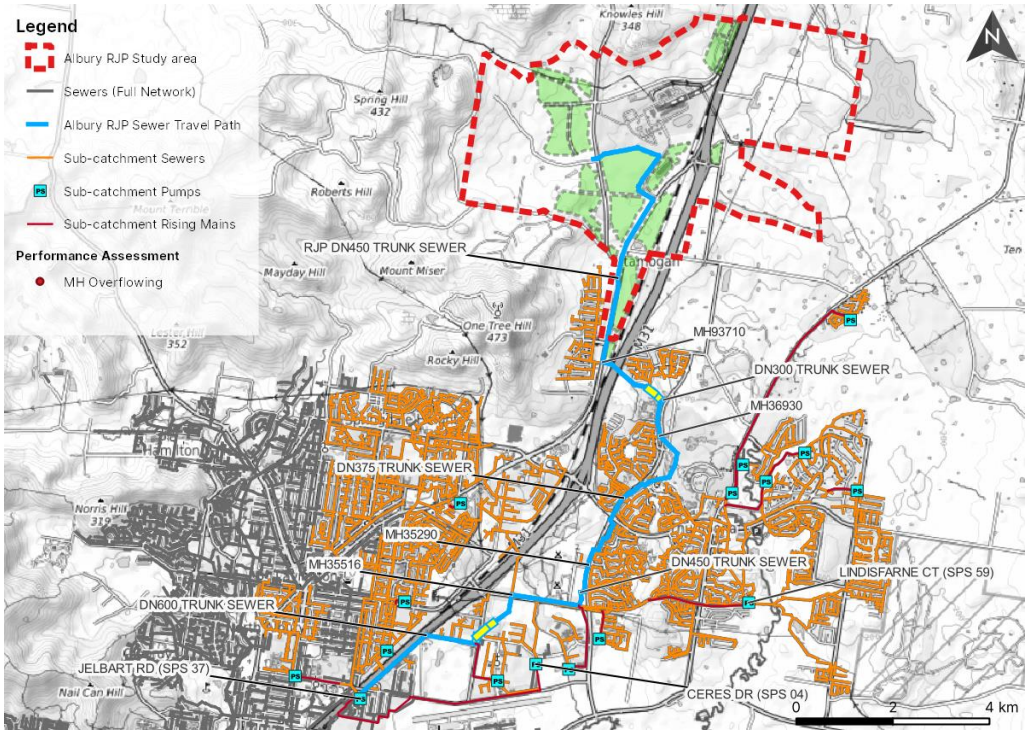

Figure 8-7 | Summary of Network Dry Weather Performance for Stage 1 scenario

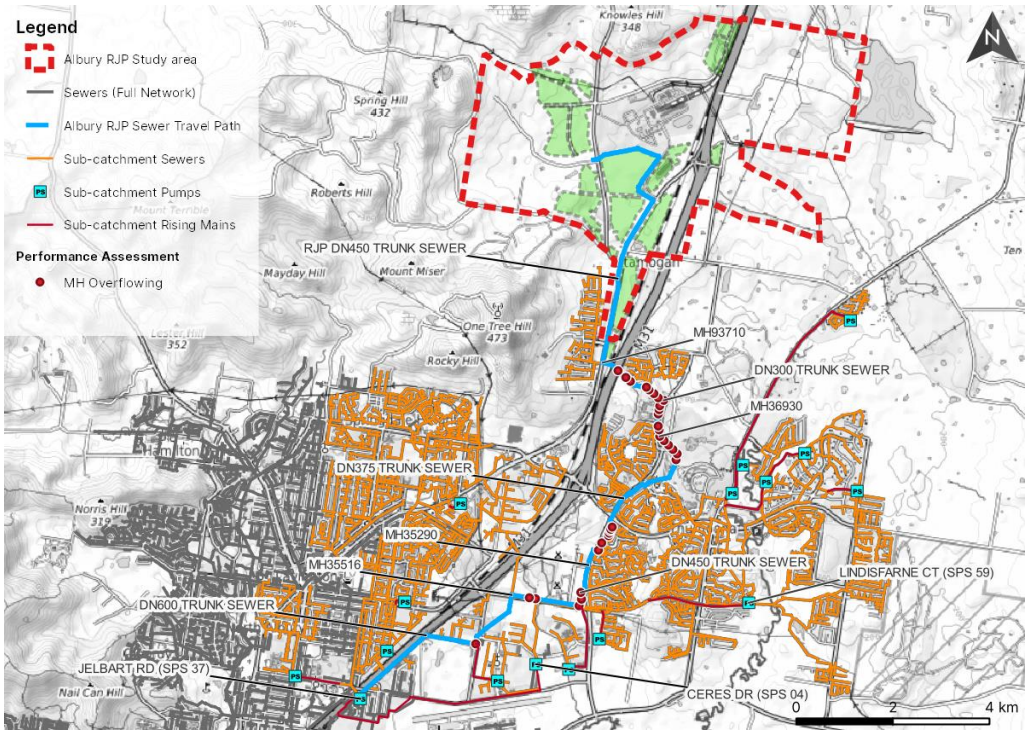

Figure 8-8 | Summary of Network Wet Weather Performance for Stage 1 scenario

Observations regarding the dry and wet weather performance of the gravity sewer network are as follows:

- The Stage 1 component of the RJP is identified in the above figures and represents approximately 30.2% of the fully developed conditions
- DN300 trunk sewer (between MH93710 and MH36930):
    - Dry Weather Performance:
        - Surcharging is anticipated to be initiated between MH36941 and MH36939 during Stage 1, primarily due to flat grading through the section.
        - The estimated flow rate at the time of surcharging is equivalent to an additional 42.8 L/s, which is equivalent to an EP of 8,579 (approximately 90.2% of the Stage 1 development or 27.2% of the total RJP development)
    - Wet Weather Performance:
        - Overflows are anticipated at a number of locations primarily due to sections of very flat grading restricting capacity and surcharging of the downstream network.
        - Overflows in this section are initiated at MH36941 equivalent to an additional wet weather flow of 47.0 L/s, which is equivalent to an EP of 3,560 (approx. 37.4% of the Stage 1 development or 11.3% of the total RJP development)
        - Further overflows are anticipated to occur at MH36937 equivalent to an additional wet weather flow of 84.2 L/s, which is equivalent to an EP of 6,372 (approx. 67.0% of the Stage 1 development or 20.2% of the total RJP development)
    - This sewer is identified for augmentation as part of the existing sewer servicing strategy and will be required prior to full development of Stage 1. Augmentation is anticipated to be triggered by overflows from wet weather flows. Further discussion on augmentation requirements is provided in Section 8.3.4.
- DN375 trunk sewer (between MH36930 and MH35290):
    - Dry Weather Performance:
        - Surcharging of the section under dry weather flows is not anticipated to occur under Stage 1 flows

- Wet Weather Performance:
  - Overflows are anticipated at the section immediately downstream of the DN300 trunk sewer due to very flat grading, restricting capacity of a number of sewers.
  - Overflows in this section are initiated at MH36930 equivalent to an additional wet weather flow of 75.4 L/s, which is equivalent to an EP of 5,709 (approximately 60.0% of the Stage 1 development or 18.1% of the total RJP development)
  - Overflowing of the identified sewers in this section is expected to progress through to MH36604 equivalent to an additional wet weather flow of 111.6 L/s, which is equivalent to an EP of 8,447 (approximately 88.8% of the Stage 1 development or 26.8% of the total RJP development)
  - Overflows are also anticipated further downstream between MH35457 and MH35441 near Sugar Gum Rd. Capacity in this section is restricted due to under capacity of the DN375 sewer and sections of very flat and/or negative grading.
- Portions of this sewer are identified for augmentation as part of the existing sewer servicing strategy and may be required prior to full development of Stage 1 due to overflows from wet weather flows. However, given these sections are not surcharging under peak dry weather flows, further consideration on augmentation timing should be completed as part of calibrating the existing network model and further investigation of peak wet weather flows. Further discussion on augmentation requirements is provided in Section 8.3.4.

- DN450 trunk sewer (between MH35290 and MH35516):
  - Dry Weather Performance:
    - Surcharging of the section under dry weather flows is not anticipated to occur under Stage 1 flows
  - Wet Weather Performance
    - Overflows are anticipated to occur in this section between MH36702 and MH35518. This section is upstream of the previously identified capacity restricted DN600 sewer and receives additional flows from residential lots in Thurgoona and minor flows from Terry Ct SPS (SP42).
    - Overflows in this section are initiated at MH35518 equivalent to an additional wet weather flow of 61.1 L/s, which is equivalent to an EP of 4,624 (approximately 48.6% of the Stage 1 development or 14.7% of the total RJP development). Note triggering flow for overflow at this location assumes Albury RJP only and therefore excludes population growth from Albury and the Thurgoona Wirlinga Residential Development.
    - Overflows are also anticipated further upstream between MH35276 and MH35286, which runs adjacent to Elizabeth Mitchell Dr and is immediately upstream of the tie-in point for residential flows from Thurgoona and SP42. This section is noted to be under capacity due to very flat and/or negative grading.
    - Overflows in this section are initiated at MH35286 equivalent to an additional wet weather flow of 79.4 L/s, which is equivalent to an EP of 6,011 (approximately 63.2% of the Stage 1 development or 19.1% of the total RJP development).
- DN600 trunk sewer (between MH35516 and Jelbart Rd SPS):
  - Dry Weather Performance:
    - Previously identified surcharging is anticipated to extend upstream to MH32007 under Stage 1 flows.
    - The estimated flow rate at the time of surcharging this section is equivalent to a dry weather additional flow of 44.2 L/s, equivalent to an EP of 8,844 (approx. 93.0% of the Stage 1 development or 28.1% of the total RJP development)
  - Wet Weather Performance

- Overflows are anticipated to occur at MH34124, which is immediately downstream of the previously identified surcharged section. Overflows are initiated here as the manhole is noted to be shallower than the upstream surcharging maintenance holes.
- Overflows in this section are initiated at MH34124 equivalent to an additional wet weather flow of 99.8 L/s, which is equivalent to an EP of 7,556 (approximately 79.5% of the Stage 1 development or 24.0% of the total RJP development).
- The existing servicing strategy identifies upgrade works along the length of the capacity restricted section, including utilisation of lift pump stations and construction of a parallel trunk main. Discussions with Council have advised that this strategy is under review and an alternative arrangement may comprise diversion of flows towards Ceres Dr SPS (SP04), which has more capacity in the trunk main, and possible augmentation of SP04. Further discussion on augmentation requirements is provided in Section 8.3.4.

8.3.3.1.3 Stage 2

A summary of the dry and wet weather performance for the Stage 2 scenario is provided in Figure 8-9 and Figure 8-10 respectively. In accordance with assessment criteria outlined earlier, occurrences of surcharging pipework and overflow locations have been identified.

