Williamtown SAP

Utilities Infrastructure Report

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Abbreviations

Abbreviation	Definition
ADD	Average Day Demand
ADWF	Average Dry Weather Flow
DAREZ	Defence and Aerospace Related Employment Zone
DPE	Department of Planning and Environment
EBD	Enquiry by Design
EPA	NSW Environment Protection Authority
ET	Equivalent Tenement
HGP	Hunter Gas Pipeline
HP	High Pressure
JSF	Joint Strike Fighter
IoT	Internet of Things
IPART	Independent Pricing and Regulatory Tribunal
LEP	Local Environmental Plans
LGA	Local Government Area
MAOP	Maximum Allowable Operating Pressure
MRF	Material Recovery Facility
NRWF	Newline Road Waste Facility
NSW	New South Wales
O&M	Operation and Maintenance
OSD	On-site Stormwater Detention
PDD	Peak Day Demand
PFAS	Per- and Polyfluoroalkyl Substances
PRV	Pressure Reducing Valve
PSC	Port Stephens Council
PWWF	Peak Wet Weather Flow
REZ	Renewable Energy Zone
RFS	NSW Rural Fire Service
RFNSA	Radio Frequency National Site Archive
SAP	Special Activation Precinct
SBWTS	Salamander Bay Waste Transfer Station

SEPP	State Environmental Planning Policy
SIP	Statutory Infrastructure Provider
STS	Sub Transmission Substation
SWOT	Strengths, Weaknesses, Opportunities & Threats
WAP	Williamtown Aerospace Precinct
WPS	Water Pump Station
WTP	Water Treatment Plant
WWPS	Wastewater Pump Station
WWTW	Wastewater Treatment Works
ZS	Zone Substation

Executive Summary

The Williamtown SAP is focused on leveraging employment and investment opportunities associated with its strategic location to the Williamtown Aerospace Precinct (WAP) including the RAAF Base Williamtown, Newcastle Airport and The Defence and Aerospace Related Employment Zone (DAREZ).

The utilities infrastructure requirements are a key component to enabling the vision and objectives of the Williamtown SAP to be realised. The process of assessing utilities infrastructure requirements through to development of the preliminary servicing strategy has followed a 3 stage process:

1. **Baseline Assessment**, to assess the existing utility infrastructure within the initial investigation area
2. **Scenario Testing**, to test the ability develop proposed scenarios to meet targeted objectives within the investigation area
3. **Structure Plan**, based on the outcomes of the Scenario Testing, with the preliminary utilities infrastructure servicing strategies prepared to meet the expected utility demand requirements

Assuming initial development commences within the Northern Sub-Precinct of the Williamtown SAP, the initial stages of the Structure Plan can be enabled through existing infrastructure, and approved plans for the Astra Aerolab precinct. However later stages of the proposed development will trigger significant augmentations to the existing utility networks.

Water supply is provided by Hunter Water through an existing network along Cabbage Tree Road and Nelson Bay Road to the Williamtown, Medowie and Port Stephens areas. The Hunter Water network is supplied from Grahamstown WTP at Tomago and is capable of meeting the predicted future demands of the Structure Plan without augmentation or additional raw water supply. Development of the Northern Sub-Precinct is expected to be largely serviced under the existing approved water servicing strategy for the Astra Aerolab, with minor extensions to the reticulation system. It is likely that ultimate projected demand from the Williamtown SAP will however require construction of a new 9 km length of 250mm transfer main from Grahamstown WPS, subject to further modelling by Hunter Water. Servicing of the Structure Plan will generally be by DN150 reticulation mains, with a DN200 linking the Northern Sub-Precinct to the Eastern and Western Sub-Precincts.

The **wastewater** discharge of the Williamtown area is serviced by Hunter Water's network via the Williamtown 1 WWPS transferring flows to Raymond Terrace WWTW. The precinct is proposed to be serviced by a pressure sewer system that discharges to Williamtown 1 WWPS. The pressure sewer system will incorporate approximately 5.7 km of rising mains and associated reticulation mains and chambers. The transfer of wastewater from Williamtown 1 WWPS to Raymond Terrace WWTW will require the upgrade of the existing system to meet the expected demand of the Structure Plan. The initial stage of the Williamtown SAP, being the Northern Sub-Precinct which incorporates the planned servicing of the Astra Aerolab is capable of being serviced by the existing system with an approved servicing strategy, however projected ultimate demands of the Northern Sub-Precinct may trigger upgrade of Williamtown 1 WWPS and Tomago 1 WWPS. Upgrade of Tomago 1 WWPS may also trigger upgrade of Raymond Terrace WWTW.

Electricity supply is provided by Ausgrid's local 33 kV and 11 kV distribution network, primarily from Williamtown Substation. The Ausgrid network is supplied via 33 kV feeders from Transgrid's bulk electricity supply at Tomago STS. There is limited residual capacity at Williamtown for further development and Ausgrid has identified that a new 33 kV substation south of Cabbage Tree Road would be required to service the final stages of the projected ultimate demand of the Northern Sub-Precinct. The development would be serviced from the new substation via a 11 kV feeder network that could incrementally expand with new development stages. The predicted ultimate demand of the Structure Plan exceeds the residual capacity of Tomago STS and will trigger the upgrade of the Tomago STS and existing 33 kV feeders from Tomago to Williamtown.

Gas supply is serviced by Jemena's 1,050 kPa gas main along Nelson Bay Road and Medowie Road. The expected demand of the Structure Plan is within the capacity of Jemena's network and augmentations to the bulk gas supply to the area are not expected. The precinct will be serviced through a connection to the

existing high-pressure gas main near the intersection of Nelson Bay Road and Williamtown Drive. A proposed distribution main will expand throughout the stages of the development. A District Regulator Set (DRS) will be required to service the ultimate demand and is likely to be required to service demand from the Eastern and Western Sub-Precincts.

Several **telecommunication** providers including NBN, Telstra and Optus currently service the area. The development will be serviced by a rollout of a NBN fibre network as the development incrementally expands. The ultimate development will likely exceed the existing mobile coverage facilities. In the later stages of the Williamtown SAP, an upgrade to one of the five existing mobile facilities or the installation of a new mobile facility will be required. Data specific facilities for defence contractors and data centres will need to be explored further but there is the opportunity to provide separate secure networks to specific developments. The adoption of 'smart poles' throughout the Williamtown SAP's road network is a key opportunity to increase the digital connectivity and security of the area and build on the initial 'smart pole' network developed at the Astra Aerolab development.

Commercial **waste** production from the Williamtown area is currently serviced by private waste facilities in the region. Within the Port Stephens LGA, the privately owned Newline Road Waste Facility (NRWF) in Raymond Terrace (20km away) is an EPA licensed facility that has the infrastructure in place to process organic waste, recyclate and general waste. The facility is licenced to process 200,000 tonnes of waste per year and is the most viable option for management of waste produced at the Williamtown SAP. The Williamtown SAP developments would need to engage in commercial agreements for waste management by private providers. Once the Williamtown SAP develops towards its ultimate state, the provision of a local waste transfer station would be feasible to manage the waste treatment produced locally.

Provision of a shared utility corridor along the proposed road corridors will allow for the reticulation of utility services throughout the Williamtown SAP. It is proposed that a 6m wide clear zone is provided adjacent to the road pavement through the Williamtown SAP to allow an allocation for water, sewer, electricity, smart traffic facilities, telecommunications and gas services.

Recommended Next Steps

Utility	Recommended Next Steps
Water	Initiate typical Developer Services process and consult with Hunter Water to undertake system modelling and performance assessment to confirm infrastructure requirements.
Sewer	Initiate typical Developer Services process and consult with Hunter Water to undertake system modelling and performance assessment to confirm infrastructure requirements.
Electricity	Engage Ausgrid to undertake Planning Study to assess residual capacity of the existing system, confirm preferred approach for servicing, incorporate Williamtown SAP into the regional plan and confirm contributions and funding agreements for upfront infrastructure upgrades. Consultation with Transgrid to confirm the residual capacity of the bulk supply network at Tomago and planned upgrades or reconfigurations of the network. Further assessment of Microgrid installation.
Gas	Consult with Jemena to incorporate Williamtown SAP into the regional plan and initiate the non-contestable design process. Model dispersion radius to determine the hazardous area classification.
Telecommunications	Engage NBN to undertake Feasibility Assessment and confirm backhaul requirements. Consult with Telstra, Optus and Vodafone to confirm mobile upgrade options. Confirm requirements for secure fibre networks for Defence and data centre developments
Waste	Consult with Newline Road Waste Facility (NRWF) to determine capacity to handle future developments waste production. Consult with PSC waste management

1 Introduction

On 28 May 2020, the Deputy Premier announced Williamtown as regional NSW's fifth Special Activation Precinct (SAP). This follows other SAPs at Parkes, Wagga Wagga, Moree and Snowy Mountains. The focus for all SAPs is a 20-year vision for job creation and regional economic development.

The Williamtown SAP is focused on leveraging employment and investment opportunities associated with its strategic location to the Williamtown Aerospace Precinct (WAP) including the RAAF Base Williamtown, Newcastle Airport and The Defence and Aerospace Related Employment Zone (DAREZ).

1.1 Purpose

The Williamtown SAP Master Plan process follows five key stages as shown in Figure 1-1.

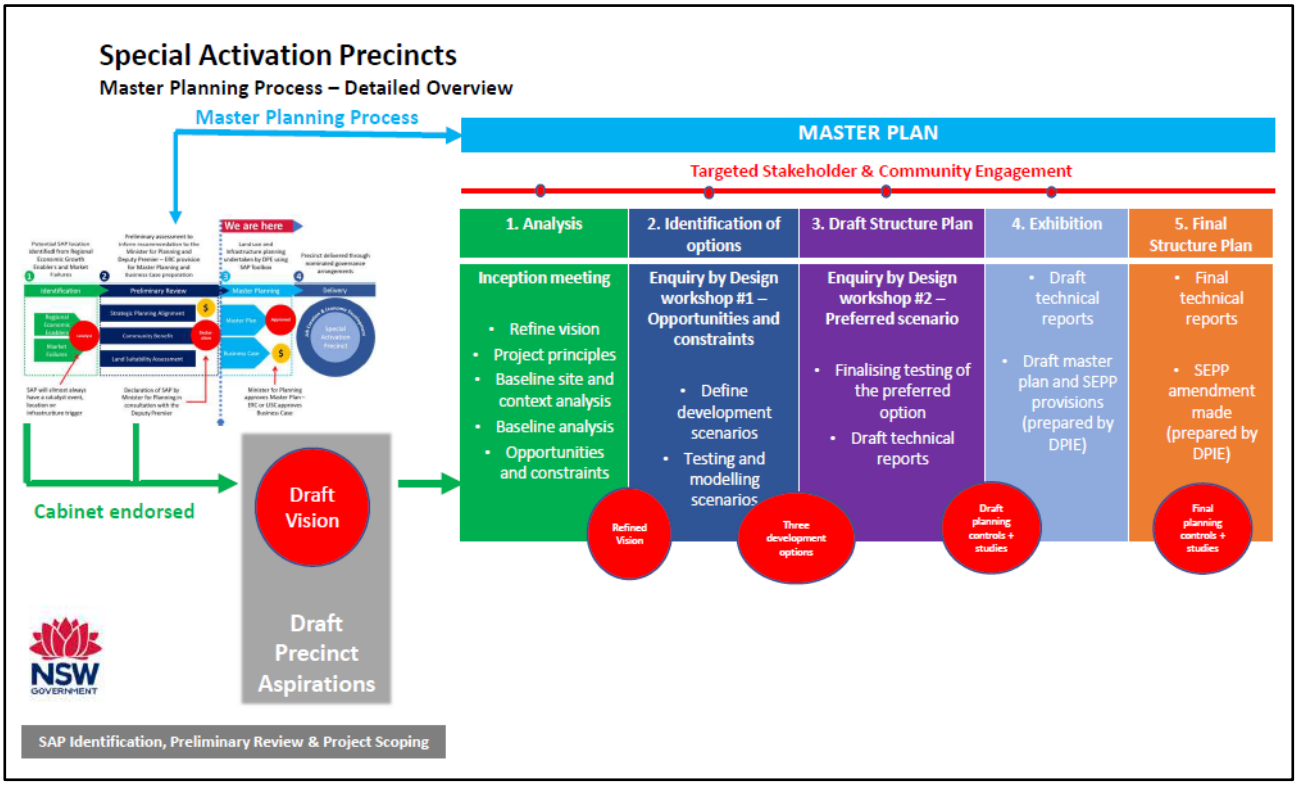


Figure 1-1 Key Stages of the Master Plan Process *(source: The Department of Planning, Industry and Environment)*

The purpose of this report is to outline the utility servicing strategy for the Structure Plan of the Williamtown SAP. The development of the utility servicing strategy will identify the existing utility infrastructure in the investigation area, highlight existing constraints and servicing opportunities, scope required infrastructure augmentations and define the future actions required to enable the development of the Williamtown SAP.

A Preliminary Enquiry by Design (EBD) workshop held on 24 February 2021 developed a range of Williamtown SAP development scenarios. Following a scenario testing of each plan, a Final Enquiry by Design (EBD) workshop was held from April 27 to April 30, 2021 to develop a Structure Plan of the Williamtown SAP.

The assessment of expected utility demand and associated future utility projects is based on the Structure Plan developed in the EBD workshop. The expected utility demands will be conservative assumptions of the requirements of the development due to the nature of the proposed precinct land types in the Structure Plan. The level of accuracy of the expected utility demands will increase as the land use types are refined in future phases of the Williamtown SAP planning process and as development opportunities are realised.

The Structure Plan preliminary servicing strategy will be based on available desktop information.

1.2 Background Context

1.2.1 Williamtown SAP Background

The Department of Planning and Environment (DPE) and Regional Growth NSW Development Corporation's establishment of Special Activation Precincts (SAPs) is a joint Government Agency and innovative approach to plan and deliver infrastructure projects in strategic regional locations in NSW. Investment in these specific areas of Regional NSW 'activate' State or regionally significant economic development and jobs creation as part of the 20-Year Economic Vision. A strategic need from a land use demand and supply perspective, is that there is limited long term availability of readily developable land. The Williamtown SAP will seek to resolve environmental, drainage and other development constraints in a coordinated precinct scale approach as opposed to a site-by-site basis.

The Williamtown SAP's vision is based on six key visions as shown in Figure 1-2. The strategic need for growth in the Hunter Region involves:

- **The Place** – leveraging the vicinity of the RAAF and civil aviation operators attract local employment and commercial investment;
- **Economy and Industry** - facilitate development of additional employment land for Defence and aerospace industries;
- **Environment and Sustainability**– regionally coordinated approach to flooding, water cycle management and contamination while preserving and enhancing the natural environment;
- **Infrastructure and Connectivity** – providing infrastructure to resolve development constraints to reduce investment barriers to entry and enable effective connections to nearby Hunter Region infrastructure;
- **Connection to Country** – To preserve, respect and integrate Aboriginal cultural heritage, particularly the Worimi people; and
- **Social and Community Infrastructure** – Enabling high skill employment, innovation, education and skill training opportunities.

Figure 1-2 Williamtown SAP Vision

1.2.2 Williamtown SAP Location

Williamtown is located approximately 15 kilometres north-east of the Newcastle Central Business District in the Lower Hunter Region of New South Wales.

Newcastle Airport and the Port of Newcastle are recognised as global gateways targeted to enable the region and the state to satisfy the demand from growing Asian economies for products and services associated with education, health agriculture, resources and tourism (Hunter Regional Plan, 2036). The Hunter Regional Plan 2036 identifies that the region's ongoing economic prosperity will depend on its ability to capitalise on its global gateway assets and as such cites a need to expand the capacity of Newcastle Airport and the Port of Newcastle.

The Williamtown SAP investigation area is low-lying coastal land on the edge of Fullerton Cove and Stockton Beach, covering 11,408ha of land within the Port Stephens local government area in the Lower Hunter Region. It is centred around the WAP.

The Williamtown SAP is focused on leveraging employment and investment opportunities associated with its strategic location to the WAP which includes:

- RAAF Base Williamtown which F35 Australia Joint Strike Fighter (JSF) fleet is based in. The area has also been affected by Per- and Polyfluoroalkyl Substances (PFAS) contamination associated with past activities conducted at the Williamtown RAAF Base;
- Newcastle Airport which is jointly owned by Port Stephens Council and Newcastle City Council, leased from the Department of Defence and shares their airport runway with RAAF Base Williamtown;
- The DAREZ which is intended for the development of aerospace and defence specific industries in close proximity to the adjoining Newcastle Airport;
- Bushland vegetation is prominent in the area with some areas containing threatened flora and fauna species as well as important wetland areas;
- Rural and agricultural lands;
- Small rural and low density residential clusters including the township of Salt Ash, Williamtown and Fullerton Cove;
- Commercial and light industrial clusters associated with the airport and RAAF Base along key road corridors;
- The Tilligery State Conservation Area;
- The Grahamstown Lake is located to the north of Fullerton Cove; and
- The investigation area is also crossed by several transport infrastructure assets including roadways.

The Williamtown SAP investigation area is presented in Figure 1-3.

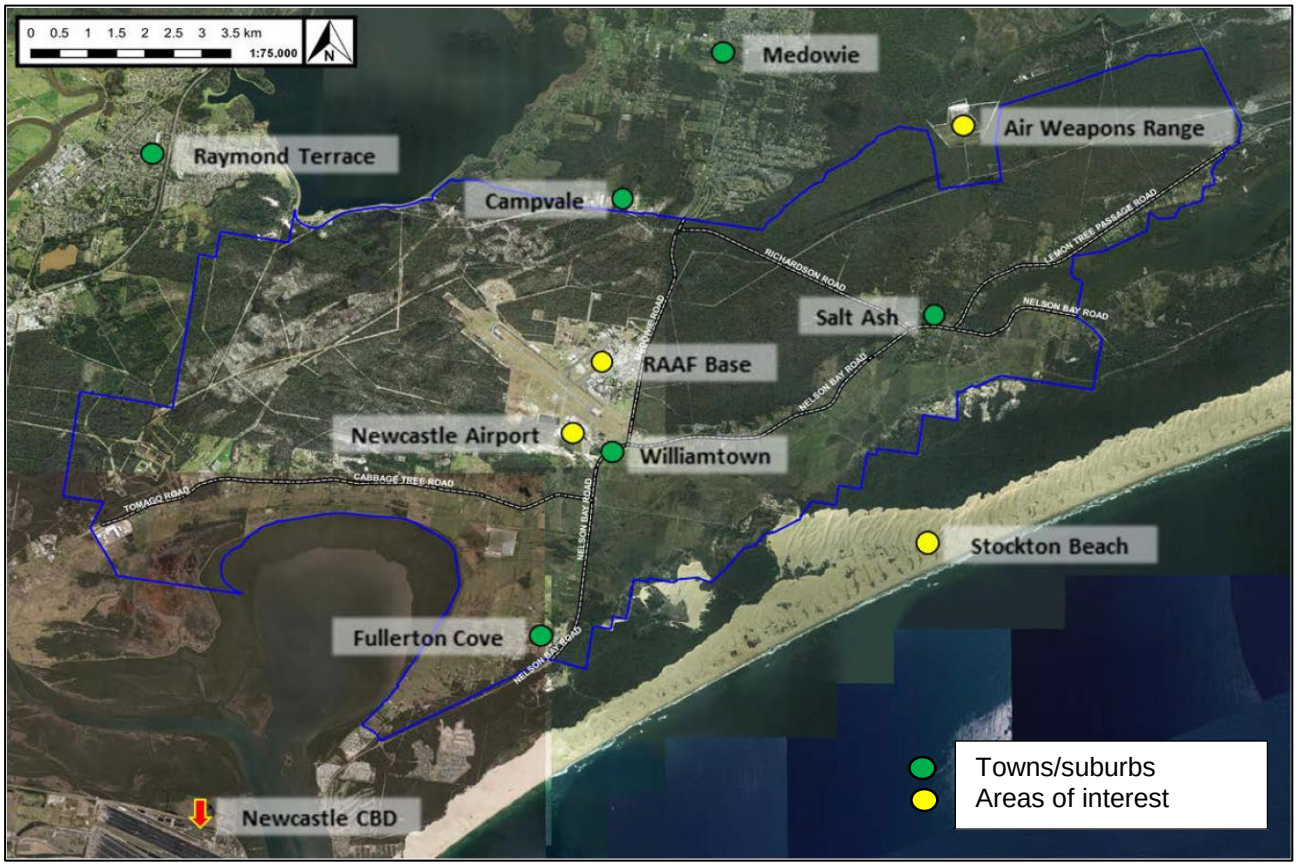


Figure 1-3 Williamtown SAP Investigation Area

1.2.3 Williamtown Utilities Infrastructure Context

The investigation area is sparsely serviced with existing utility infrastructure, with large areas of undeveloped land. The developed western area near Tomago industrial area and along Cabbage Tree Road to the Newcastle Airport and Williamtown RAAF is however serviced to meet existing needs.

The primary water source for the Lower Hunter region, Grahamstown Dam is located to the north and Grahamstown WTP is near the Tomago industrial area to the west of the investigation area, while Raymond Terrace WWTP is also nearby, to the north-west of the investigation area.

A large extent of the investigation area is designated “Bushfire Prone Land”, as well as Tilligerry State Conservation Area, which will require special utility planning considerations in accordance with *NSW RFS Planning for bushfire protection, 2019, The Environmental Planning and Assessment Act, 1979 and the Rural Fires Act ,1997.*

2 Baseline Assessment

Section 2 provides a high-level overview of the existing utility infrastructure that could be utilised to service the investigation area. This baseline assessment provides a summary of residual infrastructure capacity, based on available information and preliminary engagement with utility asset owners in the area. It also outlines identified opportunities and risks for consideration in future precinct planning.

The baseline assessment is generally based on assessment of existing utility infrastructure that is currently servicing existing demand. The residual capacity is likely to diminish with time due to projected growth, independent of the Williamtown SAP development. Therefore, the utilities servicing strategy for the Williamtown SAP will need to be integrated with existing utility authority infrastructure planning, considering projected residual capacity at time of construction and occupation as well as planned projects to further increase capacity.

The design and construction of public utility infrastructure in NSW is defined as either contestable or non-contestable works. Contestable works may be carried out by an accredited service provider under authority of the utility authority. This generally includes water and wastewater infrastructure and Ausgrid distribution and sub-transmission network assets. Telecommunications, gas and electrical transmission assets are generally classified as non-contestable works, requiring delivery by the utility authority. Consideration of utility authority processes and systems will be considered where the provision or upgrade of non-contestable utility infrastructure is required to minimise time-delay risks.

Table 2-1 Utility Authorities Servicing the Investigation Area

Service	Agency
Water and Wastewater	Hunter Water Corporation
Telecommunications	NBN
Telecommunications	Optus and/or Uecomm
Telecommunications	Telstra
Telecommunications	Nextgen
Gas	Jemena Gas North
Electricity	Ausgrid

It is noted that Port Stephens Council do not own or operate utility infrastructure within the investigation area.

2.1 Proposed Developments in The Region

There are several publicly announced developments planned within the investigation area. These developments may impact on existing utilities infrastructure servicing capacity; however, they also present as an opportunity to achieve scaled efficient upgrades if planning is coordinated effectively with the utility authorities and between the projects.

2.1.1 2036 Newcastle Airport Masterplan

Newcastle airport masterplan outlines development proposal to expand the Newcastle Airport facilities to improve customer facilities, with customers and the Terminal area required to support increased use predicted to double by 2036. The masterplan also outlines proposals to develop a ‘campus’ style business precinct and a maintenance and freight handling precinct adjacent to the airport.

The development will result in an increase in utility demand and potentially require additional utility infrastructure, which will need to be planned and coordinated through the various utility authorities listed above. Initial demand forecasts and servicing strategies are not yet available, which is recommended to be considered (where possible) as part of the Williamtown SAP master planning process.

Figure 2-1 provides an overview of the proposed masterplan vision.

Figure 2-1 2036 Newcastle Airport Masterplan *(source: 2036 Newcastle Airport Vision)*

2.1.2 DAREZ

A key component of the Newcastle Airport Masterplan is the Williamtown Defence and Airport Related Employment Zone (DAREZ) Land Use Development Strategy which supports land use and infrastructure planning to enable the commercial and industrial development to support defence and related industry. While the DAREZ increased the utility demand for the regional network, there is an opportunity to coordinate a servicing strategy and develop synergies with the Williamtown SAP.

Figure 2-2 provides an overview of the proposed DAREZ Structure Plan, which forms part of the Newcastle Airport Masterplan.

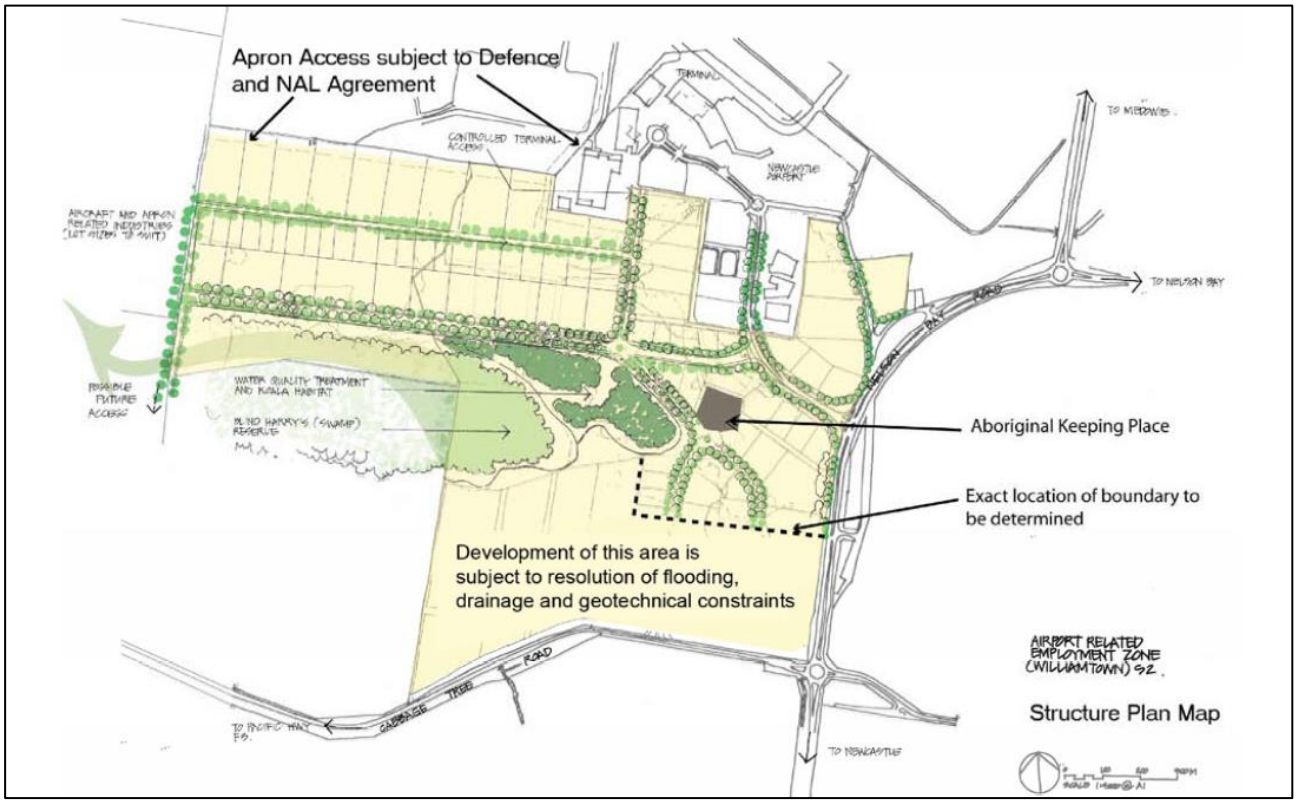


Figure 2-2 DAREZ Structure Plan *(source: Williamtown DAREZ Land Use Strategy, 2007, GHD)*

2.1.3 Air 6000 Phase 2A/B – New Air Combat Capability (NACC) Facilities Project

The Department of Defence have developed a new F-35A Operational Precinct at Williamtown RAAF and associated engineering infrastructure. The development results in an increase in utility demand and potentially require additional utility infrastructure, which will need to be planned and coordinated through the various utility authorities listed above. Initial demand forecasts as a result of the servicing strategies are not yet available, which is recommended to be considered (where possible) as part of the Williamtown SAP master planning process.

2.1.4 Port Stephens Solar Farm

Port Stephens Shire Council has approved a Development Application for a 4.5 MW solar farm at 393 Cabbage Tree Road, Williamtown. Limited details of the proposed development are currently available; however, it is understood that the solar farm is proposed to connect into the existing electricity transmission infrastructure that runs through the proposed development. Approval of the development may support the Hunter Renewable Energy Zone recently announced by DPE.

2.1.5 AGL Power Station

AGL has announced that it will construct a 250 MW Newcastle Power Station off Punt Road in Tomago and will be in operation in 2022. This new power station is intended to be operated as a peaking plant and presumably be connected to Ausgrid 132 kV network. This new power station is located outside of the Williamtown SAP investigation area and therefore AGL is not considered a project interface for the purpose of the utilities infrastructure servicing strategy.

The new power station will unlikely impact regional supply or ability to service the Williamtown SAP project.

2.2 Water

Hunter Water Corporation are the responsible water supply authority for the Lower Hunter. Existing water infrastructure servicing the Williamtown SAP investigation area are identified in Figure 2-3.

Figure 2-4 illustrates the site topography, while Figure 2-5 indicates Hunter Water interest land (catchment area, drinking water protection, easements and land ownership).

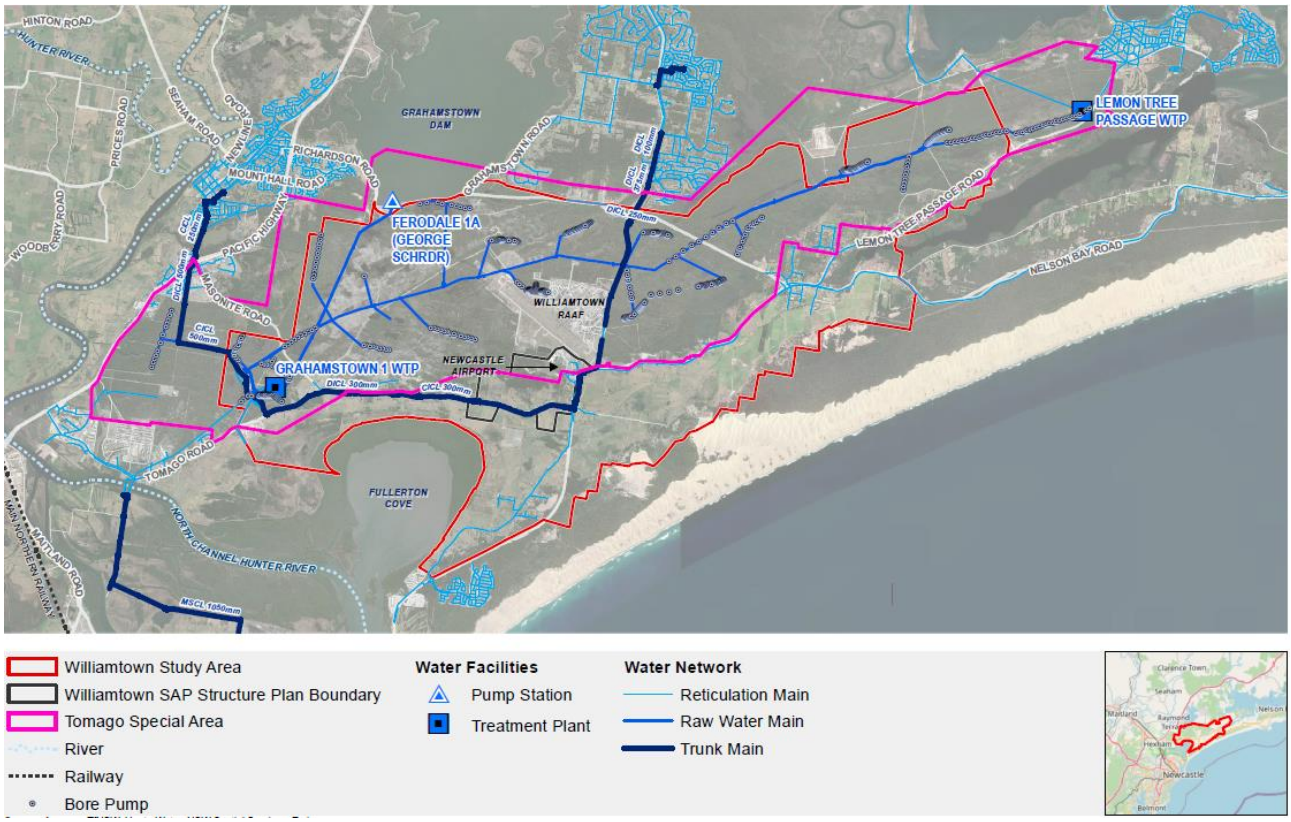


Figure 2-3 Existing Water Assets

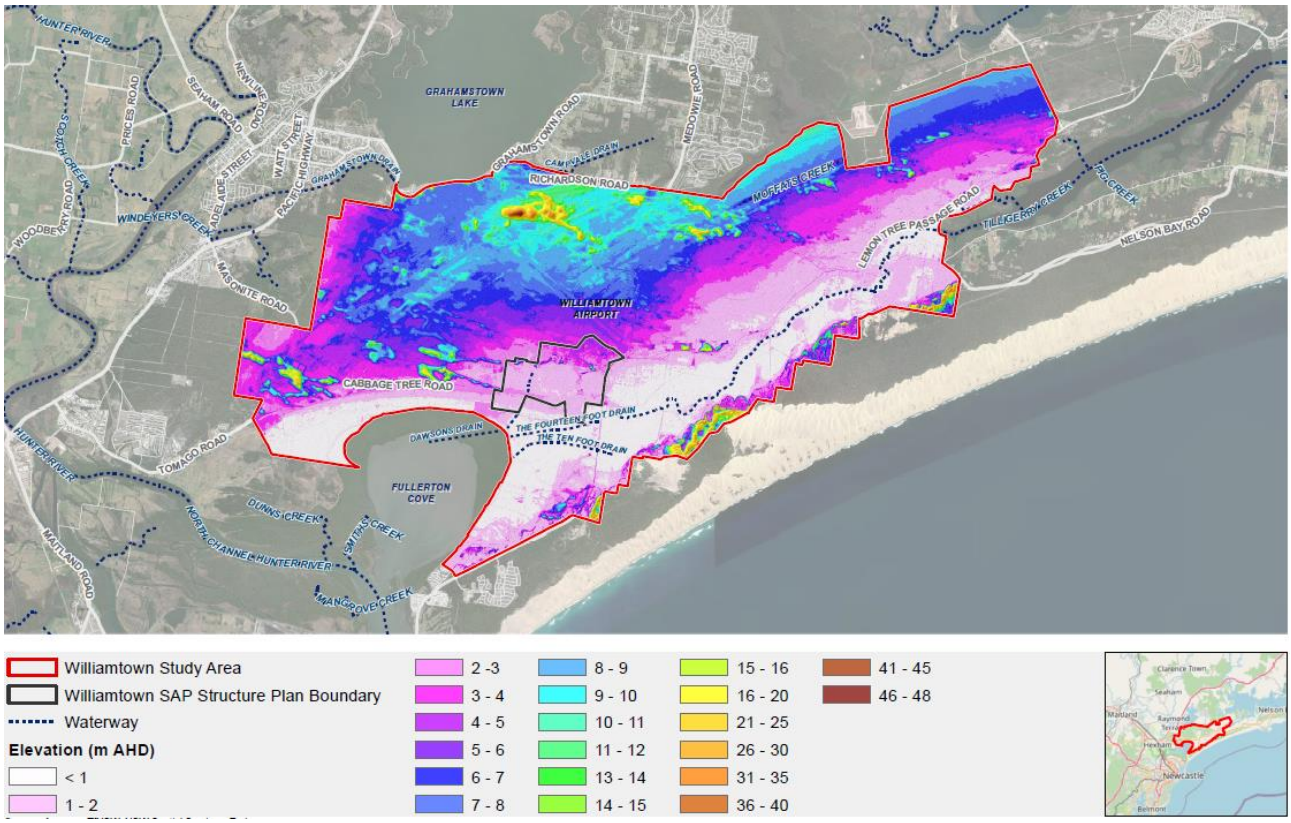


Figure 2-4 Investigation Area Topography

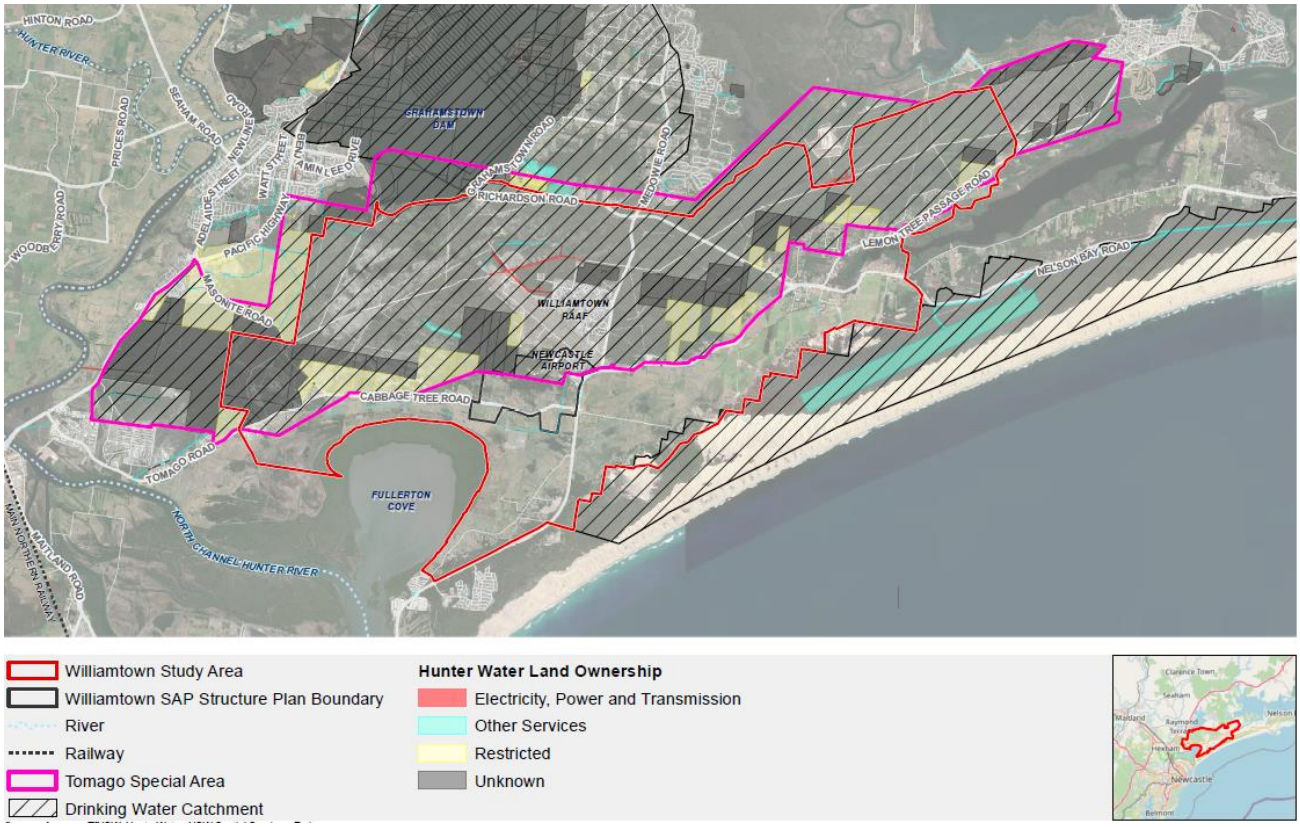


Figure 2-5 Hunter Water Interest Land

2.2.1 Water Supply and Treatment

Grahamstown Dam and Grahamstown WTP is the primary water supply for the Lower Hunter region, with treatment capacity of 257 ML/d. Initial discussions with Hunter Water indicates that water infrastructure planning is currently based on 0.6 GL/a increase in demand per year in the Lower Hunter. On this basis, the existing WTP will not face any capacity constraints because of the Williamtown SAP, given the scale and capacity of the WTP relative to the Williamtown SAP.