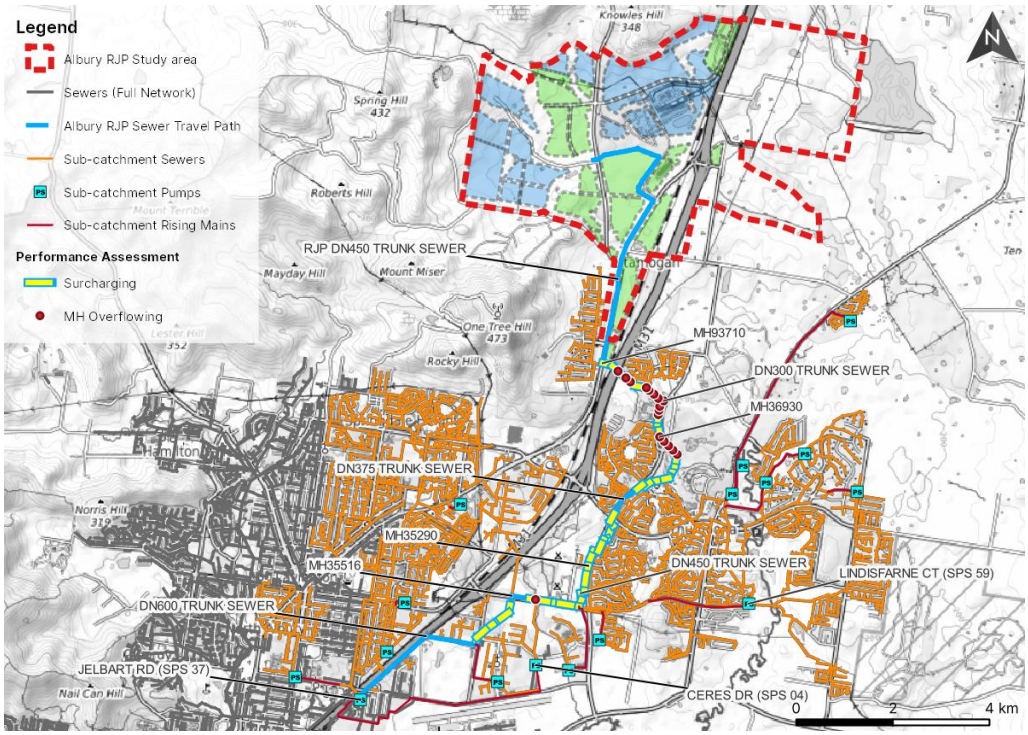

Figure 8-9 | Summary of Network Dry Weather Performance for Stage 2 scenario

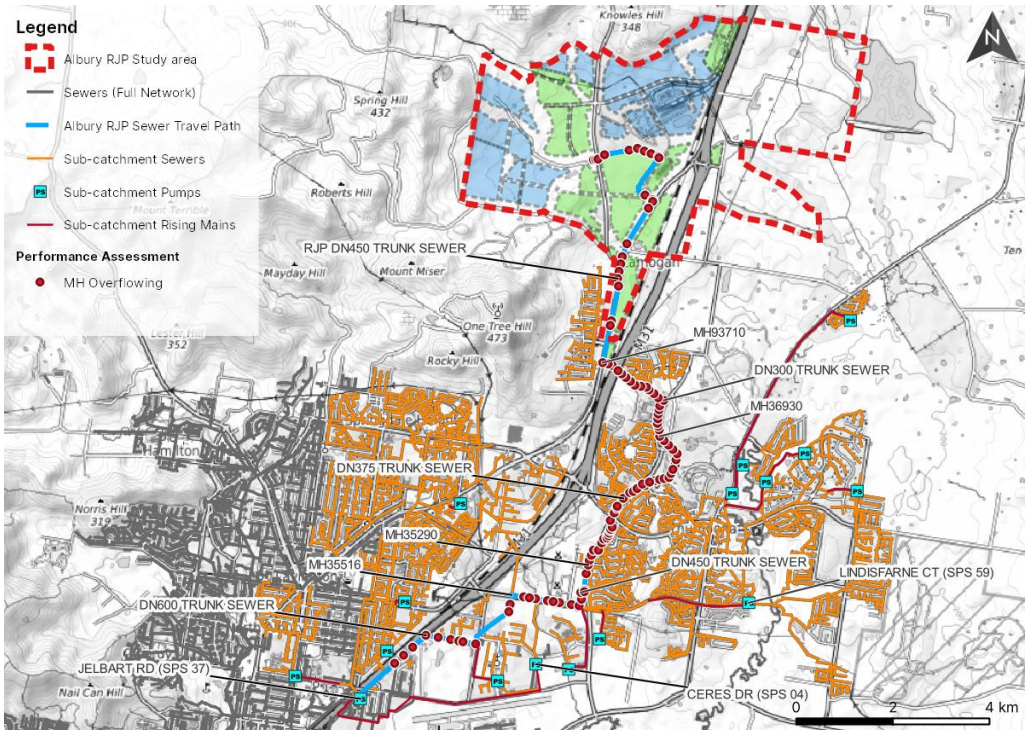

Figure 8-10 | Summary of Network Wet Weather Performance for Stage 2 scenario

Observations regarding the dry and wet weather performance of the gravity sewer network are as follows:

- The Stage 2 component of the RJP is identified in the above figures and comprises full development of the catchment west of the Hume Highway, including the current Visy Paper Mill and associated irrigation land used for effluent reuse. Full development of Stage 2 represents approximately 82.6% of the fully developed conditions
- DN300 trunk sewer (between MH93710 and MH36930):
    - Dry Weather Performance:
        - It is anticipated remaining sections of the DN300 trunk sewer will progressively become surcharged under the fully developed Stage 2 dry weather flows. It is also noted that overflows would be anticipated under dry weather flows if no augmentations are completed.
        - Initial dry weather overflows are also anticipated between MH36938 and MH36941, and become progressively worse through to full development of Stage 2.
        - Dry weather overflows are initiated at MH36941 equivalent to an additional dry weather flow of 62.8 L/s, which is equivalent to an EP of 12,590 (approx. 48.4% of the Stage 2 development or 40.0% of the total RJP development)
    - Wet Weather Performance:
        - Similar to the dry weather performance it is anticipated all remaining maintenance holes within the DN300 trunk sewer will overflow under the fully developed Stage 2 wet weather flows.
        - The last maintenance hole anticipated to overflow is MH37251 equivalent to an additional wet weather flow of 237.4 L/s, which is equivalent to an EP of 17,965 (approximately 69.1% of the Stage 2 development or 57.0% of the total RJP development).
- DN375 trunk sewer (between MH36930 and MH35290):
    - Dry Weather Performance:
        - Surcharging is anticipated to be initiated as part of Stage 2 developments and encompasses 81% of the identified DN375 trunk sewer.

- The section of DN375 sewer immediately downstream of the DN300 sewer between MH36758 and MH36930 is anticipated to become surcharged first. The segments between MH36603 and MH36605 are anticipated to be initiated first equivalent to an additional dry weather flow of 70.7 L/s, which is equivalent to an EP of 14,160 (approx. 54.4% of the Stage 2 development or 45.0% of the total RJP development)
- As part of the Stage 2 development, it is also anticipated that dry weather overflows may occur in this section between MH36930 and MH36605. Dry weather overflows are initiated at MH36608 equivalent to an additional dry weather flow of 103.9 L/s, which is equivalent to an EP of 20,814 (approx. 80.0% of the Stage 2 development or 66.1% of the total RJP development)
- Surcharging is also anticipated to occur downstream between MH35470 and MH35290, which is associated with the previously identified under capacity section near Sugar Gum Rd.
- The estimated flow rate at the time of surcharging this section is equivalent to an additional dry weather flow of 112.0 L/s, equivalent to an EP of 22,439 (approx. 86.3% of the Stage 2 development or 71.2% of the total RJP development)
- The section of sewer between MH35470 and MH35290 is not currently identified for augmentation as part of the existing servicing strategy; however, this was due to a proposed diversion of upstream flows towards Lindisfarne Ct SPS (SP59). As has been noted, the proposed augmentation required for SP59 as part of the previous strategy is not considered to be practical due to constructability issues and limited space at the existing location. It is therefore anticipated augmentation of this sewer may be required to address identified under capacity issues.

  - Wet Weather Performance:
    - It is anticipated all remaining sections of the DN375 trunk sewer will progressively overflow under the fully developed Stage 2 wet weather flows.
    - The last maintenance hole anticipated to overflow is MH36692 equivalent to an additional wet weather flow of 286.9 L/s, which is equivalent to an EP of 21,707 (approximately 83.5% of the Stage 2 development or 68.9% of the total RJP development)
    - As can be seen, it is anticipated a significant portion of the identified DN375 sewer is under capacity for dry weather and wet weather flows and therefore requiring augmentation and/or diversion to accommodate flows from the fully developed Stage 2 Albury RJP. It is also considered likely that existing and future residential areas will require augmentation and/or diversions to accommodate flows from population growth. This is identified in the previous servicing strategy, which identifies proposed augmentations of the DN375 upstream of the proposed diversion to SP59. Further discussion on augmentation requirements is provided in Section 8.3.4.

- DN450 trunk sewer (between MH35290 and MH35516):
  - Dry Weather Performance:
    - Surcharging in this section is anticipated to be initiated as part of Stage 2 development and occurs between MH36702 and MH35290, which is immediately downstream of the previously identified under capacity section of DN375 sewer. Under the fully developed Stage 2 conditions, surcharging of the DN450 sewer is anticipated to encompass 84% of the applicable sewer.
    - Surcharging is anticipated to be initiated in the segment upstream of MH35519 equivalent to an additional dry weather flow of 97.9 L/s, which is equivalent to an EP of 19,619 (approx. 75.4% of the Stage 2 development or 62.3% of the total RJP development)
    - It is also anticipated dry weather overflows may occur at MH35518 equivalent to an additional dry weather flow of 129.8 L/s, which is equivalent to an EP of 26,006 (approx. 100.0% of the Stage 2 development or 82.6% of the total RJP development)
  - Wet Weather Performance:

- It is anticipated all remaining sections of the DN450 trunk sewer will progressively overflow under the fully developed Stage 2 wet weather flows.
- The remaining segments of DN475 sewer upstream of the capacity restricted sewer is anticipated to overflow at MH35517 equivalent to an additional wet weather flow of 207.7 L/s, which is equivalent to an EP of 15,718 (approximately 60.4% of the Stage 2 development or 49.9% of the total RJP development)
- The remaining segments of DN475 sewer adjacent to Elizabeth Mitchell Dr are anticipated to overflow between MH36374 and MH35290 equivalent to an additional wet weather flow of 254.7 L/s, which is equivalent to an EP of 19,273 (approximately 74.1% of the Stage 2 development or 61.2% of the total RJP development)
- As can be seen, it is anticipated a significant portion of the identified DN450 sewer is under capacity for dry weather and wet weather flows and therefore requiring augmentation and/or diversion to accommodate flows from the fully developed Stage 2 Albury RJP. It is also considered likely that the existing and future residential areas will require augmentation and/or diversions to portions of this sewer to accommodate flows from population growth. Further discussion on augmentation requirements is provided in Section 8.3.4.

- DN600 trunk sewer (between MH35516 and Jelbart Rd SPS):
  - Dry Weather Performance:
    - Previously identified surcharging is anticipated to continue extending upstream to MH32004 under Stage 2 flows.
    - The estimated flow rate at the time of surcharging this section is equivalent to an additional dry weather flow of 119.9 L/s, which is equivalent to an EP of 24,026 (approx. 92.4% of the Stage 2 development or 76.3% of the total RJP development)
  - Wet Weather Performance:
    - Previously identified overflow location anticipated to encompass sections between MH34109 and MH34124 equivalent to an additional wet weather flow of 197.4 L/s, which is equivalent to an EP of 14,936 (approximately 57.4% of the Stage 2 development or 47.4% of the total RJP development)
    - Additional overflows are anticipated between MH32293 and MH32387, which is located approximately 500m upstream of Jelbart Rd SPS (SP37). Overflows in this location are anticipated to initiate at MH32387 equivalent to an additional dry weather flow of 300.0 L/s, which is equivalent to an EP of 22,698 (approx. 87.3% of the Stage 2 development or 72.1% of the total RJP development)
    - Overflows are also anticipated between MH32004 and MH32005, which is located immediately downstream of the DN450 trunk sewer. Overflows in this location are anticipated to initiate at MH32387 equivalent to an additional wet weather flow of 284.1 L/s, which is equivalent to an EP of 21,498 (approx. 82.7% of the Stage 2 development or 68.2% of the total RJP development)
    - Under fully developed Stage 2 flows, it can be seen that increased portions of the identified DN600 sewer are becoming compromised; however, unlike the upstream trunk sewers some capacity remains within the sewer and may be utilised further pending possible diversions and/or augmentations. Further discussion on augmentation requirements is provided in Section 8.3.4.

8.3.3.1.4 Stage 3

A summary of the dry and wet weather performance for the Stage 3 / Ultimate scenario is provided in Figure 8-11 and Figure 8-12espectively. In accordance with assessment criteria outlined earlier, occurrences of surcharging pipework and overflow locations have been identified.

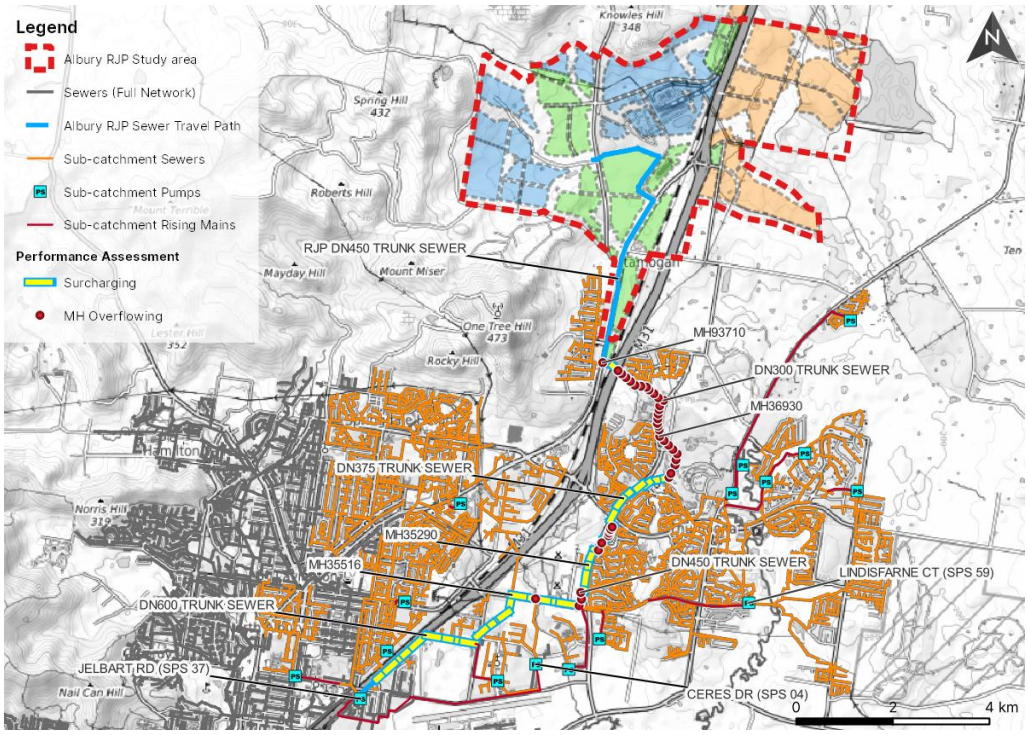

Figure 8-11 | Summary of Network Dry Weather Performance for Stage 3 scenario

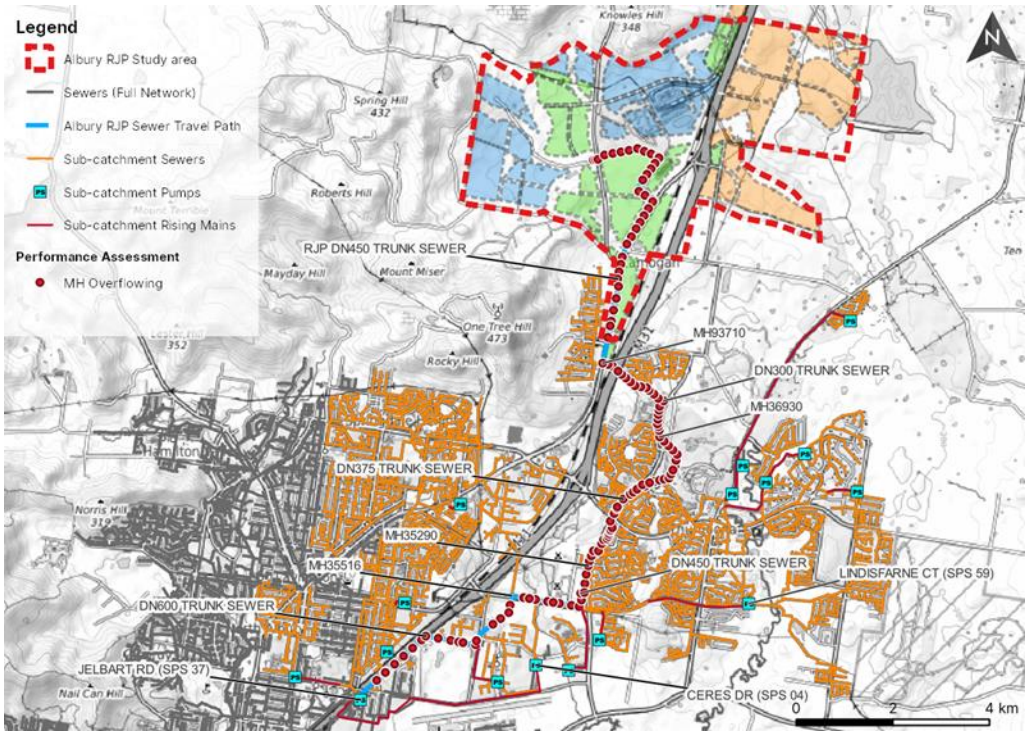

Figure 8-12 | Summary of Network Wet Weather Performance for Stage 3 scenario

Observations regarding the dry and wet weather performance of the gravity sewer network are as follows:

- The Stage 3 component of the RJP is identified in the above figures and represents the fully developed conditions for the study area. Also included within this scenario is fully developed conditions for the existing Albury catchments and Thurgoona Wirlinga Residential Area.
- DN300 trunk sewer (between MH93710 and MH36930):

- As noted earlier, all segments between MH93710 and MH36930 are anticipated to have surcharged under dry weather flows and be overflowing under wet weather flows. The majority of segments are also anticipated to be overflowing under dry weather flows

- DN375 trunk sewer (between MH36930 and MH35290):
  - Dry Weather Performance:
    - It is anticipated the majority of remaining DN375 trunk sewer will progressively become surcharged under the Ultimate dry weather flows. It is also noted that the extent of previously identified dry weather overflow locations would extend to adjacent segments upstream and downstream
  - Wet Weather Performance:
    - As noted earlier all segments between MH36930 and MH35290 are anticipated to be overflowing under wet weather flows.
- DN450 trunk sewer (between MH35290 and MH35516):
  - Dry Weather Performance:
    - It is anticipated remaining sections of the DN450 trunk sewer will progressively become surcharged under the fully developed Ultimate dry weather flows.
    - Additional dry weather overflows are anticipated between MH35276 and MH35286 equivalent to an additional dry weather flow of 142.4 L/s, which is equivalent to an EP of 28,526 (approx. 90.6% of the total RJP development)
  - Wet Weather Performance:
    - As noted earlier all segments between MH35290 and MH35516 are anticipated to be overflowing under wet weather flows.
- DN600 trunk sewer (between MH35516 and Jelbart Rd SPS):
  - Dry Weather Performance:
    - Majority of remaining segments anticipated to be surcharging under Ultimate dry weather flows with only the segments between MH36805 and Jelbart Rd SPS (SP37) having surplus capacity for dry weather flows.
    - It is noted that no dry weather overflows are anticipated under the modelled dry weather flows.
  - Wet Weather Performance:
    - Majority of remaining segments anticipated to be overflowing under Ultimate wet weather flows with only the segments between MH32383 and Jelbart Rd SPS (SP37) not anticipated to overflow.

8.3.3.2 Pump Stations

8.3.3.2.1 Jelbart Rd SPS (SP37)

The Jelbart Rd SPS (SP37) is directly impacted by flows from the RJP and is noted as being the second largest pump station within the Albury wastewater network at a nominal capacity of 440 L/s. Council have advised that an augmentation is currently being implemented to increase capacity of SP37 from 440 L/s to approximately 550 L/s.

The SP37 rising main is DN750 and discharges to the large gravity trunk sewer approximately 1.9km upstream of Wodonga Place SPS (SP01) before being pumped for treatment at Kremur Street WWTP and/or Waterview WWTP. Nominal capacity of the SP37 rising main is approximately 750 L/s representing an estimated duty head of 10.7m within the model provided.

Anticipated inflows to SP37 have been summarised in Table 8–5 below based on calculated demands from Section 8.3.2 and assuming augmentation to a capacity of 550 L/s

Table 8–5 | Summary of anticipated inflows to Jelbart Rd SPS (SP37)

Modelling Scenarios	Capacity (L/s)	PDWF (L/s)	PWWF (L/s)
Base Case	550	207.9	497.1
Stage 1 – 2026	550	269.7	657.4
Stage 2 – 2036	550	408.6	989.5
Stage 3 – Ultimate	550	759.7	1585.5

It can be seen from the above that the anticipated PWWF inflows to SP37 under ultimate conditions is 1,585 L/s and it is anticipated the proposed 550 L/s capacity for the pump station will be exceeded prior to full development of Stage 1 inflows. It is also anticipated that maximum capacity of the existing SP37 rising main will be exceeded prior to full development of Stage 2 inflows.

Note PWWF for the existing catchment have been estimated by Council based on available SCADA data; however further investigations are planned to be completed as part of reviewing the existing servicing strategy, including flow monitoring for infiltration and inflow investigations.

Based on the above it is anticipated further augmentation to capacity of SP37 will be required prior to full development of Stage 1 i.e., 2026, including electrical infrastructure (switchboard, transformer, generator, etc.). Augmentation would also be required for the SP37 rising main prior to full development of Stage 2 conditions i.e., 2036, including possible augmentation of SP01, as well as the upstream gravity sewer network and SP01 rising main. Further discussion on pump station augmentation requirements is provided in Section 8.3.4

8.3.3.2.2 Ceres Drive SPS (SP04)

The Ceres Drive SPS (SP04) has been recently constructed with a nominal capacity of 150 L/s. At the time of developing the current servicing strategy, construction of SP04 was in development and was not identified for further augmentation.