Table 2-2 Key Water Supply Infrastructure

Item	Capacity
Grahamstown WTP	257 ML/d

2.2.2 Tomago Sandbeds

The Tomago Sandbeds, located within the Williamtown SAP investigation area, is an underground aquifer with water rights predominantly allocated to Hunter Water as a contingent water supply for the Lower Hunter. The Port Stephens LEP provides provision for the protection of drinking water catchments, which includes the Tomago Special Area. Under the LEP, development is not precluded, however any development proposal would need to satisfactorily demonstrate that there would be no adverse impact on the quality and quantity of water entering the drinking water storage. This includes ensuring that any flood mitigation and drainage works do not adversely impact the drinking water catchments.

As part of the Activation Precinct SEPP the Williamtown SAP will develop a streamlined planning pathway to enable 30 day determination of Activation Precinct Certificates however, under current legislation development in the area would be referred to Hunter Water to ensure that drinking water protection requirements are still maintained under the Hunter Water Act. This may include details of:

- On-site use, storage and disposal of any chemicals, including road transport within the catchment
- Treatment, storage and disposal of wastewater and solid waste
- Any works that modify surface or groundwater flows, which may impact quantity or quality of flow into the drinking water catchment and Tomago Special Area

There is an opportunity through the streamlined planning process to simplify this engagement with Hunter Water to ensure the objectives of the Act are maintained but expedited approvals are realised.

2.2.3 Trunk Network

The Williamtown SAP investigation area is broadly serviced from Grahamstown WTP by a DN300 and DN250 transfer mains along Cabbage Tree Road. These mains are pressure boosted by the Williamtown 1A WPS to service Salt Ash and Bobs Farm via a DN300 main along Nelson Bay Road, and Medowie via a DN300 and DN150 main along Medowie Road. The southern extent of the investigation area is serviced by a DN300 transfer main along Nelson Bay Road that currently services Fullerton Cove and Fern Bay.

The existing transfer mains service the existing peak demands of the investigation area. The ability of the existing system to supply additional demand from the Williamtown SAP development will be subject to hydraulic modelling when demands (including firefighting demands) and diurnal patterns are established.

In general, Hunter Water has confirmed that the Williamtown SAP investigation area has sufficient pressure to service new connections, however areas close to the Williamtown 1A WPS will require pressure reduction at connections to the bulk transfer mains.

2.2.4 Reticulation Network

Water service pressure generally ranges between 20m and 80m (refer Figure 2-6 & Figure 2-7), however Hunter Water has identified low pressure issues on the suction (western) side of Williamtown 1A WPS (near

Williamtown RAAF) during pumping operations. Hunter Water have plans to rezone the affected area to the delivery side, increasing the observed minimum pressures from approximately 25m to 50m.

The ability to service additional Williamtown SAP precinct water demand will be subject to hydraulic modelling, to ensure adequate system pressure can be provided and maintained in the existing network. Any development on areas of higher elevation in the north of the investigation area may also require additional pressure boosting to provide serviceable pressure, with elevation being 10-20m higher than along the arterial roads. Furthermore, firefighting flows are a key consideration of peak flows and will require modelling of the proposed network to ensure peak demands are met.

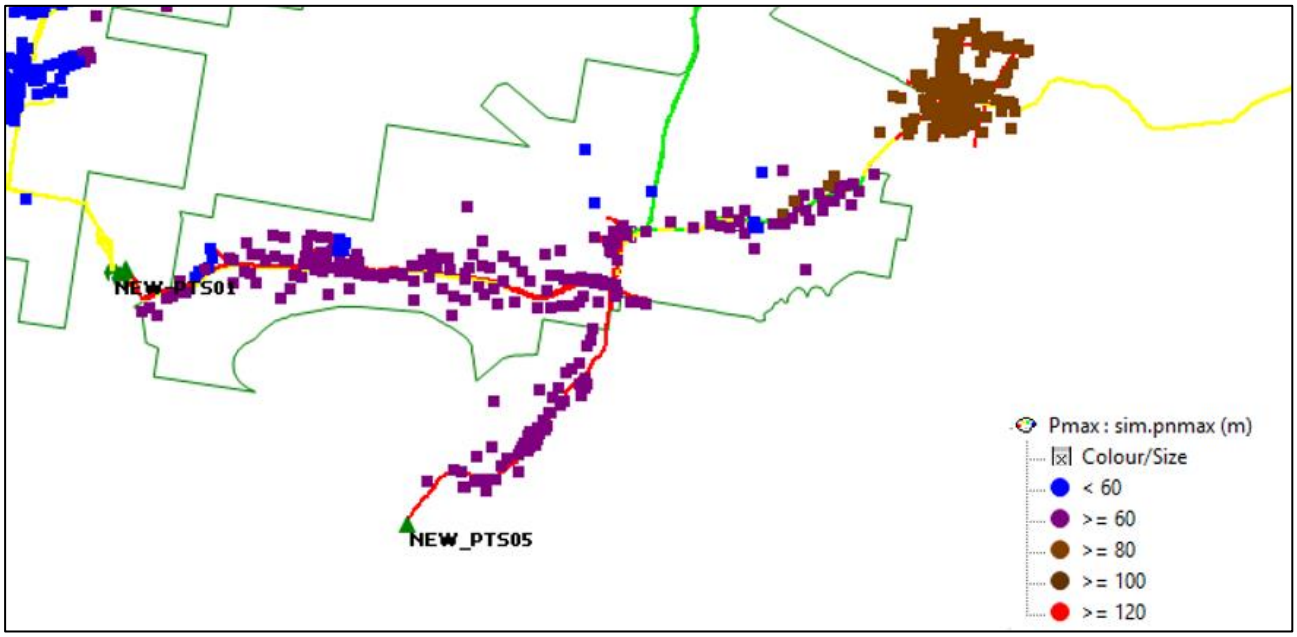


Figure 2-6 Maximum Pressure Map - Average Day Demand

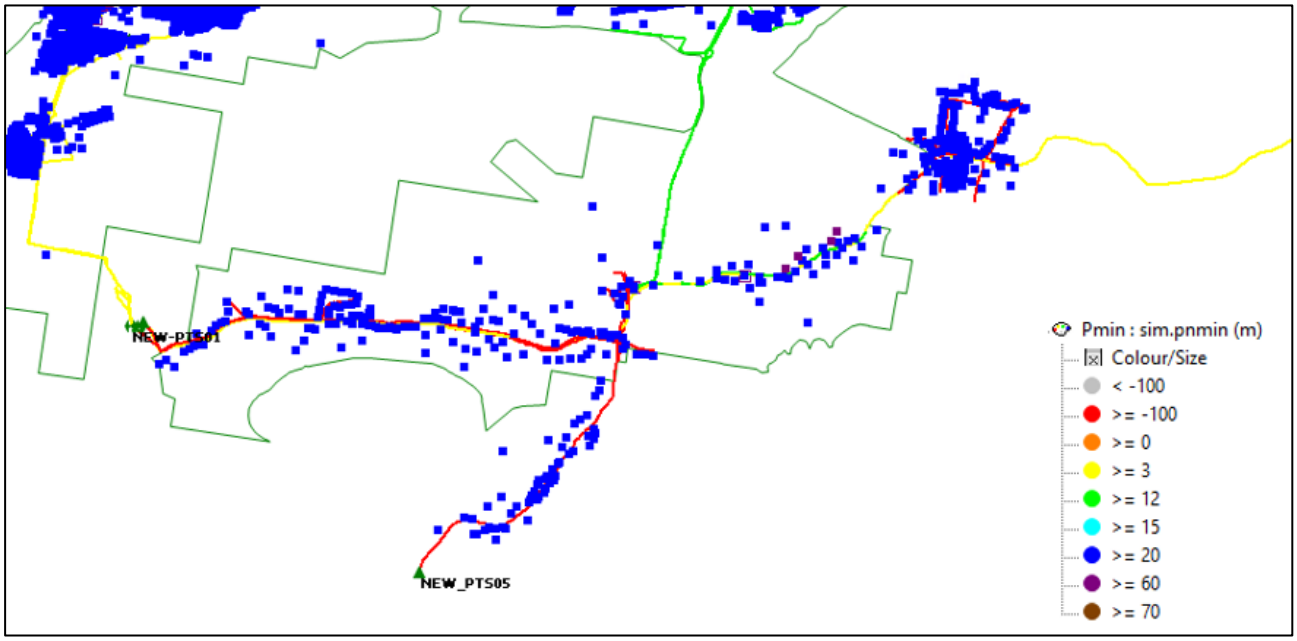


Figure 2-7 Minimum Pressure Map - Peak Summer Demand

2.2.5 Recycled Water

Hunter Water do not currently supply recycled water within the investigation area. Refer to Section 2.2.7 for details of potential future recycled water opportunities.

2.2.6 Developer Services Application Process

Extensions to Hunter Water potable water network are generally expected to require developer contributions. The project is not anticipated to trigger Hunter Water treatment capacity upgrades, however the staged demands from the project would typically be coordinated with Hunter Water through the (Hunter Water Act) Section 50 application process.

Hunter Water levy new development to recover the cost of infrastructure upgrades to service growth. Developer Charges are calculated in accordance with the Independent Pricing and Regulatory Tribunal (IPART) determination issued on the 1 July 2020.

2.2.7 Investigation Area Constraints and Opportunities

2.2.7.1 Constraint – Bushfire prone land

A significant part of the investigation area is within designated “Bushfire Prone Land” (refer to *C2.2 DPE Williamtown SAP Bushfire Scenario Analysis*). Therefore, requirements of the *RFS, Planning for Bush Fire Protection, 2019* will apply to any precinct development within the bush fire prone land. This requires that suitable water supply arrangements are provided and maintained for firefighting. The precinct development could provide an opportunity to improve local bush fire resilience, with provision of additional stored water, or power-independent reticulated water supply with special firefighting provision. Further engagement with NSW RFS will be required to develop within bushfire prone land.

2.2.7.2 Constraint – Williamtown 1A WPS

It is understood that Williamtown 1A WPS has been designed to blend with nearby Monarch Historical Museum. Any modifications to the facilities or nearby development would likely be subject to similar provision.

2.2.7.3 Constraint – Existing System Capacity

While the existing water transfer system is expected to provide suitable capacity to service likely Williamtown SAP water demands, any augmentation of the transfer system would likely require an extended upgrade of mains to the Grahamstown WTP, located 8km from the intersection of Cabbage Tree Road and Nelson Bay Road at Williamtown. Therefore, precinct options in the western part of the investigation area will be favoured from a water infrastructure servicing perspective.

2.2.7.4 Constraint – PFAS

The PFAS contamination of groundwater throughout the Williamtown SAP will require consideration of construction methods for new or upgraded pipelines.

2.2.7.5 Opportunity – Treated groundwater from Williamtown RAAF

Department of Defence are currently extracting and treating 2 ML/d of groundwater as part of ongoing PFAS contamination management. Opportunities to utilise this resource for industrial use within the Williamtown SAP precinct will be further explored. It should be noted that there may be a social stigma associated with the use of treated water and it is recommended that any treated water be used for activities that eliminate the risk of human consumption or interaction, such opportunities include conversion of treated water for hydrogen generation or closed loop cooling (not evaporative cooling).

2.2.7.6 Opportunity – Recycled Water to Tomago Industrial Area

Hunter Water are currently investigating a potential project to provide recycled water from Raymond Terrace WWTW to the Tomago industrial area, near the western boundary of the investigation area. Opportunities to utilise recycled water for industrial use within the Williamtown SAP precinct will be further explored.

2.2.7.7 Opportunity – Hunter Water Low Pressure Improvement Program

Hunter Water are currently planning works to improve low pressure issues on the suction (western) side of Williamtown 1A WPS. The upgrades will alleviate the low pressure observed during pumping and increase the pressure in the rezoned area from 25m to 50m.

A 2007 infrastructure planning assessment of the DAREZ development (RAAF Base Williamtown/Newcastle Airport Employment Zone Land Use Development Strategy, Water and Wastewater Strategy, GHD, 2007) indicated that Hunter Water plan to invest $3.1m over 20 years to augment the water supply system to accommodate planned growth. These costs are planned to be recovered through developer charges.

Opportunities to leverage these improvement works and coordinate with the proposed precinct development will be further explored.

2.2.7.8 Opportunity – OSD Recycled Water

There is an opportunity to capture rainwater from the large roof areas of industrial buildings for on-site stormwater detention (OSD) which could be used for toilet flushing, fill on-site tanks for firefighting and landscape irrigation. This reduction in demand could be used to minimise the overall demand of the Williamtown SAP precinct as development progresses.

2.3 Wastewater

Hunter Water Corporation are the responsible water authority for the area, providing wastewater collection, treatment and discharge back to the environment. Existing wastewater infrastructure servicing the Williamtown Williamtown SAP investigation area are identified in Figure 2-8.

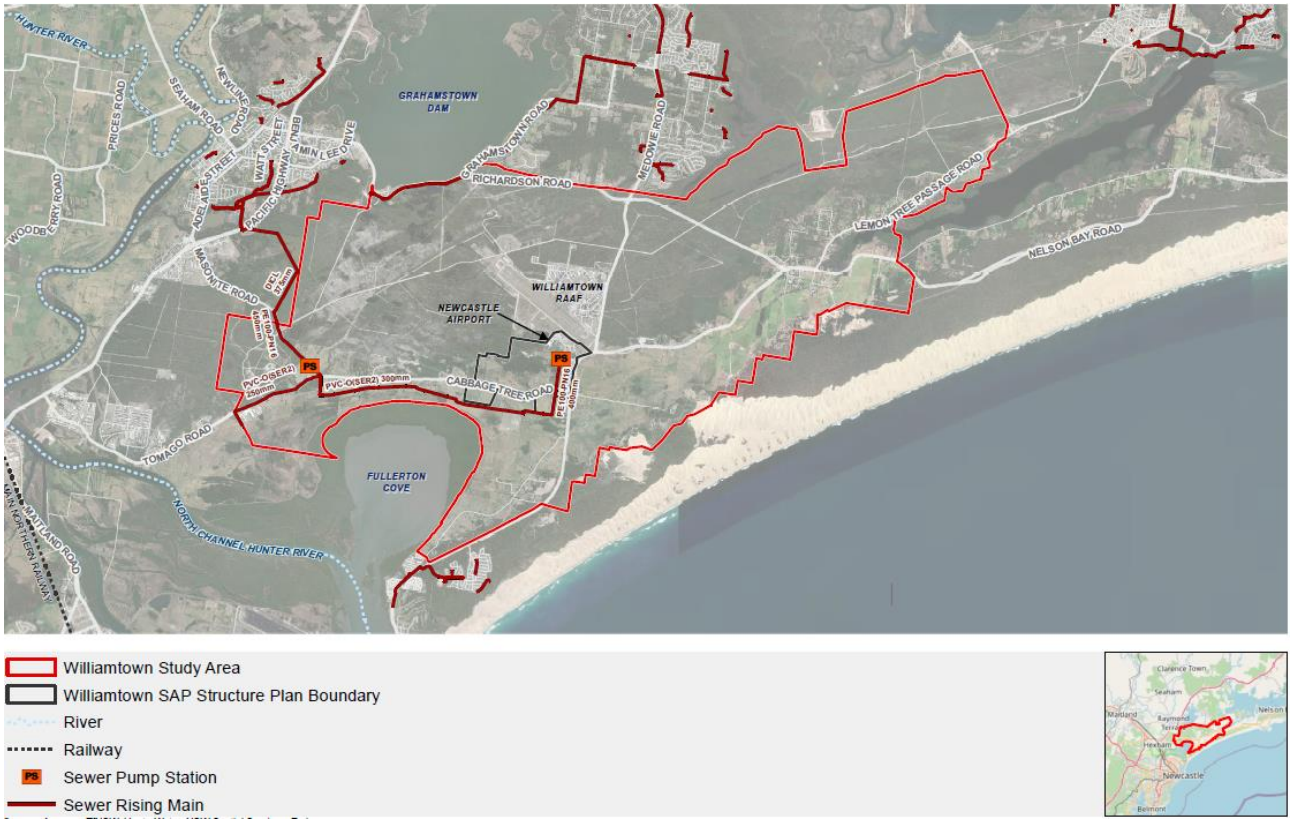


Figure 2-8 Existing Wastewater Assets

2.3.1 Treatment

The Raymond Terrace Wastewater Treatment Works (WWTW) shown in Figure 2-8, west of the investigation area, collects wastewater from serviced properties within the investigation area. Most serviced properties are located near Williamtown Airport, with the remaining undeveloped areas unserviced and relying on septic systems. It currently treats 6.4 ML/day (ADWF) and can treat an equivalent population of 35,000.

Environment Protection Licence monitoring data from 2019-2020 (Licence number 217 https://www.hunterwater.com.au/our-water/epa-monitoring/epa-pollution-monitoring/raymond-terrace-wwtw) indicates that biological treatment is performing well within license limits for nutrient load discharge. The current licence has a discharge volume limit of 5000 ML/year (average 13.7 ML/d). Current Hunter Water predictions indicate that growth beyond the current capacity of 35,000 ET will occur by 2028.

It is understood that a load increase requiring the upgrade of Tomago 1 WWPS may trigger the need to upgrade Raymond Terrace WWTW to meet EPL conditions. Therefore loads from the Williamtown SAP will need to be incorporated into Hunter Water's regional strategy.

Table 2-3 Key Wastewater Infrastructure

Item	Operating Capacity	Residual Capacity
Raymond Terrace WWTW	6.4 ML/d	Sufficient to meet current load to 2028.
Williamtown 1 WWPS	80 L/s	0 L/s *

*Current allocated inflows (including proposed Astra Aerolab) are understood to be 85.2 L/s as outlined in Section 4.

2.3.2 Trunk Network

While the Raymond Terrace WWTW may have sufficient capacity to service initial Williamtown SAP loads, there is limited existing wastewater collection infrastructure within the investigation area.

The Williamtown Wastewater Transfer Scheme (2011) saw the construction of Williamtown 1 WWPS and a pressurised DN300 rising main from the Newcastle Airport to Raymond Terrace WWTW, south of Cabbage Tree Road. The system was designed with ultimate capacity to treat load from Williamtown RAAF, Newcastle Airport, proposed Aerospace Park, and proposed Astra Aerolab, with the pump station and rising main sized accordingly. Therefore, the ability to utilise existing wastewater infrastructure to service additional load from the proposed Williamtown SAP precinct may be limited, subject to further assessment of actual current system performance by Hunter Water.

The Tomago 1 WWPS is located at the western extent of the investigation area and there may be an opportunity to utilise the existing pump station and rising main to transfer wastewater to Raymond Terrace WWTW, however this is also understood to be close to capacity. Upgrade of this pump station, may also trigger upgrade of the Raymond Terrace WWTW.

Wastewater collection infrastructure in the western part of the investigation area is understood to be close to capacity, while there is limited existing infrastructure available in the eastern part of the investigation area. Therefore, precinct development options nearest to Raymond Terrace WWTW, near the north-west boundary of the investigation area will be favoured from a wastewater servicing perspective. Provision of wastewater collection infrastructure will have significant cost to service the eastern part of the investigation area, and provision of a packaged treatment plant with on-site reuse may be considered more cost effective than long wastewater collection systems.

2.3.3 Reticulation Network

The existing developments at Williamtown Airport and adjacent developments along Nelson Bay Road are serviced by a local reticulation network that discharges to Williamtown 1 WWPS. This network is understood to be at the design capacity with planned developments at Astra Aerolab triggering upgrades to Williamtown 1 WWPS to meet load.

The large proportion of the Williamtown SAP investigation area is assumed to be not serviced by a reticulation network and it is assumed that existing properties are serviced by septic systems.

New developments in the areas away from Williamtown 1 WWPS and Tomago WWPS would require a consideration of trunk infrastructure augmentation or localised treatment and reuse.

2.3.4 Investigation Area Constraints and Opportunities

2.3.4.1 Constraint – Existing Network Infrastructure Capacity

The existing DN300 wastewater rising main and Williamtown 1 WWPS are sized for current or planned developments at the Williamtown airport precinct. Therefore, the existing reticulation infrastructure is likely to have limited residual capacity to transfer wastewater to Raymond Terrace WWTW.

2.3.4.2 Constraint – Topography

The topography of Williamtown SAP investigation area is generally relatively flat and therefore any long wastewater connections by gravity will potentially become relatively deep. It is expected that these areas are also likely to have high ground water and running sands which presents constructability challenges with deep trenches and potential groundwater contamination risks.

2.3.4.3 Constraint – Contamination

While Hunter Water do not have specific design requirements to mitigate the risk of PFAS contamination caused by potential Inflow and Infiltration (I/I), it is understood that groundwater contamination within the Williamtown RAAF wastewater system has presented ongoing risks to Hunter Water. Therefore, opportunities to maintain shallow gravity sewers and low-pressure wastewater systems will be explored further to mitigate this risk.

2.3.4.4 Constraint – Distance to Trunk Infrastructure

The existing trunk infrastructure from the Williamtown airport precinct to Raymond Terrace WWTW, located roughly along Cabbage Tree Rd, services a small proportion of the Williamtown SAP. Additional developments in unserviced areas of the Williamtown SAP will require augmentation of the trunk infrastructure over extended distances to enable wastewater to be treated at Raymond Terrace WWTW.

2.3.4.5 Constraint – Treated Groundwater Disposal

Department of Defence are understood to be currently extracting and treating 2ML/d of groundwater as part of ongoing PFAS contamination management. An option for effluent discharge is through the existing Williamtown 1 WWPS which would limit the residual capacity of this capacity available for future developments near the Williamtown Airport precinct. Reuse of this treated water source by the Williamtown SAP may provide an opportunity to free additional capacity for wastewater transfer. Further detail of the ongoing operation of the groundwater treatment program will need to be confirmed.

2.3.4.6 Constraint – Competing Developments/Timing

The residual capacity of the Williamtown 1 WWPS is sized for expected growth at the Williamtown Airport Precinct. Due to the limited residual capacity, new developments within the Williamtown SAP will likely trigger augmentations to the existing trunk infrastructure. The augmentation of infrastructure will require approval, design and commissioning before new developments within the Williamtown SAP are able to proceed. Hunter Water will review existing system performance before making a decision to upgrade existing infrastructure.

2.3.4.7 Opportunity – Precinct Level Treatment and Reuse

Existing wastewater system capacity is limited within the investigation area, therefore Precinct development options further from Raymond Terrace WWTW may require substantial network upgrades, likely requiring developer services contributions from the project. Therefore, opportunities to utilise packaged treatment solutions and water reuse on site will be further explored.

2.4 Electricity

The distribution network which passes through the Williamtown SAP investigation area is owned and operated by Ausgrid. As development takes place within the Williamtown SAP area, the demand for power will increase and the existing network's capacity to service the area will depend on several conditions, namely the current available capacities of each zone substation and power distribution feeders. Power to proposed development areas within the Williamtown SAP investigation area will be supplied from available existing Ausgrid 11 kV network or augmented existing 11 kV network; typically, via kiosks but can be direct feeder connections, depending on the consumer's load type.

2.4.1 Transgrid

Transgrid operates and manages the high voltage electricity transmission network in NSW and the ACT, connecting generators, distributors and major end users.

Transgrid owned Tomago Sub transmission 330/132/33 kV Substation is located inside the Williamtown SAP investigation boundary. It is situated adjacent the existing Tomago Aluminium site and supplies the smelting plant with 330 kV power; and supplies 33 kV power in the Port Stephens area via the eight Ausgrid-owned zone substations.

It has several 330 kV feeders connecting to other Transgrid sub transmission substations at Newcastle, Waratah West and Liddell; as well as several 132 kV feeders and 33 kV feeders. It is directly connected to five of the eight Ausgrid-owned zone substations (Tomago, Raymond Terrace, Medowie, Williamtown and Nelson Bay) via 33 kV feeders.

Refer to Section 2.4.2.1 for further details about the zone substations and the interconnecting feeders. -

2.4.2 Ausgrid

Ausgrid is one of the few distributors of electricity on Australia's east coast. In the Port Stephens area that the Williamtown SAP area is located in, Ausgrid distributes the electricity supplied from Tomago Sub transmission Substation via eight zone substations interconnected with 33 kV feeders. Each zone substation supplies power to the 11 kV network from which residential, commercial and industrial customers obtain their low voltage power, typically via kiosks. The focus will be on high voltage assets 33 kV and higher because these assets seldom require augmentation / upgrade compared with 11 kV assets; and hence an upgrade for any 33 kV or higher asset (if determined to be required) is considered a major project. Refer to Section 2.4.2.1 for further details about the zone substations and the interconnecting feeders.

2.4.2.1 Infrastructure

Six of the eight zone substations of interest are relatively new. Williamtown and Tomaree zone substations are the two identified as being at least twice the age of the other zone substations; and have been designed for 132 kV (and therefore have provision to upgrade if required).

Ausgrid has indicated no plans to retire these substations in the near future. Capacity at each of the zone substations identified are satisfactorily sufficient for existing demands.

2.4.2.1.1 Zone Substations

Williamtown 33/11 kV Substation is the only zone substation located inside the Williamtown SAP investigation area. Seven other zone substations outside of this area were identified to understand the local electricity network for which this zone substation is a part of. And it is interconnected to Stockton 33/11 kV Substation, Tanilba Bay 33/11 kV Substation and Nelson Bay 33/11 kV Substation via 33 kV feeders. Power is supplied from Tomago Sub transmission Substation via 33 kV feeders. Currently it supplies the RAAF Fighter Base.

In addition to the aforementioned zone substations, the other identified zone substations within vicinity but outside of the Williamtown SAP investigation boundary are:

- Tomago 33/11 kV Substation, Raymond Terrace 33/11 kV Substation and Medowie 33/11 kV Substation – all connected to Tomago Sub transmission Substation via 33 kV feeders, and
- Tomaree 33/11 kV Substation that is connected to Nelson Bay 33/11 kV Substation via 33 kV feeders.

Refer to Section 2.4.2.1.2 for further details about the interconnecting feeders between zone substations.

Refer to Section 2.4.2.5 for details on available network power capacity for Williamtown SAP.

2.4.2.1.2 Feeders

Majority of all 330 kV, 132 kV and 33 kV feeders are aerial lines (poles/steel towers and wires). The 33 kV network consists of approximately 195 km of predominantly overhead lines.

The majority of the Tomago Sub transmission Substation 132 kV and 33 kV feeders enters in and out of the Williamtown SAP investigation boundary.

There is also a 33 kV feeder from Medowie 33/11 kV Substation that also traverse in and out of the Williamtown SAP investigation boundary to connect to Tanilba Bay 33/11 kV Substation.

Geographically, the concentration of feeders is within the vicinities of Williamtown 33/11 kV Substation and Transgrid Tomago Sub transmission Substation and the area in-between (within the southwest quadrant of the Williamtown SAP investigation area).

There is also a north-south running 132 kV feeder that enters in and out on the west end of the Williamtown SAP investigation area and is not connected to any of the substations identified.

Table 2-4 lists all feeders interconnecting with the high voltage substations of interest.

Table 2-4 Existing Feeder Assets

Feeder ID	Voltage Level (kV)	Substation A	Substation B	Asset Owner	Within SAP area (Y/N)
82	330	Tomago STS	Liddell S	Transgrid	Y
94	330	Tomago STS	Newcastle S	Transgrid	Y
95	330	Tomago STS	Newcastle S	Transgrid	Y
9W	330	Tomago STS	Waratah West	Transgrid	Y
962	132	Tomago STS	-	Ausgrid	Y
963	132	Tomago STS	-	Ausgrid	Y
98A	33	Tomago STS	-	Ausgrid	Y
9F4	33	Tomago STS	-	Ausgrid	Y
479	132	Switchyard	Waratah West	Transgrid	Y
1716	132	Tomago STS	Switchyard	Transgrid	Y
1717	132	Tomago STS	Switchyard	Transgrid	Y
TM1	33	Tomago STS	Raymond Terrace ZS	Ausgrid	Y
TM2	33	Tomago STS	Nelson Bay ZS	Ausgrid	Y
TM3	33	Tomago STS	Tomago ZS	Ausgrid	Y
TM4	33	Tomago STS	Medowie ZS	Ausgrid	Y
TM5	33	Tomago STS	Private Customer	Ausgrid	Y
TM6	33	Tomago STS	Tomago ZS	Ausgrid	Y
TM7	33	Tomago STS	Williamtown ZS	Ausgrid	Y
TM8	33	Tomago STS	Private Customer	Ausgrid	Y
TM9	33	Tomago STS	Nelson Bay ZS	Ausgrid	Y
TM10	33	Tomago STS	Williamtown ZS	Ausgrid	Y
TM11	33	Tomago STS	Private Customer	Ausgrid	Y
TM12	33	Tomago STS	Raymond Terrace ZS	Ausgrid	Y
TM13	33	Tomago STS	Medowie ZS	Ausgrid	Y
3300	33	Williamtown ZS	Field Switch	Ausgrid	Y
3300	33	Field Switch	Nelson Bay ZS	Ausgrid	Y
3300	33	Field Switch	Tanilba Bay ZS	Ausgrid	Y
3300	33	Nelson Bay ZS	Tomaree ZS	Ausgrid	N
3301	33	Williamtown ZS	Stockton ZS	Ausgrid	Y
3305	33	Williamtown ZS	Stockton ZS	Ausgrid	Y
3306	33	Williamtown ZS	RAAF Base	Ausgrid	Y
81401	33	Medowie ZS	Field Switch	Ausgrid	Y
81401	33	Field Switch	Tanilba Bay ZS	Ausgrid	N
33366	33	Nelson Bay ZS	Tomaree ZS	Ausgrid	N

2.4.2.2 Current Projects

Ausgrid are currently undertaking a project in the investigation area to increase capacity (and redundancy) to Williamtown RAAF, including a new 33 kV feeder.

2.4.2.3 Planned Projects

Ausgrid are aware of planned projects (at the time of the issue of this report) for the Astra Aerolab and the Aerospace Centre Precinct 52 (planning refused). These will require additional demand from the Williamtown Zone substation; however, details are not yet available.

Opportunities to coordinate current and planned projects will be further assessed in Concept Design phase.

2.4.2.3.1 New AGL Power Station

AGL has announced that it will construct a 250 MW Newcastle Power Station off Punt Road in Tomago and will be in operation in 2022. This new power station is intended to be operated as a peaking plant and presumably be connected to Ausgrid 132 kV network. This new power station is located outside of the Williamtown SAP investigation area and therefore AGL is not considered a project interface for the purposes of the utilities infrastructure servicing strategy.

The new power station is unlikely to impact regional supply or ability to service the Williamtown SAP project.

2.4.2.4 Ausgrid Developer Servicing Process

The Williamtown SAP project will be required to submit an application for Ausgrid Planning Study during the next phase of the project planning when precinct location and demands have been identified. Ausgrid will provide servicing options during the undertaking of this study prior to providing a design information pack on the preferred option. Ausgrid will provide servicing options to supply the proposed development, including options for redundancy if required to service specific industry or defence requirements.

2.4.2.5 Available Network Power Capacity

Table 2-5 provides the capacities and forecasted loads for the eight existing Ausgrid substations and feeders, as well as Transgrid's Tomago 330/132/33 kV Sub transmission Substation, within the Port Stephens area, based on Ausgrid's Distribution Annual Planning Report (DAPR) December 2019's load forecasting (estimates do not account for Williamtown SAP Project load demands). Other than the Newcastle Airport and Williamtown RAAF, the other loads including future urban developments described in the DAPR are related to local residential and industrial customers.

The values are representative of summer ratings as it indicates the maximum loading onto the network per year. Since demand on the electrical network is expected to increase annually, the latest forecast data is used to ensure realistic and conservative calculations which produce the minimum amount of available firm capacity. Firm capacity refers to the capacity under N-1 conditions (during a transformer or line failure for example) and is used to ensure reliability and security of the network during planning. The available capacity is calculated by subtracting each substation's firm capacity by its 2023/24 forecasted load (Williamtown SAP Project load demands is not accounted for - once known, Williamtown SAP loads will be provided to Ausgrid to include in their planning study and thus the 2023/2024 forecast loads would be revised).

Table 2-5 Existing Substation Capacities and Forecast Loads

Area Plan	Substation	Sub-station Type	Total Capacity (MVA)	Firm Capacity (MVA)	Actual Load 2018/19 (MVA)	Forecast Load 2023/24 (MVA)	Available Firm Capacity (MVA)
Port Stephens	Tomago 132/33 kV	STS	219.3	153.1	115.2	133.2	19.9
Port Stephens	Medowie 33/11kV	ZS	73.0	38.1	12.4	13.7	24.4
Port Stephens	Nelson Bay 33/11 kV	ZS	65.6	45.7	23.1	26.5	19.2
Port Stephens	Raymond Terrace 33/11 kV	ZS	73.6	38.1	22.9	22.8	15.3
Port Stephens	Stockton 33/11 kV	ZS	40.0	20.0	8.0	9.3	10.7
Port Stephens	Tanilba Bay 33/11 kV	ZS	38.8	18.7	10.4	11.1	7.6
Port Stephens	Tomago 33/11 kV	ZS	74.3	38.1	11.3	10.9	27.2
Port Stephens	Tomaree 33/11 kV	ZS	73.3	38.1	15.8	16.5	21.6
Port Stephens	Williamtown 33/11 kV	ZS	45.3	24.8	5.8	6.4	18.4

Although Ausgrid's DAPR load forecasting identifies existing residual capacity in the network, Ausgrid has identified that the existing Williamtown 33/11 kV zone substation does not have capacity to meet increased demands in the Williamtown area. Further consultation with Ausgrid will be required during Concept Design of the Williamtown SAP to determine the preferred servicing strategy and capability of the existing network.

The firm capacity, forecast load and available capacity of each zone substation of interest (sourced from DAPR 19/20), including the Transgrid Sub transmission Substation and new AGL power station are also shown in Figure 2-9.

Ausgrid GIS feeder information has not been received; however indicative details are shown in Figure 2-10.

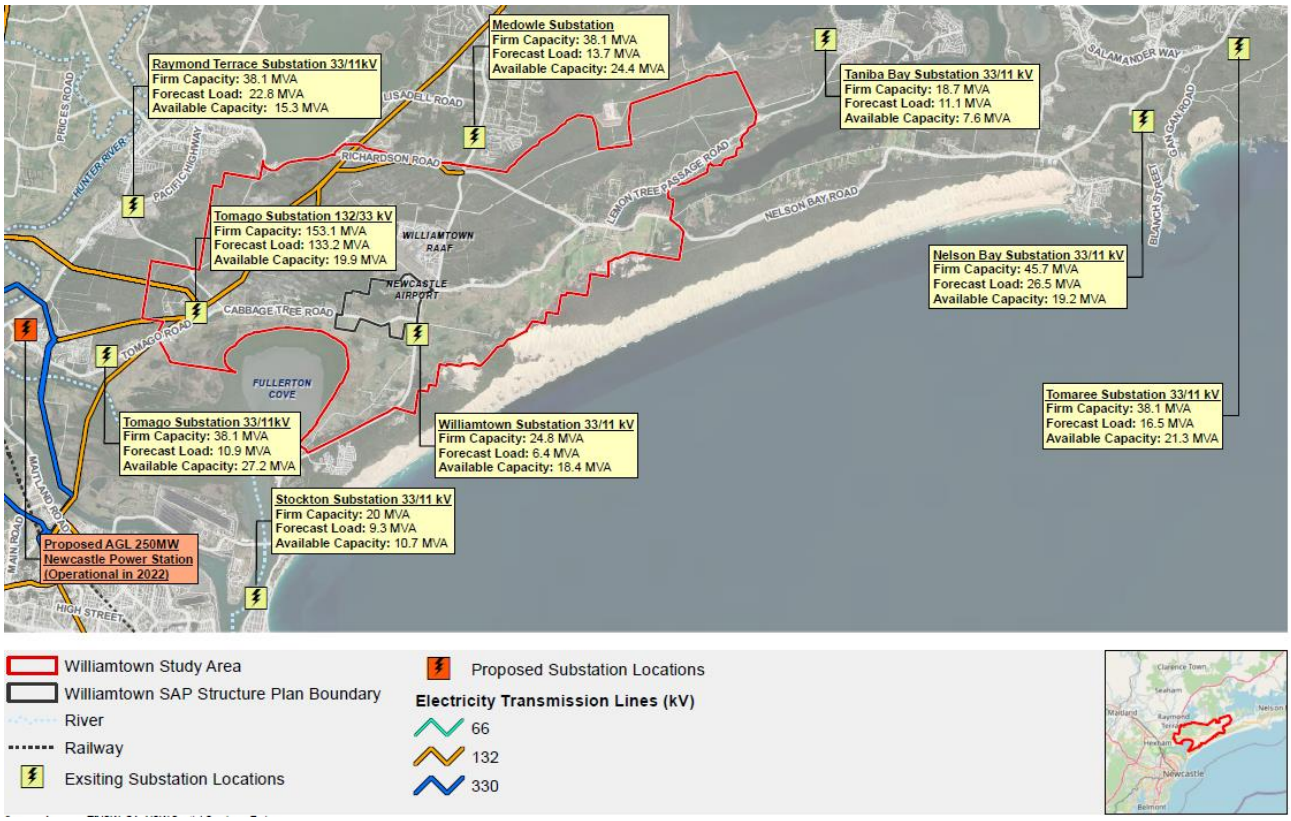


Figure 2-9 Available Electrical Capacity for the Williamtown SAP Investigation Area

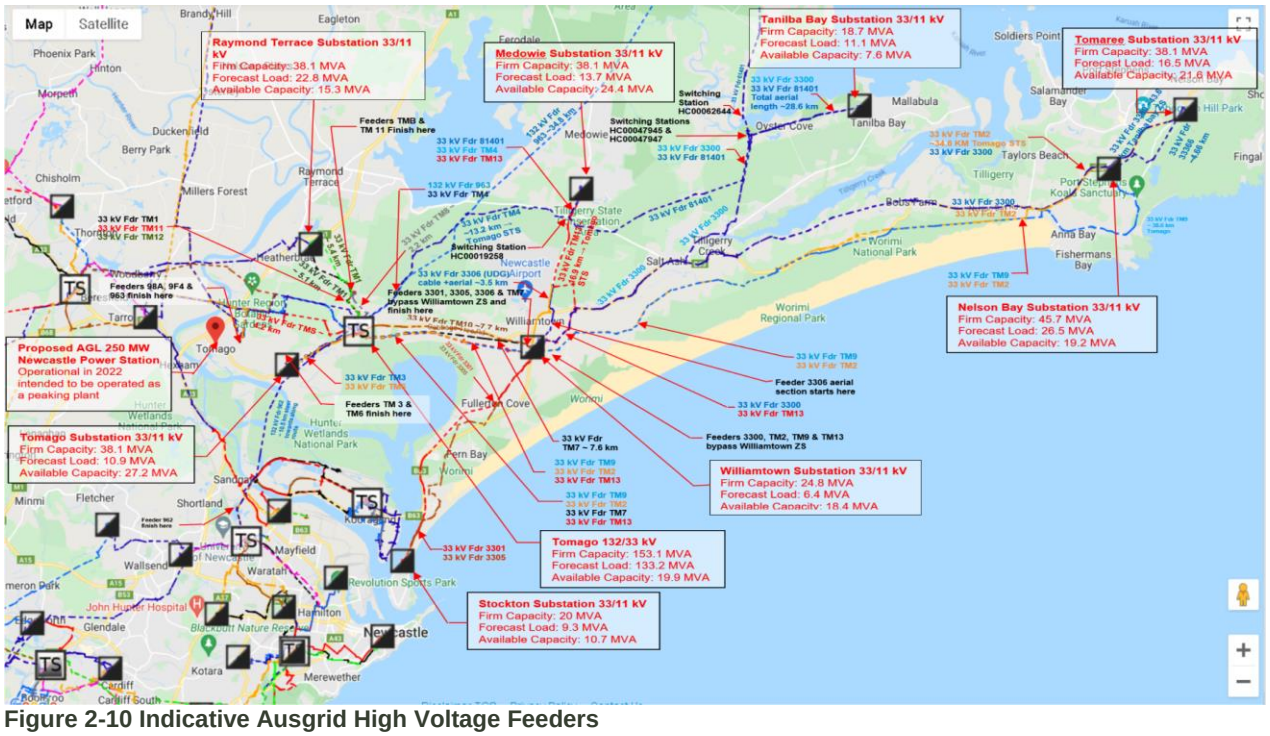


Figure 2-10 Indicative Ausgrid High Voltage Feeders

Ausgrid's latest feeder forecast (based on summer ratings, and does not account for Williamtown SAP Project load demands), identified that two 33 kV Feeders TM7 and TM10 between Tomago Sub transmission Substation and Williamtown Substation currently do not have residual capacity.