The SP04 rising main is DN375 and discharges immediately upstream of the Jelbart Rd SPS (SP37). Nominal capacity of the SP04 rising main is understood to be 185 L/s representing an estimated duty head of 32.5m within the model provided.

Council have advised that the inlet gravity sewer for SP04 is primarily DN600 and has surplus capacity to accommodate possible flows from Albury RJP; however, diversion works would be required to direct flows towards SP04. The upstream gravity network is estimated to have a capacity in the order of 290 – 650 L/s with the majority of flows currently coming from SP59.

Council have also advised that under a revised servicing strategy SP04 is likely to be utilised for loads from the Thurgoona Wirlinga Residential Area as an alternative to SP59 and there is sufficient space available to augment SP04, including the upstream gravity sewer and rising main, to accommodate future flows. Diversion works would be required to facilitate transfer of Albury RJP flows to SP04; however, it would allow bypass of the capacity restricted DN600 gravity sewer upstream of SP37.

Anticipated inflows to SP04 have been summarised in Table 8–6 based on calculated demands from Section 8.3.2. The existing arrangement has been assumed for the purpose of assessing, therefore no diversion is present to direct Albury RJP flows towards SP04. It is also assumed that the majority of flows from the Thurgoona Wirlinga Residential Area will be directed towards SP04 via either SP59 or gravity networks based on discussions with Council.

Table 8–6 | Summary of anticipated inflows to Ceres Drive SPS (SP04)

Modelling Scenarios	Capacity (L/s)	PDWF (L/s)	PWWF (L/s)
Base Case	150	45.0	159.2
Stage 1 – 2026	150	56.7	205.9
Stage 2 – 2036	150	85.8	322.7
Stage 3 – Ultimate	150	239.3	937.9

Based on the above it can be seen that the anticipated PWWF to SP04 under Ultimate conditions is 937.9 L/s, which is significantly higher than capacity of the pump station and primarily due to flows from the Thurgoona Wirlinga Residential Area.

The existing capacity of SP04 is comparable to anticipated PWWF under the base case conditions and exceeded prior to full development of Stage 1 inflows. It is also anticipated that estimated capacity of the SP04 rising main is exceeded prior to full development of Stage 1 inflows. However, it is noted that capacity of the incoming DN600 gravity sewer typically exceeds anticipated PWWF until Ultimate conditions are realised, which aligns with Council's advice regarding surplus capacity.

Note PWWF for the existing catchment have been estimated by Council based on available SCADA data; however further investigations are planned to be completed as part of reviewing the existing servicing strategy, including flow monitoring for infiltration and inflow investigations.

Based on the above it is anticipated significant augmentation would be required for SP04 to accommodate possible future flows, including the rising main; however, there may be an opportunity to divert Albury RJP flows towards SP04 to utilise the surplus capacity. Further discussion on pump station augmentation requirements is provided in Section 8.3.4.

8.3.3.2.3 Wodonga Place SPS (SP01)

The Wodonga Place SPS (SP01) is located downstream of SP37 and is the primary feed pump station to the Kremur St and Waterview WWTP with an approximate capacity of 760 L/s based on recent investigations completed by Council.

The existing servicing strategy proposes to retain the existing SP01 and construct a new main sewage pump station at the same location with a proposed capacity of 1,010 L/s, including a new DN750 rising main between the new pump station location and Waterview WWTP.

It is intended to utilise the retained SP01 as a wet weather overflow to facilitate transfer of overflow volumes to the existing Kremur St SPS (SP48) and existing 14ML emergency storage, where it can be pumped to Waterview WWTP for treatment when available. Operating capacity of the retained pumps at SP01 are proposed to be reduced to a nominal flow rate of 570 L/s to match the existing flow rate of SP48.

This strategy is currently under review by Council; however, for the purposes of this assessment these proposed capacities have been adopted in Table 8–7. Anticipated inflows to SP01 have been summarised based on calculated demands from Section 8.3.2.

Table 8–7 | Summary of anticipated inflows to Wodonga Place SPS (SP01)

Modelling Scenarios	Capacity (L/s)	PDWF (L/s)	PWWF (L/s)
Base Case	760	260.1	1,061.4
Stage 1 – 2026	760	329	1221.2
Stage 2 – 2036	1,580 (1,010 + 570)	439.7	1647.9
Stage 3 – Ultimate	1,580 (1,010 + 570)	729.4	2029.0

It can be seen from the above that the existing capacity of 760 L/s would be unable to meet the base case or Stage 1 PWWF. It is also anticipated that proposed capacity at SP01 under the proposed strategy outlined above may be exceeded prior to full development of Stage 2 inflows; however, consideration of the emergency storage would be required to confirm.

Note PWWF for the existing catchment have been estimated by Council based on available SCADA data; however further investigations are planned to be completed as part of reviewing the existing servicing strategy, including flow monitoring for infiltration and inflow investigations.

Based on the above it is anticipated augmentation to the existing capacity of SP01 would be required prior to full development of Stage 1 i.e., 2026. Augmentation or diversion would also be required prior to full development of Stage 2 conditions i.e., 2036. Further discussion on pump station augmentation requirements is provided in Section 8.3.4.

8.3.3.3 Wastewater Treatment Plants

As noted in the baseline assessment, there are two treatment plants for the Albury catchment, Waterview WWTP and Kremur Street WWTP, which are located in the south western area of the catchment. The nameplate treatment capacity of Waterview WWTP and Kremur Street WWTP is 8 ML/d and 12 ML/d respectively, representing a combined treatment capacity of 20ML/d.

As noted previously the Kremur St WWTP is over 100yr old and is scheduled for decommissioning in 2028. This will coincide with augmentation of the Waterview WWTP to an ADWF design capacity of 17.6 ML/d and full treatment capacity of 70.4 ML/d (4x ADWF). It is also proposed to retain the existing 14ML emergency storage at Kremur St WWTP following its decommissioning.

A summary of anticipated inflows to the Kremur and Waterview WWTP's has been provided in Table 8–8 based on calculated demands from Section 8.3.2.

Table 8–8 | Summary of anticipated combined inflows to Kremur St WWTP and Waterview WWTP

Modelling Scenarios	Capacity (ML/d)	ADWF (ML/d)	3x ADWF (ML/d)	Storage time for ADWF (hr)
Base Case	20.0	14.4	43.3	23.3
Stage 1 – 2026	20.0	17.2	51.7	19.5
Stage 2 – 2036	70.4	23.6	70.7	14.3
Stage 3 – Ultimate	70.4	38.8	116.3	8.7
* Confirmation required on WWTP bypass capacity for excess flows during PWWF				

The anticipated nominal treatment capacity for each planning horizon is assumed to be represented as 3x ADWF. From Table 8–8 it can be seen that the combined 20 ML/d treatment capacity of the Albury WWTP's is nearing capacity for anticipated ADWF, but is already exceeded by 3x ADWF flows under the base case scenario. It is noted the 14ML emergency storage provides approximately 23.3hr of storage under ADWF to accommodate peaking flows.

The proposed 70.4 ML/d capacity for the proposed augmented Waterview WWTP appears to be sufficient for the fully developed Stage 2 flows but is unable to meet Ultimate flows associated with a fully developed RJP and Thurgoona Wirlinga Residential Area.

Based on the above it is anticipated that the proposed augmentation works for the Waterview WWTP will be sufficient to accommodate increasing inflows through to Stage 2 with further augmentation then required in order to meet the Ultimate conditions.

It is also noted that an increase in inflows to the treatment plants will require an amendment to the existing discharge license for the WWTP. It is noted the existing discharge license represents a 'Nil Discharge' for the Kremur St WWTP and Waterview WWTP, and it would be anticipated this would remain for any augmentation of the treatment capacity. As noted earlier, treated effluent from the existing Albury WWTP's is currently managed via discharge to the nearby Wonga Wetlands, irrigation for nearby timber plantations, and/or utilised by residents for irrigation purposes. Further investigation would be required to confirm the capacity of these existing reuse options to receive increased effluent loads associated with increasing inflows to the WWTP's.

Further discussion on pump station augmentation requirements is provided in Section 8.3.4.

8.3.4 Identified Upgrades

A summary of the proposed works, including assumed staging, is provided in Figure 8-13 below. The proposed solutions have been determined based on discussions with Council to establish the following general strategies and assumptions:

- Discussions with Council have agreed that augmentation of the Jelbart Rd Rising Main and associated augmentations within the Albury CBD sewer network, including Wodonga Place SPS (SP01), are unlikely to be viable due to construction difficulties and high density of urban infrastructure. Instead, it is anticipated a new Northern WWTP will be more economical.
- A new Northern WWTP is to be constructed to accommodate flows from the Albury RJP and Thurgoona Wirlinga Residential Area. Preliminary location is in the north eastern corner of the RJP study area. At the time of writing, the need and location of a Northern WWTP is to be confirmed by Council as part of reviewing the existing servicing strategy, which is currently ongoing.
- Timing for a new Northern WWTP is yet to be determined; however, for the purposes of this assessment the trigger point for a new Northern WWTP will coincide with exceedance of infrastructure requirements for Ultimate conditions. This has been nominated as Ultimate conditions will incorporate generally lower flows once diversion works to the new Northern WWTP are implemented and increasing capacity requirements above Ultimate condition requirements would represent overcapitalisation of infrastructure.
- Trigger points have generally been represented as increases to EP/flow. This has been adopted as increasing flows will be dependent on development of the RJP as well as development of Thurgoona Wirlinga Residential Area.
- Council have advised that Jelbart Rd SPS (SP37) may be utilised as a transfer pump station to the new Northern WWTP by repurposing an existing DN500 Raw Water Main. Council to investigate viability of this option as part of their review of the servicing strategy.
- Further diversion works, etc. to direct flows other than Albury RJP flows are under investigation by Council and have not been considered here.
- Ceres Dr SPS (SP04) is considered viable for augmentation and the existing upstream gravity sewer should be prioritised over the capacity restricted DN600 trunk sewer.

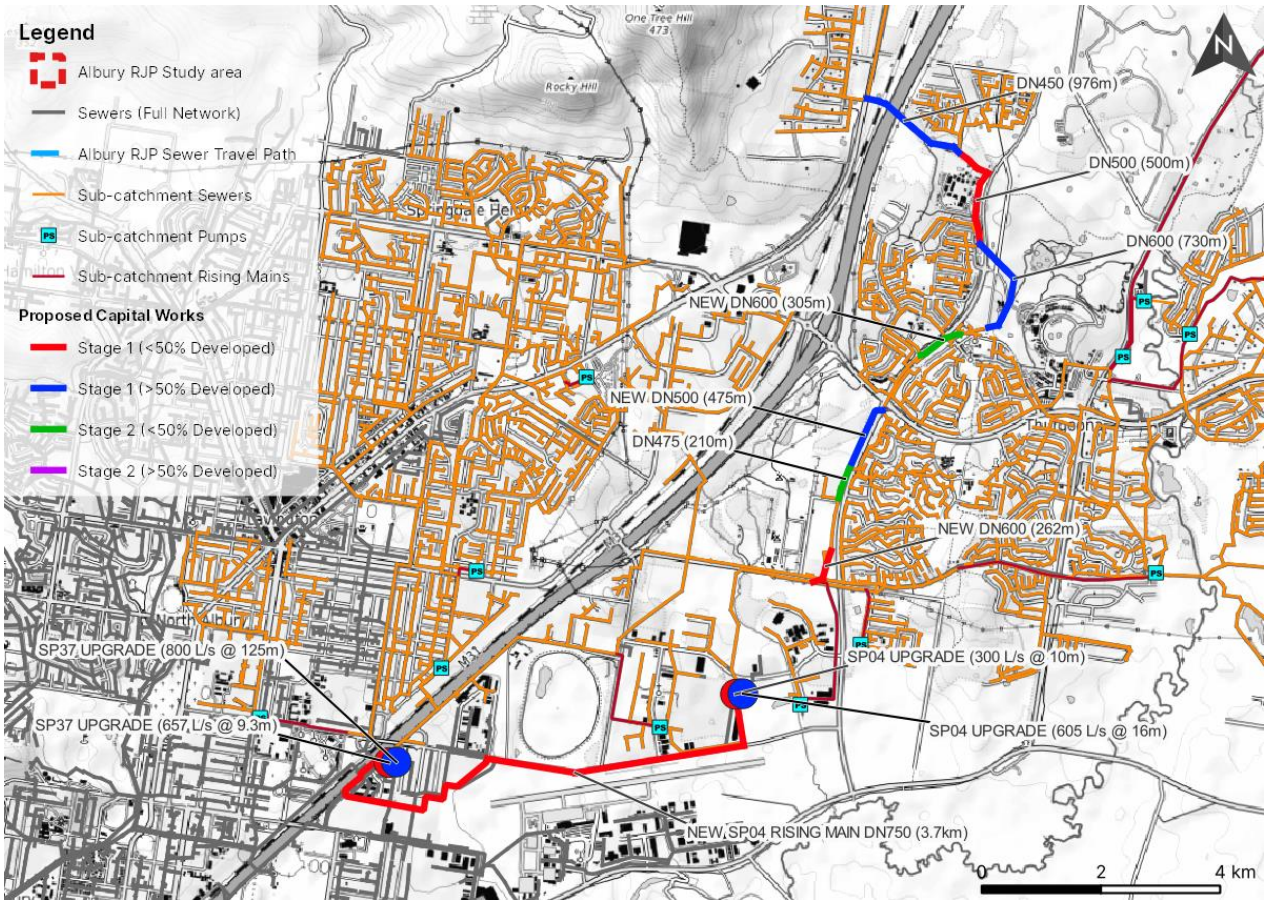

Figure 8-13 | Summary of Proposed Capital Works and Staging

A summary of the proposed works for each stage is provided below with further details and discussion provided in subsequent sections:

Stage 1

- Construction of new reticulation sewer for Stage 1 RJP lots, utilising the existing DN450 trunk sewer.
- Augmentation required to the DN300 and DN375 trunk sewer to address wet weather overflows.
- Divert flows towards Ceres Drive SPS (SP04), including upgrade of pumps and rising main, to utilise surplus capacity in the gravity sewer and minimise flows towards the capacity restricted DN600 sewer.
- Upgrade Jelbart Rd SPS (SP37) to accommodate anticipated increases in PWWF.

Stage 2

- Extension of the RJP reticulation network to incorporate additional Stage 2 lots.
- Construct a new DN600 sewer from MH87762 and MH35651. Proposed to construct a new sewer in addition to retaining the existing DN375 sewer as it is located within residential areas
- Augmentation of existing DN375 sewer to DN450 to address wet weather overflows
- Upgrade Jelbart Rd SPS (SP37) to 800 L/s; including electrical, civil and mechanical works
- Upgrade Ceres Dr SPS (SP04) to 605L/s; including electrical, civil and mechanical works
- Construction of the new Northern WWTP, including construction of associated diversion works:
    - New RJP pump station at capacity of 289 L/s, to divert flows to the new Northern WWTP
    - Implementation of diversion works within the existing catchment to divert Thurgoona Residential flows to the new Northern WWTP. Council to confirm required diversion works

Stage 3 (Ultimate)

- Construction of reticulation network for Stage 3 of the RJP discharging to new Northern WWTP.
- Pending split of flows between Waterview WWTP and New Northern WWTP:
    - Construction of new wet weather pump station near Jelbart Rd SPS to divert approx. ~200L/s to the new Northern WWTP
    - Repurposing of existing DN500 Raw Water Main as a rising main for new wet weather pump station near Jelbart Rd SPS. Council to assess viability of the existing raw water main to act as a rising main
    - Augmentation of new Northern WWTP to accommodate required flows, as determined by Council

8.3.4.1 Albury RJP Network

Stage 1

An overview of the proposed reticulation network for Stage 1 of the RJP is provided in Figure 8-14 below and comprises the following infrastructure:

- Approximately 4.6km of new sewer, including:
    - 231m of DN450
    - 219m of DN375

- 347m of DN300
- 446m of DN250
- 2,326m of DN225
- 1,029m of DN150

- RJP SPS-01 (20L/s @ 7m head), including DN150 rising main (approx. 1,085m)
  - Proposes to utilise a pump station for an isolated section near the ERH intermodal due to flat and low elevation surfaces immediately south of Visy location and high elevation north of Visy. There may be an opportunity to decommission RJP SPS-01 when the Visy site is redeveloped pending finished surface levels.

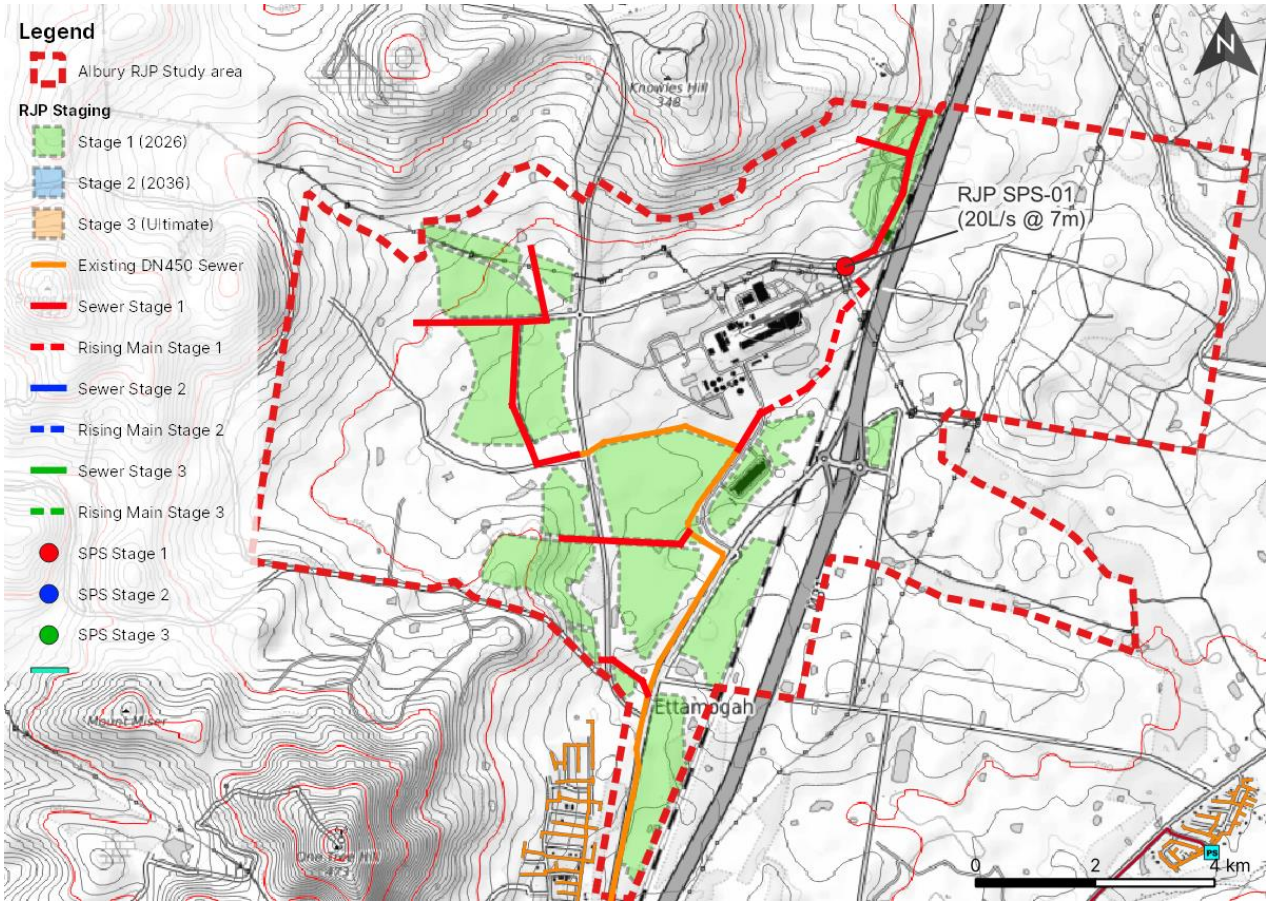

Figure 8-14 | Summary of Proposed RJP Sewer Network (Stage 1)

Stage 2

An overview of the proposed reticulation network for Stage 2 of the RJP is provided in Figure 8-15 below and comprises the following infrastructure:

- Approximately 5.8km of new sewer, including:
  - 1,174m of DN900 (inlet sewer for New Northern WWTP)
  - 1,178m of DN450 (duplication of existing DN450 sewer, refer below)
  - 1,141m of DN250
  - 1,090m of DN225
  - 1,258m of DN150

- RJP SPS-02 (289L/s @ 15.6m head), including DN600 rising main (approx. 3,145m)
    - Preliminary location for the new Northern WWTP is provided in Figure 8-15 below and. Refer Section 8.3.4.8 for discussion on timing of treatment plan.
- Existing DN450 sewer:
    - During Stage 2, overflows are anticipated to occur within the existing DN450 trunk sewer due to under capacity issues, therefore it is proposed a duplication of the sewer will be completed. Anticipated timing for the augmentation is at an approximate EP of 19,354 (approx. 74.4% of the Stage 2 development or 61.4% of the total RJP development)