As Ausgrid identified in their own forecast the potential overloading of Feeders TM7 and TM10, Ausgrid would determine if upgrading is required and would undertake the upgrade works separate to Williamtown SAP Project.

2.4.2.6 Easement Requirements

Sections of 33 kV overhead lines can be converted to underground if required to accommodate the development proposal. This would require further collaboration with Ausgrid during the precinct planning process. This is also applicable to Transgrid 132 kV; however, the cost implications may limit this option.

The easement width of Ausgrid's 11 kV and 33 kV aerial lines are 20 m (10 m either side of pole perpendicular to the aerial line). For Ausgrid's 132 kV the easement widths are in the range from 30 m to 45 m (depends on the support structure type and footprint, hence 45 m should be considered).

Figure 2-11 and Figure 2-12 provide the applicable easement widths for current infrastructure. Development within these easements is restricted and governed by the relevant utility authorities. The transmission lines (330/132) are generally limited to the western portion of the precinct and are not likely to be impacted.

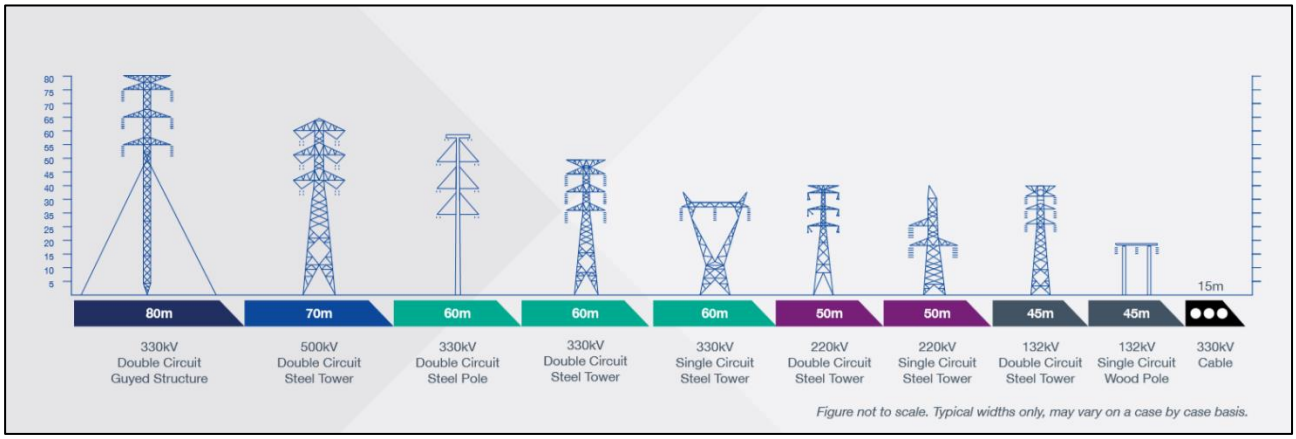


Figure 2-11 Typical Easement Widths of Transgrid Aerial Line Assets *(source: Transgrid Easement Guidelines)*

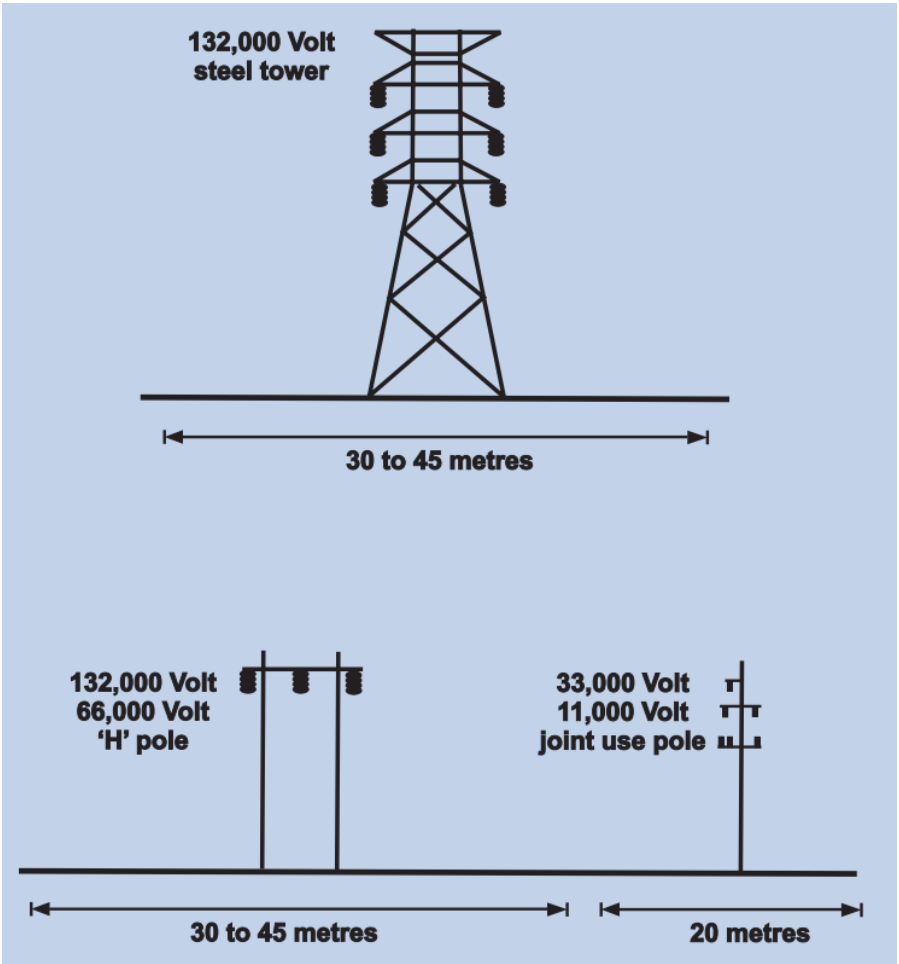


Figure 2-12 Typical Easement Widths of Ausgrid Aerial Line Assets *(source: Ausgrid Easement Brochure)*

Future development within easements is permissible subject to Transgrid and Ausgrid guidelines for the permissible development and subdivision requirements.

2.4.3 Hunter Water Private Supply

Hunter Water maintain a private power supply to operate the Tomago Sandbeds. Location of Hunter Water power supply easements are provided in Figure 2-5. This is not anticipated to impact servicing of the Williamtown SAP given they are located in low priority areas for further investigation. However, scenario testing and the subsequent structure plan will need to consider the location of this infrastructure and Hunter Water land ownership.

2.4.4 Bushfire Requirements

Listed below are the key clauses extracted from the NSW RFS Planning for Bushfire Protection 2019 that must be complied with (section 5.3.3 Services – Water, electricity and gas):

- *'location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings'*
- 'where *practicable, electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follows: lines are installed with short pole spacing of 30 m, unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.'*

2.4.5 Investigation Area Constraints and Opportunities

2.4.5.1 Opportunity – Existing Local Network Power Sufficient for Williamtown SAP Loads

Ausgrid's DAPR load foresting indicates that there is some residual capacity in the regional network servicing the Williamtown SAP. During Concept Design, Ausgrid will be engaged to determine the capacity of the network to meet the expected demand of the Williamtown SAP.

The Ausgrid study will determine if the available capacity of Williamtown can service the Williamtown SAP only service or does it require to be supplemented by the other zone substations it is connected to.

2.4.5.2 Opportunity – Upgrade Existing Zone Substations to Service Williamtown SAP Project

Ausgrid has identified that the existing Williamtown 33 kV zone substation does not have residual capacity to service the expected demands of the Williamtown SAP. The upgrade of the Williamtown zone substation creates the opportunity to service the Williamtown SAP precinct or other developments, avoiding the need to otherwise identify and acquire additional land for an alternative 33 kV supply.

2.4.5.3 Opportunity – Hunter Renewable Energy Zone

The NSW government is in the early stages of feasibility for a new Renewable Energy Zone (REZ) in the Hunter. There may be potential for the Williamtown SAP to further support existing renewable energy proposals in the area and support the Hunter REZ. Opportunities for renewable energy and the Hunter REZ is further outlined in *B1.2I Renewable Energy Baselines Analysis Report*.

2.4.5.4 Constraint – New Infrastructure Near Existing Power Lines

Existing high voltage aerial lines would impose limits/ restrictions for planned Williamtown SAP infrastructure near any of the 132 kV or 33 kV feeders due to already established easements.

2.4.5.5 Constraint - Other Requirements for Any Feeder Upgrades / Augmentation

Feeder upgrades or augmentations will need to avoid known sand beds, national parks, rural fire service locations and privately owned parcels of land. Also, it is recommended to install underground feeder cables instead of overhead conductors particularly near or on known bushfire-prone areas.

2.5 Gas

The Port Stephens LGA is supplied with gas via a DN 500 high capacity main which is a take-off from the Wilton to Newcastle trunk main. This is part of the Jemena Gas Network (JGN), the primary gas distribution network in NSW.

2.5.1 Existing Infrastructure

The Wilton to Newcastle trunk main is supplied with gas from the Eastern Gas Pipeline (EGP), the Moomba Sydney Pipeline System (MSP) and Camden Coal Seam Methane. The blue line in Figure 2-13 shows an existing gas infrastructure servicing the Williamtown SAP investigation area, along Nelson Bay Road.

The maximum allowable operating pressure (MAOP) of each of these supplying pipelines is 6,890kPag. Areas within the Port Stephens LGA are supplied by a 1,050kPag steel gas main that runs along Nelson Bay Road and Fullerton Cove Road; gas is then supplied to some residential consumers via 210kPag polyethylene or nylon mains. In the 2017 calendar year the Port Stephens LGA consumed approximately 44 TJ of natural gas with the customer breakdown summarised in Table 2-6.

Table 2-6 Natural gas consumption in the Port Stephens LGA for 2017 *(source: Jemena)*

Customer Type	Number of Customers	Average Consumption per Customer (GJ/year)	Total Consumption for Customer Type (GJ/year)
Residential	1,840	13.52	24,876
Business	60	326.64	19,598

The gas supply from the existing Jemena Gas Network could be expanded through the Williamtown SAP with an extension of the secondary network HP of 1050 kPa supply and low-pressure Network Main of 210 kPa throughout the area. It is expected that low pressure mains would follow the existing arterial roads through the area. The existing network within the investigation area is shown in Figure 2-13.

Figure 2-13 Existing Gas Infrastructure

At present, the Williamtown SAP area includes Williamtown RAAF base and Newcastle Airport and additional businesses with high gas requirements could be expected in the future.

2.5.2 Service Capacity

Jemena has indicated that they would be able to expand their current gas network, supporting an expected consumption of 0.5 to 1.5 TJ/day based on a study for a similar Williamtown SAP. Jemena can provide up to 3.8 TJ/d (160 GJ/h) of consumption at the Williamtown SAP. Any installation would comprise one or more district regulators, which would reduce the pressure from 1050 kPa to 210 kPa in the low-pressure polyethylene distribution network.

In the event that large supply capacity is required at the Williamtown SAP, alternative connection options to the high-pressure gas mains (approximately 4,000 to 5,000 kPa) may be considered. Gas supply for the Williamtown SAP could be taken from the Hexham metering station or via a hot tap on the main trunk at some location between Hexham and Kooragang Island. However, a study would need to be conducted to determine an appropriate tie-in location and pipeline route and it should be noted that this concept would require pipeline to cross the North Channel (Hunter River). The current Jemena high pressure gas pipeline route is shown in Figure 16 above.

If tying in to the JGN distribution network, the impact on the existing local network must be considered. Approximately 56% of the natural gas usage in the Port Stephens LGA was by residential customers while the remaining 44% was from business customers. The average business customer uses approximately 25 times more gas than a residential customer, making the network far more sensitive to the addition of businesses in the Williamtown SAP. However, if the Williamtown SAP is predicted to significantly increase the population in the Port Stephens LGA then the impact on gas demand will need to be considered. Jemena defines both residential and business customers as ‘volume market’ as they consume less than 10 TJ/year (per customer). For industrial customers consuming more than 10 TJ/year, Jemena defines these as ‘demand market’ and will work with these industries to provide the required capacity.

Additionally, the AGL-owned Newcastle Gas Storage Facility (NGSF) at Tomago, which can store up to 1.5PJ of natural gas, feeds gas back into the JGN via Hexham. This may provide additional gas capacity for the Williamtown SAP due to their close proximity. The closest primary connection point would be to connect to the existing 1,050kPag main along Nelson Bay Road.

2.5.3 Planned Infrastructure

Jemena’s Gas Networks Draft 2020 Plan details the company’s plans for gas infrastructure in NSW over the next five years; however, no specific reference is made to the Port Stephens region. For servicing the future Williamtown SAP Jemena will likely monitor developments and reactively provide additional supply and gas infrastructure. Early coordination between Jemena and the other road or utilities upgrade works in the Williamtown SAP would be beneficial to take advantage of any possible construction efficiencies.

The proposed Hunter Gas Pipeline (HGP) will run from the proposed Narrabri Gas Project to Newcastle and will be another source of gas to the Newcastle and wider NSW coastal area. This high-pressure, 420 km long pipeline could either increase the supply capacity for the JGN or be a direct source of gas for the Williamtown SAP if demand is high enough.

Traditionally, natural gas for the Newcastle, and wider NSW, area has been sourced from South Australia and Victoria, however these supplies are decreasing relative to the demand for natural gas in Australia. Advent Energy, through its wholly owned subsidiary Asset Energy, has calculated significant prospective gas supply in the Sydney Offshore Basin (PEP11). This gas could be supplied into the JGN, preventing the expected shortages to the gas network due to declining supply from South Australia and Victoria and ensuring high gas availability to the local area.

2.5.4 Constraints and Opportunities

2.5.4.1 Opportunity - Hydrogen Potential

Hydrogen is a clean fuel that when burnt, produces only water, making it a carbon neutral power generation method. It can be produced from resources such as natural gas and renewable power such as solar and wind. There are two possible methods to utilise Hydrogen in the Williamtown SAP, one method is having a dedicated hydrogen network and a second method is to inject hydrogen into an existing gas pipeline.

The development of a Hydrogen production plant will likely require an EPA approval process to gain the appropriate licences.

2.5.4.2 Opportunity - Dedicated Hydrogen Network

A pipeline network would be the best option for the comprehensive and large scale of hydrogen as an energy source, because parallel natural gas and hydrogen pipes bring an economy of scales when constructing both at once, it also ensures hydrogen pipes are designed for the purpose of transporting hydrogen which ensures safety across the design (e.g.: the risk of hydrogen induced cracking should be engineered out of the piping design). Another benefit is that it makes the development a circular hydrogen economy; however, it constitutes high initial capital costs of new pipeline constructions that can be paid off with time.

Several facilities and projects ongoing in Australia and worldwide giving credence to the legitimacy of the technology.

2.5.4.3 Opportunity - Blended Hydrogen into Existing Gas Pipeline

Another method of using hydrogen gas to power the precinct is through injecting hydrogen into the existing gas pipeline. Converting natural gas pipelines to a carry a blend of natural gas and hydrogen (up to 15% hydrogen) may not require any modifications to the pipeline. An example of this technique is currently being trialled by Jemena in their Jemena Power to Gas currently under trial, it aims to improve network efficiencies by utilising their existing infrastructure and technologies. The process converts solar and wind power into hydrogen gas, via electrolysis, which will then be stored for use across the Jemena Gas Network (JGN) in New South Wales.

There are existing constraints to this technology which make it difficult to get a significant amount of hydrogen in the pipes. These constraints include the limit to prevent hydrogen induced stress corrosion cracking in the pipes due to high hydrogen concentrations, similarly with high pressure limits. Additionally, the blended gas must comply with the Natural Gas specifications in AS 4564. This will likely limit the maximum hydrogen concentration in the blended gas.

There would be restrictions on the location of the hydrogen blending facility to ensure that the blended gas can be distributed throughout the Williamtown SAP. (i.e.: the blending must be carried out at an upstream location to ensure the flow of natural gas past the blending point)

2.5.4.4 Opportunity – Existing Gas Network Expansion

The existing gas network that supplies to the Williamtown SAP can be expanded throughout the area. This benefits the community, new businesses and residential customers in the area. The current residual gas capacity is 3.8 TJ/day.

2.5.4.5 Constraint – Capability to produce Hydrogen

The current technical and financial capability to produce hydrogen is a constraint as a new hydrogen infrastructure has very high initial costs and current studies worldwide are still assessing the credence of this technology.

2.6 Telecommunications

The Williamtown SAP investigation area is serviced by all major mobile network carriers and partially by both NBN fibre and fixed wireless services. The majority of telecommunications infrastructure is concentrated around the Newcastle Airport and RAAF Base Williamtown (Airport precinct), as well as located along the arterial roads servicing the surrounding population.

Newcastle is serviced by various major trunk fibre networks which are shown to extend north to Port Macquarie, either through or nearby to the Williamtown SAP investigation area.

Figure 2-14 illustrates the existing telecommunications infrastructure within the surrounding area as well as the indicative NBN fibre and fixed wireless coverage.

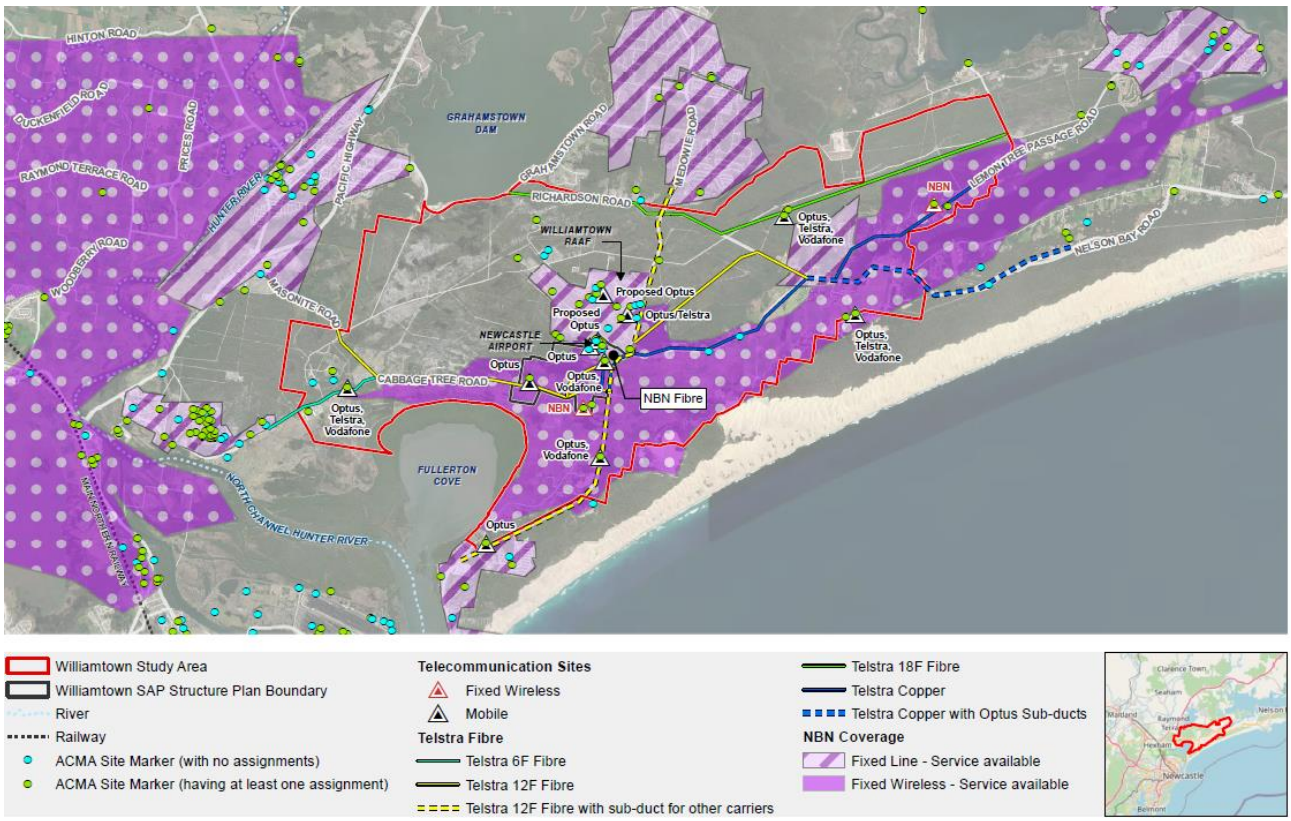


Figure 2-14 Existing Telecommunication Infrastructure

2.6.1 Existing Telecommunications Infrastructure

Full 3G and 4G coverage are identified to service the entire Williamtown SAP investigation area with 5G coverage being available to service strategic areas and locations along Cabbage Tree Road in proximity to Tomago, south of Nelson Bay Road in Fullerton and both north and south of Lemon Tree Passage Road in Salt Ash. The remaining areas do not have 5G services or are not yet serviced by this technology.

The Williamtown SAP investigation area is serviced by the telecommunications infrastructure summarised in Table 2-7 and further detailed below. Given the relatively low population in the immediate surrounding area, the existing mobile telecommunications infrastructure is considered adequate and have residual capacity for an increase in call/data traffic.

Table 2-7 Summary of Existing Telecommunications Infrastructure *(source: Radio Frequency National Site Archive (RFNSA))*

RFNSA No.	Address	Carrier / Provider	Technology		
			3G	4G	5G
2318001	Williamtown RAAF Base, Williamtown NSW 2318	Telstra	✓	✓	
2318005	456 Fullerton Cove Road, Fullerton Cove NSW 2318	Optus, Vodafone	✓	✓	
2318006	1405 B Richardson Road, Salt Ash NSW 2318	Optus, Telstra*, Vodafone	✓	✓	✓ *
2318007	Newcastle Airport, Williamtown Drive, Williamtown NSW 2318	Optus	✓		
2318008	2849 Nelson Bay Road, Salt Ash NSW 2318	Optus, Telstra*, Vodafone	✓	✓	✓ *
2318011	1 Technology Place, Williamtown NSW 2318	Optus, Vodafone	✓	✓	
2318012	365 Lemon Tree Passage Road, Salt Ash NSW 2318	NBN		✓	
2318013	236 Cabbage Tree Road, Williamtown NSW 2318	Optus	✓	✓	✓
2318014	Medowie Road, Williamtown NSW 2318	Optus (Proposed)	✓		
2318015	Williamtown Drive, Williamtown NSW 2318	Optus (Proposed)	✓	✓	
2318016	75 Cabbage Tree Road, NSW 2318	NBN		✓	
2318017	42a Fullerton Cove Road, Fullerton Cove NSW 2318	Optus	✓	✓	✓
2322010	94a Tomago Road, Tomago NSW 2322	Optus, Telstra, Vodafone	✓	✓	
2295004	1 Paperbark Court, Fern Bay NSW 2295	Telstra	✓	✓	✓
2295006	1117 Nelson Bay Road, Fern Bay NSW 2295	Telstra		✓	
2318004	987 Richardson Road, Campvale NSW 2318	Optus, Telstra, Vodafone	✓	✓	
2324017	4 Leisure Way, Raymond Terrace NSW 2324	Optus, Telstra		✓	

* means the technology is only available for the relevant mobile carrier and/or internet provider

2.6.1.1 Telstra

According to the Telstra coverage maps, both 3G and 4G is available across the entire investigation area. Telstra 5G services are available in Medowie and to the west of Fullerton Cove. However, Telstra 5G services do not cover the majority of the Williamtown SAP investigation area. A search of the RFNSA indicates that 5G coverage is available on the west, south and east boundaries of the Williamtown SAP specifically on primary arterial roads being Cabbage Tree Road, south of Nelson Bay Road in Fullerton and south of Lemon Tree Passage Road in Salt Ash. Two (2) existing facilities are identified to include 5G coverage in Salt Ash. It may indicate that Telstra coverage maps are not likely to be up to date.

Telstra inground services include fibre and copper lines. These generally traverse the investigation area but are noticeably absent in the north west of the Williamtown SAP boundary.

A planned expansion of the 5G services on the western side of Medowie indicates a commitment to deploy 5G services in the region.

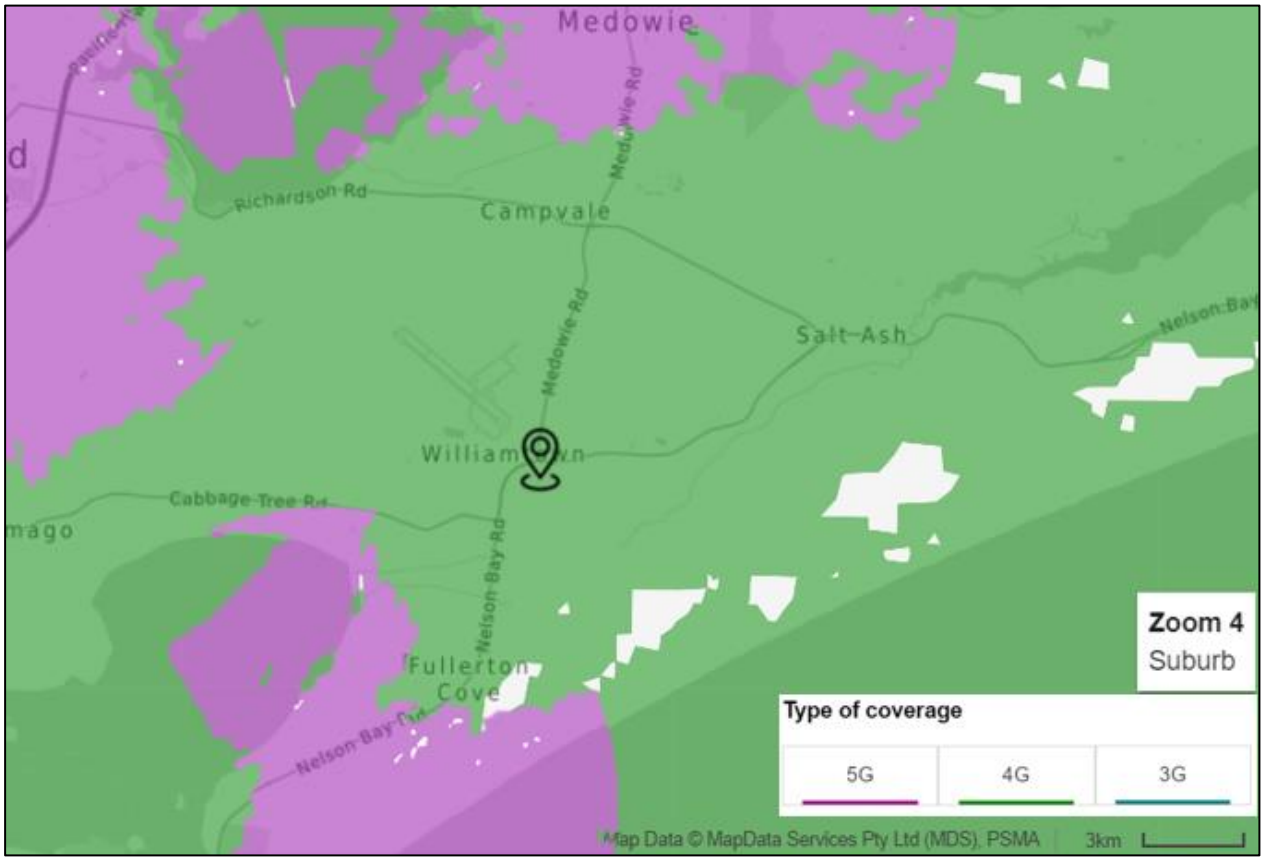


Figure 2-15 Current Telstra Coverage Map *(source: Maps Data)*

2.6.1.2 Optus

Optus coverage and capacity are identified to be relatively similar compared to Telstra across the entire investigation area. Given the scale of the airport precinct, a high volume of existing telecommunications facilities is present within this area. While, several existing facilities containing 5G technology are localised close to airport precinct and to the south along Nelson Bay Road in Fullerton, the Optus coverage map shows 5G service being available only along Cabbage Tree Road. The remaining investigation area is not serviced by Optus 5G. It does however signal an intention to deploy the technology regionally in the area, by Optus.

Figure 2-16 Current Optus Coverage Map *(source: Maps Data)*

2.6.1.3 Vodafone

Vodafone coverage is considered substandard compared to Telstra and Optus within the investigation area. Both 3G and 4G coverage are present servicing strategic locations similar to Telstra and Optus which are along primary arterial roads and at the Newcastle Airport. A search of the RFNSA indicates that there is no Vodafone 5G coverage within the investigation area.

Figure 2-17 Current Vodafone Coverage Map *(source: Maps Data)*

2.6.1.4 NBN

There are two (2) existing NBN fixed wireless facilities within the Williamtown SAP investigation area being the 'Williamtown' located at 75 Cabbage Tree Road and the 'Salt Ash' at 365 Lemon Tree Passage Road. The Williamtown facility is identified to provide high speed fixed wireless coverage for the central portion of the investigation area specifically for the Newcastle Airport and RAAF Base Williamtown as per Figure 2-18. In addition to this, the locations of Medowie and Salt Ash are also serviced by fixed line fibre services.

NBN fibre is shown to service the Newcastle Airport and RAAF Base Williamtown. NBN Business Fibre Zones in the area include Medowie and RAAF Base Williamtown. All businesses within these zones have access to Enterprise Ethernet supplied by NBN.

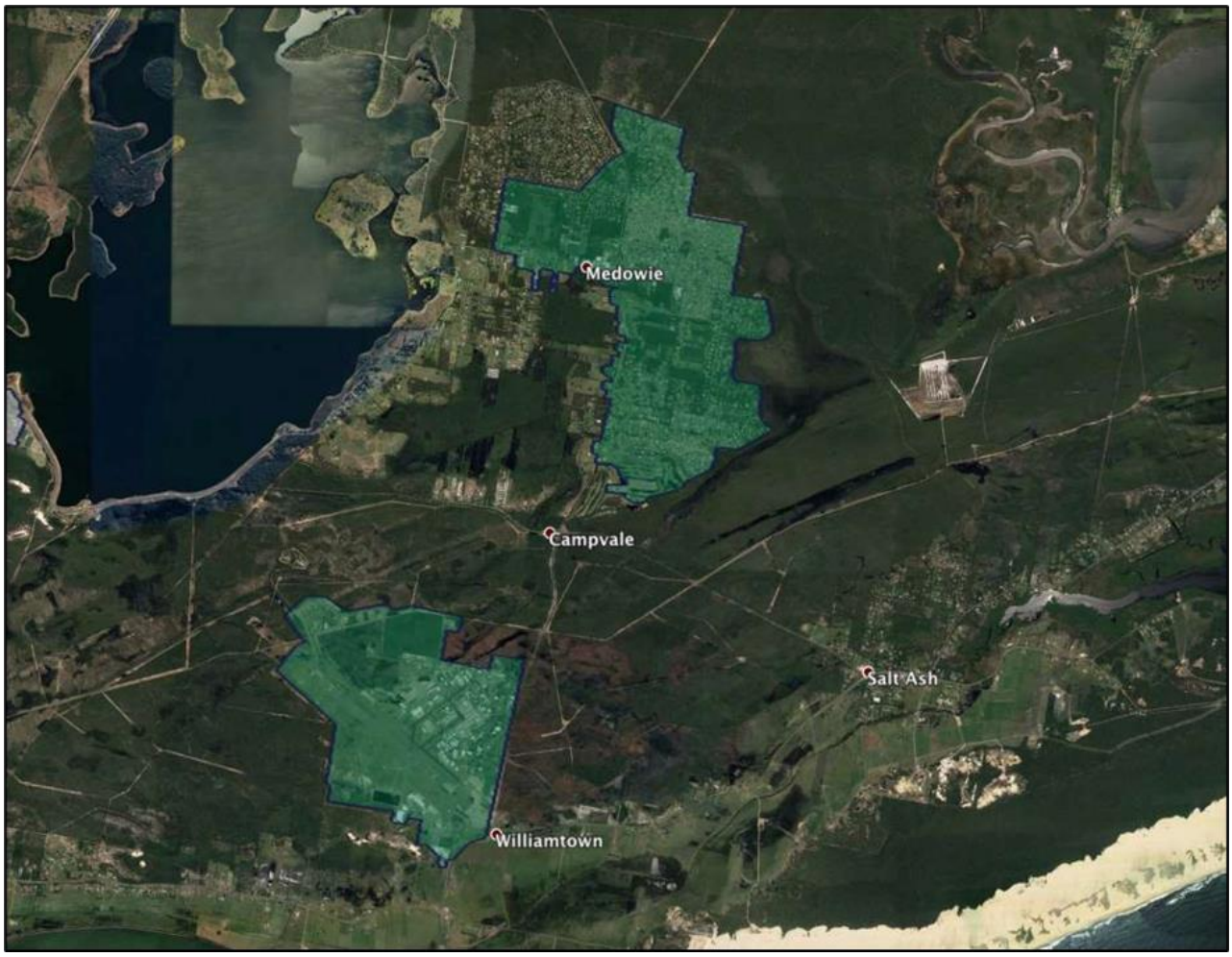


Figure 2-18 NBN Business Fibre Zone Eligibility Map - Williamtown and Surrounds *(source: NBN)*

2.6.1.5 AARNet

The AARNet network is an ultra-high-speed network connecting the Australian research and education community with the public Internet, the global research and education community and selected service and content providers.

The AARNET WDM Transmission network is built using industry standard optical transmission Dense Wavelength Division Multiplexing (DWDM) technology and delivering multiple (up to 80) 100 Gigabit per second (Gbps) wavelengths. Although the specific location of this network is not available at this stage, a general connection is known to be available running between Sydney and Newcastle and Newcastle up to the Port Macquarie.

Connection to this network is generally available to all institutions and organisations involved in research, education and training.

2.6.1.6 Vocus

The Vocus fibre network runs up the east coast of Australia from the Sydney, through Newcastle and onto Brisbane. Vocus provides Dark Fibre, Ethernet and Business Ethernet services. Businesses within any future Williamtown SAP would have the opportunity to engage with Vocus to determine if the fibre solution is available to them.

2.6.2 Investigation Area Constraints and Opportunities

2.6.2.1 Opportunity – NBN Regional Investment

Partnering with NBN during the recently announced funding boost for regional connectivity programs and possible expansion to the Business Fibre Zones should be considered during the development of the Williamtown SAP.

Furthermore, the co-investment fund for extension of NBN infrastructure, and an investment acceleration plan for which the Williamtown area could be a candidate should be considered during options development.

2.6.2.2 Constraint – RAAF Base Williamtown

All communication facilities in the area surrounding the Williamtown RAAF Base are subject to strict height controls, due to the low altitude flight patterns associated with the base. As a result, the coverage area of telecommunications facilities may be comparatively reduced. The development of any new mobile or fixed wireless facility in the area will need to comply with these height controls, which will act to reduce the effective coverage area, despite the terrain.

2.7 Waste

The Port Stephens Council LGA is responsible for waste management in the region and provide a range of solid waste management services to approximately 70,000 residents, including in Williamtown and the surrounding area. Each resident is levied with a waste service charge for the collection, disposal and processing of waste. The services include:

- Weekly kerbside collection of general domestic waste (240 litre red bin);
- Fortnightly kerbside collection of domestic recycling waste (240 or 360 litre bin);
- On-call bulky and green waste collection;
- Processing of residual waste and recyclables;
- Landfilling of residual wastes as required; and
- Community recycling centres.

Beside the services offered by Port Stephens Council LGA, businesses may also choose to have separate Commercial Waste Services Agreements. These are optional agreements with third-party waste service providers to manage specific waste streams.

The two main waste facilities in the Port Stephens LGA are detailed below and their spatial relationship to the Williamtown SAP investigation area is shown in Figure 2-19.

Salamander Bay Waste Transfer Station (SBWTS) is located at 4 Tarrant Rd, Salamander Bay, approximately 35km east of the Williamtown SAP investigation area. It is owned and operated by the Council. Waste is accepted, sorted and transferred to other facilities for recycling, processing or disposal and also doubles as a self-haul and Community Recycling Centre.

Newline Road Waste Facility (NRWF) (also known as the SUEZ Raymond Terrace Resource Recovery Park (SUEZ RRP)) on Newline Road, Raymond Terrace is approximately 15kms north of the Williamtown SAP investigation area. It is a commercial business, owned and operated by SUEZ. The facility has an advanced resource recovery technology that composts organic wastes and a landfill. It accepts dry waste from commercial customers and local councils in the region, with an operational capacity to process up to 200,000 tonnes of waste each year. The facility is licensed to accept the following waste types:

- Biosolids;
- Garden vegetation and wood waste;
- Mixed putrescible waste;
- Non-putrescible waste;
- Lead acid batteries;
- Tyres;
- Asbestos; and
- Virgin Excavated Natural Materials (VENM).

The Port Stephens LGA is one of the primary contributors to the NRWF with the amount of waste generated in the region expected to mirror the annual average population growth rate of 1.47% in the Port Stephens Council LGA (2016 Census).

The Williamtown SAP will also contribute to the regional waste generation as development takes place. It is recommended that the estimated waste generation rate and types of waste from the Williamtown SAP be assessed based on the land use scenarios and proposed waste generating activities and refined in subsequent planning and development stages. The primary objective of the future assessment will be to ensure the existing waste infrastructure is sufficient in both capacity and license.

Figure 2-19 Existing Waste Management Facilities in Port Stephens LGA

2.7.1 Investigation Area Constraints and Opportunities

2.7.1.1 Opportunity – Use of existing nearby waste facilities

Close to existing road network with direct access to the NRWF that is licensed to accept the typical types of waste that could be generated with the Williamtown SAP.

While only two waste facilities are shown within close proximity to the Williamtown SAP, there are other facilities within the region capable of accepting the Williamtown SAP s waste (in the Newcastle area). There are also a range of private waste management contractors that service the region.

While the NRWF will likely process the majority of Williamtown SAP waste for beneficial reuse, the residual will have to go to landfill. At this stage the remaining capacity of the landfill is unknown.

2.7.1.2 Opportunity – Waste to Energy

There is an opportunity to reduce the overall quantity of waste transferred to existing collection facilities by the thermal treatment of waste and generating electricity from landfill biogas. This would potentially extend the service life of waste collection facilities. Refer to *Aurecon - B1.2I Renewable Energy Baseline Analysis* for more Waste to Energy details.

In 2015, the released *Energy from Waste Policy Statement* (NSW EPA, 2015) supports increased investment in energy from waste infrastructure and delivers regulatory certainty to industry. The development of a Waste to Energy plant would require an EPA approval process to gain the appropriate licences (outlined in the *NSW EPA Energy from Waste Policy Statement*) to demonstrate that international best practice techniques are used to ensure air quality and human/environmental health are protected. The assessment process would involve consultation with key stakeholders, including community, councils and state government agencies.

Energy from waste is an emerging technology in Australia, however several technology options exist (e.g. moving grate combustion, gasification etc.) that have a proven track record of success internationally in terms of operational, technical, human health and environmental performance. Currently, several state significant waste to energy proposals are being assessed in NSW, for example Cleanaway's Western Sydney Energy & Resource Recovery Centre.

2.7.1.3 Constraint – Increased Waste Vehicle Movements

There will be an increase in traffic movements required for waste collection, however this will be minimal relative to the overall traffic increase associated with the Williamtown SAP development. This is further outlined in *Aurecon - B1.2C Traffic and Transport Baseline Analysis.*

2.8 Investigation Area Constraints and Opportunities Summary

The investigation area is sparsely serviced with existing utility infrastructure, with large areas of undeveloped land. The area is located adjacent to several key utility sites including Grahamstown WTP, Raymond Terrace WWTW, Tomago 132 kV Ausgrid Sub transmission Station and a DN500 high pressure JGN gas main. From these sites, trunk infrastructure generally follows the arterial roads of Cabbage Tree Road, Nelson Bay Road and Medowie Road.