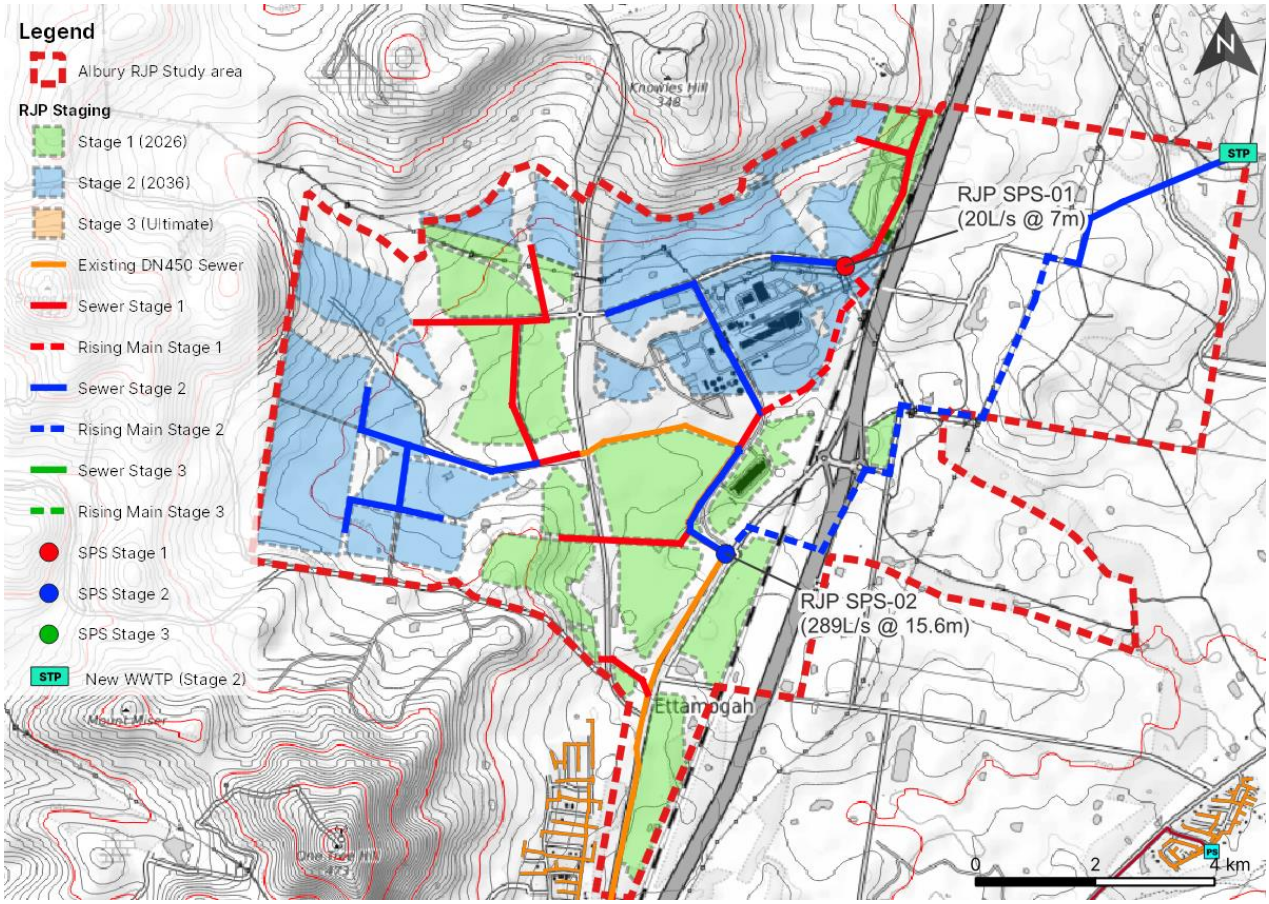

Figure 8-15 | Summary of Proposed RJP Sewer Network (Stage 2)

Stage 3 (Ultimate)

An overview of the proposed reticulation network for Stage 3 of the RJP is provided in Figure 8-16 below and comprises the following infrastructure:

- Approximately 3.34km of new sewer, including:
    - 827m of DN225
    - 2,516m of DN150
- RJP SPS-03 (32L/s @ 24m head), including DN200 rising main (approx. 1,700m)
    - Areas in the southern section of Stage 3 are at low elevations and are isolated from the new Northern WWTP due to localised high points/hills, making a gravity connection difficult. Requirement for this pump station may be reviewed pending finished surface levels of the lots after earthworks are completed.
    - RJP SPS-04 is located at the lowest point of the isolated section of Stage 3 and may represent an alternative location for RJP SPS-03 pending grading and finished surface levels for the lots in this area. Sizing for this pump station has not yet been completed due to uncertainties around lot layouts within the area and associated reticulation network.

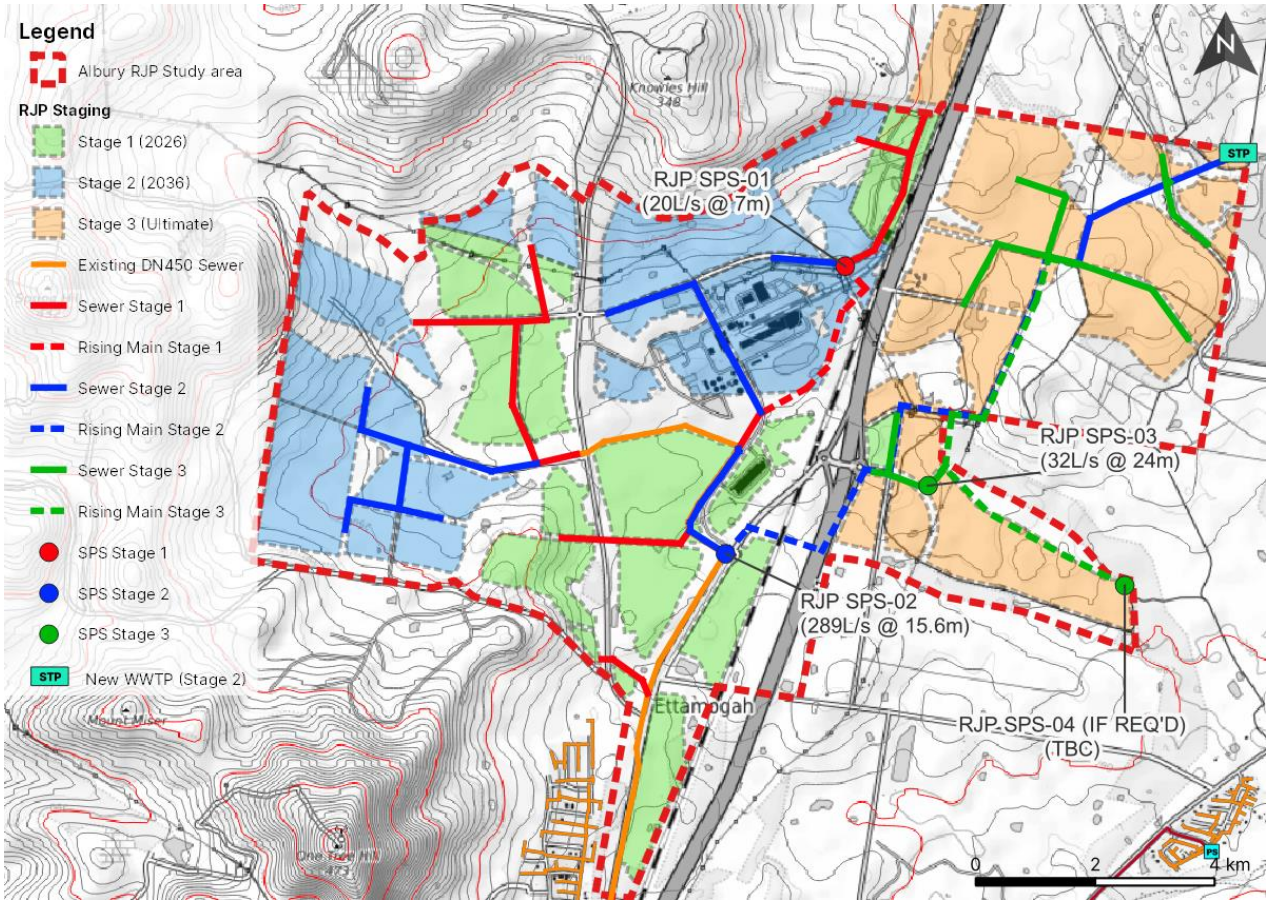

Figure 8-16 | Summary of Proposed RJP Sewer Network (Stage 3)

8.3.4.2 DN300 Trunk Sewer Main (between MH93710 and MH36930)

The following augmentations and upgrades are proposed for the DN300 trunk main to resolve capacity issues identified in Section 8.3.3.1.

Stage 1

- Augmentation of approximately 976m between MH93710 and MH36938 from DN300 to DN450.
- Augmentation of approximately 500m between MH36938 and MH36930 from DN300 to DN500.
- Diameter requirements to be confirmed following investigations on wet weather inflows and possible re-grading of very flat areas.

Stage 2

- No further augmentations are proposed under Stage 2 as the proposed sizing above is sufficient to meet Ultimate conditions after construction of a new Northern WWTP.
- Prior to construction of the new WWTP it is expected sections of the augmented trunk main between MH36941 and MH36930 will experience wet weather overflows equivalent to an additional wet weather flow of 172.3 L/s, which is equivalent to an additional EP of 13,040 from the RJP (approx. 41.4% of the Stage 2 development or 50.1% of the total RJP development), therefore construction of a new Northern WWTP and associated diversions works will be required before this is realised.

Stage 3 (Ultimate)

- No further works are proposed following construction of the new Northern WWTP.

8.3.4.3 DN375 Trunk Sewer Main (between MH36930 and MH35290)

The following augmentations and upgrades are proposed for the DN375 trunk main to resolve capacity issues identified in Section 8.3.3.1.

Stage 1

- Augmentation of approximately 730m between MH36930 and MH36763 from DN375 to DN600. Diameter requirements to be confirmed following investigations on wet weather inflows and possible re-grading of very flat areas.
- Construction of a new DN500 sewer between MH35469 and MH35440, approximately 475m in length, to address capacity issues in residential lots near Sugar Gum Rd. Proposed to construct a new sewer in addition to retaining the existing DN375 sewer as it is located within residential areas.

Stage 2

- Construction of a new DN600 sewer between MH87762 and MH35651, approximately 305m. Proposed to construct a new sewer in addition to retaining the existing DN375 sewer as it is located within residential areas.
- Augmentation of approximately 210m between MH35440 and MH35290 from DN375 to DN450.
- Prior to construction of the new WWTP it is expected sections of the augmented trunk main between MH36930 and MH36605 will experience wet weather overflows equivalent to an additional wet weather flow of 174.3 L/s, which is equivalent to an additional EP of 13,192 from the RJP (approx. 41.9% of the Stage 2 development or 50.7% of the total RJP development), therefore construction of a new Northern WWTP and associated diversions works will be required before this is realised.

Stage 3 (Ultimate)

- No further works are proposed following construction of the new Northern WWTP.

8.3.4.4 DN450 Trunk Sewer Main (between MH35290 and MH35516)

The following augmentations and upgrades are proposed for the DN450 trunk main to resolve capacity issues identified in Section 8.3.3.1.

Stage 1

- Construct a new DN600 sewer from MH36374 to MH102297, approximately 262m, to allow diversion of Albury RJP flows to SP04. New DN600 sewer is required to cross the existing DN450 sewer; however, the provided invert levels indicate the DN450 sewer is approximately 3.3m higher than the SP04 gravity sewer. These levels are to be confirmed.

Stage 2

- No further augmentations are proposed under Stage 2 as the proposed sizing for the diversion is sufficient to meet Ultimate conditions after construction of a new Northern WWTP.
- The DN450 trunk sewer is not anticipated to represent a trigger point for construction of the new Northern WWTP; however, the receiving gravity sewer for SP04 is anticipated to experience overflows between MH102299 and MH102300 due to increasing flows.
- The presence of overflows in this area is equivalent to an additional wet weather flow of 386 L/s, which would comprise a combination of flows from the Albury RJP and Thurgoona Wirlinga Residential Area via SP59. Monitoring of development within Albury RJP and Thurgoona Wirlinga will be required to ensure construction of a new Northern WWTP and associated diversions works are implemented before this is realised.

Stage 3 (Ultimate)

- No further works are proposed following construction of the new Northern WWTP.

8.3.4.5 DN600 Trunk Sewer Main

Stage 1

- It is not intended to complete any augmentation works on the DN600 sewer as it is already capacity restricted.
- As per the above, it is recommended to construct a diversion at MH36374 to direct flows to SP04; however, it is recommended to retain the existing DN600 trunk sewer main and incorporate a flow split within MH36374, via a weir or similar, to avoid overloading the receiving SP04 gravity network.

Stage 2 & Stage 3 (Ultimate)

- No further works are proposed following construction of the diversion sewer towards SP04.

8.3.4.6 Jelbart Road SPS (SP37)

Stage 1

For Stage 1, the anticipated PWWF to Jelbart Rd SPS (SP37) is approximately 657 L/s. As noted in Section 8.2 works are currently underway to augment SP37 to a nominal capacity of 550 L/s. Based on modelling, further augmentation of SP37 may be required under Stage 1 to address wet weather inflows; however further investigation will be undertaken as part of Council's upcoming review of the servicing strategy, including infiltration and inflow investigations to determine peak wet weather flows.

A decision on possible augmentation for SP37 can be finalised following outcomes of this investigation; however, for the purposes of this assessment it is assumed SP37 would require augmentation to 657 L/s @ 9.3m head to transfer Stage 1 PWWF.

Stage 2

At the time of diverting flows to a new Northern WWTP, the PWWF to Jelbart Rd SPS (SP37) are approximately 885 L/s. This exceeds the nominated capacity of the rising main; however further investigation will be required to confirm

anticipated PWWF flows to SP37 and possible impact of increased flows through the existing rising main and downstream network.

At this stage it would be proposed to augment SP37 to the proposed rising main capacity of 800 L/s at 12m head as a minimum and assess impact on timing for the new Northern WWTP and downstream sewer network, including the gravity network, SP01 and Waterview WWTP.

Following construction of the new Northern WWTP it has been proposed by Council to utilise Jelbart Rd SPS as a transfer pump station towards the new WWTP. Council have advised there is an existing DN500 raw water main running immediately adjacent to SP37 which may be repurposed as a rising main. Further investigation will be required on the condition and suitability of this pipe to be utilised as a rising main.

Stage 3 (Ultimate)

Stage 3 (Ultimate) under ultimate conditions the anticipated inflow to Jelbart Rd SPS is approximately 968 L/s.

As noted above, it is anticipated a component of these flows will be directed to a new Northern WWTP with the rest continuing towards Waterview WWTP via SP01. The eventual split will be dependent on remaining capacity within the augmented Waterview WWTP and gravity sewer network within the Albury CBD.

As noted earlier, a DN500 raw water main has been proposed for repurposing as a rising main. The elevation difference between Jelbart Rd SPS and the RJP is approximately 65.5m. Assuming the pipe has a nominal internal bore of 500mm, the equivalent flow for a velocity of 1.0m/s is approximately 196 L/s and representing a total head of ~90.1m. This flow rate would be sufficient to reduce the remaining PWWF under ultimate flows to less than 800L/s, which may be appropriate for SP37 whilst remaining within capacity of the existing DN750 rising main.

Assuming this arrangement is adopted and pending condition and suitability of the DN500 raw water main, Jelbart Rd SPS (SP37) could be utilised to provide 800 L/s towards SP01 and Waterview WWTP with a new pump station diverting ~200L/s to a new Northern WWTP under wet weather conditions.

8.3.4.7 Ceres Drive SPS (SP04)

As noted earlier, the Ceres Drive SPS (SP04) is anticipated to be a primary for Thurgoona Loads; however current capacity for the pump station and rising main is limited to 150 L/s and 185 L/s respectively.

Under the proposed strategy, anticipated PWWF under Stage 1 would be 250 L/s and therefore requiring augmentation of the pumps and rising main. Anticipated PWWF to SP04 across the various stages are provided in Table 8–9.

Table 8–9 | Summary of anticipated inflows to Ceres Dr SPS (SP04), including diversion of RJP flows

Modelling Scenarios	PDWF (L/s)	PWWF (L/s)
Stage 1 – 2026	42	250
Stage 2 – 2036 (prior to North WWTP)	~145	605
Stage 3 – Ultimate	138	570

There is a significant variation between the Stage 1 inflows and Stage 2/3, therefore augmentation of infrastructure for SP04 will be staged. The proposed staging is as follows:

- Stage 1 – Augment SP04 to 300L/s at ~10m head and construct a new DN750 rising main (approx. 3.7km)
- Stage 2 – Augment SP04 to 605L/s at 15.7m head
- Stage 3 – Operate SP04 at a reduced rate of 570 L/s at 14.8m head

8.3.4.8 New Northern WWTP

Stage 1

- Based on the performance assessment completed in Section 8.3.3.1 construction of a new Northern WWTP would not be required for Stage 1 flows.

Stage 2

- It is anticipated the new Northern WWTP will be required prior to fully developed Stage 2 conditions due to under capacity issues during wet weather events.
- The key trigger points for each infrastructure type is provided below; however ongoing monitoring of inflows, specifically wet weather inflows, will be required to determine an appropriate timeframe for implementation:
    - **RJP DN450 Trunk Sewer:** Approximately 172.3 L/s, equivalent to an additional EP of 13,040 from the RJP (approx. 50.1% of the Stage 2 development or 41.4% of the total RJP development).
    - **DN300 Trunk Sewer:** Approximately 172.3 L/s, equivalent to an additional EP of 13,040 from the RJP (approx. 50.1% of the Stage 2 development or 41.4% of the total RJP development).
    - **DN375 Trunk Sewer:** Approximately 174.3 L/s, equivalent to an additional EP of 13,192 from the RJP (approx. 50.7% of the Stage 2 development or 41.9% of the total RJP development).
    - **Ceres Dr SPS (SP04) / incoming gravity sewer** – 605 L/s equivalent to capacity of the upstream gravity main. Flows are dependent on Albury RJP and Thurgoona Wirlinga Residential Area.
    - **Jelbart Rd SPS (SP37)** – 800 L/s equivalent to capacity of the rising main.
- Based on the above trigger points it is anticipated a new Northern WWTP will be required by 50% development of Stage 2.
- Anticipated 100% of flows from the RJP and Thurgoona Wirlinga Residential Area will be diverted towards a new Northern WWTP. Diversion works associated with the Thurgoona Wirlinga Residential Area are to be confirmed by Council as part of reviewing the existing sewer servicing strategy.
- The proposed name plate treatment capacity for the new Northern WWTP under Stage 2 is 25.4 ML/d (3x ADWF). A breakdown of anticipated loading for the New Northern WWTP under Stage 2 loads is provided in Table 8–10 below.

Table 8–10 | Anticipated loading for the New Northern WWTP at Stage 2

Region	ADWF (ML/d)	3x ADWF (ML/d)
Albury RJP	5.7	17.0
Thurgoona Wirlinga Residential Area	2.8	8.4
Total	8.5	25.4

- It is anticipated a 'Nil Discharge' would be required for a new Northern WWTP, therefore appropriate effluent reuses would be needed, such as irrigation, wetland treatment, etc. It is anticipated that irrigation and wetland treatment would represent the likely effluent reuses and further discussion on the anticipated sizing of a wetland for the new Northern WWTP is provided in the *Albury Regional Job Precinct Hydrogeology, Water Quality and Water Demand Master Plan* (SMEC, 2022).
- As noted in Section 5.6.5, the construction of a new WWTP presents an opportunity to consider co-generation through methane gases and storage of energy via an onsite battery. It is encouraged that Council consider innovations in sewerage treatment processing and onsite energy generation in preparing a feasibility study for the new treatment plant.

Stage 3 (Ultimate)

- Anticipated loading for the new Northern WWTP under Ultimate conditions is provided in the table below and is anticipated to require an upgrade of the WWTP to a new name plate capacity of 60.5 ML/d (3x ADWF). Note

anticipated ultimate loads will be subject to change based on Council's review of the existing sewer servicing strategy, which is currently underway (refer Table 8–11).

Table 8–11 | Anticipated loading for the New Northern WWTP at Stage 3

Region	ADWF (ML/d)	3x ADWF (ML/d)
Albury RJP	6.9	20.6
Thurgoona Wirlinga Residential Area	13.3	39.8
Total	20.2	60.5

- Diversion of Albury RJP wastewater loads is discussed in Section 8.3.4.1 above; however, Council are to confirm proposed diversion works required within the existing network to facilitate the transfer of flows to a new Northern WWTP.
- Upgrade of the WWTP will require an amendment to the discharge license, including possible augmentation of future effluent reuse schemes and sludge reuse schemes.

8.3.5 Suggested Funding Mechanisms

To support the timely provision of new infrastructure within the Albury RJP, it is recommended that Council prepare a feasibility study and concept design for the location and sizing of the new sewage treatment plant. Understanding the split of loads between the augmented Waterview WWTP and the new Northern WWTP, as well as the composition of trade waste pollutants, will be necessary to determine the costing of the new treatment plant infrastructure. This will also determine upgrades required to the trunk sewer network and pump stations.

As much of the RJP is outside of the designated sewer area in the Development Servicing Plan (DSP), a revised DSP will need to be prepared in order to levy contributions from development toward the provision of sewerage upgrades.

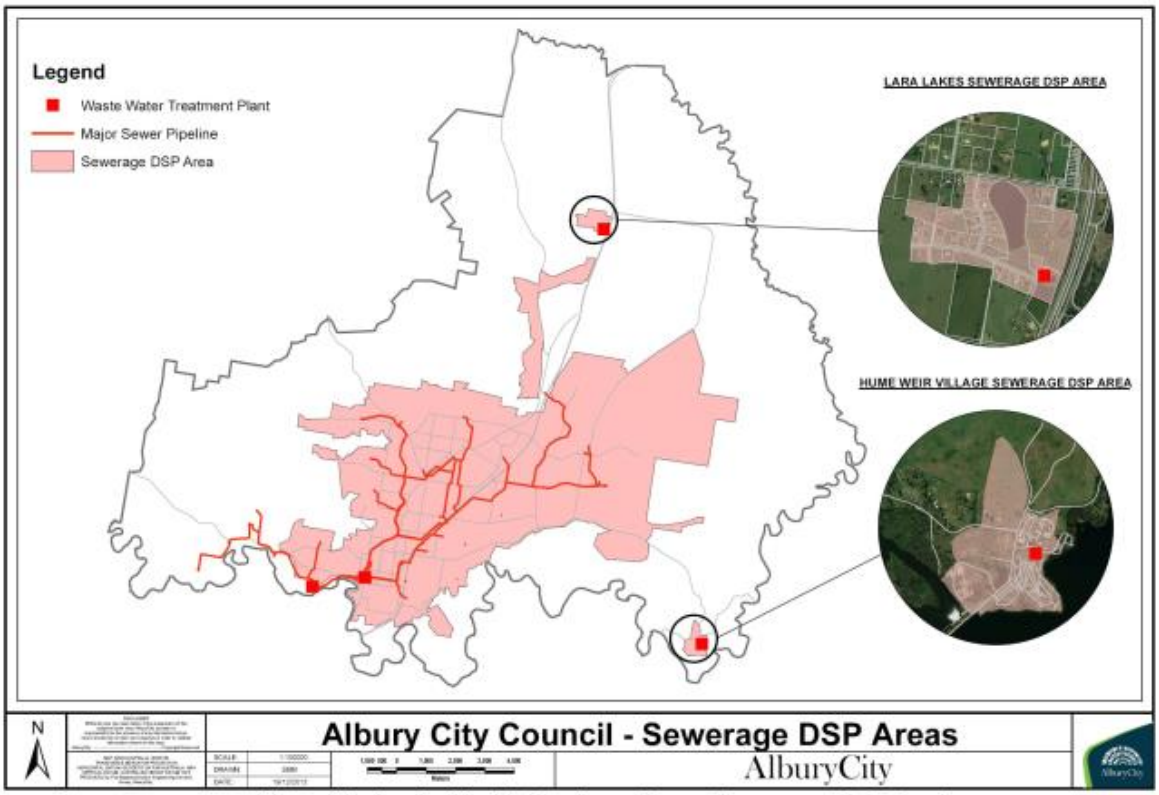

Figure 1.5 Land subject to Developer Charges for sewerage infrastructure

Figure 8-17 | Land Subject to Developer Charges for Sewerage Infrastructure under the Albury Infrastructure Contributions Plan 2014