Potential sites along Cabbage Tree Road and adjacent to WAP will be preferable from a utilities servicing perspective, due to the proximity to existing trunk infrastructure and the reduced distance to treatment plants, transmission stations and high-pressure mains. Sites to the north-east of Medowie Road and south of the Cabbage Tree Road and Nelson Bay Road intersection would require extensions to the existing trunk infrastructure, to be serviced from the existing utility networks.

Key constraints for the Williamtown SAP site include:

- Tomago Sandbeds Drinking Water Catchment limits development area;
- Limited residual capacity in wastewater trunk network;
- Low pressure zones in potable water reticulation network;
- Flat topography limits wastewater gravity reticulation network;
- Development limits near electricity easements;
- PFAS contamination; including construction requirements for managing soil removed during trenching works under the NSW Waste Classification Guidelines, including the PFAS Addendum 2016. Groundwater and surface water intercepted during utility installation will also require treatment prior to discharging to the environment;
- Bushfire prone land infrastructure servicing requirements;
- RAAF Williamtown height restrictions on surrounding structures, particularly telecommunications towers.

Utility opportunities for the Williamtown SAP site include:

- Recycled water supply from Raymond Terrace WWTW for industrial use;
- Treated Groundwater supply from Williamtown RAAF PFAS treatment program for industrial use;
- Onsite wastewater treatment and reuse;
- Hydrogen gas energy supply;
- Partnering with NBN Co infrastructure expansion; and
- Electricity supply and upgradability.

3 Scenario Testing

Section 3 of the report provides a summary of the scenario development during the first Enquiry by Design workshop held on 10 and 11 February 2021 which involved implementing visions and concepts, testing constraints of the investigation area, identifying challenges and developing innovative solutions at a precinct-wide level across all technical streams. The scenarios were developed and refined by Roberts Day for the Williamtown SAP investigation area. They considered land use, transport, infrastructure, PFAS, environmental, social, aboriginal heritage and economic matters in conjunction with the Williamtown SAP vision.

Each of the scenarios tested identifies the development limitations, constraints management and required infrastructure that would be required to support the respective structure plan's proposed development.

The process of the scenario testing identified key challenges and no-go zones and preferred elements and opportunities within the investigation area to be explored in the structure plan. This specifically included identifying areas of land where there are opportunities to leverage existing infrastructure and defining areas of constraints due to Hunter Water critical water catchments.

A high-level comparison between the various scenarios was completed which considered both strategic utility planning aspects as well as planned infrastructure upgrades. A SWOT analysis was undertaken to assess the strengths, weaknesses, opportunities and threats of each option. The utility infrastructure testing criteria used is outlined below in Table 3-1 as the benchmark for desirable utility servicing outcomes. A risk based approach was then used to assess each scenario against the testing criteria as outlined in Table 3-2.

Table 3-1 Testing criteria used for scenario testing

Testing Criteria	Details
Inefficiency of Required Utility Infrastructure	Evaluate the required infrastructure to determine if the proposed land development scenario creates the need for extended trunk infrastructure
Implementation of Precinct Vision	Determine the ability of the existing infrastructure to address the precinct vision's scope.
Staging and Scalability	Evaluate the capability of the required utility infrastructure to be scaled to meet the demand of the likely staging of the Williamtown SAP development.

Table 3-2 Comparative Analysis Colour Rating

Rating	Description
Green	Low risk of utility impacts requiring business as usual management Utility infrastructure effectiveness protected and/ or enhanced Utility infrastructure effectively implements the precinct's vision Utility infrastructure can be easily staged to meet the growing demands of the precinct
Amber	Medium risk of utility impacts requiring moderate management and coordination with the applicable service authority. Utility infrastructure effectiveness maintained Utility infrastructure assists in meeting the precinct's vision Utility infrastructure staging is constrained but can be staged to meet growing demand

Rating	Description
Red	High risk of utility impacts requiring significant/major management and in-depth coordination with the applicable service authority. Utility infrastructure effectiveness reduced Utility infrastructure restricts the precinct's vision Utility infrastructure cannot be staged to meet the growing demands of the precinct

Following the individual specific technical assessments, several rounds of stakeholder review and multi-disciplinary workshops were conducted to explore all the technical findings, provide a holistically balanced approach to managing constraints and develop the preferred Williamtown SAP structure plan.

4 Structure Plan

4.1 Methodology and Approach

Section 4.2 of the report provides a summary of the scenario development during the second Enquiry by Design workshop held on the 27 to 30 April 2021. This workshop involved the further testing of the previously prepared scenarios and development of the draft Williamtown SAP structure plan. Like in the previous Enquiry by Design workshop, the structure plan considers land use, transport, infrastructure, PFAS, environmental, social, aboriginal heritage and economic matters in conjunction with the Williamtown SAP vision.

Figure provides an outline of the key principles which were incorporated into the masterplan.

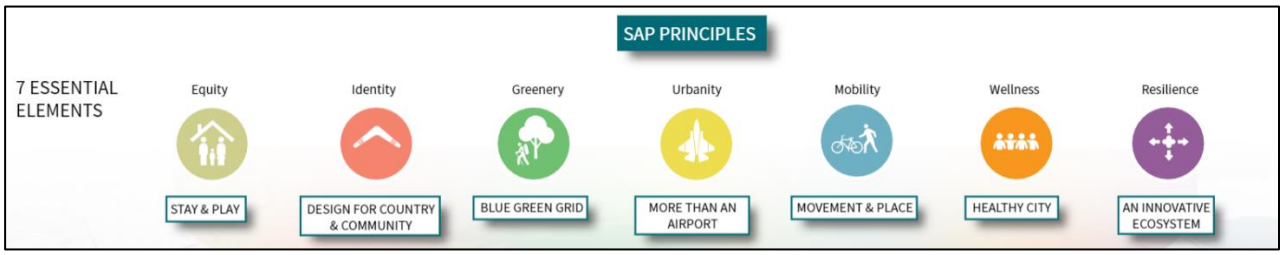


Figure 4-1 The 7 Williamtown SAP Principles which governed the masterplan

The structure plan leverages the preferred elements of all the scenarios developed, further explores the items under investigation and avoids the earmarked no-go zones. The previously identified strengths and opportunities of each scenario were pursed while weaknesses and threats mitigated. This approach was taken to maximise the positive development outcomes rather than considering the previous scenarios as options and adopting one as the preferred structure plan.

4.2 Proposed Structure Plan

The Structure Plan refined by Roberts Day is centred around the existing Williamtown Airport Precinct, which includes Newcastle Airport, Williamtown RAAF base and Astra Aerolab. The precinct incorporates a core development area south of the existing airport. Initial stages of the Williamtown SAP development are to incorporate aerospace and defence contractor industries around the southern airside boundary of the airport. The landuses within the Williamtown SAP's northern catchmenrt focuses on defence and aerospace, commercial centres, freight and logistics and research and development industries. The later stages of the Williamtown SAP, which includes the Western and Eastern Sub-Precincts, focus on a more flexible land use application which focuses on complimentary industries such as commercial centres, advanced manufacturing, light industry and research and development. The plan shown in Figure 4-2 adheres to the existing drainage and flooding characteristics and incorporates the inclusion of the Dawson's and Leary's drain reserve. Additionally, it maintains hydrological regime for the biodiversity corridor, facilitates controlled flooding throughout the Williamtown SAP precinct and utilises floodplains South of Cabbage Tree Road to offset impacts.

The development of the Structure Plan has identified that the inclusion of large-scale renewable energy production is not viable due to the constraints throughout the investigation area. As a result, a renewable energy corridor has not been included in the Structure Plan.

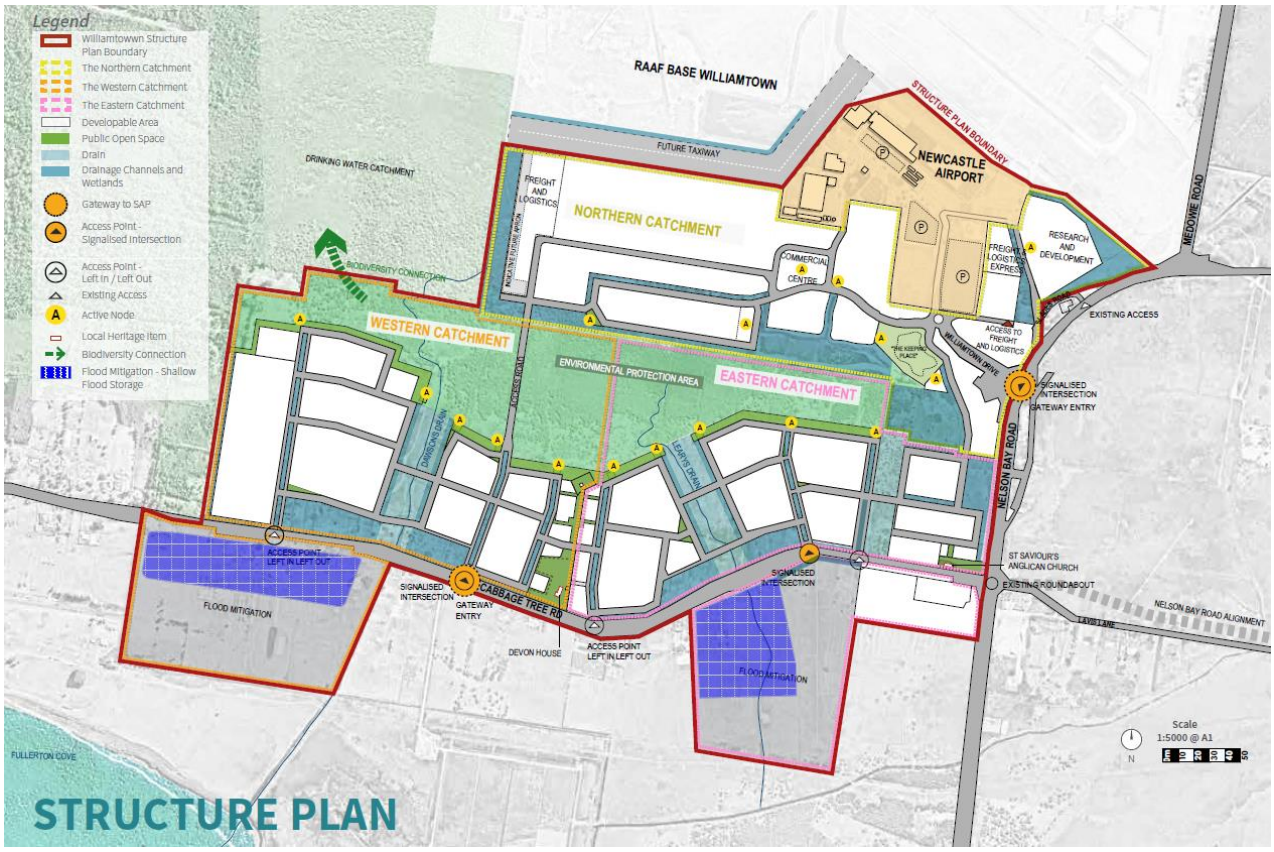


Figure 4-2 Williamtown SAP Structure Plan

The following sections of this report outline the preliminary utility servicing requirements for the Williamtown SAP Structure Plan, highlighting key constraints and opportunities, required utility infrastructure and staging and the planning framework required to enable the Williamtown SAP development. The report will provide the local and broader preliminary servicing strategy for:

- Water
- Wastewater
- Electricity
- Gas
- Telecommunications; and
- Waste Resources

The Williamtown SAP structure plan is predominantly a greenfield site with minimum existing utility infrastructure. As shown in Figure 2-5, it does not include items such as Hunter Water power supply easements. This report assesses the capability of the existing systems to cater to the development requirements.

The proposed sub-precinct zones to be provided by the Williamtown SAP are outlined in Figure 4-3. The timing and proposed land use for the sub-precinct zones is dependant on market uptake, particularly in the eastern and western sub-precincts which are expected to be made up of a flexible combination of:

- Commercial Centre
- Advanced Manufacturing
- Light Industrial
- Research and Development

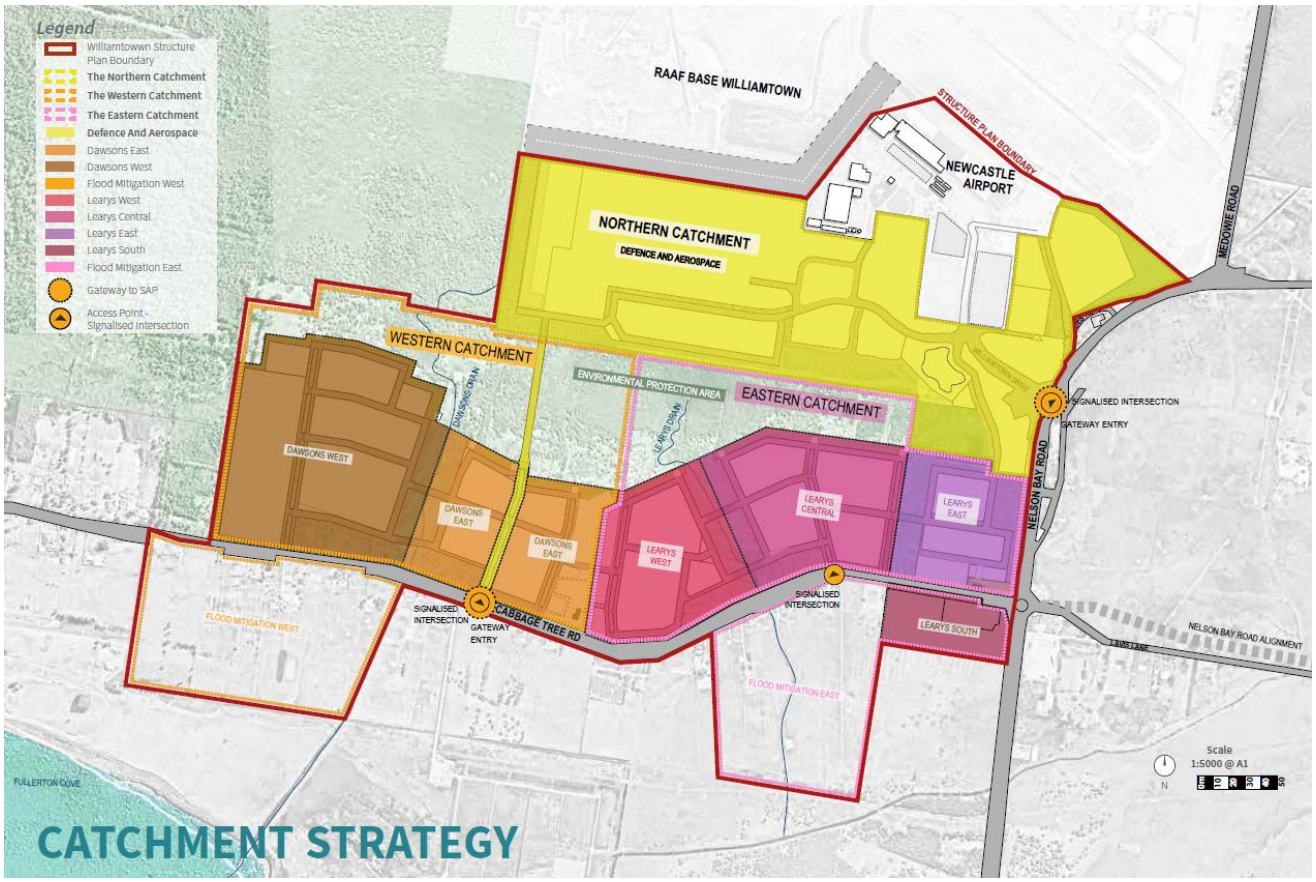


Figure 4-3 Williamtown SAP Structure Plan Staging Map

The proposed land uses, and net developed areas for the Structure Plan are summarised in Table 4-1.

Table 4-1 Structure Plan Developable Area Provided

Land Use	Net Developable Area (ha)
Northern Sub-Precinct	
Defence and Aerospace (including DAREZ/Astra Aerolab)	20
Defence and Aerospace (Direct Airside Access) (including DAREZ/Astra Aerolab)	30
Commercial Centre	5
Freight and Logistics	7
Research & Development	7
Eastern and Western Sub-Precincts	
Commercial Centre	68*
Advanced Manufacturing	
Light Industrial	
Research & Development	
Total Area	**137**

**total area provided in the sub-precincts. Land use mix open to market uptake*

4.3 Water Servicing Strategy

4.3.1 Demand Assessment

Design water demands have been calculated in accordance with Water Supply Code of Australia, Hunter Water edition Version 2 WSA03-2011. The projected design water demand for the Structure Plan sub-precincts are outlined in Table 4-2.

Hunter Water adopted demand rates are summarised below.

- Light Industrial, commercial – 11.5 kL/day/ha
- Medium Industrial – 26.5 kL/day/ha

Demands for the Defence and Aerospace sub-precincts are based on the approved Water and Wastewater Servicing Strategy, Astra Aerolab Technology Park Development, ADW Johnson Pty Ltd, 2020, noting that part of this infrastructure has been constructed.

Table 4-2 Structure Plan Projected Water Demand

Land Use	Net Developable Area (ha)	Adopted Unit ADD (kL/day/ha)	ADD (kL/day)*	PDD (kL/day)**	Land Use Assumptions
Northern Sub-Precinct					
Defence and Aerospace (including DAREZ/Astra Aerolab)	50		1408	1630	Land use, demand assumptions and water servicing strategy based on approved Astra Aerolab servicing strategy
Commercial Centre	5	11.5	66	92	Commercial
Freight and Logistics	7	11.5	93	97	Light Industrial
Research & Development	7	11.5	93	129	Commercial
Eastern and Western Sub-Precincts					
Commercial Centre	68				Assumed 100% medium industrial as worst case scenario for water demand for advanced manufacturing
Advanced Manufacturing		26.5	2072	2162	
Light Industrial					
Research & Development		-	-		
Total	**137**	**-**	**3731**	**4110**	

**ADD including 15% unaccounted for water*

***Peak day factor of 1.6 adopted for commercial, 1.2 for industrial in accordance with WSA03-2011*

It is noted that the adopted demand values from WSA03-2011 typically provide a conservative assessment of water demand for each land use for the purpose of designing for infrastructure capacity, as developed by Hunter Water. The demand assessment may be refined in consultation with Hunter Water as details of the precinct developments are progressed, including details of land use, water efficiency measures, stormwater harvesting and on site water reuse.

4.3.2 Proposed Infrastructure

Potable water supply to Williamtown is currently provided through 300mm and 250mm transfer mains along Nelson Bay Road from Grahamstown WTP. These mains are boosted at Williamtown WPS to service the Medowie and Nelson Bay service networks. Hunter Water has identified that there are existing low-pressure issues on the suction side of the Williamtown WPS, however it is understood that the water servicing strategy for Astra Aerolab is based on connection on the suction side of the Williamtown WPS. The water supply system for the Williamtown SAP is proposed to be integrated with and expanded from the as-constructed Astra Aerolab infrastructure, with further system upgrades as required.

The Williamtown network is supplied by the Grahamstown WTP which has an existing capacity of 257 ML/d and services the Lower Hunter region from Grahamstown WPS. Hunter Water has identified that water infrastructure planning is currently based on 0.6 GL/annum demand increase in the Lower Hunter. Over a 30-year ultimate development horizon, the expected demand of the Williamtown SAP accounts for 6% of the expected growth in the Lower Hunter.

Discussion with Hunter Water indicate that the ultimate demand of the Williamtown SAP exceeds the capacity of the existing Hunter Water system at Williamtown and may require augmentation of trunk mains to service the ultimate demand. Further system modelling is required by Hunter Water to confirm constraints of the existing system.

It is proposed that the Northern Sub-Precinct will be serviced by extending from the existing water supply infrastructure constructed for the Astra Aerolab project, without major upgrades to the existing trunk mains to the area.

Servicing of the Eastern and Western Sub-Precincts is proposed by extending a DN200 main from the Northern Sub-Precinct through to Cabbage Tree Rd, with DN150 reticulation offtakes constructed as land development progresses within the Eastern and Western Sub-Precincts. It is expected that servicing the ultimate demand for the Williamtown SAP will also require construction of a new DN250 main along Cabbage Tree Rd, back to Grahamstown WTP. The proposed preliminary water servicing strategy will be subject to hydraulic modelling and approval by Hunter Water during the concept design phase.

The proposed water infrastructure will follow the existing road corridors and alignments of proposed roads within the Williamtown SAP. The water mains will be allocated a location within the road corridor, along with the other utility services. Allocations for Pressure Reducing Valves (PRV) and storage reservoirs and other specific infrastructure may be required depending on the configuration of the water network developed in the Concept Design phase. Land allocation for this infrastructure will need to be assessed as required.

There are potential occupier specific firefighting requirements within the Williamtown SAP, particularly in the case of high-risk defence industries. The inclusion of high fire risk developments within the Williamtown SAP will require the assessment of additional on-site storage requirements to meet large fire flow peak demands. The identification of high-risk developments is to be consulted with Hunter Water to set a requirement for on-site storage to limit the peak demand on the wider water servicing network.

Refer to Appendix B for the proposed preliminary Water Servicing Plan.

4.3.3 Infrastructure Staging

As the ultimate demand of the Williamtown SAP can be supplied by the Grahamstown WTP headworks, the demand of each stage of the Williamtown SAP can be met by incremental expansion of the local reticulation network from the existing water transfer network along Nelson Bay Road.

It is expected that the existing Hunter Water system will be at or near capacity after approximately 50% uptake of the Williamtown SAP (subject to further modelling and land use). As discussed above, it is anticipated that a new 250mm main will need to be constructed from Grahamstown WPS to the Williamtown SAP via Cabbage Tree Road to service further development.

The staging of earthworks ahead of property developments allows the opportunity to construct utility infrastructure upfront when PFAS capping and fill balancing is undertaken (ie install capped mains), with

infrastructure later commissioned as required to service demand. This could be adopted to mitigate the risk of future water infrastructure impacting PFAS barriers and capping layers.

4.3.4 Constraints and Opportunities

The assessment of water servicing requirements of the Williamtown SAP Structure Plan has identified several key constraints including:

- Low pressure issues within the existing Hunter Water network on the suction side of Williamtown 1A WPS (west of the WPS). Hunter Water is to model the expected demands and confirm the capacity of the existing network to supply expected demand.
- Development location is restricted by the Tomago Sandbeds Hunter Water Drinking Water Catchment (Refer to *Appendix A – Hunter Water Land Assets* for more details).
- Groundwater extraction from the Tomago and Stockton Sandbeds beneath the Williamtown SAP Structure Plan is restricted due to contamination and operability limitations. The extraction of groundwater at Williamtown is not a continuous raw water supply and is controlled to ensure water table drawdown does not cause contaminants, including PFAS and metals do not enter the Tomago Sandbeds Drinking Water Catchment.
- The re-use of treated PFAS groundwater is limited by water quality levels for the end user. The groundwater would need to be treated to a sufficient level to meet the Australian Drinking Water Guidelines water quality targets. The treatment would also need to eliminate contaminant build-up in the water network and the wastewater network.
- The construction of water mains through PFAS contaminated soil will require a consideration of construction methodologies to limit contamination of surrounding soil and waterways. The depth of water mains will also need to be limited to above the groundwater table where possible to eliminate PFAS contamination through ingress into the water main. Mitigation controls and pipe material will be an important construction and operation consideration.

The proposed preliminary servicing strategy for the Structure Plan meets the expected level of service of the Williamtown SAP, however there remains several opportunities to improve the water servicing of the expected development and particularly the sustainability of the development. These opportunities include:

- Recycled water scheme based on the opportunity to decentralise the wastewater servicing from the Hunter Water wastewater catchment. This would provide an opportunity to supplement the water demand requirements of the Williamtown SAP with recycled water for non-potable purposes. The construction of a local recycled water plant would significantly reduce the wastewater discharged to the existing Hunter Water network and offset the water supply required from the Hunter Water network.
- On-site stormwater detention (OSD) storage can be implemented as a development requirement to both reduce the runoff generated from development and supplement the water demand with a recycled water source for non-potable water uses such as toilet flushing and on-site storage for irrigation and firefighting requirements.
- Installation of local service reservoirs to meet the peak demands of the Williamtown SAP, particularly the firefighting demands of developments. The integration of reservoirs into the network will further add redundancy as a back-feed supply in the event of an asset failure.

4.3.5 SWOT Analysis

The strengths, weaknesses, opportunities and threats to service the water demand of the proposed Williamtown SAP Structure Plan are outlined in Table 4-3.

Table 4-3 Structure Plan Water Servicing SWOT Analysis

Strengths	Weaknesses
▪ Expected demand can be serviced by Grahamstown WTP headworks ▪ Reticulation network can be staged incrementally to meet the demand of each new development stage of the Williamtown SAP	▪ Servicing relies on assumption that Hunter Water transfer mains have capacity to service initial stage of development.
Threats	**Opportunities**
▪ Development is restricted within Hunter Water's Drinking Water Catchment (Tomago and Stockton Sandbeds) ▪ PFAS contamination restricting deep excavations and construction of permeable materials below groundwater tables ▪ High fire risk developments will require additional peak demand capacity in the network or on-site storage requirements.	▪ Supplementation of non-potable water supply from treated PFAS groundwater at Williamtown RAAF ▪ OSD requirements for new developments to reduce water demand from Grahamstown WTP. ▪ Recycled water supply from on-site treated wastewater and potential for Hunter Water recycled water scheme to Tomago can reduce water demand from Grahamstown WTP. ▪ Demands based on typically conservative WSA assessment. Infrastructure requirements to be adaptive to suit actual industry and water usage

4.3.6 Planning and Approval Framework and Control Recommendations

Hunter Water has identified that the Williamtown SAP will require approvals in line with the typical Developer Servicing Strategy process. This process will require the submission of Developer Servicing Strategy report to Hunter Water that details the following:

- Development Context
- Options Development including, design water and wastewater loadings, infrastructure and constraints and options assumptions
- Servicing Options including water and wastewater demand assessment, infrastructure description, technical assessment and constraints, community/ stakeholder constraints and social impact, environmental constraints and impact and financial analysis

It is recommended that the following controls are applied to developments within the Williamtown SAP to enhance the efficiency and sustainability of the Williamtown SAP:

- On-site stormwater detention (OSD) and on-site recycled water systems for non-potable water usage.
- IoT smart water meters
- On-site fire storage for developments identified to have a high fire risk

4.4 Wastewater Servicing Strategy

4.4.1 Load Assessment

The expected wastewater discharge generated Structure Plan sub-precincts are outlined in Table 4-4.

Design sewage loads have been calculated in accordance with the Sewerage Code of Australia, Hunter Water edition Version 2 WSA02-2014. The projected design sewage loads for the Structure Plan sub-precincts are outlined in Table 4-4.

Hunter Water adopted loading rates are summarised below.

- Industrial Clean Dry Trades – 4 ET/ha
- Commercial high density zone, Industrial Dry Dirty Trades – 10 ET/ha

Sewage loads for the Defence and Aerospace sub-precincts are based on the approved Water and Wastewater Servicing Strategy, Astra Aerolab Technology Park Development, ADW Johnson Pty Ltd, 2020, noting that part of this infrastructure has been constructed.

Table 4-4 Structure Plan Projected Wastewater Discharge

Land Use	Net Developable Area (ha)	Adopted ET	Projected ADWF (kL/day)	Projected PWWF (kL/day)*	Land Use Assumptions
Northern Sub-Precinct					
Defence and Aerospace (including DAREZ/Astra Aerolab)	50	797	757	3447	Land use, loading assumptions and sewerage servicing strategy based on approved Astra Aerolab servicing strategy
Commercial Centre	5	50	48	299	Commercial, high density zone
Freight and Logistics	7	28	27	178	Industrial, clean dry trades
Research & Development	7	70	67	406	Commercial, high density zone
Eastern and Western Sub-Precinct					
Commercial Centre	68	680	646	3268	Assumed 100% Commercial, high density / Industrial, Dirty Dry Trades as worst case scenario for sewerage loading
Advanced Manufacturing					
Light Industrial					
Research & Development					
Total	**137**	**1625**	**1544**	**7599**	

**Based on 50% typical Storm allowance considering construction of a Pressure Sewer System*

The hydraulic analysis has been completed at a precinct level, based on assumptions of expected land use types. The adopted load values from WSA02-2014 typically provide a conservative assessment of wastewater discharge for each land use for the purpose of designing for infrastructure capacity, as developed by Hunter Water. It is recommended that the load assessment be refined as details of the precinct developments are progressed, including details of land use and on site water reuse with consideration of existing infrastructure performance also recommended.

4.4.2 Proposed Infrastructure

Wastewater discharges from the Williamtown catchment are currently transferred from Williamtown WWPS to Raymond Terrace WWTW via a 300mm rising main to Tomago WWPS. Information provided by Hunter Water indicates that Williamtown 1 WWPS has an existing PWWF capacity of 6912 kL/day (80 L/s) and the existing 300mm rising main has a maximum capacity of 10 368 kL/day (120 L/s). Hunter Water has a planned infrastructure upgrade of Williamtown WWPS to 10 368 kL/day (120 L/s) within the next 15-year time frame and will be triggered in line with load growth.

The existing Williamtown Wastewater Transportation Scheme has an allocation of 3456 kL/day (40 L/s) for the Department of Defence to discharge from their Wastewater Treatment Plant into Williamtown 1 WWPS. It is also understood from the Water and Wastewater Servicing Strategy, Astra Aerolab Technology Park Development, that there is also an existing load of 14.3 L/s PWWF at Williamtown 1 WWPS. Therefore it is considered that there is 25.7 L/s spare capacity in the Williamtown 1 WWPS at PWWF. On this basis, upgrade of the Williamtown 1 WWPS would be triggered before full uptake of the Northern Sub-Precinct. The existing Williamtown 1 rising main may also require upgrade to service the ultimate load from the Williamtown SAP, depending on land use and actual sewerage load within the Eastern and Western Sub-Precinct. Tomago 1 WWPS has an existing capacity of 9936 kL/day (115 L/s) and a planned upgrade to 17 280 kL/day (200 L/s) when triggered by development growth. Hunter Water has identified that the planned upgrade could be increased further than 17 280 kL/day (200 L/s) without significant augmentation to the rising main that discharges to Raymond Terrace WWTW. On this basis, development of the Northern Sub-Precinct is not expected to trigger upgrade of the Tomago 1 WWPS, however the ultimate load from the Williamtown SAP, including the Eastern and Western Sub-Precinct may trigger upgrade of the WWPS. This may also trigger upgrade of the Raymond Terrace WWTW.

Raymond Terrace WWTW has an existing capacity to treat a ADWF of 6.4 ML/day. Hunter Water will need to factor projected load from the Williamtown SAP into the regional servicing strategy as the increased load may trigger upgrade of the Raymond Terrace WWTW.

It is also understood that Hunter Water is also currently assessing a request to discharge treated groundwater from Williamtown RAAF Base groundwater treatment plants into Williamtown 1 WWPS. This may further impact capacity of the Williamtown 1 WWPS and Tomago 1 WWPS, unless the treated groundwater can be utilised for industrial load within the Williamtown SAP.

The proposed preliminary servicing strategy of the Williamtown SAP involves a pressure sewer system that discharges to the existing Williamtown 1 WWPS. A pressure sewer system does not require deep at grade pipes as a conventional gravity main does and would therefore limit the need for reticulation mains to be below the groundwater table in PFAS contaminated soil. Pressure sewer systems can also integrate ‘smart’ controlled systems that help to attenuate flows at the individual lot level and reduce the cumulative flow entering Williamtown 1 WWPS. The existing Astra Aerolab development at Williamtown has adopted a pressure sewer system for similar reasons.

The operation and maintenance of pressure wastewater systems is critical to ensure the ongoing function of the reticulation network. The ongoing maintenance of pumps, chambers and mains is significantly higher than the alternate gravity main systems. Consideration of corrosion and odour impacts need to be carefully considered in the design of the pressure sewer system, particularly with long rising mains lengths and long detention times.

The proposed preliminary pressure wastewater servicing strategy has sized infrastructure to transfer PDWF and 50% of the Hunter Water recommended storm allowance. Pressure wastewater reticulation systems should have very little infiltration and additional inflows if constructed and maintained to the expected standard. The expected PWWF are therefore conservative for the proposed developments. During refined analysis of the wastewater discharges in Concept Design, there is an opportunity to optimise the WWPS and rising main capacity upgrades and reduce the size of required augmentations.

The overall preliminary wastewater servicing plan is provided in *Appendix B.*

The proposed preliminary wastewater servicing strategy integrates the proposed Astra Aerolab servicing strategy proposed in January 2020. The Astra Aerolab development is incorporated into the Northern Sub-Precinct of the Williamtown SAP and it is proposed that the Northern Sub-Precinct will generally be serviced in accordance with the Astra Aerolab servicing strategy with minor extensions to pick up additional Williamtown SAP loads.

Servicing of the Western and Eastern Sub-Precincts will need to consider ultimate flow of wastewater from west to east. Therefore any early development in the Eastern Sub-Precinct will need to extend through and be sized for collection of ultimate loads in the Western Sub-Precinct. Similarly, early development in the Western Sub-Precinct will also need to be sized with consideration to service ultimate loads from the Eastern Sub-Precinct.

The proposed pressure sewer network will follow the alignment of proposed road corridors within the Williamtown SAP. The pressure sewer chambers will require a footprint within the road corridor as well as a footprint for lot wastewater chambers within the boundary of each lot. The configuration of the pressure sewer network will be refined within the Concept Design phase of the Williamtown SAP.

There is an opportunity to move Williamtown 1 WWPS south of Cabbage Tree Road to free up land near Newcastle Airport and minimise potential odour issues associated with the pump station if major upgrades to the pump station and rising main are required. This shift would require a reconfiguration of existing mains discharging into Williamtown 1 WWPS to be able to discharge to the new site.

Hunter Water wastewater quality controls require that trade waste is separated from domestic wastewater discharging to Raymond Terrace WWTW. Therefore, occupiers with trade waste identified under Hunter Water wastewater quality regulations will require on-site septic storage and implement wastewater discharge measures that meet trade waste regulations.

4.4.3 Infrastructure Staging

The construction and commissioning of the pressure wastewater reticulation network can be undertaken in stages in line with the development expansion.

The initial stages of the Williamtown SAP can be serviced by the existing wastewater transfer scheme at Williamtown 1 WWPS. As described above, it is expected that the residual capacity in the existing Williamtown 1 WWPS will become exhausted prior to ultimate load from the Northern Sub-Precinct.

The staging of earthworks ahead of property developments allows the opportunity to construct utility infrastructure upfront when PFAS capping and fill balancing is undertaken (ie install capped mains), with infrastructure later commissioned as required to service load. This could be adopted to mitigate the risk of future sewerage infrastructure impacting PFAS barriers and capping layers.

4.4.4 Constraints and Opportunities

The assessment of wastewater servicing requirements of the Williamtown SAP Structure Plan has identified several key constraints including:

- A decentralised wastewater system is constrained by operational requirements that the Williamtown SAP would need to offset. The ongoing operation of a treatment facility requires a managing party to have ongoing responsibility for the plant. Hunter Water could act as the managing party and will require consultation on the feasibility of this operation. Secondly, the discharge of effluent (if not

integrated into a recycled wastewater reuse scheme) would need to be into the Hunter Water network due to water quality restrictions of effluent entering the downstream waterway of Fullerton Cove (a Ramsar wetland). A Section 60 (of the Local Government Act 1993) discharge consent or similar level of assessment or approval depending on the owner/applicant, would be required for the discharge of wastewater effluent that is off-spec water, wet-weather bypass or production exceeding load for recycled water. An assessment of the Section 60 approval requirements has not been undertaken in this work. An investigation into the approval constraints for a Section 60 discharge consent into the Fullerton Cove Ramsar wetlands would be required in future project phases.

- The flat topography of the Williamtown SAP creates a constructability issue for conventional gravity mains, as the depth of mains would increase over the flat expanse of the reticulation network. Within the PFAS contaminated soil profile, there is a risk that the wastewater network would encounter contamination issues from infiltration and ingress to the reticulation network.

The proposed preliminary servicing plan for the Structure Plan meets the expected level of service of the Structure Plan, however, there remains several opportunities to improve the wastewater servicing of the expected development and particularly the sustainability of the development. These opportunities include:

- Recycled wastewater scheme that decentralises the wastewater network from the Hunter Water network and supplements the potable water demand of the Williamtown SAP with recycled wastewater. The construction of a wastewater treatment works, and purification plant would significantly reduce the wastewater discharge to the Hunter Water network and supplement the water supply from the Hunter Water network. Hunter Water has identified a plan to extend the recycled water scheme for industrial use at Kooragang Island to Tomago. Therefore, the collection and treatment of wastewater for industrial reuse aligns with the current Hunter Water servicing strategy for the region.
- The upgrade of Williamtown WWPS and the rising main could be optimised during Concept Design as the expected PWWF is refined. There is also the opportunity to consider additional storage capacity at Williamtown WWPS to allow the attenuation of peak flows which could further reduce the upgrade requirements.

4.4.5 SWOT Analysis

The strengths, weaknesses, opportunities and threats to service the wastewater discharge of the proposed Williamtown SAP Structure Plan are outlined in Table 4-5.

Table 4-5 Structure Plan Wastewater Servicing SWOT Analysis

Strengths	Weaknesses
▪ Peak Wet Weather Flows can be reduced with pressure wastewater reticulation network. ▪ Reticulation network can be staged incrementally to meet the load of each new development stage of the Williamtown SAP	▪ Initial Williamtown SAP development loads exceed the capacity of Williamtown 1 WWPS and may exceed capacity of the Tomago 1 WWPS. ▪ Ultimate Williamtown SAP wastewater discharge may exceed capacity of Raymond Terrace WWTW.
Threats	**Opportunities**
▪ PFAS contamination restricting deep excavations and construction of permeable materials below groundwater tables. ▪ Wastewater discharge quality not within Hunter Water trade waste regulations, will require additional on-site treatment	▪ Recycled water supply from on-site treated wastewater can reduce wastewater discharge to Raymond Terrace WWTW.

4.4.6 Planning and Approval Framework and Control Recommendations

Hunter Water has identified that the Williamtown SAP will require approvals in line with the typical Developer Servicing Strategy process. This process will require the submission of Developer Servicing Strategy report to Hunter Water that details the following:

- Development Context
- Options Development including, design water and wastewater loadings, infrastructure and constraints and options assumptions
- Servicing Options including water and wastewater load assessment, infrastructure description, technical assessment and constraints, community/ stakeholder constraints and social impact, environmental constraints and impact and financial analysis

It is recommended that the following controls are applied to developments within the Williamtown SAP to meet development requirements and enhance the efficiency of the wastewater servicing network:

- Separated on-site trade waste controls including the discharge of trade waste (fat, oil, grease) into separated septic storage and transfer of trade waste to a regulated discharge location, separate from the domestic wastewater discharged into the proposed pressure wastewater network.

4.5 Electricity Servicing Strategy

4.5.1 Demand Assessment

The Williamtown SAP's electrical demand is supplied through Ausgrid's distribution network. The bulk supply of the Ausgrid network is provided by Transgrid's regional transmission feeders to Tomago STS.

The expected electricity demand of the Structure Plan sub-precincts are outlined in Table 4-6. No provision for data centres has been made in this analysis and a 50% allowance for refrigeration has been considered for Freight and Logistics.

Adopted energy demand by land use occupancy are as summarised below:

- Warehouses, with light and power and ventilation, based on AS/NZS 3000 + 50% for refrigeration – 0.4 MVA/ha
- Commercial office spaces, with light and power and cooling, based on AS/NZS 3000 – 0.85 MVA/ha
- Light Industrial, with light and power, ventilation, and air conditioning, based on AS/NZS 3000 – 0.7 MVA/ha

Table 4-6 Structure Plan Sub-Precinct Expected Electricity Demand

Land Use	Net Developable Area (ha)	Adopted Unit Electricity Demand (MVA/ha)	Expected Electricity Demand (MVA)	Land Use Assumptions
Northern Sub-Precinct				
Defence and Aerospace (including DAREZ/Astra Aerolab)	50	0.81	40.6	75% Offices, 25% Light industrial
Commercial Centre	5	0.85	4.3	Commercial office space
Freight and Logistics	7	0.4	2.8	Assume similar demands to warehouse plus 50% provision for extra refrigeration demand
Research & Development	7	0.85	6.0	Commercial office space
Eastern and Western Sub-Precincts				
Commercial Centre	68	0.85	57.8	Assumed 100% office space as worst case scenario for electricity demand
Advanced Manufacturing		0.85		
Light Industrial		0.85		
Research & Development		0.85		
Total	**137**	**-**	**111.4**	

4.5.2 Proposed Infrastructure

Ausgrid has indicated that the zone substation has no residual capacity for expected Williamtown SAP demand. Ausgrid have acquired land on the southern side of Cabbage Tree Road for planned future construction of a new zone substation. Further ongoing consultation with Ausgrid will be required to ensure that demands from the proposed Williamtown SAP are incorporated into Ausgrid's regional servicing strategy and plan for timely construction of the proposed new substation.

This substation installation would require new transformers, switchgears, feeders and a new 11kV switch-room building.

Table 4-7 outlines the substation capacity and forecasted loadings information gathered from the *Distribution and Transmission Annual Planning Report (DTAPR, 2020)* for Ausgrid.

Table 4-7 Affected Existing Substations for Williamtown SAP

Substation	Total Capacity (MVA)	S Firm Capacity (MVA)	S Forecast Load (MVA) 2021/2022	S Forecast Load (MVA) 2024/2025	Available Firm Capacity (MVA)
Tomago 132/33 kV STS	219.3	153.1	120.2	120.9	32.2
Williamtown 33/11 kV ZS	45.3	24.8	5.4	5.3	19.5

The expected demand of the Williamtown SAP structure plan exceeds the capacity of the local Ausgrid distribution network and will require augmentation of the network to provide capacity.

Considering the advice from Ausgrid, Williamtown Zone Substation 33/11 kV has no capacity for further Williamtown SAP demands, hence a new zone substation is proposed along Cabbage Tree Road. It is proposed that Williamtown substation would feed the new zone substation. A single line diagram of the proposed network augmentation is shown in Figure 4-4.

The new 33/11 kV Zone Substation is proposed to be within Ausgrid owned land on the southern side of Cabbage Tree Road.

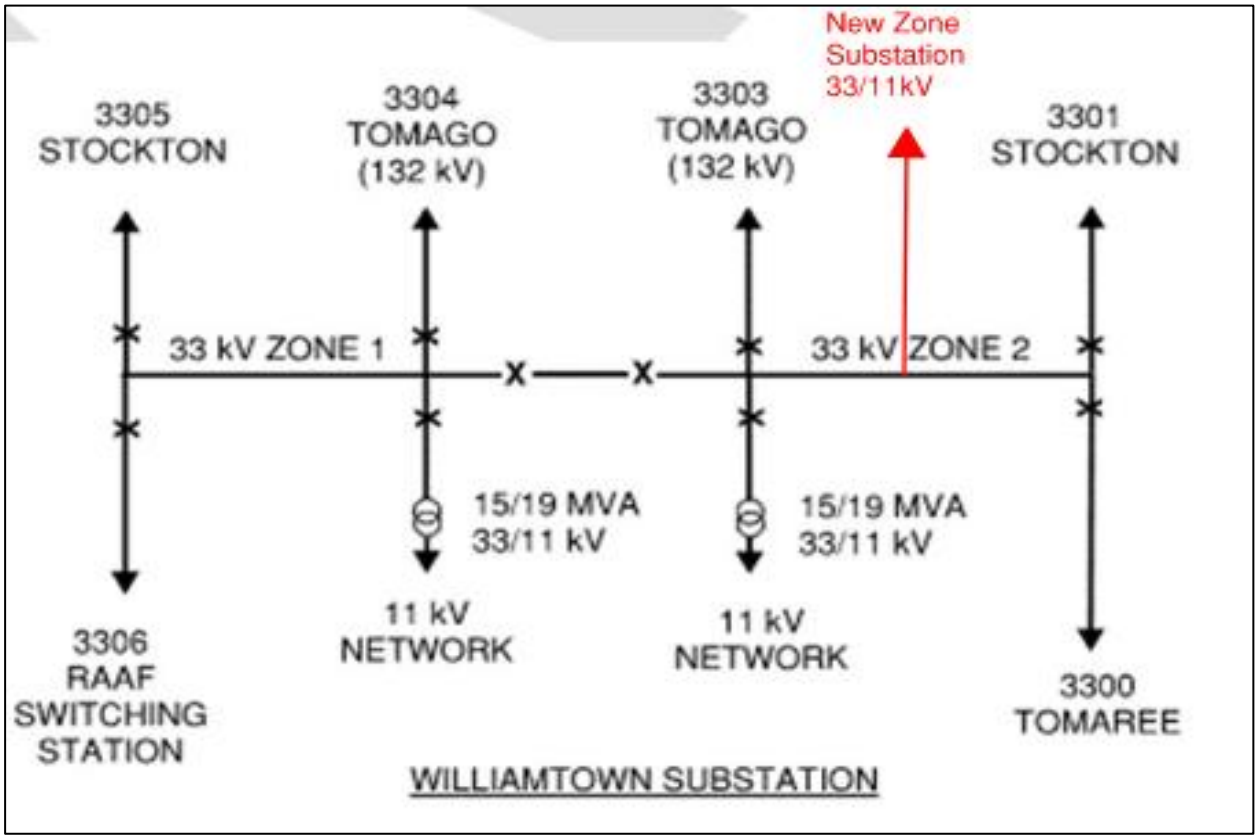


Figure 4-4 Single Line Diagram of Proposed Williamtown Substation Augmentation

To meet the expected demands of the Northern Sub-Precinct, expansion of the network will require new transformers, a 11 kV switch room within the Northern Sub-Precinct, 11 kV feeder conduits, cables and pits. The Northern Sub-Precinct can be serviced by a new 55 MVA transformer with an additional 60 MVA transformer installed to service the expected demand of the Eastern and Western Sub-Precincts at a later phase.

It is expected that the residual capacity of Tomago STS 132/33 kV (which is ~32MVA) will not be enough for the ultimate development of the Northern Sub-Precinct (which is ~54MVA). It is proposed that around the middle phase of the Northern SubPrecinct development, Tomago STS will require upgrading to service the ultimate demand (part of Northern Sub-Precinct + Eastern and Western Sub-Precincts). This translates to an additional ~80MVA transformer to be installed for the upgrade. Further consultation with Ausgrid and Transgrid will be required to determine the feasibility of this upgrade.

The 33kV feeders (TM7 and TM10) that supply Williamtown ZS do not have existing residual capacity for additional demand from the Williamtown SAP. Table 4-8 provides the existing feeder capacity. The feeders will require an initial upgrade to provide at least the additional 109 MVA capacity to meet the Williamtown SAP expected demand. The upgrade can be completed through the installation of a third feeder or the replacement of existing feeders with an upsized feeder system. Replacement of the feeders in same alignment is a preferred option when considering easement and maintenance, however, consultation with Ausgrid will be required to determine the feasibility of this upgrade.

The proposed preliminary electrical servicing strategy for the Structure Plan is provided in Appendix B.

Table 4-8 Feeder TM7 and TM10 Load Forecast *(DTAPR, 2020)*

Feeder Name	Voltage (kV)	(MVA)	Summer (MVA)		Winter (MVA)	
			2020/21	2024/25	2020	2024
Feeder TM7 – Tomago STS to Williamtown ZS	33	Load	35.8	35.7	31.4	31.3
		Rating	30.2	30.2	33.8	33.8
Feeder TM10 – Tomago STS to Williamtown ZS	33	Load	36.1	36.0	31.8	31.6
		Rating	30.2	30.2	33.8	33.8

4.5.3 Infrastructure Staging

The staging of required upgrades to Ausgrid and Transgrid's network is outlined in Table 4-9.

Table 4-9 Williamtown SAP Structure Plan Electricity Network Upgrades Staging

Stage	Required Infrastructure Upgrades
Northern Sub-Precinct	▪ New Zone Substation at Cabbage Tree Road (33/11 kV). First Transformer should be able to accommodate ~55 MVA. Building and yard of sufficient size to fit future equipment for ultimate load (~112 MVA). The project can start off with the installation of a 55 MVA transformer to service the Northern Sub-Precinct. ▪ Upgrade feeders TM7 and TM10 to accommodate additional 109 MVA ▪ New 11 kV switch-room building of sufficient size for the ultimate load. ▪ New 33kV feeders from Williamtown ZS ▪ New 11kV underground feeders to new 11 kV switch-room building. ▪ One cable pit at designated location to allow extension of 11 kV feeder conduit run (Refer Appendix B). ▪ Extension of 11kV feeder to and from 11kV switch-room ▪ New 11 kV feeder bank of conduits from this switch-room building to designated areas of the Northern Sub-Precinct. It should make provision for comms and low voltage as well. ▪ Extension of 11kV feeders from the cable pits to service the Northern Sub-Precinct as developed. ▪ Figure 4-5 below shows a stage 1 design for the Astra Aerolab. There is not enough detail in the Structure Plan to develop similar level of detail for all stages especially LV distribution.
Eastern and Western Sub-Precincts	▪ Upstream upgrade (Tomago STS 132/33kV) needed to accommodate ultimate load with additional 80MVA. ▪ Second transformer at New substation to accommodate additional (~60 MVA). This would be able to service the Eastern and Western sub-precincts. ▪ New 11 kV feeder bank of conduits to designated areas of the Eastern and Western Sub-Precincts. It should make provision for comms and low voltage as well. ▪ Extension of 11kV feeders to service the Eastern and Western Sub-Precincts as developed.

The installation of electricity conduits to the road corridors should provide spare conduits for future cable installations required during the ultimate realisation of the Williamtown SAP. The initial installation will minimise the need for re-work and will only require the installation of cabling to commission new

developments serviced from the 11 kV switch room installed for the Northern Sub-Precinct. Conduit allocations should provide the following conduit arrangements at a minimum:

- 6 HV conduits, 2 LV conduits and 2 telecommunication conduits to future proof additional stages
- 2 HV conduits, 2 LV conduits and 2 telecommunication conduits for a service route to a single sub-precinct stage.

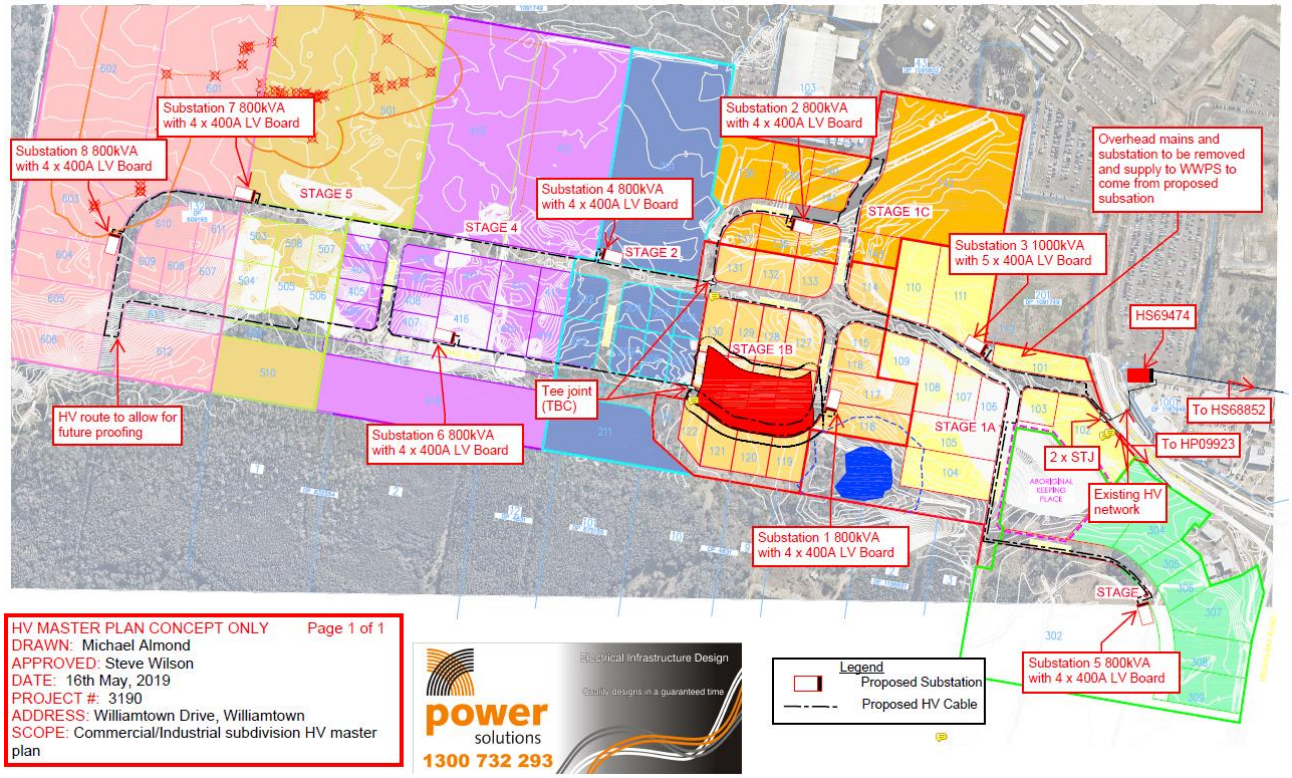


Figure 4-5 Astra Aerolab Electrical Servicing Strategy

4.5.4 Constraints and Opportunities

The assessment of electricity servicing requirements of the Williamtown SAP Structure Plan has identified several key constraints including:

Subject to further assessment by Ausgrid's planning study, Tomago STS may not meet the expected total demand of the Structure Plan. An expansion of the current bulk supply infrastructure is required to meet the expected demand of the Structure Plan. This may require upgrading TM-7 and TM-10 (33kV feeders). The upgrade involves replacing the existing feeders or augmenting them with parallel lines along the same easement. This is a significant upgrade and will require a major investment to meet the expected demand of Stages 3 to 6 of the Williamtown SAP.

The proposed servicing strategy for the Structure Plan meets the expected level of service of the Structure Plan, however, there remains several opportunities to improve the electricity servicing of the expected development and particularly the sustainability of the development. These opportunities include:

- On-site renewable energy generation may offset the need for some infrastructure upgrades; however, the scale of potential changes to the suggested utilities infrastructure scenarios will need to be determined following thorough assessment and sizing of potential renewable energy options.
- There is also an opportunity to implement microgrid into the Williamtown SAP. The microgrid will provide resilience to the Williamtown SAP through its island mode capabilities wherein it will be able to

operate and supply energy to the Williamtown SAP independent of the grid. This will ensure that a supply of energy is made available to the Williamtown SAP during loss of main grid supply. At least 250kW sized community batteries (and possibly larger as energy densities improve over time) throughout the sub-precinct in the order of one community battery for every 1000kVA 11kV/415V kiosk installed. These batteries will be owned and managed by Ausgrid. These will be installed as part of Ausgrid's business-as-usual planning function of developing their electricity network as the sub-precinct grows over the next 20 to 30 years.

Refer to *B3.2I Renewable Energy Scenarios Report* for more details on the opportunity for renewable energy and micro grids at Williamtown SAP.

4.5.5 SWOT Analysis

The strengths, weaknesses, opportunities and threats to service the wastewater discharge of the proposed Williamtown SAP Structure Plan are outlined in Table 4-10.

Table 4-10 Structure Plan Electricity Servicing SWOT Analysis

Strengths	**Weaknesses**
▪ Williamtown SAP electrical loads concentrate close to the proposed zone substation and Williamtown Zone Substation (requiring upgrade) and it means impact to electrical infrastructure by area can be limited.	▪ Williamtown zone substation has no residual capacity for further Williamtown SAP demands.
Threats	**Opportunities**
▪ Timing and funding for delivery of new zone substation	▪ Install conduits and add cable pits at strategic locations to enable simple 11k V extensions from the central road between the Eastern and Western Sub-Precinct at later stages. ▪ Microgrid infrastructure incorporating batteries and on-site renewable energy production would reduce the electrical demand from the grid. ▪ Smart Pole technology enhancing the digital interface of the Williamtown SAP

4.5.6 Planning Framework and Control Recommendations

Further consultation with Ausgrid and Transgrid will be required to facilitate planning of the proposed upgrades in the Williamtown SAP servicing strategy.

It is recommended that the following controls are applied to developments within the Williamtown SAP to meet development requirements and enhance the efficiency of the electricity servicing network:

- Smart pole network infrastructure (incorporating street lighting, public Wi-Fi and CCTV technology)
- On-site roof top solar panel systems
- Micro-grid battery network

4.6 Gas Servicing Strategy

4.6.1 Demand Assessment

The expected gas demands of the Structure Plan sub-precincts are outlined in Table 4-11.

Adopted gas demands by land use occupancy are as summarised below:

- Industrial / Advanced manufacturing – 0.2 GJ/d/ha
- Industrial, manufacturing and warehouses and logistics, based on Moorebank Intermodal Facility usage rates – 0.2 GJ/d/ha
- Commercial and office spaces, based on Australia Department Climate Change and Energy Consumption and Greenhouse Gas Emissions in Commercial Buildings in Australia, assuming water heating and space heating is provided by Natural Gas. – 2.0 GJ/d/ha

Table 4-11 Structure Plan Sub-Precinct Expected Gas Demand

Land Use	Net Developable Area (ha)	Adopted Unit Gas Demand (GJ/d/ha)	Expected Gas Demand (GJ/d)	Land Use Assumptions
Northern Sub-Precinct				
Defence and Aerospace (including DAREZ/Astra Aerolab)	50	1.6	78	75% Offices, 25% industrial
Commercial Centre	5	2	10	Commercial / Offices
Freight and Logistics	7	0.2	1	Warehouses and logistics
Research & Development	7	2	14	Commercial / Offices
Eastern and Western Sub-Precincts				
Commercial Centre	68	2	136	Assumed 100% commercial/offices as worst case scenario for gas demand
Advanced Manufacturing		0.2		
Light Industrial		0.2		
Research & Development		2		
Total	**137**	**-**	**239**	

4.6.2 Proposed Infrastructure

Gas supply to Williamtown is currently provided through a 1,050 kPa main along Nelson Bay Road. Based on the calculated demand, Jemena has confirmed a tie-in to the Williamtown SAP is possible and will be able to supply the new development using the existing High Pressure main.

The preliminary gas servicing strategy is provided in *Appendix B.*

Proposed gas mains have generally been located within existing and future road reserves. As shown in *Appendix B*, gas infrastructure is proposed to be extended from the existing 210 MOP kPa network main to service the Northern Sub-Precinct. The Eastern and Western Sub-Precinct is proposed to be serviced by extending the 210 MOP kPa network main from the existing main in Williamtown Dr, with local reticulation to be supplied as offtakes from this main. A District Regulator Set (DRS) may be required at the offtake to maintain pressure. A new district regulator will require a designated footprint of 5m x 5m within the development area.

The gas supplier has advised they would typically design a distribution network to provide the most flexibility for potential clients rather than targeting specific demands, following initial review of the gas servicing strategy map, the supplier has suggested a gas main through the precinct of 160mm PE with 110mm and 63mm PE mains and branches.

4.6.3 Infrastructure Staging

The construction and commissioning of the gas network can be undertaken in stages in line with the development expansion.

The initial stages of the Williamtown SAP can be serviced by the existing network within the Northern Sub-Precinct and expanded as development expands to the west.

The staging of earthworks ahead of property developments allows the opportunity to construct utility infrastructure upfront when PFAS capping and fill balancing is undertaken (ie install capped mains), with infrastructure later commissioned as required to service load. This could be adopted to mitigate the risk of future gas infrastructure impacting PFAS barriers and capping layers.

4.6.4 Constraints and Opportunities

The assessment of gas servicing requirements for the Williamtown SAP Structure Plan has identified several key constraints, including:

- The servicing currently relies on the assumption that Jemena has capacity to service the new development as previously specified. Jemena currently runs the HP Secondary Main along Nelson Bay Road and confirmed that the current demand can be met with their existing gas network. However, this might change over time due to future developments to happen around the area and connect to the same network. However, in the scenario that Jemena is unable to service the actual gas demand for the entire Williamtown SAP, there is an opportunity to connect to the AGL Gas storage facility located in Tomago Road.
- The addition of a district regulator will add a new hazardous area classification. The continuous presence of natural gas will classify the area as a Zone 0, the exact extent of the hazardous classification radius will vary depending on leak testing and hole size. However, this will impact the type of buildings that can be built within the area. For example, residential buildings, school or hospitals are not likely to be approved within this radius.

The proposed servicing strategy for the Structure Plan meets the expected level of service of the Williamtown SAP, however, there remains several opportunities to improve the gas servicing of the expected development and particularly the sustainability of the development. These opportunities include:

- With the existing gas capacity infrastructure, there is an opportunity for Jemena to extend this development to supply other customers in adjacent areas, therefore supplying gas to places that are currently further away from the existing HP secondary main, ie improve regional servicing outside of the Williamtown SAP.
- There is an opportunity to use hydrogen gas to improve the sustainability of the services by either blending hydrogen in the new gas infrastructure or developing a hydrogen only infrastructure that will allow for greener gas supply in the area.

4.6.5 SWOT Analysis

The strengths, weaknesses, opportunities and threats to service the gas demand of the proposed Williamtown SAP Structure Plan are outlined in Table 4-12.

Table 4-12 Structure Plan Gas Servicing SWOT Analysis

Strengths	Weaknesses
▪ Expected demand can be serviced by Jemena. ▪ Future works can be staged incrementally to meet the demand of each new development stage of the Williamtown SAP.	▪ Servicing relies on assumption that Jemena has capacity to service new development as previously specified.
Threats	**Opportunities**
▪ Development is restricted to Jemena's existing capacity and there is a risk that new developments relying on this network may affect the service capacity to Williamtown SAP over time. ▪ Hazardous area is likely to be introduced at the location of the district regulator, these can affect the condition of development made near this area within the hazardous area radius.	▪ Opportunity to use hydrogen gas supply in the area, by either mixing into existing gas main offtakes or by developing a new hydrogen gas network. ▪ Expected gas demand is based on conservative assessment and the actual requirement may be significantly lower, this will allow for a simpler infrastructure development. ▪ Distribution piping could include High Pressure main that could be used for future consumers. ▪ Opportunity for Jemena to extend this development to supply other customers in adjacent areas.

4.6.6 Planning Framework and Control Recommendations

Jemena is to determine the control of the distribution system pressure and it is expected they will deliver a constant pressure gas supply. Jemena will be ultimately responsible for the design and construction of the gas reticulation system. Further consultation with Jemena is recommended as details of the proposed developments are progressed.

During the design stages, it is important to consider overpressure protection, therefore studying whether a pressure relief valve will be needed for this system and if it can be placed close to the different categories to be developed.

Hazardous area is likely to be introduced at the regulator station and consideration must be taken given that it can affect the development of the allocated land nearby.

4.7 Telecommunication Servicing Strategy

4.7.1 Demand Assessment

The Williamtown SAP investigation area is serviced by all major mobile network carriers and partially by both NBN fibre and fixed wireless services. The majority of telecommunications infrastructure is concentrated around the Newcastle Airport and RAAF Base Williamtown (airport precinct), as well as located along the arterial roads servicing the surrounding population.

Existing demand and residual capacity are confidential in nature and this information may be available with the telecommunications utility providers and carriers should they choose to disclose. As such, preliminary consultations with the latter have been undertaken to understand the existing demand and residual capacity to inform the strategic development of the Structure Plan.

A summary of the consultation feedback is provided in Table 4-13 with associated comments and recommendations from the main utility providers.

Table 4-13 Consultation activities with telecommunications network carriers

Network carrier	Comments	Recommendations
Telstra	NBN is the default provider for fixed and wireless telecommunications for Broadband. Telstra will manage the Williamtown area when development/customer applications are requested. With regards to Telstra mobile coverage, Telstra will monitor the mobile traffic and upgrade the network as required.	For future development within the Williamtown SAP, applications should be lodged to Telstra. Telstra will investigate and plan for any future greenfield sites, expansion or upgrade of services that may be required to accommodate this development.
Optus	There are currently no existing plans for Optus to establish new sites or upgrades in the Williamtown area. However, this can change quickly with mobile carriers depending on the demand in that area.	It is recommended to further engage and seek specialist planning advice with Optus prior or during concept design or once the Williamtown SAP is more defined.
Vodafone	Vodafone did not provide comment on the strategic direction of their infrastructure within the Williamtown area.	It is recommended to further engage and seek specialist planning advice with prior or during concept design or once the Williamtown SAP is refined.
NBN	Once the final structure plan registered with NBN. Co., NBN will undertake a site analysis of the current capacity of Telstra pit and pipe network to confirm the residual capacity of the existing telecommunications network. This analysis will provide the forecasted demand and the rationale to install a Telstra pit and piped network at capped rates. Further, NBN will undertake a site analysis of any proposed greenfield locations should this be required for future development within the Williamtown SAP.	The developer is encouraged to complete an application at the 'New Developments landing page' at https://www.nbnco.com.au/develop-or-plan-with-the-nbn/new-development. The Structure Plan will be required to be registered with NBN Co. who will undertake a feasibility assessment for the backhaul activity and additional build and therefore plan for the future communication service requirements.

Based on the preliminary consultation with network carriers, it appears that telecommunications infrastructure to support development within the Williamtown SAP will require a reactive response as development progresses as opposed to a proactive response. Further, under the Australian Government's Telecommunications Infrastructure in New Developments (TIND), NBN Co. is the default Statutory Infrastructure Provider (SIP) in Australia as of July 2020. Accordingly, NBN Co. undertakes the initial investigations and deployment within the area and the mobile carriers (i.e. Telstra, Optus and Vodafone) subsequently follow.

As a result, it is recommended that further engagement is undertaken with the network carriers as the design for the Structure Plan progresses and the demand for the Williamtown SAP is more defined.

4.7.2 Proposed Infrastructure

The underground fibre network forms part of the essential infrastructure required to enable future development within the Williamtown SAP. The Structure Plan area contains only existing Telstra (fibre 12G and copper) and Optus underground fibre assets along Cabbage Tree Road and Nelson Bay Road. As for NBN.Co, the existing fibre located north of the existing airport precinct is required to be extended to connect to future development area involving the package of land north west of the Cabbage Tree Road and Nelson Bay Road.

The overall telecommunications preliminary servicing strategy is provided in *Appendix B.*

The underground infrastructure will be required primarily around the airport precinct and is assumed to be built incrementally as each stage of development for the Williamtown SAP progresses. The underground fibre network allows NBN Co. to undertake any initial deployment within the area with mobile carriers to follow as required.

Defence and aerospace industries are likely to require a high security network and hence a specific fibre and type of cabling for defence purposes may be required.

It is recommended that this requirement is further investigated during the concept design phase of the Williamtown SAP where new pits and conduits may be necessary. Details of secure defence related networks will be subject to security classification and will not be presented on general infrastructure masterplans.

It is likely that the construction of new pits and conduits within the Williamtown SAP will use conventional trenched excavation (700 – 1000 mm) and will be proposed in the shared services corridors. The final location and arrangement are to be confirmed at concept design phases.

With regard to wireless coverage, the Williamtown SAP development will put additional pressure onto the existing network capacity and will require infrastructure upgrade to existing facilities within the Williamtown SAP area. There are five (5) existing telecommunications facilities involving a combination of freestanding (2) and rooftop (3) structures within the Williamtown SAP area. They currently provide mobile and internet coverage to individuals and premises to the package of land northwest of the intersection Cabbage Tree Road and Nelson Bay Road as well as the airport precinct.

Mobile carriers (i.e. Optus and Vodafone) will require to upgrade and expand existing facilities within the Williamtown SAP to accommodate the extra demand from the higher volume of traffic and usage at on and off-peak hours.

A new facility (Optus, Telstra and Vodafone) will be required, should co-location onto an existing facility not be feasible. The opportunity to locate a new telecommunication tower at the local high point, back-haul to the fibre network should be considered and also to provide 5G or fixed wireless connection to the area. The proposed location will need to consider environmental constraints and impact to the nearby wetland. The new facility will be ideally located north of Cabbage Tree Road. The introduction of the tower will also present an opportunity for other utility providers to install equipment and co-locate when customer additional demand reaches a certain point within the Williamtown SAP.

The identification of a new facility is to be consulted and confirmed with the internet providers and mobile carriers to address any extra demand on the wider telecommunications network as well as any other specific requirements for access and cabling associated with the new facility.

Further engagement is recommended with the network carriers as the design for the Structure Plan progresses and the Williamtown SAP more defined to confirm future deployment locations and specific infrastructure requirements in the Williamtown SAP area.

The proposed preliminary telecommunications servicing strategy shown in *Appendix B* will accommodate the staging of development for the Williamtown SAP.

4.7.3 Infrastructure Staging

The construction and commissioning of the telecommunications network can be undertaken in stages in line with the development expansion.

The initial stages of the Williamtown SAP can be serviced by the existing network within the Northern Sub-Precinct and expanded as development expands to the west.

The staging of earthworks ahead of property developments allows the opportunity to construct utility infrastructure upfront when PFAS capping and fill balancing is undertaken (ie install capped mains), with infrastructure later commissioned as required to service load. This could be adopted to mitigate the risk of future telecommunications infrastructure impacting PFAS barriers and capping layers.

A summary of the telecommunications infrastructure staging for the structure plan is provided in Table 4-14.

Table 4-14 Telecommunications infrastructure staging requirements for Structure Plan

Sub-Precinct	Infrastructure Description	Underground fibre distance (km)
Northern Sub-Precinct	The existing underground fibre network (NBN) north of the Airport precinct area will extend to connect to future development area involving the package of land north west of the Cabbage Tree Road and Nelson Bay Road.	5
Eastern and Western Sub-Precincts	While the demand for telecommunications services infrastructure is unknown at this stage the following potential upgrades may be considered at the concept design stage: **Optus** Upgrade and expand capacity for existing facilities with RFNSA No. 2318007 and 2318015 to include 4G and 5G technologies. Upgrade and expand capacity for existing facility with RFNSA No. 2318011 to include 5G technology. Expand capacity for existing facility with RFNSA No. 2318013. **Vodafone** Upgrade and expand capacity for existing facility with RFNSA No. 2318011 to include 5G technology **Optus, Vodafone and Telstra** Erect a new tower (if co-location is not feasible). The type of infrastructure and location is to be confirmed with mobile carriers.	5

The Williamtown SAP contains existing Telstra and Optus underground fibre which runs along arterial road being Cabbage Tree Road and Nelson Bay Road. Fibre provisioning shall occur wherever possible with

other buried services as demand grows. Accordingly, proposed road and intersection upgrade shall take the existing asset infrastructure into consideration prior or during the concept design phases.

4.7.4 Constraints and Opportunities

There are a range of opportunities and constraints for telecommunications infrastructure for the Williamtown SAP. These opportunities and constraints should continue to be refined as the design progresses and staging for future development finalised.

Based on the desktop assessment of telecommunications infrastructure, the following conclusions and findings are presented in assessing the potential constraints within the Williamtown SAP and should be further considered in the concept design.

- Development within the Williamtown SAP area is subject to height controls due to the low altitude flight patterns associated with the Williamtown RAAF Base and hence may impact the coverage area which may in turn reduce the RF objectives. The development of any new mobile or fixed wireless facility in the area will need to take this criterion into consideration and comply with the height controls which will act to reduce the effective coverage area despite the terrain.
- Existing PFAS contamination within the Structure Plan boundary is likely to restrict excavation works that may be required for future telecommunications infrastructure. Appropriate mitigation controls are required during construction and operation consideration.
- Each telecommunications carrier's network information, including existing network capacity, demand and future strategic infrastructure deployment, is commercial in confidence. The final structure plan is to be registered with telecommunications utility providers. Once registered, a site analysis of the existing network demand and residual capacity of the area will be undertaken which will provide the basis to plan for future telecommunication service requirements within the structure plan area.
- Mobile carriers and internet providers follow a reactive approach rather than proactive. Further engagement is undertaken with network carriers as the design for the Structure Plan progresses to continue to gain their buy-in with regards to the telecommunications infrastructure future demand and residual capacity.

The land topography and restrictive height controls associated with the terrain in combination with the existing defence and airport precinct have provided the basis for the following conclusions and findings which should be further investigated at the concept design stage.

The proposed servicing strategy for the Structure Plan meets the expected level of service of the Structure Plan, however, there remains several opportunities to improve the telecommunications servicing of the expected development. These opportunities include:

- The Northern Sub-Precinct involves development within defence or airport areas. It provides an opportunity for high security network to be implemented and as such a specific fibre and type of cabling for these key industries depending on the specific needs and requirements. It is understood that under the intended commercial model, participating state and territory governments are required to fund all incremental proactive local fibre network (LFN) and distribution fibre network (DFN) build costs upfront, with NBN Co funding the cost of reactively deploying FTTP lead-ins when a high-speed tier (100 Mbps or higher) is ordered by a Retail Service Provider.
- Smart Pole infrastructure is being installed within the Astra Aerolab precinct, providing wireless internet to facilitate co-creative outdoor meeting spaces, and potential for CCTV for increased security within the precinct. Expansion of the Smart Pole infrastructure throughout the Williamtown SAP precinct is recommended to enhance development appeal for potential defence and R&D related industries.

In the last two years, mobile carriers have trialled small cells and used existing poles for deployment across Queensland (QLD) and New South Wales (NSW). This trial has involved fixing slim telecommunication antennas to a light pole generally owned by Council or utility entity. Small panel antennas were deployed onto existing poles within an area. The idea was to avoid erecting a single freestanding ground structure such as a

lattice tower or a monopole typically at a 40 – 50 m height level. In addition, this preferred approach and deployment solution keep in with the character of the area and mitigates visual prominence when viewed from proximity.

The Williamtown SAP provides an opportunity to draw on innovation and smart solutions. It is important to consider smart poles which use a similar concept to the small cell deployment. A smart pole also known as the 'multi-function pole' is a modular system that delivers a platform to house and support the digital infrastructure within an area. It can house multiple devices and attachments with the aim of having different infrastructure or aesthetic purposes depending on the subject location and character.

They may include but are not limited to:

- Multi-pod (to house panel antennas);
- Lighting;
- CCTV camera;
- Environmental sensors (temperature, humidity, weather etc);
- Public address system;
- Traffic control signals; and
- Signage.

There are currently many variations of a multi-function pole available on the market. Figure 4-6 provides is an indicative representation the additional services which may be used on a smart pole.

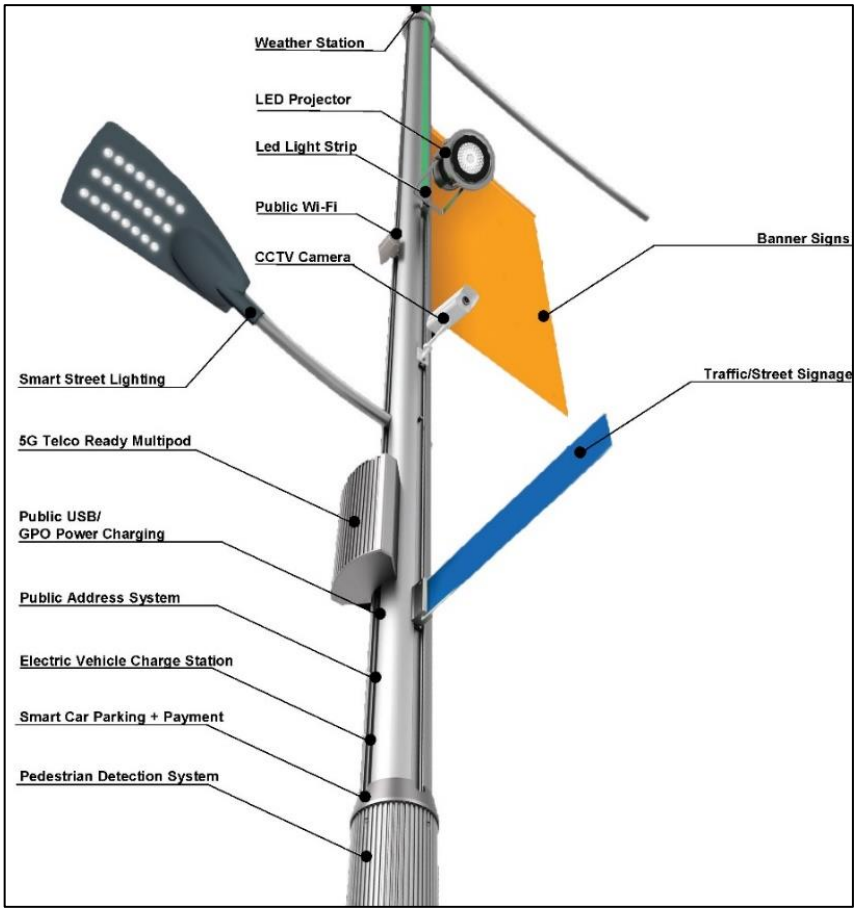


Figure 4-6 A smart multi-function pole *(Source: https://multipole.com.au/)*

The feasibility of the multi-function pole will require to be installed on new poles or be fitted onto existing poles. Within the Structure Plan, power will be supplied by Ausgrid and the telecommunications network for Telstra and Optus may be serviced by existing underground fibre located along Cabbage Tree Road and Nelson Bay Road. As for NBN Co., the existing underground fibre north of the airport precinct area extend to connect to

the future development area involving the package of land located north west of the Cabbage Tree Road and Nelson Bay Road.

Further, establishing and deployment of smart poles within the Williamtown SAP will align with the Port Stephens Smart City Strategy which aims to:

- Improve the quality of our customer and community engagement;
- Reduce operating costs of Council;
- Gather data for better informed decision making;
- Build capacity for local business and improve liveability for our community; and
- Align our Smart City initiatives with the broader Hunter region.

The strategy covers key requirements which play a significant role when combined, in the development of smart infrastructure. The development of smart telecommunications infrastructure is further aligned with the 'NSW Government Smart Infrastructure' policy which is committed to '*smart infrastructure that produces, analyses and helps to securely share data to improves the liveability, productivity and sustainability of towns and cities in NSW*' (NSW Government's Smart Infrastructure Policy, July 2020).

Existing case studies within Australia include:

- City of Newcastle - smart poles where sensor fittings were installed to existing street poles for a smart city network.
- Brisbane City Council - smart poles where panel antennas were deployed to existing poles to provide improved network coverage and sensors were installed on new light poles to collect data across Brisbane CBD.
- Sydney's Royal Botanic Garden - Wi-Fi and panel antennas were installed onto new smart poles to provide free internet connectivity and access to information about the garden and the area in addition to a 24/7 monitoring of the visitors.

Figure 4-7 From left to right - City of Newcastle smart poles[1] *(www.newcastle.nsw.gov.au/smarter-living)***, Brisbane City Council smart poles**[2] [3] *(www.rfnsa.com.au)* **and Sydney's Royal Botanic Garden** [4] *(https://urbis.com.au/projects/sydney-royal-botanic-gardens-and-domain-lightpoles/)*

4.7.5 SWOT Analysis

The strengths, weaknesses, threats and opportunities to service the telecommunications infrastructure requirements of the Structure Plan are outlined in Table 4-15.

Table 4-15 Structure Plan Telecommunications Infrastructure SWOT analysis

Strengths	Weaknesses
▪ Additional demand for future development within the Williamtown SAP can be partially serviced by existing telecommunications infrastructure located on the boundaries of the Williamtown SAP area. ▪ Additional demand can be staged incrementally to meet the demand of each new development stage of the Williamtown SAP	▪ Each telecommunications carrier's network information, including existing network capacity, demand and future strategic infrastructure deployment, is commercial in confidence. ▪ Mobile carriers and internet providers follow a reactive approach rather than proactive.
Threats	**Opportunities**
▪ Development is restricted subject to height controls due to the low altitude flight patterns associated with the Williamtown RAAF Base. Coverage area and RF objectives may be reduced. ▪ Existing PFAS contamination within the Structure Plan boundary restricts excavation for any proposed future freestanding telecommunications structure. ▪ Existing telecommunications infrastructure does not meet expectations/requirement of occupiers	▪ Opportunity to implement multi-function smart poles across the structure plan area. This is a preferred approach due to the topography and terrain of the area and being in close proximity to the airport which is subject to strict height controls. ▪ Opportunity to consider high security cabling to supply defence and airport industries.

4.7.6 Planning Framework and Control Recommendations

Further consultation will be required between DPE, Department of Defence and telecommunication providers, particularly NBN in order to plan for provision of sufficient network capacity, developer delivery requirements and funding agreements.