9. Conclusion

Sections 7.11 and 7.12 of the Environmental Planning and Assessment Act 1979 (EP&A Act) permit the collection of local development contributions by councils, in accordance with local infrastructure plans. These plans cover the construction of public infrastructure that will ultimately be owned by the local council such as open space, community facilities and stormwater upgrades. Funding for State infrastructure is levied through Special Infrastructure Contributions (under Clause 7.24 of the EP&A Act) or through planning agreements. In addition, Section 64 of the Local Government Act 1993 allows a Council to levy fees for water, sewer and stormwater infrastructure where the Council has a Development Servicing Plan. Section 64 contributions typically only apply in non-metropolitan areas, where the Council is the water supply authority.

The Albury Infrastructure Contributions Plan 2014 levies development contributions under Section 7.11 of the EP&A Act for local infrastructure and for water/sewer supply under Section 64 of the Local Government Act 1993. Given the time that has lapsed since the preparation of these contributions plans and based on the current and predicted residential growth in Thurgoona, along with the development envisaged under the RJP master plan, a substantial investment in infrastructure will be required. An updated development contributions plan should be prepared by Council to ensure the appropriate levying of development to support the cost-effective, equitable and timely provision of key infrastructure for the RJP.

It is recommended that this Contributions Plan be expanded to include the Albury RJP, noting that it only applies to part of the RJP. In light of the infrastructure upgrades and staging recommendations in the RJP master plan, it is recommended that the Contributions Plan be reviewed to provide Council with a mechanism to collect funding for the infrastructure that will be required to support employment and industrial growth. Alternatively, Council could adopt a site specific contributions plan for the RJP area only, which could allow the continuation of the existing 2014 contributions plan in parallel.

State Infrastructure Contributions (SICs) help to fund the delivery of state and regional infrastructure such as hospitals, schools, state and regional roads, public transport infrastructure, emergency services, biodiversity and some larger regional open space improvements. SICs are payable in addition to local contributions, and a determination made by the Planning Minister determines when and where a SIC levy applies.

As a result of the expected additional population in the Thurgoona growth area, and the additional employment generated by the RJP, it is recommended that a SIC be considered as an appropriate mechanism to fund new infrastructure such as schools, hospitals, regional open space and upgrades to Regional and State Roads. A wider Social Impact Assessment to determine future education, health and regional sporting needs of a growing Albury should be undertaken.

9.1 Recommended Upgrades, Timing and Funding

Costing of infrastructure associated with a master planned development is inherently backward facing. A high level indicative costing of the staged infrastructure recommended in this report is provided below. This has been prepared by a Quantity Surveyor, based on our master planning activities and assumed quantities.

A breakdown of the recommended upgrades and assumed trigger points is provided in the table below.

Table 9–1 | Recommended upgrades and assumed trigger points

Stage	Item Description	Scope and Equipment
Stage 1		
Electricity	Additional 42MVA capacity required	0.5ha site (minimum with consideration at 2ha ultimate)
		42MVA Transformed load via 2/3 Transformers
		Associated Electrical plant and buildings

Stage	Item Description	Scope and Equipment
		Associated site amenities and access facilities
		Network interconnectivity cabling, conductors and distribution centres (subject to proximity to substation and network nodes)
Telecommunications	New Telecommunications Tower	Allocate 400 sqm site for new telecommunications tower – possibly at existing Table Top Reservoir
Potable Water Supply	WPS24 Update from 2 x 110 kW D/S to 2 x 70 kW D/S	2 x Pump Duty Point 118 L/s at 55m head
	Transfer Main: WPS24 to WR-RJP	3,700m x DN450 DICL
	Water Reservoir Site, WR-RJP (New site)	3 x 2.5ML
	Supply Main: WR RJP to RJP (Hub Road)	1,250m x DN450 DICL
	Eastern Ring Main: WR-RJP Zone	3,200m x DN200 PVC
	Reticulation Network: WR-RJP Zone	1,300m x DN150 PVC Includes southern Highway crossing (under boring)
	Water Pump Station WPS-RJP (New Site) D/S, 2 x 7 kW	2 x Pump Duty Point 39 L/s at 33 m head
	Transfer Main WPS-RJP to WR-28	650m x DN300 DICL
	Reticulation Network: WR28 Zone	200m x DN200 PVC
	Reticulation Network: WR28 Zone	800m x DN150 PVC
Sewerage	Approximately 4.6km of new sewer for RJP reticulation network	231m of DN450 219m of DN375 347m of DN300 446m of DN250 2,326m of DN225 1,029m of DN150
Sewerage	New RJP SPS (RJP SPS-01)	20L/s @ 7m head, including DN150 rising main (approx. 1,085m)
	Augmentation of existing DN300 sewer between MH93710 and MH36938	Augment to DN450 (976m) (approx.)
	Augmentation of existing DN300 sewer between MH36938 and MH36930	Augment to DN500 (approx. 500m)
	Augmentation of existing DN375 sewer between MH36930 and MH36763	Augment to DN600 (approx. 730m)
	Construct a new sewer from MH35469 to MH35440	New DN500 sewer (approx. 475m)
	Construct a new sewer from MH36374 to MH102297	New DN600 sewer (approx. 262m)

Stage	Item Description	Scope and Equipment
	Upgrade Jelbart Rd SPS (SP37)	Upgrade SP37 to 657 L/s @ 9.3m
	Upgrade Ceres Dr SPS (SP04)	Upgrade SP04 to 300L/s at ~10m head and construct a new DN750 rising main (approx. 3.7km)
Stage 2		
Electricity	62MVA	1ha site assumed expanded from Stage 1
		62MVA Transformed load via Transformers additional to Stage 1
		Associated Electrical plant and buildings augmented from Stage 1
		Associated site amenities and access facilities augmented from Stage 1
		Network interconnectivity cabling, conductors and distribution centres (subject to proximity to substation and network nodes)
Telecommunications	Dual Conduit along Collector Roads	New Road Connections in Stage 2
	Install Public Wi-Fi system in the productivity area	1,000m
	Install smart lighting in public domain	1,000m
	Independent Testing of 5G Network	Testing and reporting
Potable Water Supply	WPS24 Upgrade from 2 x 70 kW D/S to 2 x 198 kW D/S	2 x Pump Duty Point 254 L/s at 76 m head
	Upgrade Water Reservoir Site, WR-RJP from 3 x 2.5 ML to 6 x 2.5 ML	3 x 2.5ML
	Eastern Ring Main: WR-RJP Zone	DN250 PVC x 1,750m
	Eastern Ring Main: WR-RJP Zone	DN200 PVC x 850m
	Reticulation Network: WR-RJP Zone	DN150 PVC x 3,200m
	Upgrade Water Pump Station, WPS-RJP from 2 x 7 kW D/S to 2 x 81 kW D/S	2 x Pump Duty Point 111 L/s at 38 m head
	WR28 Upgrade, existing planned upgrade from 1.66 ML to 3.5 ML	1 x 3.5 ML
	Reticulation Network: WR28 Zone	DN200 PVC x 1,800m
	Reticulation Network: WR28 Zone	DN150 PVC x 2,750m
Sewerage	Approximately 5.8km of new sewer for RJP reticulation network	1,174m of DN900 (inlet sewer for New Northern WWTP) 1,178m of DN450 (duplication of existing DN450 sewer) 1,141m of DN250 1,090m of DN225 1,258m of DN150

Stage	Item Description	Scope and Equipment
	Construct a new sewer from MH87762 and MH35651	New DN600 sewer (approx. 305m)
	Augmentation of existing DN375 sewer between MH35440 and MH35290	Augment to DN450 (approx. 210m)
	Upgrade Jelbart Rd SPS (SP37)	Upgrade SP37 to 800 L/s @ 12m
	Upgrade Ceres Dr SPS (SP04)	Upgrade SP04 to 605L/s at 15.7m
	New Northern WWTP	25.4 ML/d (3x ADWF), including wetland for effluent reuse
	New RJP SPS (RJP SPS-02)	289L/s @ 15.6m head, including DN600 rising main (approx. 3,145m)
Stage 3 (Ultimate)		
Electricity	37MVA	0.5ha site assumed expanded from Stage 1 & 2
		37MVA Transformed load via new Transformers additional to Stage 1 & 2
		Associated Electrical plant and buildings via augmented Stage 1 and 2
		Associated site amenities and access facilities via augmented Stage 1 and 2
		Network interconnectivity cabling, conductors, and distribution centres (subject to proximity to substation and network nodes)
Telecommunications	Install smart poles and provide 5G capability in key activity nodes	7,200m
Potable Water	WPS24 Upgrade from 2 x 198 kW D/S to 2 x 242 kW D/S	2 x Pump Duty Point 304 L/s at 86MVA head
	Upgrade Water Reservoir Site, WR-RJP 6 x 2.5 ML to 8 x 2.5 ML	2 x 2.5 ML
	Eastern Ring Main: WR-RJP Zone	DN200 PVC x 2,800m
	Reticulation Network: WR-RJP Zone	DN150 PVC x 5,450m Includes Hume Highway Crossing (under boring) and may require upgrade to DICL
Sewerage	Approximately 3.34km of new sewer for RJP reticulation network	827m of DN225 2,516m of DN150
	New RJP SPS (RJP SPS-03)	32L/s @ 24m head, including DN200 rising main (approx. 1,700m)
	Repurpose existing DN500 Raw Water Main as new rising main	Recommission approximately 11.4km of existing DN500 water main for use as a sewage rising main. Council to undertake investigations on condition and suitability for this main to be utilised as a rising main
	New Jelbart Rd SPS 2	New 196 L/s @ 90.1m head. Provide tie-in to repurposed raw water main
	Upgrade Northern WWTP	Upgrade capacity of Northern WWTP to 60.5 ML/d (3x ADWF), including wetland for effluent reuse

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