It is identified that the Williamtown SAP will require applications to be made at internet provider (NBN) and mobile carriers (i.e. Optus, Telstra and Vodafone) with details of the following:

- Final structure plan
- Number of lots/premises to be serviced.

The following telecommunications infrastructure will be investigated during the concept design phase to enhance the network coverage, capacity and technology of the Williamtown SAP and establish the parties responsible for planning, delivering and funding.

- 5G technology coverage across the Williamtown SAP
- Any new telecommunications infrastructure shall consider smart pole as the default alternative
- High level security cabling for key industries (i.e. defence and airport areas)

Should the deployment of telecommunications infrastructure on new or existing infrastructure be required, the proposal is likely to be exempt or require planning consent from a local government authority being the local Council. Information regarding network demand and residual capacity is with the telecommunications utility providers and as a result the process will be managed by the latter accordingly.

Deployment will be subject to the *Federal Telecommunications Act 1997* (Telecommunications (Low-Impact Facilities) Determination 2018 ('The Determination) for exempt facilities only) and will follow the Industry Code of Practice C564:2020 Mobile Phone Base Station Deployment ('The Code'). The Determination is made under the Telecommunications Act 1997 and allows deployment of telecommunications infrastructure to existing facilities and allows mobile carriers to undertake a planning pathway exempt from Council approval.

Generally, if a deployment is not permissible under The Determination, planning consent is required from the Council. In the case of NSW, the planning framework allows telecommunications infrastructure to be deployed

under the State Environmental Planning Policy (Infrastructure) 2007 ('ISEPP 2007') for existing and new facilities. Should deployment not be permissible under The Determination or ISEPP 2007, planning consent is required from the Council.

Table 4-16 provides an indicative planning pathway required for deploying new telecommunications infrastructure or installing telecommunications equipment to existing facilities within the Structure Plan area. The table does not take environmental constraints into consideration and takes into assumption that the design component meets the legislative planning criteria.

Table 4-16 Indicative planning pathways and deployment processes

Item	Description	Comments	Planning Pathway	Deployment Process
Upgrade or expand capacity	Co-location to existing facility	Telecommunications equipment to existing facility	The Determination ISEPP 2007 (Exempt or Complying Development)	Deployment Code 7 under The Code.
Erect a new facility	New facility without development approval	New telecommunications infrastructure on rooftop or free-standing facility	The Determination ISEPP 2007 (Exempt or Complying Development)	Deployment Code 6 under The Code.
	New facility with development approval	New telecommunications facility	Planning consent required from Council	-
Poles	Small Cells	Telecommunications equipment onto a pole	The Determination ISEPP 2007 (Exempt or Complying Development)	Deployment Code 5.2 under The Code.

4.8 Waste Servicing Strategy

4.8.1 Demand Assessment

Adopted waste generation by land use occupancy are as summarised below:

- Freight and logistics – 73 t/year/ha solid waste to landfill, 73 t/year/ha solid waste to recycling
- Mixed use research and development, advanced manufacturing , light industrial– 328.5 t/year/ha solid waste to landfill, 1,642.5 t/year/ha solid waste to recycling
- Commercial and office spaces – 630 t/year/ha solid waste to landfill, 712 t/year/ha solid waste to recycling

Table 4-17 Structure Plan Sub-Precinct Expected Waste Production

Land Use	Net Developable Area (ha)	Adopted Solid Waste – Landfill Production rate (t/year/ha)	Expected Solid Waste – Landfill Production (tonnes/year)	Adopted Solid Waste – Recycling Production rate (t/year/ha)	Expected Solid Waste – Recycling Production (tonnes/year)	Land Use Assumptions
Northern Sub-Precinct						
Defence and Aerospace (including DAREZ/Astra Aerolab)	50	328.5	16,425	1642.5	82,125	Mixed use research and development, advanced manufacturing , light industrial
Commercial Centre	5	630	3,150	712	3,560	Commercial and office spaces
Freight and Logistics	7	73	511	73	511	Freight and logistics
Research & Development	7	328.5	2,300	1,642.5	11,498	Mixed use research and development, advanced manufacturing , light industrial
Eastern and Western Sub-Precinct						
Commercial Centre	68	630	42,840	712	48,416	Assumed 100% commercial/offices as worst case scenario for waste production
Advanced Manufacturing						
Light Industrial						
Research & Development						
Total	**137**		**65,226**		**146,1110**	

This estimate has been completed at a precinct level, based on assumptions of expected land use types. The high-level nature of these assumptions has produced conservative values for the expected waste production. The exact demand values will be refined in future project phases as the land use types become more refined in detail.

4.8.2 Proposed Infrastructure

The waste generated by the Williamtown SAP will have to be collected from every property and taken for treatment or final disposal. The Port Stephens LGA provides a kerbside collection service for residents, while commercial business either need to engage with the LGA or private waste management companies. The handling and treatment options for this waste is dependent on the type of waste. Generally, common recyclable waste can be handled by a public or private waste management facility that has the infrastructure in place to separate the waste into its individual constituents and prepare it for sale on the open recycling material market. Likewise, organic wastes can be processed into compost at specialised facilities. General waste that cannot be recycled is sent to landfill, while hazardous waste needs to be sent to a specialised facility for disposal.

Within the Port Stephens LGA, the privately owned Newline Road Waste Facility (NRWF) in Raymond Terrace (20km away) is an EPA licensed facility (Licence number 7628) that has the infrastructure in place to process organic waste into compost, a Material Recovery Facility (MRF) to process recyclate for sale and a landfill to store general waste. It has no facilities to accept hazardous waste other than asbestos. The facility is licensed to process 200,000 tonnes of waste per year. While the current annual processing volumes and residual landfill volume of the NRWF are unknown, it is likely that the Williamtown SAP waste will be handled by this facility.

The Salamander Bay Waste Transfer Station (SBWTS) is located in Salamander Bay and serves as a central collection point for the surrounding suburbs on the peninsula where it is consolidated before being transported to the NRWF. It is unlikely that this facility will service the Williamtown SAP.

Further afield, outside the Port Stephens LGA are other public and privately owned waste management facilities that are also able to handle and treat the Williamtown SAP wastes.

Considering the availability of established waste management facilities in the region, the replication of these facilities within the Williamtown SAP is not advised. Furthermore, these facilities are traditionally located on the outskirts of settlements and require extensive environmental controls as well as licenses. There may also be restrictions on the development of certain facilities (landfills) in close proximity to a working airfield due to the increased risk of bird strikes from the increased bird activity these facilities produce.

Considering the close proximity of the NRWF, the development of a waste transfer station may not be required in the early stages. Should it be found at later stages that the NRWF is unable to process the Williamtown SAP waste or that significant volumes of waste are being treated at another facility further away, the development of a waste transfer facility within the Williamtown SAP may be viable.

4.8.3 Infrastructure Staging

During the initial stages of the Williamtown SAP, it is likely that waste could be handled by the NRWF. As subsequent stages are developed and the waste profile of the Williamtown SAP becomes more refined, it may be found that the development of a waste transfer station within the Williamtown SAP becomes economically viable.

4.8.4 Constraints and Opportunities

The assessment of waste servicing requirements of the Williamtown SAP Structure Plan has identified several key constraints including:

- Lack of available information from existing waste management facilities in the region. Consultation with the waste facility operators will be included during further investigations to refine the requirements of waste management facilities within the Williamtown SAP.

The proposed servicing strategy for the Structure Plan meets the expected level of service of the Williamtown SAP, however there remains several opportunities to improve the waste servicing of the expected development and particularly the sustainability of the development. These opportunities include:

- Waste to Energy facilities are a circular economy-based opportunity to reduce the overall quantity of waste transferred to existing waste facilities. The thermal treatment of waste and generation of electricity will offer the dual benefit of eliminating waste produced by the Williamtown SAP and providing an alternate energy source for local use within the precinct and export to the wider energy market. The economic feasibility at the scale of expected waste production is to be explored further in the Concept Design phase. It is also noted however, that the proximity to the RAAF base will present as a constraint with exhaust plume impacts on the OLS to be considered.

Opportunities for a network of waste to energy, local resource recovery, and landfill facilities will be further explored pending detailed analysis and breakdown of waste streams from proposed land uses.

The transportation of waste materials must be conducted in accordance with Heavy Vehicle National Law (NSW) No 42a of 2013 and the Protection of the Environment Operations (Waste) Regulation 2014. Waste

transportation requirements include covering the load safety to prevents waste spilling, leaking or otherwise escaping and compliance with tracking/licensing requirements.

It is recommended that the heavy vehicle movements associated with the Williamtown SAP be operated under the requirements of the Safety, Productivity and Environment Construction Transport Scheme (SPECTS), which reflect industry best practice approaches to transporting construction materials, including vehicle efficiency, safety and minimising impacts to the environment, infrastructure and public amenity. However, it is noted that participation in the scheme is voluntary. In addition, a large portion of the Williamtown SAP and the existing waste facilities are outside the spatial boundaries of the scheme, which encompasses Wollongong, Sydney and greater Newcastle, therefore it may not be possible/practical to constrain the waste transportation routes to approved SPECTS routes only.

4.8.5 SWOT Analysis

The strengths, weaknesses, opportunities and threats to service the waste production of the proposed Williamtown SAP Structure Plan are outlined in Table 4-18.

Table 4-18 Structure Plan Waste Servicing SWOT Analysis

Strengths	**Weaknesses**
▪ Waste to Energy facility eliminates reliance on existing waste facilities.	▪ Waste management is reliant on privately owned infrastructure outside the control of the Williamtown SAP, with expected demand to far exceed the capacity of existing facilities. ▪ The commercial viability of waste to energy plant is highly dependent on the type and quantity of feedstock available, which is unknown at this time. ▪ The close proximity of the airport may have an impact on the location of a waste to energy plant due to chimney stacks and emissions.
Threats	**Opportunities**
▪ Waste management is reliant on privately owned infrastructure, who's owners may not have the environmental licenses to expand their current facilities or develop new ones. ▪ The development of a waste to energy plant within the Williamtown SAP will require extensive consultation with the EPA and is subject to strict environmental requirements. ▪ Waste to energy plant in proximity to the RAAF base will be constrained to avoid impacting OLS	▪ A waste to energy plant requires more waste that what would be generated by the Williamtown SAP, it is likely it could service the region of Newcastle and north Sydney.

4.8.6 Planning Framework and Control Recommendations

Prior to the development of the Williamstown SAP, the developer will be required to liaise with the Port Stephens LGA and private waste management companies to confirm the residual capacity of their facilities prior or during the future Concept Design project phases.

4.9 Utility Servicing Interface Coordination

The investment in enabling utility infrastructure for the Williamtown SAP is a critical interface for the staging of expansions throughout the development horizon. Several key interfaces will require further consultation and consideration throughout the future phases of the Williamtown SAP. These interfaces include:

- The staging of earthworks, including capping of PFAS contaminated land and proposed fills, should consider the provision of future utility infrastructure ahead of required commissioning for development stage realisation. To prevent re-work of contaminant capping at the stage of development, there is the opportunity to construct mains and conduits at the time of earthwork construction in order to enable later stages of development with shorter lead times. The upfront construction of infrastructure requires the sizing of mains prior to future development stages are realised and therefore has the risk of incorrect sizing and inefficient infrastructure. The upfront construction does not require immediate commissioning and can allow commissioning at the time of development realisation. This can be facilitated by the installation of provisional conduits and pipe networks that can be later utilised and commissioned.
- The development of the DAREZ, particularly the Astra Aerolab, has been integrated into the Northern Sub-Precinct of the Williamtown SAP. The servicing strategy developed for Astra Aerolab has been coordinated with the overall servicing strategy of the Williamtown SAP and existing infrastructure utilised where possible. Consultation with the Astra Aerolab developers has been limited at this stage. It is recommended that consultation is undertaken to confirm the integration of the existing servicing strategy with the proposed Williamtown SAP servicing strategy.
- It is proposed to expand the existing 'smart pole' network at Astra Aerolab to the entire Williamtown SAP development. The network will follow the alignment of the proposed road network and the service allocation indicated below in Figure 4-8. An integrated street lighting and smart pole network design will be refined in the Concept Design. Refer to Section 4.7.4 for details on the 'smart pole' technology.
- The allocation of utility infrastructure within the Williamtown SAP is proposed to be integrated into the road network. Supply and reticulation infrastructure will be integrated into defined service allocations in the road corridors, minimising the required footprint for easements and service allocations within developable land in the Williamtown SAP. It is proposed that all utility services are allocated within a 6m wide corridor outside of the road pavement, as defined in Figure 4-8.

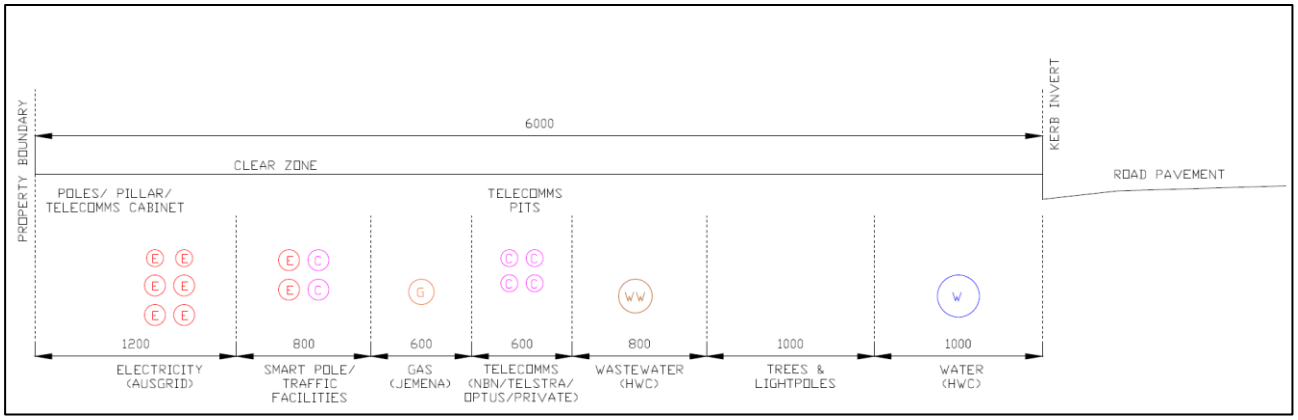


Figure 4-8 Utility Infrastructure Corridor Allocation

4.10 Structure Plan Comparative Analysis

A comparative analysis of the Structure Plan against the testing criteria identified in Section 3 is presented in Table 4-19.

Table 4-19 Comparative Analysis of Utility Infrastructure

Testing Criteria	Structure Plan
Inefficiency of Required Utility Infrastructure	The proposed servicing strategies for the Williamtown SAP expand on existing trunk and reticulation networks in the local area. In the case of water, wastewater and electrical servicing where the existing residual capacity is exceeded, the proposed network augmentations will improve the connectivity, efficiency and redundancy of the regional servicing at Williamtown. The centralised nature of the Structure Plan minimises expansive extensions of trunk infrastructure to the development extremities. The upgrade of water, wastewater and electrical infrastructure between Williamtown and Tomago will improve the local network and provides the opportunity to improve the servicing of the Williamtown, Medowie and Port Stephens region.
Implementation of Precinct Vision	The centralisation of the Williamtown SAP near the WAP will leverage the existing defence and aerospace development and focus on this industry. The installation of new utility infrastructure to service expected demand will offer the opportunity to adopt community-scale sustainable development practices and enhance the connectivity with the local environment.
Staging and Scalability	The proposed staging of the Williamtown SAP offers the opportunity for an incremental expansion of the servicing strategy to enable each development stage. It is expected that development of the Northern Sub-Precinct can largely be serviced by the residual capacity of existing infrastructure. However trunk system upgrades are anticipated to service the ultimate demands. The nature of the reticulation networks will allow an incremental expansion to meet the demand of new development stages as they are realised. The scalability of the servicing network is a complex interface and will depend on land development uptake. There is the opportunity to install utility infrastructure upfront when earthworks are completed to minimise future PFAS risks and enable shorter lead times for future stages. However preliminary sizing of utility infrastructure will be based on development assumptions creating the risk of constructing incorrectly sized or inefficient infrastructure.

5 Conclusions and Recommendations

This report assesses the infrastructure and servicing requirements of the Williamtown SAP Structure Plan developed in the second EBD workshop and refined by Roberts Day. The preliminary servicing requirements of the Williamtown SAP Structure Plan are outlined below:

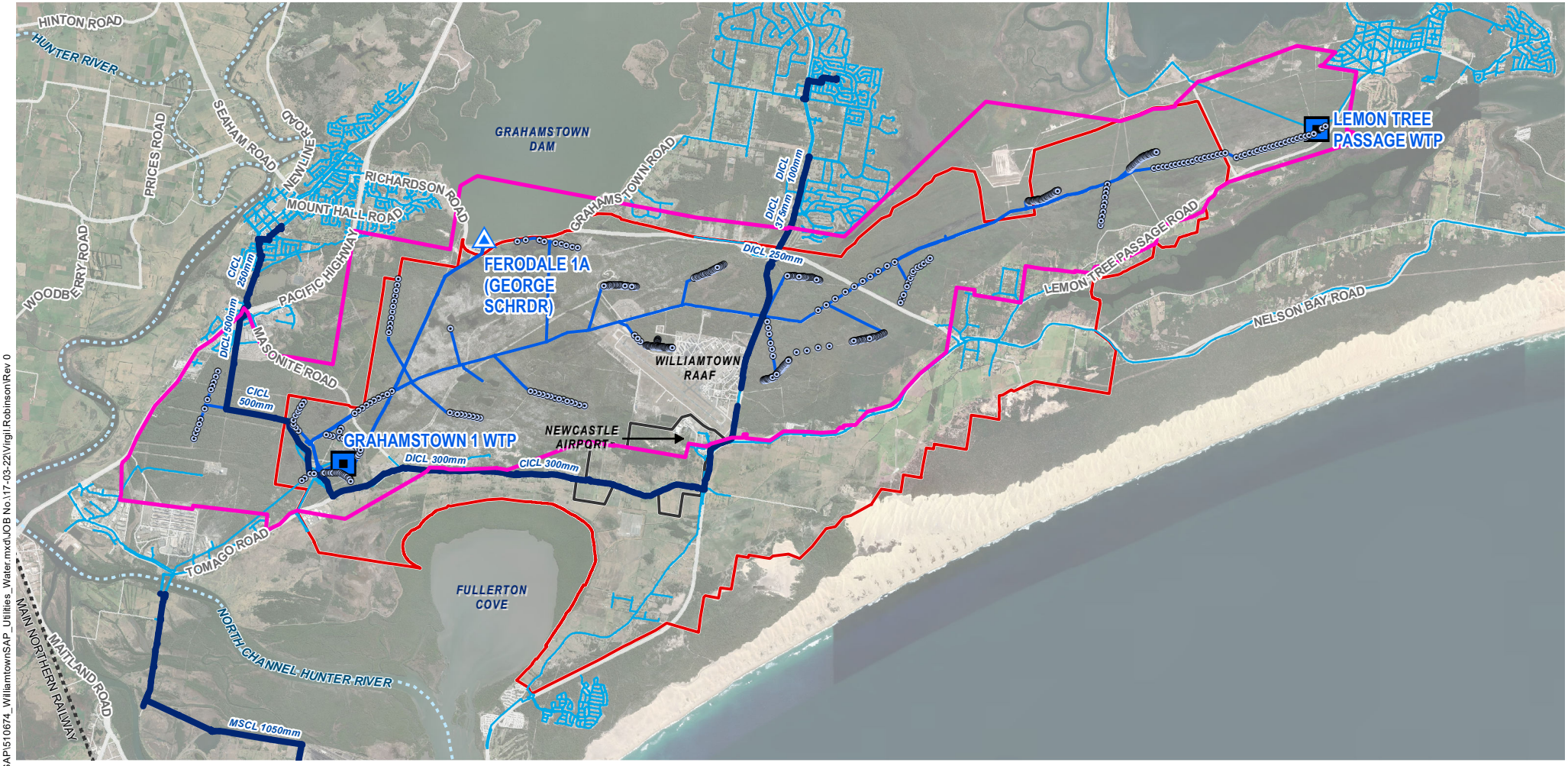
Service	Summary of Servicing Strategy and Required Infrastructure	Recommended Next Steps
Water	Initial infrastructure investment: ▪ New 200mm reticulation main (2.2 km) at construction of the North-South road from Cabbage Tree Road to the Northern Sub-Precinct Future infrastructure investment: ▪ New 250mm rising main (9 km) from Grahamstown WPS to Williamtown via Cabbage Tree Road corridor ▪ New 150mm reticulation mains	▪ Continue implementation of the Astra Aerolab water servicing strategy to service the Northern Sub-Precinct, with minor amendments as required. ▪ Detailed assessment of Hunter Water supply capacity from existing network. ▪ The assessed demand basis is expected to be conservative and further refinement of the adopted demand including comparison to similar developments and consultation with Hunter Water models is recommended. ▪ Further design development and refinement of the servicing strategy in consultation with Hunter Water is recommended before attempting to establish an estimated project cost.
Wastewater	Initial infrastructure investment: ▪ Extension of the pressure sewer system to service the Northern Sub-Precinct Future infrastructure investment: ▪ Construction of nominal DN110 to DN200 pressure sewer system to service the Eastern and Western Sub-Precincts (including smaller diameter local mains) ▪ Williamtown 1 WWPS upgrade (to meet ultimate PWWF) – upgrade is assumed to be within existing Hunter Water land at WWPS site ▪ Tomago 1 WWPS upgrade to meet ultimate demand	▪ Continue implementation of the Astra Aerolab sewer servicing strategy to service the Northern Sub-Precinct, with minor amendments as required ▪ Detailed assessment of the residual capacity of the existing Hunter Water network. ▪ Further consultation with Hunter Water on planned upgrades to Williamtown 1 WWPS, Tomago 1 WWPS, Raymond Terrace WWTW. ▪ The assessed load basis is conservative and further refinement of the adopted load including comparison to similar developments and consultation with Hunter Water models is recommended. ▪ Further design development and refinement of the servicing strategy assumptions in consultation with Hunter Water is recommended before attempting to establish an estimated project cost.

Electricity	Initial infrastructure investment: ▪ New 11 kV switch room – requires a 5m x 5m footprint within the Northern sub-precinct ▪ New 33/11 kV Williamtown Zone Substation on – requires a 0.5 ha site south of Cabbage Tree Road (within Ausgrid owned land) ▪ New 33 kV feeder connection to new Williamtown Zone Substation ▪ 2.25 km of new 11 kV feeders Future infrastructure investment: ▪ 0.5km of new 11 kV feeders ▪ Upgrade of 132 kV/ 33 kV Tomago STS ▪ TM7 and TM10 33 kV 6.5 km feeder upgrade ▪ 1.5km of 11 kV feeder expansion ▪ 0.9km of 11 kV feeder expansion ▪ 1.5km of 11 kV feeder expansion	▪ Further consultation with Ausgrid, and completion of Ausgrid Planning Study to confirm the residual capacity of the network and determine the preferred approach for servicing the Williamtown SAP stages. ▪ Consultation with Transgrid to confirm the residual capacity of the bulk supply network at Tomago and planned upgrades or reconfigurations of the network. ▪ Further design development and refinement of the servicing strategy assumptions is recommended before attempting to establish an estimated project cost. ▪ Further assessment for the potential feasibility of a Microgrid installation
Gas	Initial infrastructure investment: ▪ New 160mm PE gas main to service the Northern Sub-Precinct Future infrastructure investment: ▪ 160mm PE gas main expansion to service the Southern Sub-Precinct ▪ New District regulator – requires a 5m x 5m footprint within the Williamtown SAP Structure Plan	▪ Further design development and refinement of the servicing strategy assumptions is recommended before attempting to establish an estimated project cost. ▪ The dispersion radius to determine the hazardous area classification needs to be calculated based on modelling of different scenarios, leak testing and hole size.

Telecommunications	Initial infrastructure investment: ▪ NBN fibre network expansion to service the Northern Sub-Precinct Future infrastructure investment: ▪ NBN fibre network expansion to service the Eastern and Western Sub-Precincts ▪ Upgrade existing Optus mobile facilities (3) ▪ Upgrade to existing Vodafone mobile facilities ▪ Install a new mobile tower – requires a 250m^2 footprint within the Williamtown SAP Structure Plan	▪ Engage NBN to undertake a feasibility assessment of the proposed Williamtown SAP development and confirm a concept servicing strategy. ▪ Consult with Telstra, Vodafone and Optus on the preferred long-term upgrade options to mobile telecommunication facilities. ▪ Confirm the requirements for secure fibre networks for Department of Defence and data centre specific developments. ▪ Further design development and refinement of the servicing strategy assumptions is recommended before attempting to establish an estimated project cost.
Waste Resources	Future infrastructure investment: ▪ Waste transfer facility - requires 2ha site within the Williamtown SAP Structure Plan	▪ Consultation with Newline Road Waste Facility (NRWF) to determine capacity to handle future development's waste production ▪ Consultation with PSC waste management ▪ Further design development and refinement of the servicing strategy assumptions is recommended before attempting to establish an estimated project cost.

Appendix A
Baseline Assessment Utility Infrastructure Maps

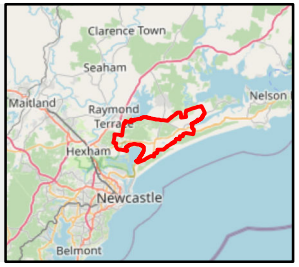
Appendix A provides maps of the existing utility servicing networks within the Williamtown SAP investigation area completed for the Baseline Assessment.



Williamtown Study Area
Williamtown SAP Structure Plan Boundary
Tomago Special Area
River
Railway
Bore Pump

Water Facilities
Pump Station
Treatment Plant

Water Network
Reticulation Main
Raw Water Main
Trunk Main



P:\GIS\Project-4\project\510674_Williamtown_SAP\510674_WilliamtownSAP_Utilities_Water.mxd\JOB No.\17-03-22\Virgil\Robinson\Rev 0

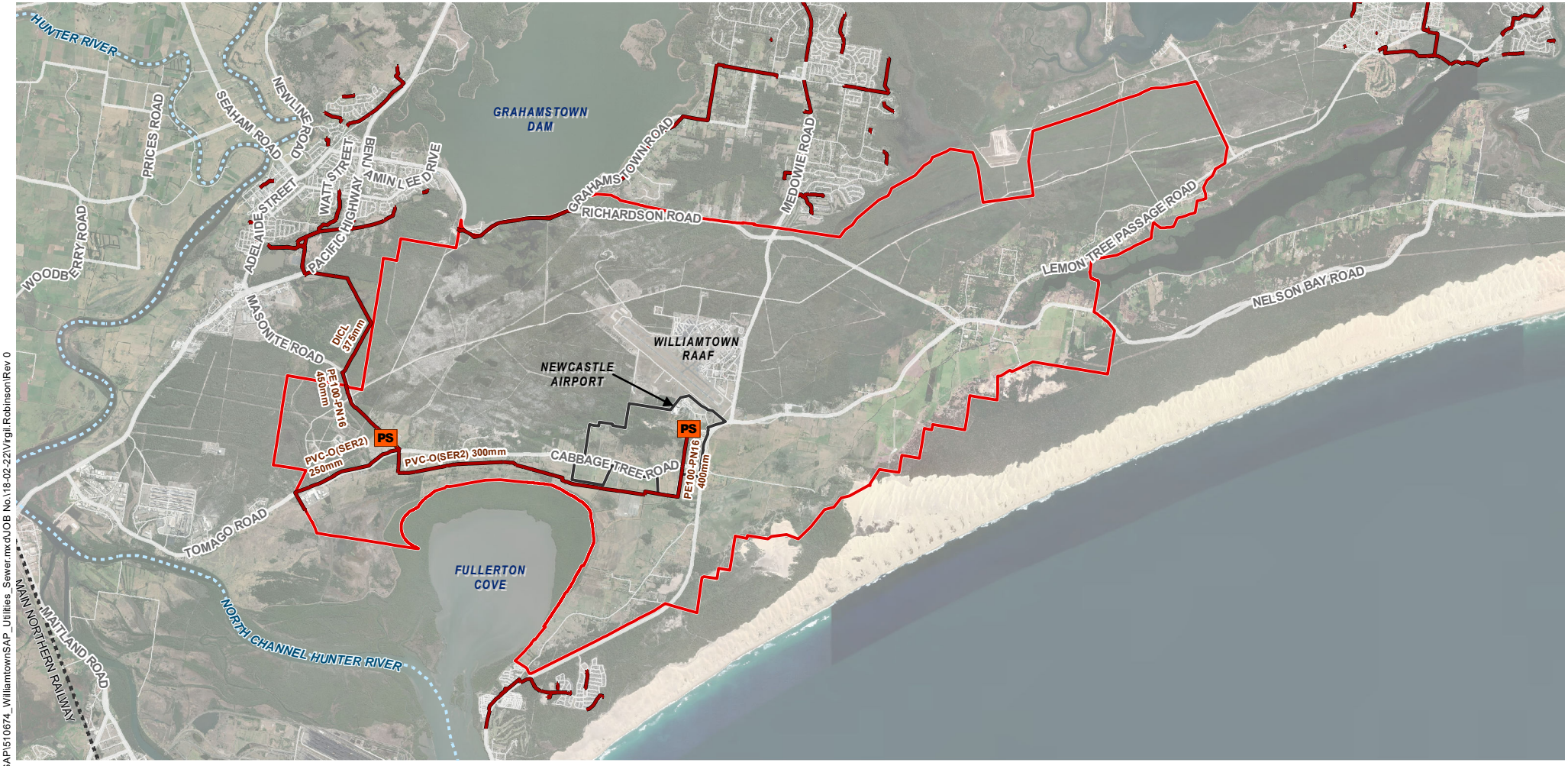
Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Esri

1:125,000 @ A4
0 2 4 km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Water Infrastructure



Williamtown Study Area

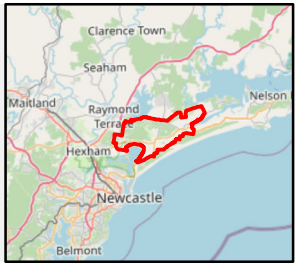
Williamtown SAP Structure Plan Boundary

River

Railway

PS Sewer Pump Station

Sewer Rising Main



Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Esri

1:125,000 @ A4

0 2 4km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Sewer Infrastructure

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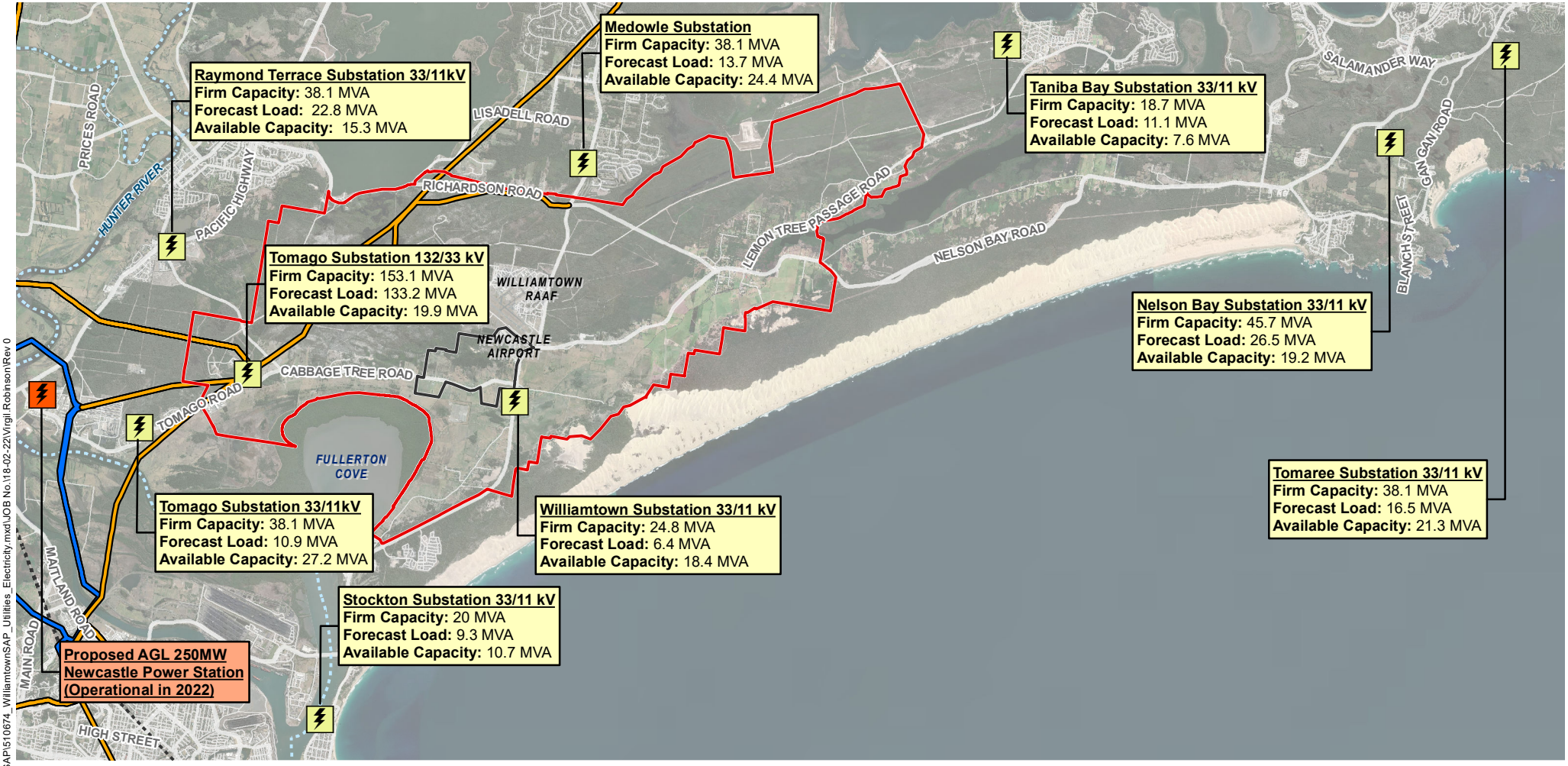
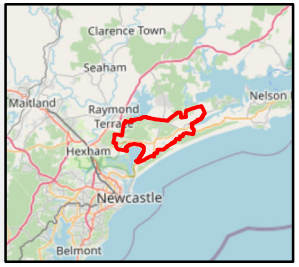


Williamtown Study Area
Williamtown SAP Structure Plan Boundary
River
Railway
Exsiting Substation Locations
Proposed Substation Locations

Electricity Transmission Lines (kV)

66
132
330



Source: Aurecon, TfNSW, GA, NSW Spatial Services, Esri

1:160,950 @ A4
0 2 4km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Electricity

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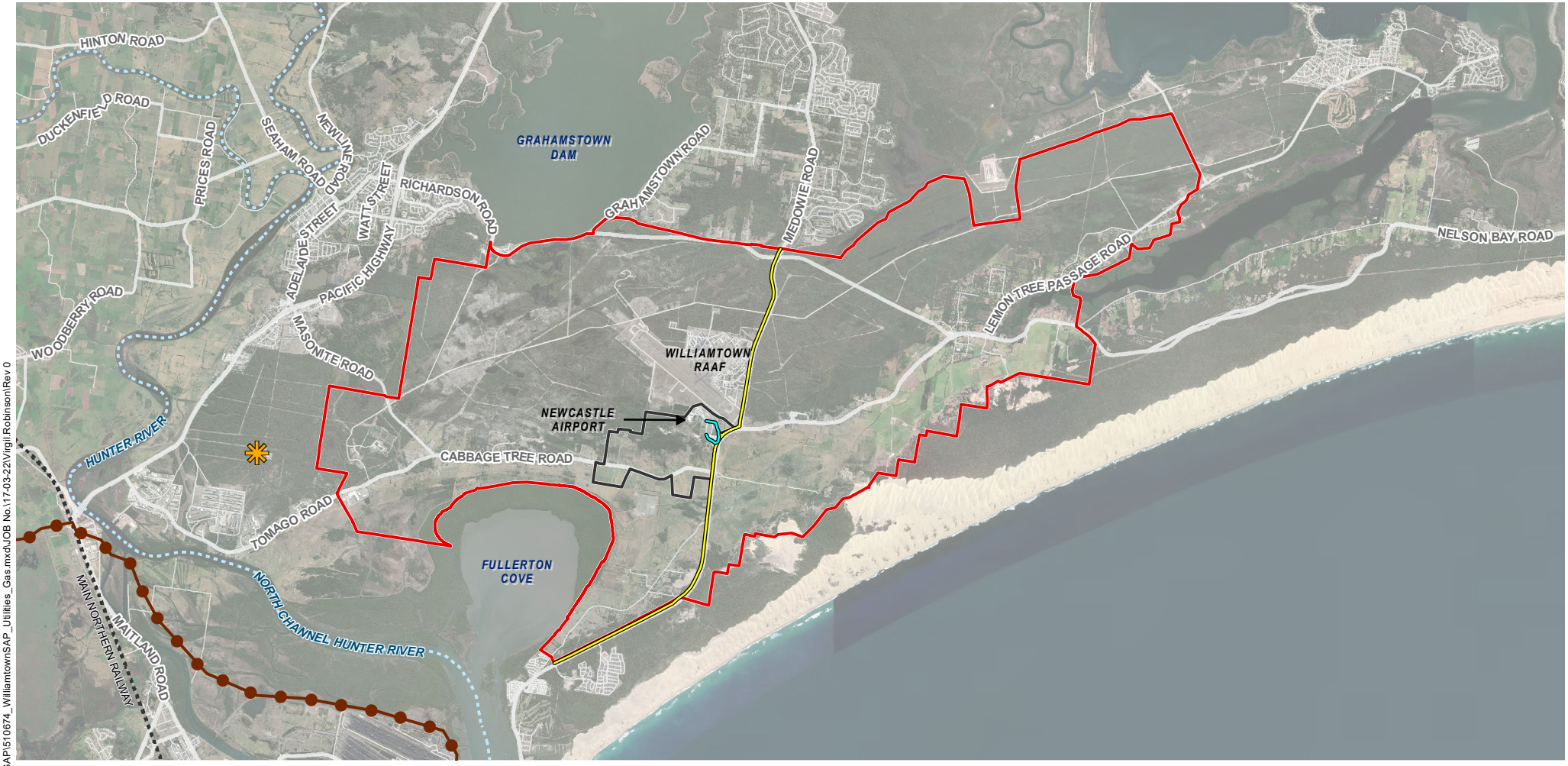
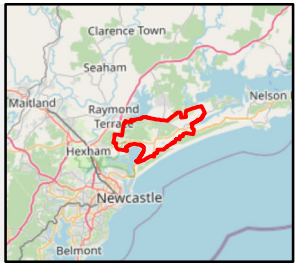
aurecon



P:\GIS\Project-4\project\510674_Williamtown_SAP\510674_WilliamtownSAP_Utilities_Gas.mxd\JOB No.\17-03-22\Virgil.Robinson\Rev 0

- Williamtown Study Area
- Williamtown SAP Structure Plan Boundary
- River
- Railway
- AGL Newcastle Gas Storage Facility
- Network Main (MP) - 210 MOP kPa
- Secondary Network (HP) - 1050 MOP kPa
- Gas Trunk Main



Source: Aurecon, TfNSW, Jemena, NSW Spatial Services, Esri

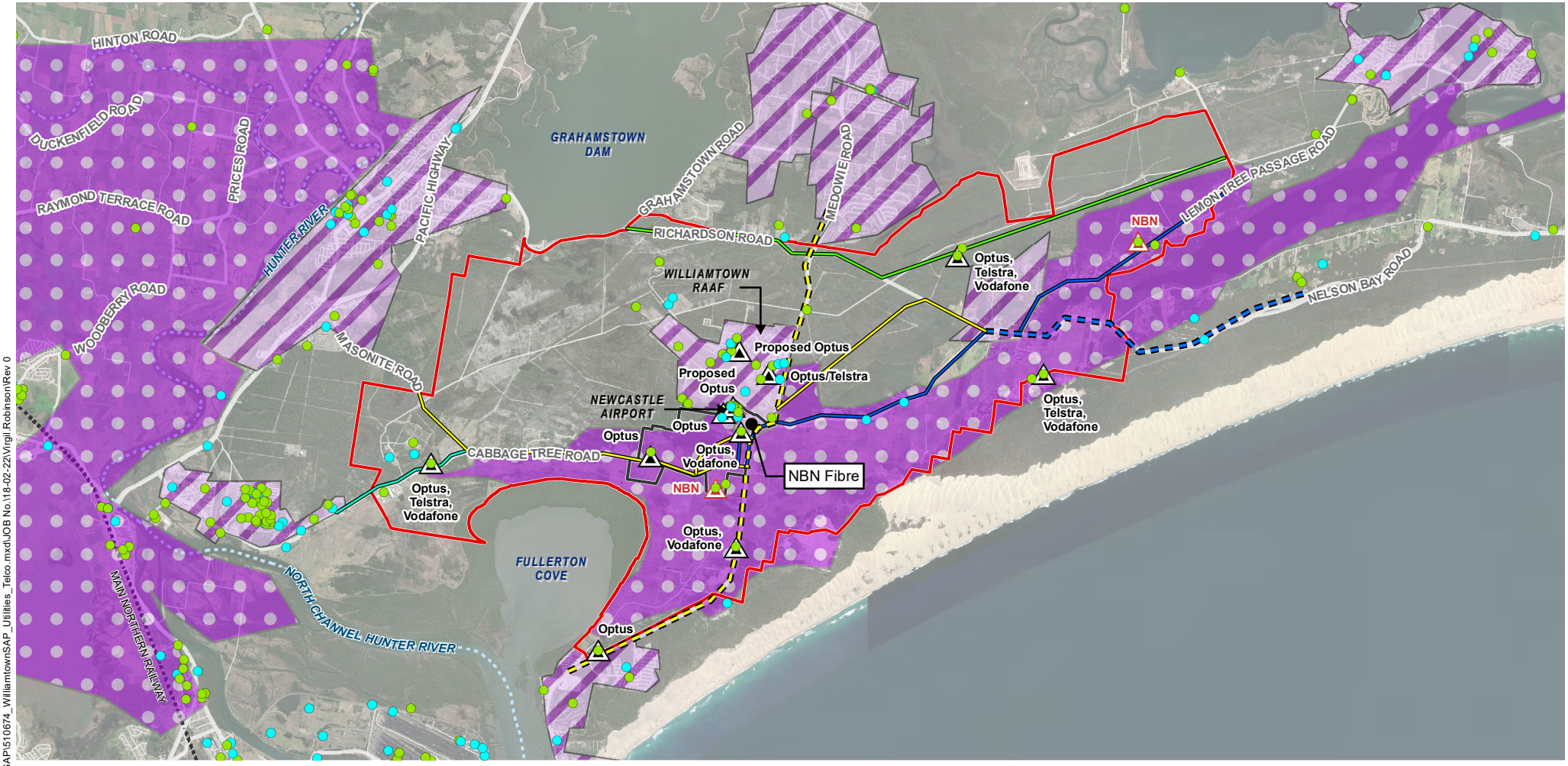
1:135,000 @ A4

0 2 4 km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Gas Infrastructure



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- Williamtown Study Area
- Williamtown SAP Structure Plan Boundary
- River
- Railway
- ACMA Site Marker (with no assignments)
- ACMA Site Marker (having at least one assignment)

Telecommunication Sites

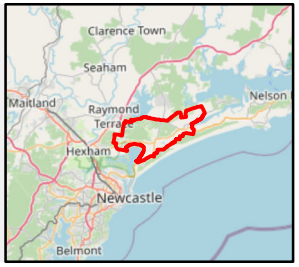
- Fixed Wireless
- Mobile

Telstra Fibre

- Telstra 6F Fibre
- Telstra 12F Fibre
- Telstra 12F Fibre with sub-duct for other carriers
- Telstra 18F Fibre
- Telstra Copper
- Telstra Copper with Optus Sub-ducts

NBN Coverage

- Fixed Line - Service available
- Fixed Wireless - Service available



Source: Aurecon, TfNSW, ACMA, NSW Spatial Services, Esri

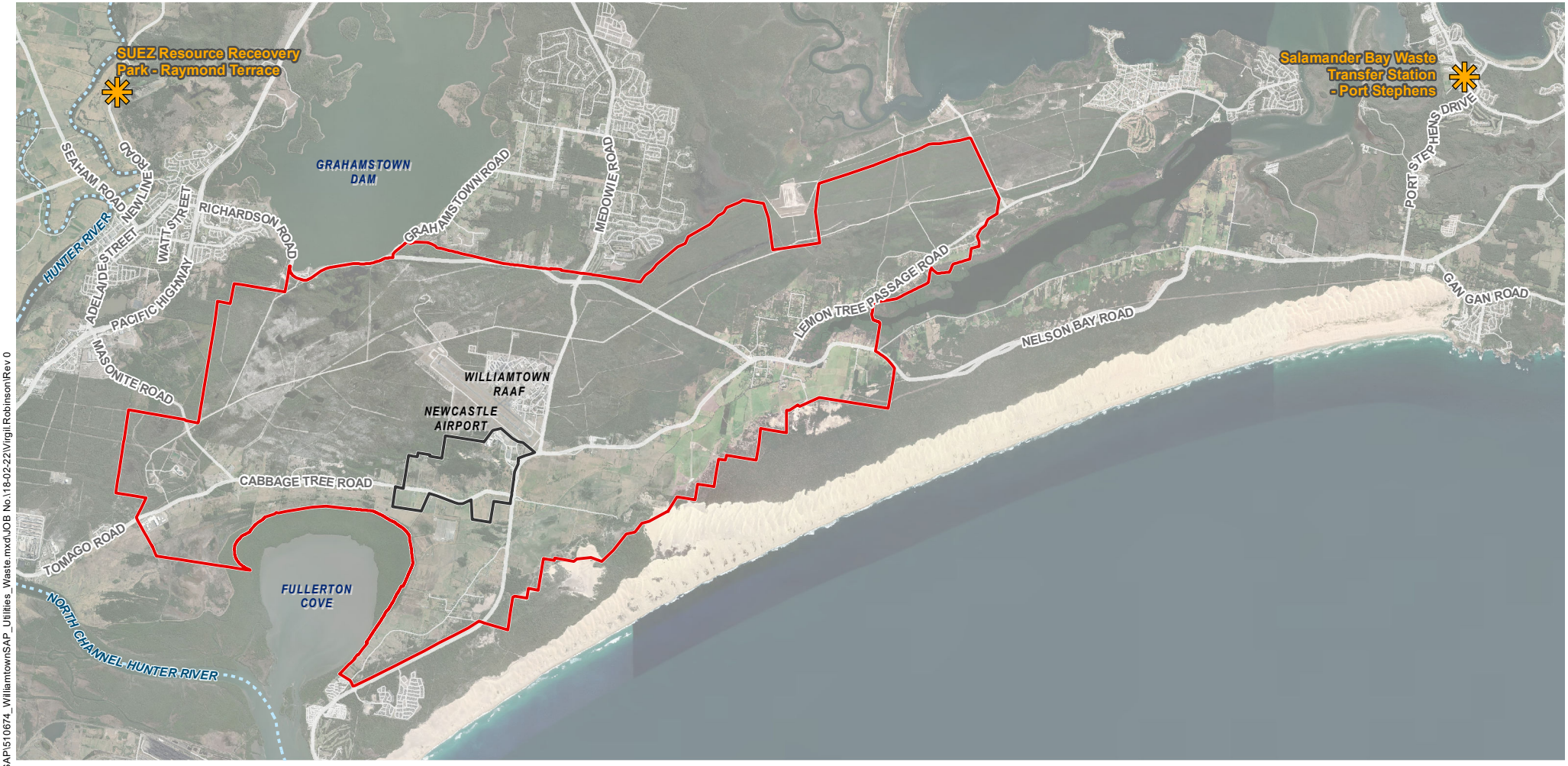
1:135,000 @ A4

0 2 4km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Telecommunications Infrastructure



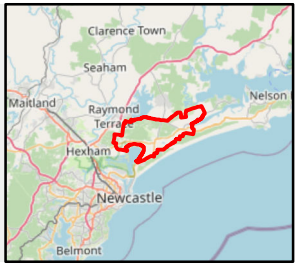
Williamtown Study Area

Williamtown SAP Structure Plan Boundary

River

Railway

Waste Infrastructure Locations



Source: Aurecon, TfNSW, DEE,NSW Spatial Services, Esri

1:135,000 @ A4

0 2 4km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Waste Infrastructure

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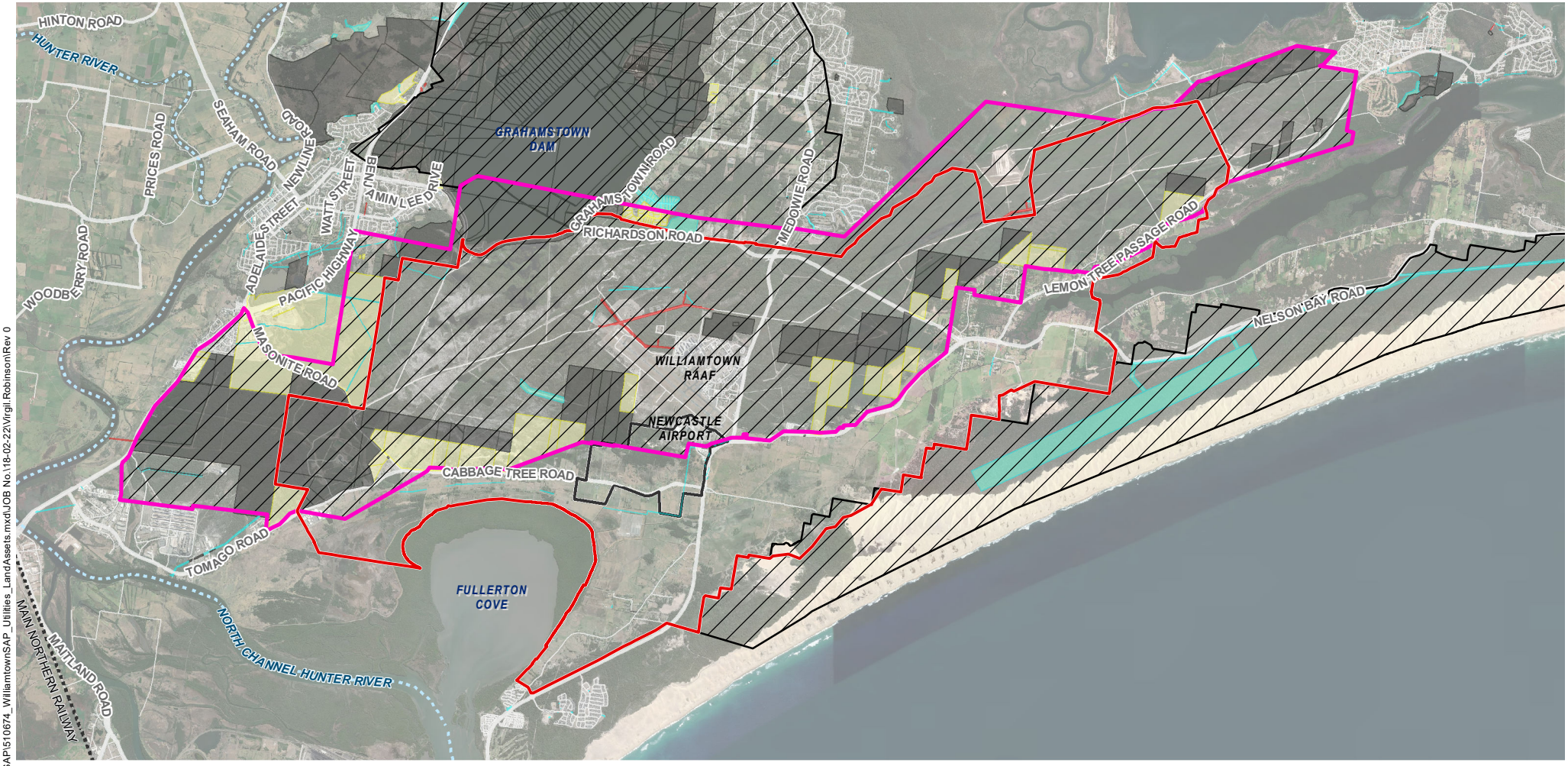
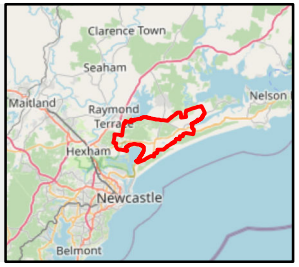


Williamtown Study Area
Williamtown SAP Structure Plan Boundary
River
Railway
Tomago Special Area
Drinking Water Catchment

Hunter Water Land Ownership

Electricity, Power and Transmission
Other Services
Restricted
Unknown



Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Esri

1:125,000 @ A4
0 2 4km

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Hunter Water Area of Interest

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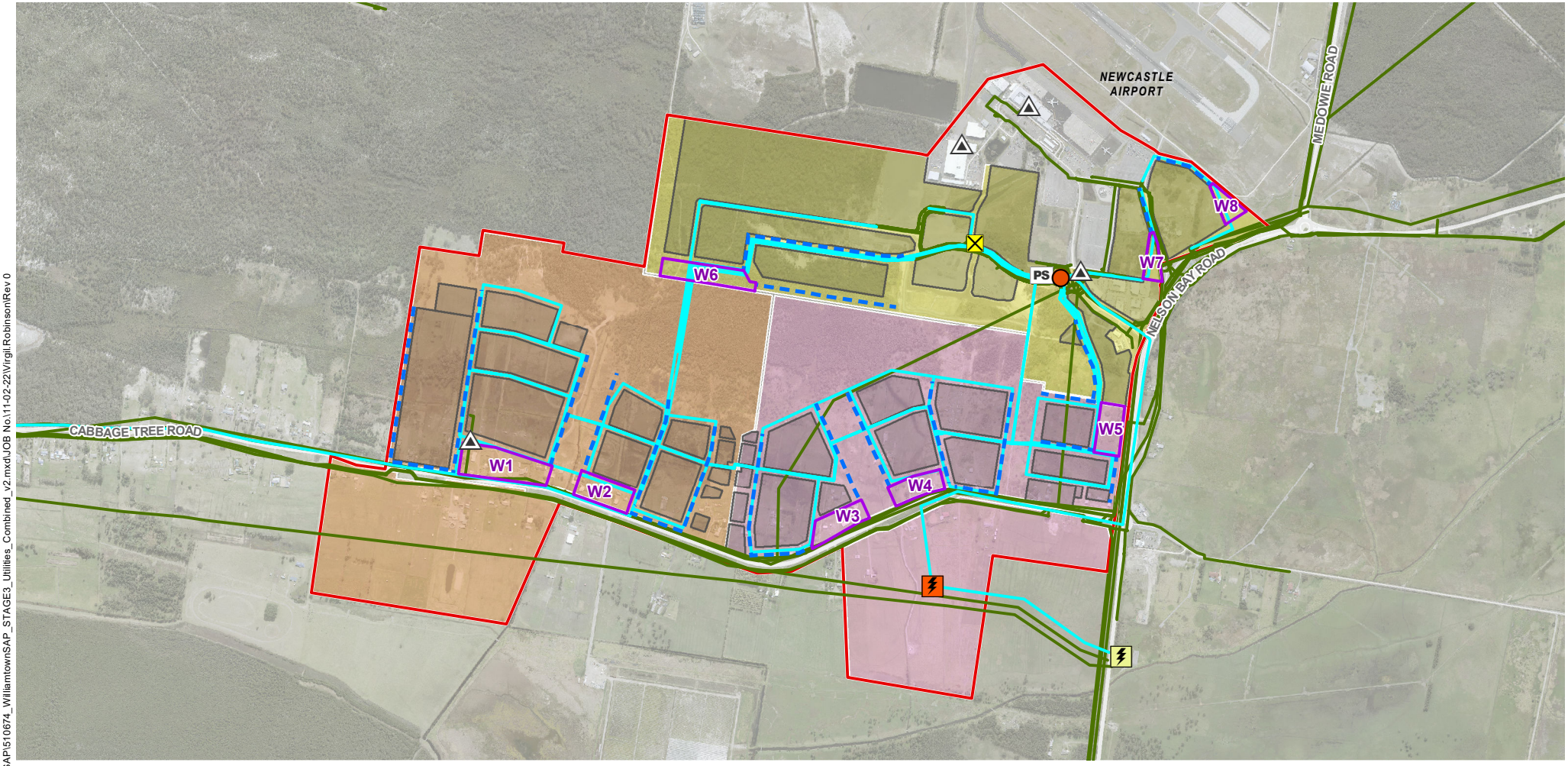
Appendix B
Structure Plan Utility Servicing Strategies

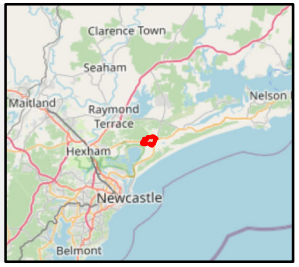
Appendix B outlines the utility infrastructure servicing strategy for the Williamtown SAP completed as part of the Final Analysis of the Williamtown SAP Structure Plan.



Williamtown SAP Structure Plan Boundary
Western Sub-precinct
Eastern Sub-precinct
Northern Sub-precinct
Developable Block
River

Existing utility line
Existing comms site to be upgraded
Existing sewer pump station
Existing substation location
Proposed trunk utility corridor
Proposed cable pit

Proposed 11kV switchroom
Proposed zone substation
Wetlands
Drainage Channel



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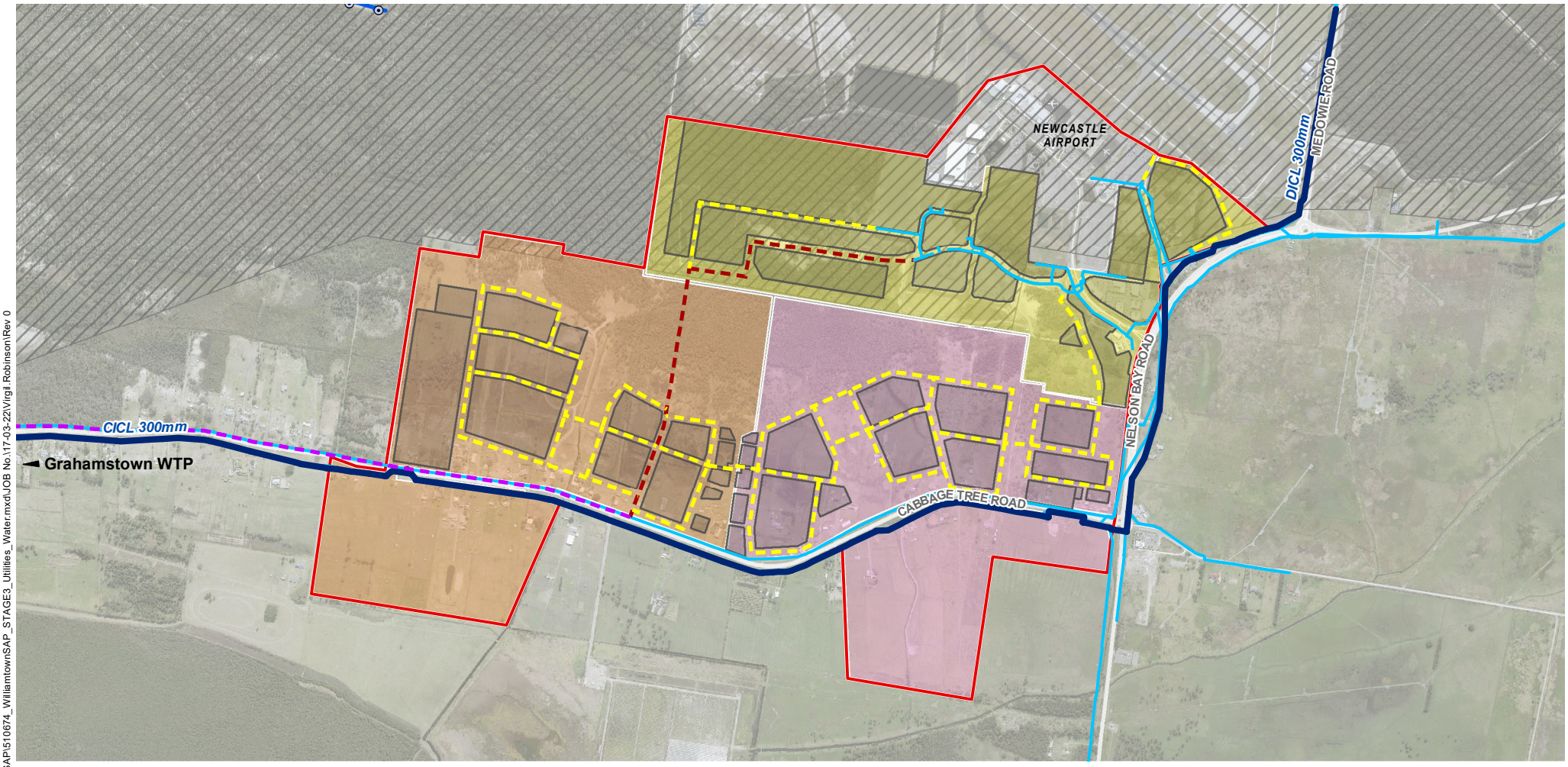
Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Aerometrex, Esri

1:20,000 @ A4
0 200 400 m

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Site utilities | Structure Plan

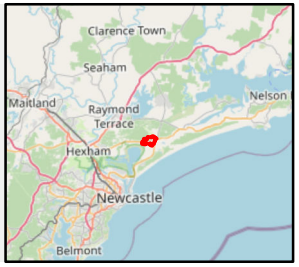


Williamtown SAP Structure Plan Boundary
Western Sub-precinct
Eastern Sub-precinct
Northern Sub-precinct
Developable Block
River

Bore Pump
Tomago Special Area

Existing Water Network
Reticulation Main
Raw Water Main
Trunk Main

Proposed Water Main
DN250
DN200
DN150



Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Aerometrex, Esri

1:20,000 @ A4
0 200 400 m

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Water Infrastructure | Structure Plan

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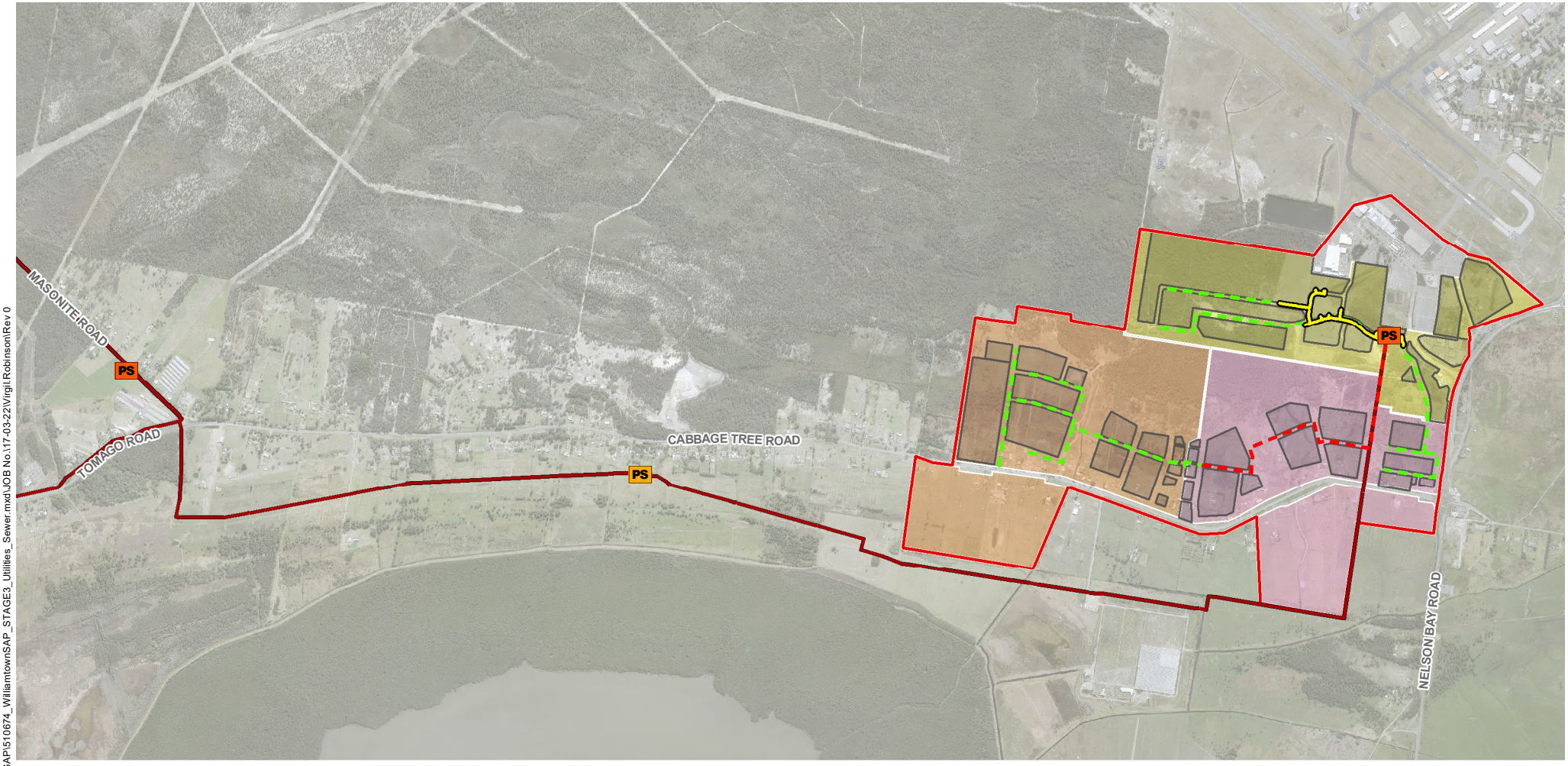


Williamtown SAP Structure Plan Boundary
Western Sub-precinct
Eastern Sub-precinct
Northern Sub-precinct
Developable Block

PS Existing Sewer Pump Station
PS New Sewer Pump Station
Existing Sewer Rising Main
Existing Pressure Sewer

Proposed Sewer Main
DN200
DN110

P:\GIS\Project-4\project\510674_Williamtown_SAP\510674_WilliamtownSAP_STAGE3_Utilities_Sewer.mxd\JOB No.\17-03-22\Virgil.Robinson\Rev 0

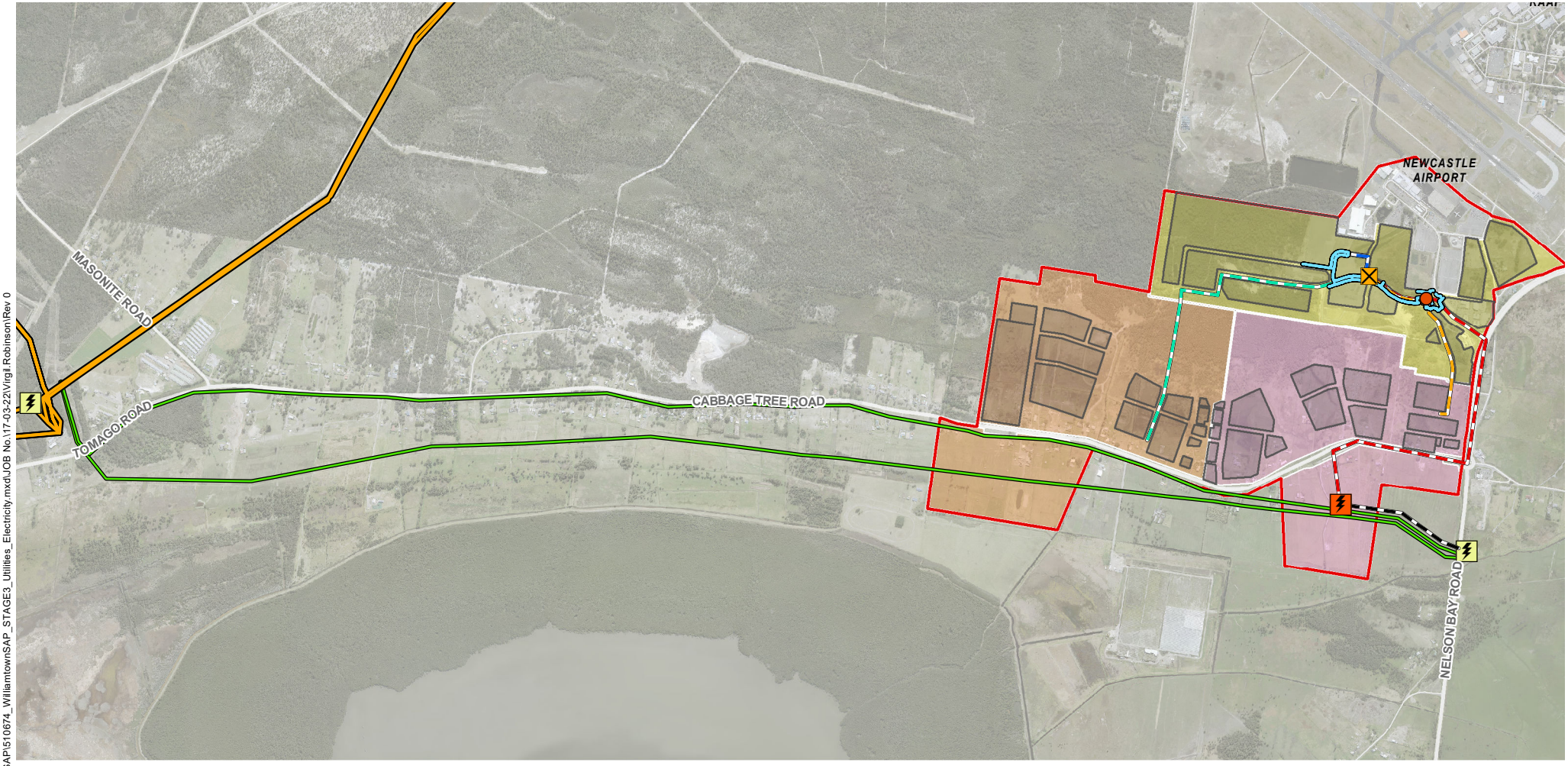
Source: Aurecon, TfNSW, HunterWater, NSW Spatial Services, Esri

1:30,000 @ A4
0 250 500 Meters

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Sewer Infrastructure | Structure Plan



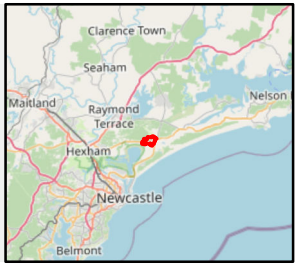
- Williamtown SAP Structure Plan Boundary
- Western Sub-precinct
- Eastern Sub-precinct
- Northern Sub-precinct
- Developable Block
- Existing electrical line
- Existing Substation Locations
- Proposed zone substation
- Proposed 11kV switchroom
- Proposed cable pit
- Proposed 33kV feeder

Proposed 11kV feeder

- Incoming Feeder (Main)
- Northern Catchment
- Eastern Catchment
- Western Catchment

Existing Transmission

- 132 kV
- 33 kV



Source: Aurecon, TfNSW, GA, NSW Spatial Services, Aerometrex, Esri

1:30,000 @ A4

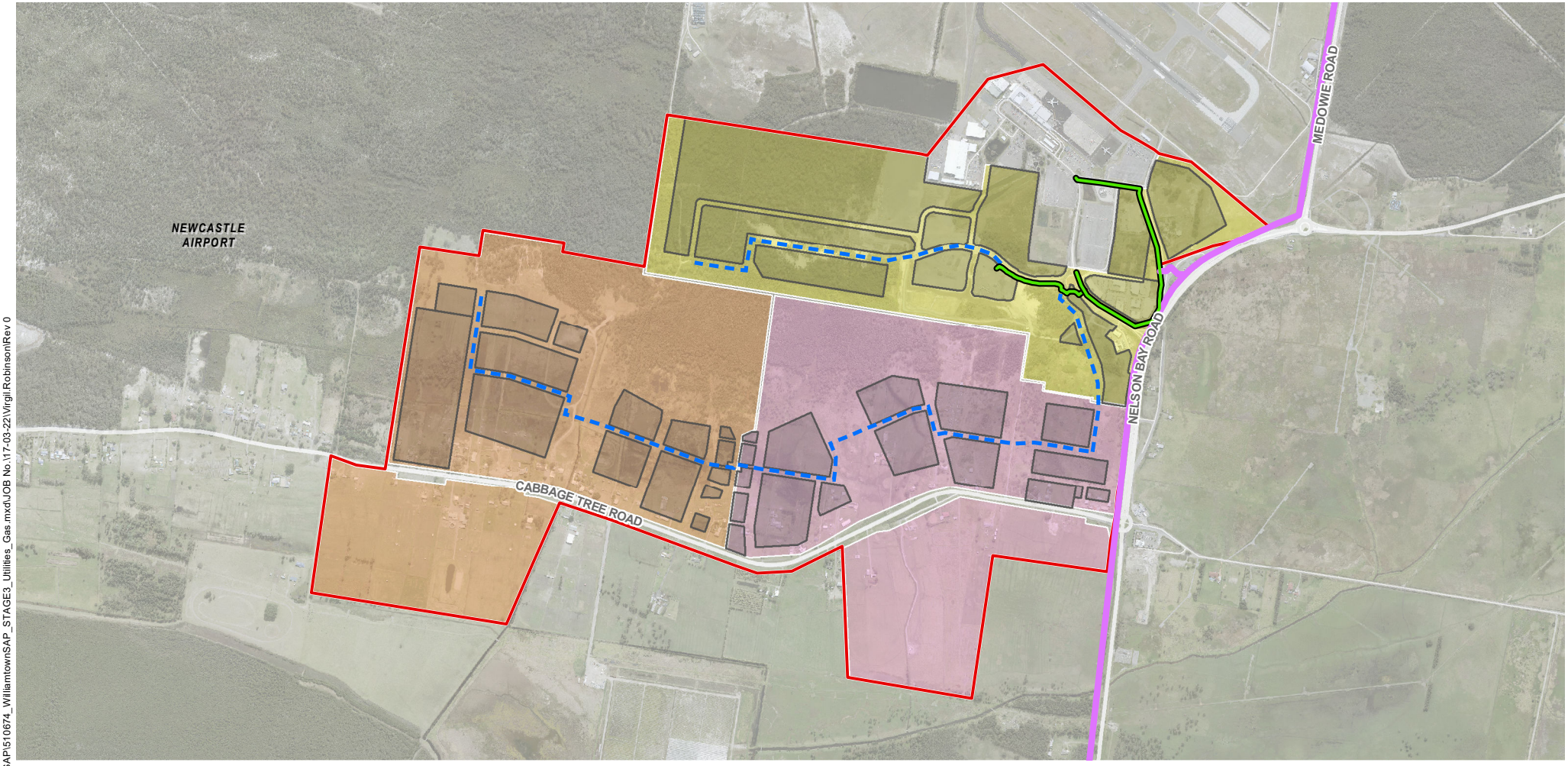
0 0.5 1km

Projection: GDA 1994 MGA Zone 56

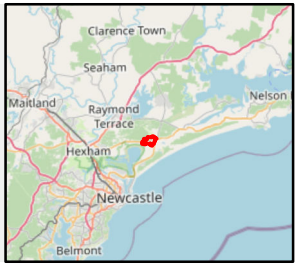
Williamtown SAP **Infrastructure Utilities**

FIGURE: Electricity | Structure Plan

P:\GIS\Project-4\project\510674_WilliamtownSAP\510674_WilliamtownSAP_STAGE3_Utilities_Electricity.mxd\JOB No.\17-03-22\Virgil.Robinson\Rev 0



Williamtown SAP Structure Plan Boundary
Western Sub-precinct
Eastern Sub-precinct
Northern Sub-precinct
Developable Block
Network Main (MP) - 210 MOP kPa
Secondary Network (HP) - 1050 MOP kPa
Proposed Network Main Extension (MP) - 210 kPA MOP



P:\GIS\Project-4\project\510674_Williamtown_SAP\510674_WilliamtownSAP_STAGE3_Utilities_Gas.mxd\JOB No.\17-03-22\Virgil.Robinson\Rev 0

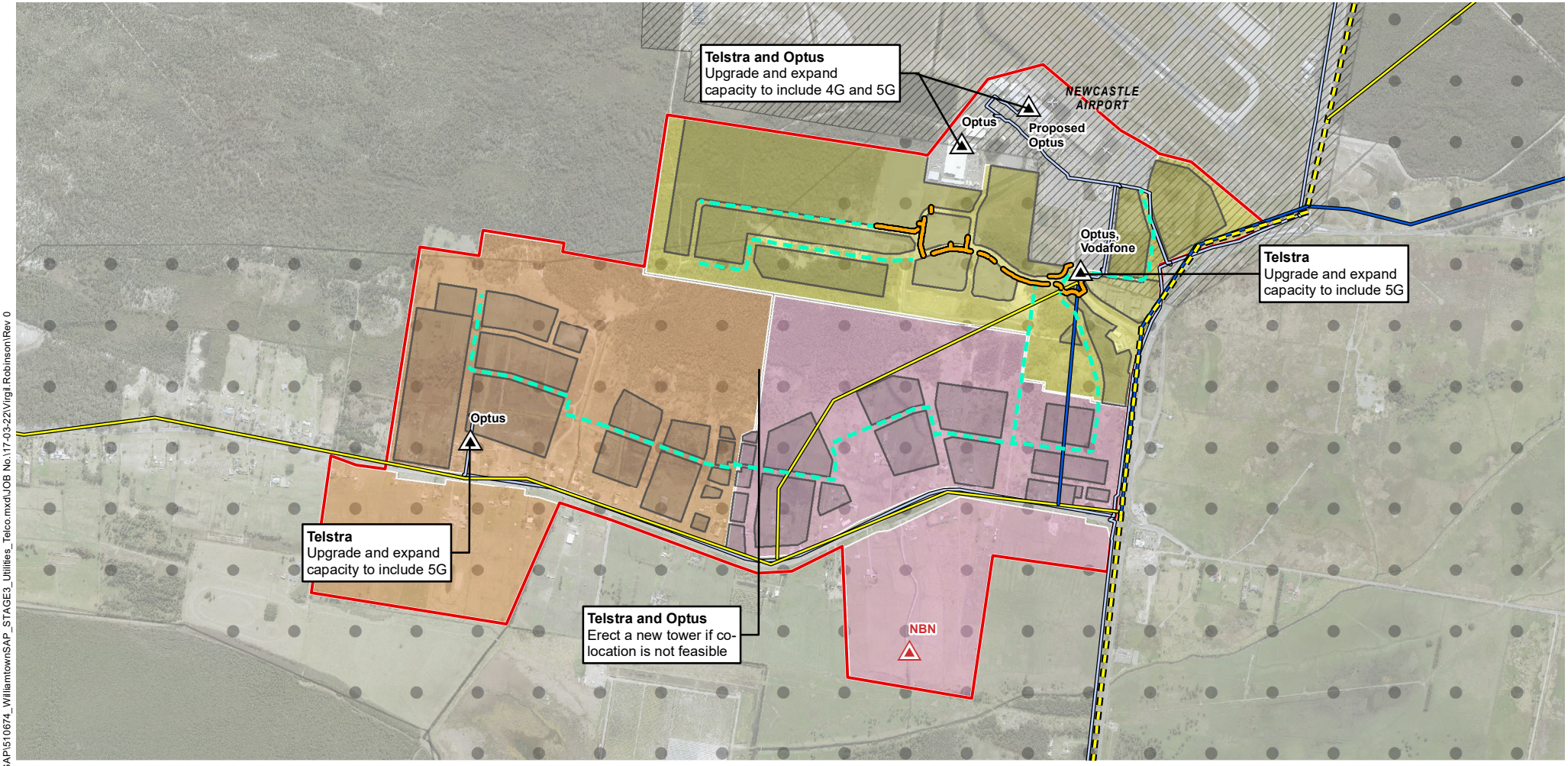
Source: Aurecon, TfNSW, Jemena, NSW Spatial Services, Esri

1:20,000 @ A4
0 250 500 Meters

Projection: GDA 1994 MGA Zone 56

Williamtown SAP **Infrastructure Utilities**

FIGURE: Gas Infrastructure | Structure Plan



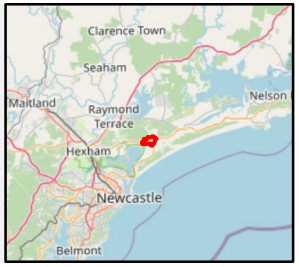
Williamtown SAP Structure Plan Boundary
Western Sub-precinct
Eastern Sub-precinct
Northern Sub-precinct
Developable Block
Existing comms service line
Proposed comms service line

Telecommunication Sites
Fixed Wireless
Mobile

Telstra Fibre
Telstra 12F Fibre
Telstra 12F Fibre with sub-duct for other carriers

Telstra Copper
Optus Fibre

NBN Coverage
Fixed Line - Service available
Fixed Wireless - Service available



Source: Aurecon, TfNSW, ACMA, NSW Spatial Services, Esri

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Projection: GDA 1994 MGA Zone 56

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Williamtown SAP **Infrastructure Utilities**

FIGURE: Telecommunications Infrastructure | Structure Plan

Appendix C
Hunter Water, Protecting our Drinking Water Catchments

Appendix C outlines the requirements and guidelines for proposed developments within Hunter Water's Drinking Water Catchments applicable to the Williamtown SAP investigation area.

PROTECTING OUR DRINKING WATER CATCHMENTS

2017

Guidelines for developments in the drinking water catchments

HUNTER WATER

TABLE OF CONTENTS

Disclaimer:

This information is provided for general guidance only. It is not intended to replace legal advice for specific circumstances. Consult your local Council or Hunter Water for development advice in the first instance.

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Printed hard copies of this document are uncontrolled. Please refer to the Hunter Water website www.hunterwater.com.au for the latest version.

 ABN: 46 228 513 446

1 OVERVIEW

Hunter Water is a State Owned Corporation within the meaning of the *State Owned Corporations Act 1989* (NSW) responsible for providing water and wastewater services for over half a million people in the Lower Hunter. Hunter Water's commitment to supplying safe, high quality drinking water begins with healthy drinking water catchments. Catchment management and source water protection provide the first barrier for the preservation of high quality drinking water.

Hunter Water's operations are regulated by the NSW Government on behalf of the community through a number of regulatory instruments. The main regulatory instrument, Hunter Water's Operating Licence, issued by the NSW Independent Pricing and Regulatory Tribunal (IPART) requires Hunter Water to comply with the Australian Drinking Water Guidelines (ADWG).

The ADWG advocate a 'catchment to tap' approach to managing drinking water quality that includes proactive catchment management as an effective barrier against threats to water quality. Hunter Water participates in the planning and assessment process for development proposals that may impact on drinking water supplies by referral from the relevant consent authority.

Hunter Water's drinking water catchments are located within the Port Stephens and Dungog local government areas. Under Section 51 of the *Hunter Water Act 1991* (NSW) ('the Hunter Water Act'), consent authorities, including Dungog Shire Council, Port Stephens Council and the NSW Department of Planning and Environment, are required to refer development applications to Hunter Water for comment that may significantly impact on water quality in the drinking water catchments. The consent authorities are then required to take Hunter Water's comments into consideration when assessing and determining the development applications. Similarly, Section 55 of the Hunter Water Act requires activities proposed by public agencies in drinking water catchments to be referred to the Department of Industry, Skills and Regional Development, which under Section 56 of the Act, is then required to refer the proposal to Hunter Water for comment.

The NSW Department of Planning and Environment forecasts that an additional 130,000 people will reside in the Lower Hunter in the next two decades, and that most housing will be developed on 'greenfield' sites. Some of these locations will be within drinking water catchments, such as the Medowie, Clarence Town and Dungog areas. It is recognised that increasing development and land use within drinking water catchments has the potential to cause a decline in water quality, increasing both the risks to water quality and the costs of treating water.

2 WHO DO THESE GUIDELINES APPLY TO

Following the introduction of a new *Hunter Water Regulation* in September 2015, this document has been prepared to provide guidance to anyone proposing to undertake development activities within the drinking water catchments and to consent authorities about matters of concern to Hunter Water regarding protection of drinking water quality. The guidelines describe Hunter Water's expectations of how these matters should be addressed in development applications.

The purpose of this document is to ensure that development and land use activities within the drinking water catchments are planned and undertaken so that they do not adversely affect drinking water quality. The guidelines are not intended to replace existing council planning processes and policies, rather they are intended to complement existing planning processes.

The objectives of these Guidelines are to:

1 Provide a greater level of certainty and transparency for consent authorities, key agencies and land owners/developers wishing to develop their land about the risks to drinking water quality from development and what constitutes appropriate development;

2 Clearly explain Hunter Water's expectations for proposed developments to prevent or mitigate unacceptable impacts to water quality in the drinking water catchments, and provide advice on how proponents can best meet these expectations using established local, NSW and national government guidelines and standards; and

3 Promote partnerships with local government, key State agencies and the development community for more effective management of drinking water catchments. These Guidelines are intended to support and complement policies and planning instruments of local and state government, in order to ensure the protection of drinking water supplies into the future.

3 OUR CATCHMENTS

3.1 What is a Catchment?

A catchment is an area where water is collected by the natural landscape. In a catchment, all rain and run-off water eventually flows to a dam, lake or ocean via a creek or river, or into a groundwater system.

In the Lower Hunter drinking water is harvested from three types of catchments - rivers, dams and groundwater systems. These are shown on the catchment map overleaf. Anyone planning a development or activity in any of these catchments should read these Guidelines and consult with the local council.

3.2 Our River Catchments

Williams River

The Williams River catchment has its headwater in the forests of the Barrington Tops. The remainder of the catchment is primarily agricultural land and rural townships, including the communities of Dungog and Clarence Town. Water harvested from the Williams River at the Seaham Weir is a major source of water for Grahamstown Dam, providing around half of its inflows. Therefore, impacts on the Williams River may also have an impact on water quality in the dam. The Williams River catchment is located within both the Dungog Shire and Port Stephens local government areas. The catchment of the Williams River is formally gazetted as the Williams River Catchment Area.

Paterson and Allyn Rivers

The Paterson and Allyn River catchments comprise forested land in the headwaters and mainly agricultural land in the remainder of the catchments. The townships of Gresford and Vacy are also located along these rivers, which have their confluence at Vacy. The water supply system for Gresford is harvested from these rivers, according to the availability and quality of water, with the Allyn River being the primary source (approximately 75% of volume). Lostock Dam is located on the Paterson River upstream of Gresford and is used to support agricultural production. The Paterson and Allyn River catchments are not protected as Special Areas.

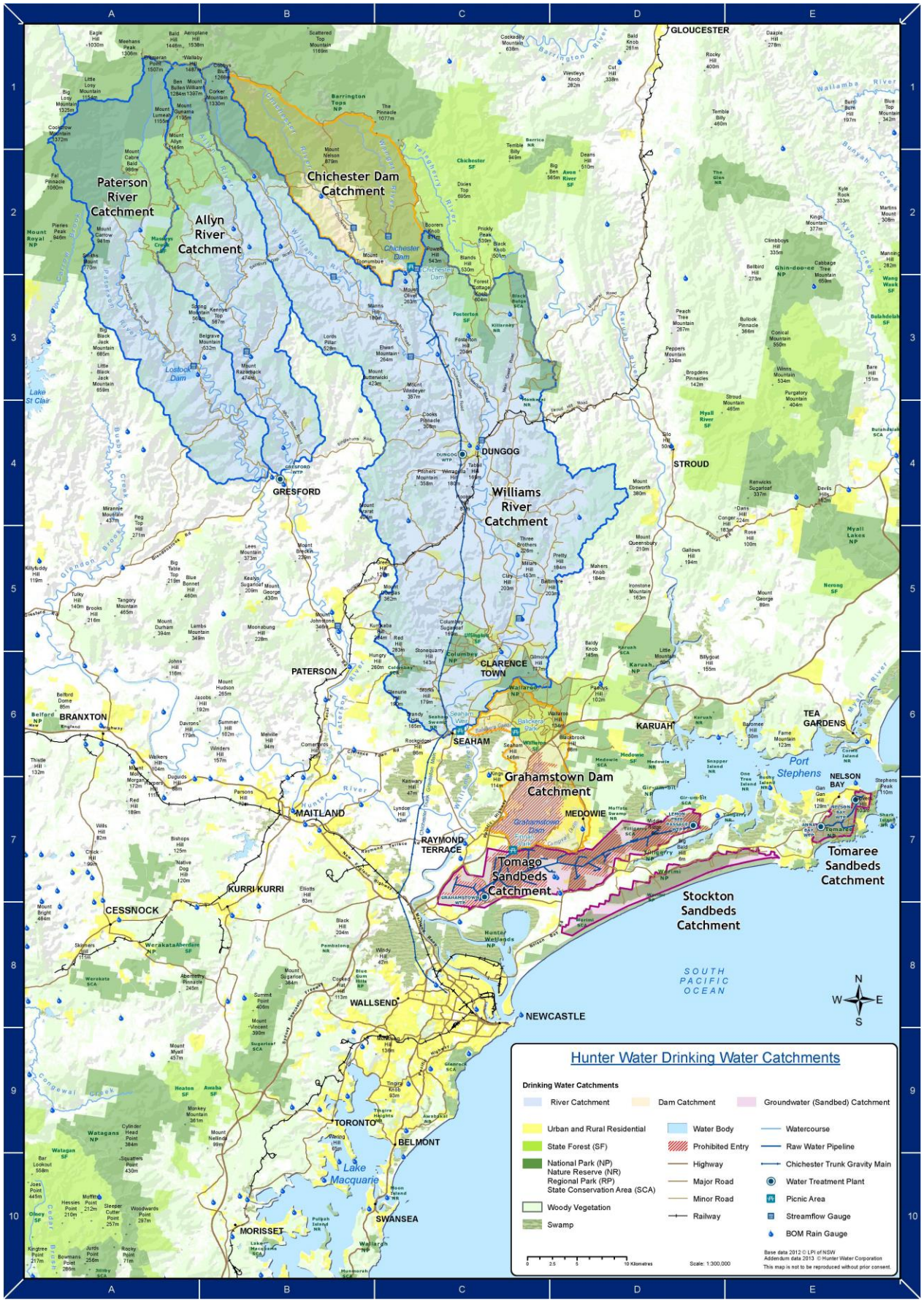
Key Threats to the River Catchments

Key threats to water quality in the river catchments include runoff from agricultural lands, which can include chemicals (such as pesticides, herbicides and fertilisers) as well as contamination from livestock faeces and urine, which contain pathogens and nutrients (particularly nitrogen and phosphorus).

Onsite sewage treatment and disposal systems (such as septic tanks and infiltration trenches) on unsewered properties are also a major potential source of pathogens and nutrients in river catchments. Excess nutrients in waterways can cause problematic algal blooms in rivers and dams, and can make the water more difficult and costly to treat.

Both human and animal wastes can contain pharmaceutical compounds, which are often persistent in the environment for long periods of time and can be difficult to remove from water.

Increasing residential and commercial/industrial development also increases stormwater runoff in the catchments. Stormwater runoff from urban areas contains a broad range of contaminants which pose risks to water quality in the drinking water catchments.


Paterson River Catchment
Allyn River Catchment
Chichester Dam Catchment
Williams River Catchment
Grahamstown Dam Catchment
Tomago Sandbeds Catchment
Stockton Sandbeds Catchment
Tomaree Sandbeds Catchment
GLOUCESTER
DUNGOG
STROUD
GRESFORD
PATERSON
CLARENCE TOWN
SEAHAM
KARUAH
TEA GARDENS
NELSON BAY
Port Stephens
BRANXTON
MAITLAND
MEDOWIE
RAYMOND TERRACE
KURRI KURRI
CESSNOCK
WALLSEND
NEWCASTLE
TORONTO
BELMONT
SWANSEA
MORISSET
Lake Macquarie
SOUTH PACIFIC OCEAN
Hunter Water Drinking Water Catchments
Drinking Water Catchments
River Catchment
Dam Catchment
Groundwater (Sandbed) Catchment
Urban and Rural Residential
State Forest (SF)
National Park (NP)
Nature Reserve (NR)
Regional Park (RP)
State Conservation Area (SCA)
Woody Vegetation
Swamp
Water Body
Prohibited Entry
Highway
Major Road
Minor Road
Railway
Watercourse
Raw Water Pipeline
Chichester Trunk Gravity Main
Water Treatment Plant
Picnic Area
Streamflow Gauge
BOM Rain Gauge
Scale: 1:300,000
Base data 2012 © LPI of NSW
Addendum data 2013 © Hunter Water Corporation
This map is not to be reproduced without prior consent.

3.3 Our Dam Catchments

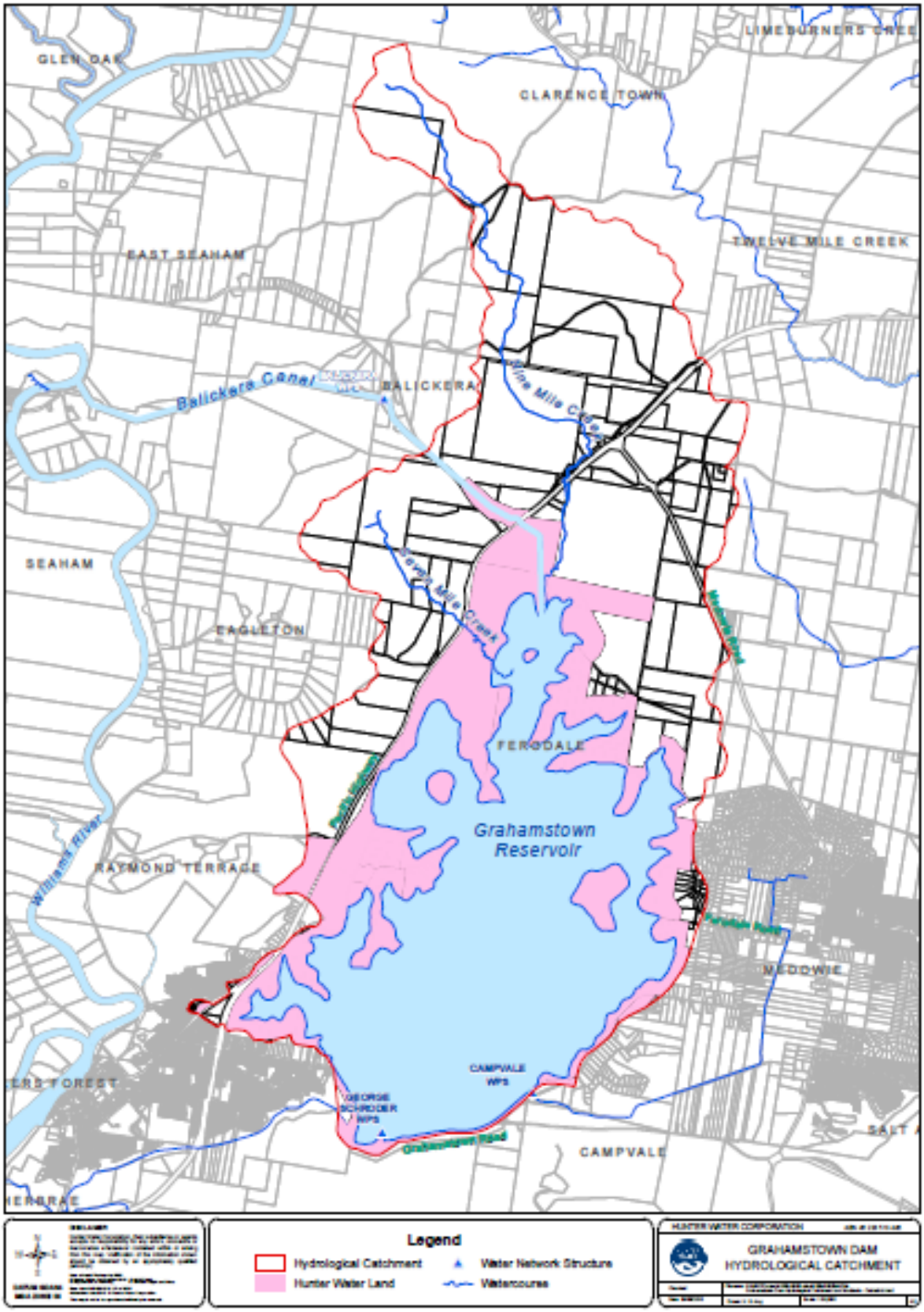
Chichester Dam

Chichester Dam, located at the base of the Barrington Tops National Park World Heritage Area, is a major drinking water supply for the Lower Hunter. The dam is supplied by flows from both the Chichester River catchment (mixed use, including farmland) and the Wangat River catchment (largely pristine forested land). The catchment of Chichester Dam is formally gazetted as the Chichester Catchment Area.

Grahamstown Dam

Grahamstown Dam is the Lower Hunter's largest drinking water supply, providing around half of the drinking water needs of the region. Grahamstown Dam is an off-river storage located between Raymond Terrace and Medowie. Stormwater runoff from the Medowie/Campvale area drains to Campvale Canal, where it is pumped into Grahamstown Dam, making up around 10% of its annual inflows. Approximately half of the water supplied to the dam is pumped from the Williams River at Seaham Weir. Direct rainfall onto the dam and runoff from the dam's local catchment makes up the remaining inflows. The catchment of Grahamstown Dam is formally gazetted as the Grahamstown Catchment Area.

The figure below shows the direct hydrological catchment of Grahamstown Dam. This catchment includes a small area of existing and potential future development and excludes the majority of Medowie.


GLEN OAK
CLARENCE TOWN
LIMEBURNERS CREEK
EAST SEAHAM
TWELVE MILE CREEK
Ballickers Canal
BALICKERA
Nine Mile Creek
SEAHAM
Long Mile Creek
EAGLETON
FERODALE
Grahamstown Reservoir
Williams River
RAYMOND TERRACE
MEDOWIE
CAMPVALE WPS
GEORGE SCHRODER WPS
CAMPVALE
Legend
Hydrological Catchment
Hunter Water Land
Water Network Structure
Watercourse
HUNTER WATER CORPORATION
GRAHAMSTOWN DAM
HYDROLOGICAL CATCHMENT

Key Threats to the Dam Catchments

Similar to the river catchments, agriculture, on-site sewage systems and increasing development density are key threats to water quality within both dams. Grahamstown Dam is under particular pressure from increased urban and commercial development. Water quality in the dam has been declining in recent years. The broader Medowie area is earmarked for increased urbanisation, with local and state government anticipating an additional 3,100 dwellings and 6,500 people over the next two decades. Increased stormwater runoff, potential discharges from on-site sewage systems and land use intensification are major threats to water quality in Grahamstown Dam, particularly the direct hydrological catchment, unless stringent development conditions are implemented (as discussed in Section 6).

3.4 Our Groundwater Catchments

Tomago Sandbeds

The Tomago Sandbeds catchment provides an important source of water for the Lower Hunter, supplying up to 20% of annual consumption, and is used to supplement our dams during times of drought or water quality issues. A significant proportion of this area is protected land, the majority comprising formally gazetted reserves managed by the NSW National Parks and Wildlife Service. Other land uses include Defence facilities, agriculture and urban areas. The Tomago Sandbeds are formally gazetted as the Tomago Sandbeds Catchment Area.

Tomaree Sandbeds

The Tomaree Sandbeds are primarily covered by the Tomaree National Park and exclusively supply the Tomaree Peninsula, a significant resident population and major tourism destination, with visitor numbers peaking during the summer holiday season. The catchment area also incorporates the Shoal Bay urban area. The Tomaree Sandbeds are formally gazetted as the Nelson Bay Catchment Area.

Stockton Sandbeds

The Stockton Sandbeds catchment is primarily covered by various land tenures comprising the Worimi Conservation Lands, managed by the NSW National Parks and Wildlife Service, with some freehold land. Other land uses include sand extraction and tourism activities. This area largely comprises coastal forest and mobile sand dunes and is formally gazetted as the North Stockton Catchment Area.

Key Threats to the Groundwater Catchments

Sand is highly permeable; consequently, any spills or contamination tend to move through to the groundwater table quickly in the form of pollutant plumes. Lateral groundwater movement through sands can also be rapid, spreading contamination and threatening drinking water supplies, even if the source of pollution is not close to the extraction bores.

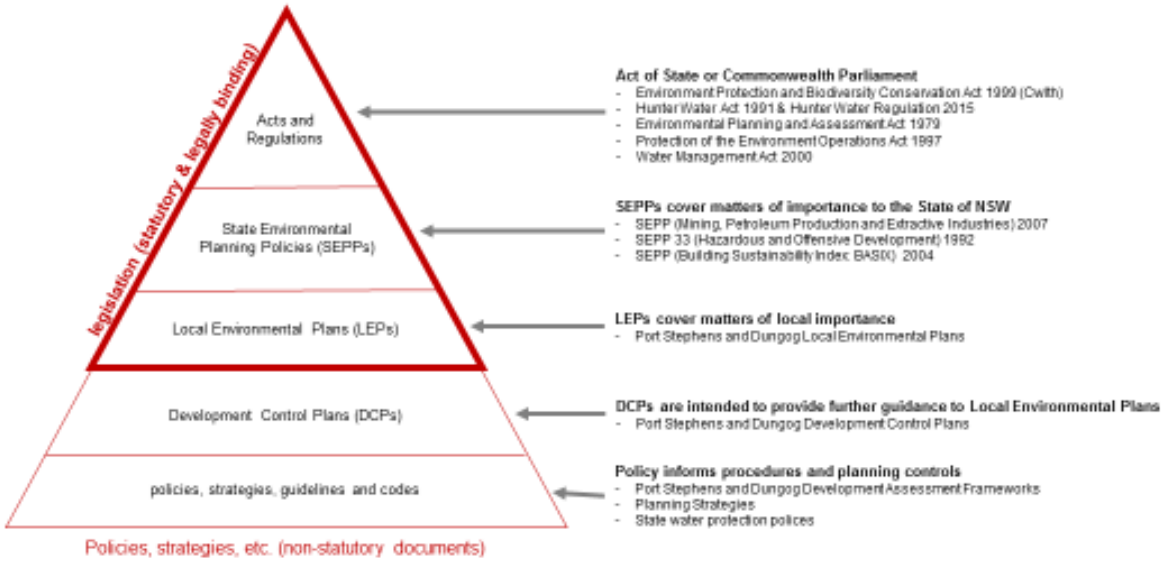
The Tomaree Sandbeds are largely within the Tomaree National Park, which provides a good level of protection. Conversely, the Tomago Sandbeds catchment contains expanding industrial/commercial areas, RAAF Base Williamtown, Newcastle Airport, a small area of agriculture, and residential areas, some of which are not sewered. Increasing areas of impervious surfaces in the catchment (buildings, roads and paved or concrete hardstand areas) interfere with aquifer recharge as well as increasing stormwater flows, which carry contaminants.

Sand mining and mineral extraction also present potential risks to groundwater quality within the groundwater catchments.

Onsite sewage systems in and around the groundwater catchments are also of concern as unsewered residential development continues to expand in these areas, increasing the potential for the discharge of effluent directly to land within or close to the drinking water catchments.

4 THE REGULATORY CONTEXT

Development in the drinking water catchments is regulated by a number of local and state planning instruments (and Commonwealth instruments when triggered). These are illustrated in the diagram below.



The following is an overview of legislation and key planning instruments that may be relevant to most developments. Please note this is not an exhaustive list and is intended as a guide.

At the Commonwealth level, the principal instrument relating to development within the drinking water catchments is:

- The *Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*, which includes protections for native ecosystems, and includes water resources as a matter of national environmental significance in relation to coal seam gas (CSG) and coal mining developments, known as the 'water trigger'.

At the State level, the principal instruments relating to development within the drinking water catchments are:

- *Hunter Water Act 1991* (NSW)
- *Hunter Water Regulation 2015*
- *Environmental Planning and Assessment Act 1979* (NSW)
- *Environmental Planning and Assessment Regulation 2000*
- *Protection of the Environment Operations Act 1997* (NSW)
- *Protection of the Environment Operations (General) Regulation 2009*
- *Water Management Act 2000 (NSW)*
- *Water Management (General) Regulation 2011*

The NSW government has also published various policies and guidance documents to assist the protection of water resources and water quality.

In the *Hunter Water Act 1991* and the *Hunter Water Regulation* (2015), the catchments (except the Allyn & Paterson River catchments) are referred to as **Special Areas**.

At the Local Government level, the principal instruments are:

- The Local Environmental Plan (LEP) of each Council, which provides zoning information declaring which development types and activities are permissible in each zone;
- The Development Control Plans (DCPs) of each Council, which provide more detailed guidance on how developments and activities are to be planned and carried out; and
- Other ancillary plans or policies (such as the Onsite Sewage Management Policy of Council including the Development Assessment Framework, or DAF, for unsewered development), which specify assessment and reporting benchmarks for development applications, or planning strategies, which direct the type and scale of development in respective locations.

Pursuant to the *Conveyancing Act 1919* (NSW), Hunter Water as a prescribed authority may, with the consent of the landowner, create covenants over parcels of land within Hunter Water's Special Areas to protect water quality from inappropriate development or activity. A covenant is a legally binding instrument which restricts the uses of the land on a case-by-case basis, in response to specific circumstances. Covenants are either 'positive,' whereby the land owner is directed to undertake a specified activity on that land; or 'restrictive,' whereby the land owner is not permitted to undertake specified activities on that land.

5 TRIGGERS FOR REFERRAL TO HUNTER WATER

Section 51 of the Hunter Water Act states:

51 Consent authority to notify Corporation of certain applications etc.

(1) In this section, ***consent authority*** has the meaning given in the *Environmental Planning and Assessment Act 1979* and includes a council to which an application for approval to erect a building under Part 1 of Chapter 7 of the *Local Government Act 1993* may be made.

(2) If a consent authority within the area of operations or a special area receives a development application or building application in relation to any matter that, in the opinion of the consent authority, may:

(a) significantly damage or interfere with the Corporation's works, or

(b) significantly adversely affect the Corporation's operations, or

(c) significantly adversely affect the quality of the water from which the Corporation draws its supply of water in a special area,

the consent authority must, within 7 days of the receipt of the application, give the Corporation notice of the application.

(3) The consent authority must take into account any submissions made by the Corporation in relation to the development application or building application in determining whether to consent to the development application or building application or to attach conditions to any such consent.

Developments or activities which pose unacceptable risks to drinking water catchments are not likely to be supported by Hunter Water. Hunter Water may request further information, modifications to the proposal, or make recommendations for additional development consent conditions to ensure drinking water supplies continue to be adequately protected.

The types of development proposals that have the potential to significantly affect water quality in the drinking water catchments without appropriate mitigation and management measures are shown below.

Development Types that trigger referral to Hunter Water under S. 51 of Hunter Water Act 1991 (NSW) within the entire drinking water catchments:

- Any development with a constructed area of above 2000m^2
- Landfilling, earthworks or clearing of more than 2500m^2 or that has the potential to significantly alter groundwater tables / overland flows (i.e. where there is a demonstrable impact on water quality)
- Industrial or commercial related development involving:
    - Processing, use or storage of waste, chemicals, hazardous or toxic materials (including fuel stations or storage, fertilisers, explosives, fire-fighting chemicals or other chemicals);
    - Wet industry (liquid processing);
    - Mechanical workshops; and
    - Any development with potential to produce nutrients in the catchment.
- Subdivisions involving more than 4 lots or residential developments with more than 4 new dwellings
- Forestry operations
- Intensive agriculture (including plant, livestock and aquaculture)

- Airport related developments
- Medical developments involving bio-hazard wastes including hospitals, doctor's surgeries, vet clinics, medical research facilities, intensive animal facilities.
- Military bases or outposts
- Animal boarding and training establishments and intensive animal facilities (including horse training facilities)
- Solid waste landfills and composting facilities
- Wastewater treatment plants and water recycling plants
- Extractive industries

Development Types that trigger referral to Hunter Water under S. 51 of Hunter Water Act 1991 (NSW) within the draw zone of groundwater extraction wells or the direct hydrological catchment of surface water storages

All development excluding:

- Exempt and complying development as nominated under State Environmental Planning Policy (SEPP) – Exempt and Complying Development Codes 2008 or another Environmental Planning Instrument;
- Development construction works, civil works, clearing or landfill under 50m2 in area;
- Rural sheds up to 200m2 in area;
- Subdivisions of two lots or less, boundary adjustments or consolidations;
- Change of use of premises other than industrial development or uses nominated in Figure A above;
- Home business or industry;
- Bed and breakfast premises;
- Signage;
- Minor demolition works;
- Fences and retaining walls; and
- Mobile food & drink outlets.

Additionally, requirements outlined in Section 55 and 56 of the Hunter Water Act apply to public agencies proposing activities within a special area. These sections state:

55 Exercise of functions by public bodies in special areas

(1) A public agency may not, in relation to land within a special area, exercise functions other than functions under this Act unless notice is first given as prescribed by the regulations to the Secretary.

(2) On receiving a notice, the Secretary may make such representations to the public agency as the Secretary thinks fit.

(3) A public agency may not exercise functions contrary to any such representations unless, before the exercise of its functions, not less than 28 days' notice has been given to the Secretary and the Corporation of the functions intended to be exercised.

(4) In this section and section 56, public agency means the Governor, a Minister of the Crown or a statutory body.

56 Secretary to notify Corporation of certain proposals etc.

(1) If the Secretary receives notice of a proposal to take action under section 54 (1) or a notice under section 55 (1) in relation to any work that may damage or interfere with the Corporation's works or adversely affect the Corporation's operations, the Secretary is, within 14 days, to give the Corporation notice of the proposal or notice.

(2) The Secretary is to take into account any submissions made by the Corporation in relation to a matter referred to in subsection (1) in determining whether to approve of the action, to attach conditions to an approval given or to make representations to the public agency.

Secretary *means the Secretary of the Department of Industry, Skills and Regional Development.*

Hunter Water has an ongoing relationship with the local councils to ensure that, as a minimum, the above types of developments are referred for comment. However, if the consent authority deems a smaller-scale development proposal or a development outside a special area as likely to pose a significant impact on water quality, it will refer it to Hunter Water for comment.

If planning is being undertaken for any development or activity in the drinking water catchments, the local Council should be consulted in the first instance. Hunter Water may be contacted for advice.

6 MINIMUM EXPECTATIONS FOR DEVELOPMENT IN THE CATCHMENTS

This section provides guidance on Hunter Water's expectations for developments and activities in the drinking water catchments. These minimum standards can also be beneficially applied to small-scale developments to improve environmental and public health outcomes. For larger-scale development proposals, more stringent controls may be required.

It is important to note that different aspects of the same development or activity can impact surface water and groundwater over the lifetime of the project, from initial construction and ongoing operation, to decommissioning and rehabilitation (where relevant). Pollution and changes to hydrology that occur as a result of land clearing, erosion, runoff, increasing impervious surfaces (such as roofs and hardstand areas), diffuse-source and point-source contamination are the largest threats to our water supplies. Proposed developments and activities should be designed to avoid, minimise or mitigate these potential impacts, with appropriate supporting evidence to accompany the DA to the consent authority.

It is an offence under the *Hunter Water Regulation* 2010 to pollute waters in the drinking water catchments without an Environment Protection Licence (EPL) issued by the EPA.

Hunter Water expects all developments in drinking water catchments to demonstrate a Neutral or Beneficial Effect (NorBE) on water quality. A development is considered to demonstrate NorBE if the development:

(a) has no identifiable potential impact on water quality, or

(b) will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or

(c) will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority.

The level of assessment required is commensurate to the level of risk of the development - developments with a greater potential risk to water quality will require more detailed assessment and design. Detailed computer modelling may be requested for some projects, and/or follow-up water quality monitoring once the project is approved and underway. Assessment of the potential impact of development should compare the pre-development condition with the post-development condition inclusive of any controls that are proposed to be implemented; i.e. post-development pollutant loads discharged from the site should be equal to or less than the pre-development loads discharged from the site to demonstrate NorBE. Hunter Water may request further information from the proponent, or recommend additional measures or conditions for the project, in order to ensure that the risks to drinking water are appropriately managed.

As a minimum, Hunter Water expects the following management issues to be addressed in DA submissions where potential impacts on water quality are identified (note that Council may require additional matters to be addressed and should be consulted for further information and advice):

1. **Vegetation management (including clearing and revegetation)**
2. **Erosion and sediment control (for earthworks, construction and extractive industries)**
3. **Water sensitive urban design (stormwater management)**
4. **Wastewater management (domestic and trade wastes)**

5. **Management of potentially contaminating activities or hazardous materials or goods.**

6.1 Vegetation Management

Vegetation, particularly native vegetation, is very effective at improving runoff quality and helping protect our water supplies from pollution, as well as improving other environmental outcomes. Erosion in the catchments due to exposure of bare soil and rock as a result of vegetation clearing is a major contributor to suspended sediments, leading to poor source water quality.

For every development, Hunter Water encourages the retention of existing vegetation (not weeds) and improve it where possible, through regeneration works and ongoing weed management. This is particularly important for riparian vegetation, as vegetated creek and river banks are far more resistant to erosion and bank failure, compared with cleared or otherwise disturbed banks. Landscaped areas can form protective buffers around developments, and can be integrated into the water sensitive urban design aspects of a site (such as vegetated swales, raingardens and wetlands for stormwater management). If native vegetation is to be cleared, it is recommended that topsoils are stockpiled for later use in landscaped areas as this retains the endemic native seed bank present at the site for natural regeneration (where native species are considered appropriate for landscaped areas).

Depending on the scale and scope of the development, as well as the ecological sensitivity of the site and surrounds, a detailed Vegetation Management Plan may be required by the consent authority. The Plan should demonstrate how proposed changes to vegetation will be managed (including soil stockpiling and revegetation, where relevant). Erosion and Sediment Control Plans may also be required in conjunction with proposals for substantial vegetation clearing (see Section8.2 below). Consult with Council or Hunter Water for further information.

6.2 Erosion and Sediment Control

All development that involves construction or earthworks of any kind has the potential to create water-borne sediment (suspended solids) and other pollutants as exposed soils (and rock) are susceptible to erosion. Erosion of soils and rock leads to contamination of runoff with elevated suspended solids, dissolved solids, nutrients (particularly nitrogen and phosphorus) and any pre-existing soil contaminants (such as chemicals or metals at industrial sites, naturally occurring acid sulphate soils, etc.). Unless it is appropriately managed (i.e. captured) on-site, the suspended sediment ultimately reaches waterways, where it increases turbidity, reduces water quality and ultimately smothers aquatic habitat as it settles out of suspension. Settled sediment can be resuspended and be further transported into streams, rivers, lakes and dams.

Erosion and sediment control is an ongoing issue for developments where large areas of soil and/or rock are permanently or frequently exposed, including (but not limited to) quarries, mines, landscape suppliers, unsealed roads and annual rotation crops.

Hunter Water expects DAs to be accompanied by supporting documentation that demonstrates how erosion and sediment control measures will be successfully implemented and managed to protect the drinking water catchments. Council's Development Control Plans and the selected references at Appendix A provide guidance in the first instance. Consult with Council or Hunter Water for further information.

6.3 Water Sensitive Urban Design (Stormwater)

Ongoing stormwater runoff post-construction can negatively impact water quality and increase flood volume and velocity. This includes runoff from impervious surfaces (urban areas and commercial/industrial developments) as well as pervious surfaces such as agriculture, mine sites, landfills, quarries, sports ovals and so on.

Water Sensitive Urban Design (WSUD) principles should be incorporated into the design, operation and maintenance of all new residential, commercial and industrial developments in the drinking water catchments. Harvesting roof rainwater for appropriate reuse is strongly encouraged as an important source control, in order to reduce stormwater flows as well as to reduce potable water demand. In areas serviced by reticulated water supply, harvested rainwater can be used for toilet flushing and cold water laundry supply without any treatment.

Similarly, stormwater conveyance systems should also follow WSUD principles by slowing and retaining stormwater to allow maximum infiltration (such as grassed swales, pervious pavements and so on); and there should be appropriate end-of-system controls (such as stormwater detention basins and/or wetlands).

Council's Development Control Plans and the selected references at Appendix A provide guidance in the first instance. Consult with Council or Hunter Water for further information.

6.4 Wastewater Management

Wastewater can include domestic (human) wastewater as well as trade wastewater from agricultural, commercial and industrial developments (including animal-derived wastes from agricultural and commercial operations). Hunter Water expects all new developments to connect to a reticulated sewerage system where possible. Where sewer is not available and an onsite sewage management system is considered acceptable, the onsite sewage management system must be installed in accordance with the Council's relevant plans and policies, including the Development Assessment Framework (DAF), Development Control Plan and Onsite Sewage Management Policy. On-site sewage management systems are regulated and managed by the local council.

The key threats from on-site sewage management systems are water-borne pathogens such as *Cryptosporidium* and *Giardia*. In addition, the high phosphorus and nitrogen content of effluent can pollute waterways and water supplies, and can cause problematic algal blooms. Furthermore, the effectiveness of on-site systems generally decreases with time, increasing the risk to the drinking water catchments.

The disposal of trade wastewater directly to Hunter Water's sewer system will require a trade waste agreement with Hunter Water. Contact Hunter Water's Trade Waste Team by phoning 1300 657 657.

The majority of commercial and industrial developments in the drinking water catchments that are remote from reticulated sewer services will require trade wastewater to be tankered to a licenced wastewater treatment facility. Discuss your development with Council's planning staff and Hunter Water's Developer Services Team to find out whether it is remote from sewer services and what options are available for wastewater management (contact numbers are provided at the end of these Guidelines).

Applications to improve or upgrade existing on-site sewage management systems on existing developed and inhabited lots are supported in-principle by Hunter Water, and are particularly important for small and/or heavily developed properties.

6.5 Management of Potentially Contaminating or Hazardous Materials or Goods

Hazardous or potentially contaminating substances can include physical, chemical or biological agents and are produced or handled by a very broad range of industries. They can pose human and environmental health risks, are often difficult and costly to remove from drinking water supplies and can persist in surface waters, soils and groundwater for a long time. Approvals for developments involving these substances are often subject to additional planning controls from relevant NSW government agencies (consult Council in the first instance). Hazardous and toxic materials must be dealt with in accordance with the relevant legislation and where relevant, an Environment Protection Licence issued by the EPA. Robust management systems and contingency/emergency plans will be required for such developments in any drinking water catchment.

Examples of developments involving potentially contaminating or hazardous materials include, but are not limited to:

- Service stations and fuel storage facilities
- Chemical production, processing or storage facilities (including fertilisers, explosives, fire-fighting chemicals and other chemicals)
- Intensive agriculture (particularly chemical use and storage)
- Wastewater treatment plants and water recycling plants
- Solid waste landfills and composting facilities
- Extractive industries including mines, gas wells and quarries
- Military bases or outposts (particularly chemical use and storage)
- Forestry operations (particularly chemical use and storage)
- Any facility that handles bio-hazardous wastes, including (but not limited to) hospitals, doctors' surgeries and general practices, veterinary clinics, medical research facilities, intensive animal facilities, and so on.

Hunter Water will assess referred developments that involve hazardous substances on a case-by-case basis in consultation with the appropriate regulatory authorities.

In addition, the transportation of dangerous or problematic substances by road within the drinking water catchments is an ongoing risk to water quality, which is managed by Hunter Water in partnership with NSW Roads and Maritime Services, the Environment Protection Authority, Fire and Rescue (Hazmat) and transportation companies and contractors.

For further information about development in the drinking water catchments please contact:

Dungog Shire Council:

4995 7777

Port Stephens Council:

4980 0255

Hunter Water:

1300 657 657

Hunter Water Emergency Assistance After Hours:

1300 657 000

APPENDIX A – GUIDELINES AND STANDARDS FOR DEVELOPMENT & LAND USE

The list of documents will change as management practices and technology change, and more documents are updated or replaced. Consult with Planning staff at your Council.

Erosion and Sediment Control, Stormwater & Water Sensitive Urban Design (WSUD)

Managing Urban Stormwater: Soils and Construction Volume. 1, 4th edition (‘*the Blue Book Vol.1*’) (NSW Landcom, 2004)

Managing Urban Stormwater: Harvesting and Reuse (NSW Department of Environment and Conservation, 2006)

Water Sensitive Urban Design Engineering Procedures: Stormwater (Melbourne Water, 2005)

Water Sensitive Design Guide for Rural Residential Subdivisions (Sydney Catchment Authority, 2011)

MUSIC by E-Water: User Manual for MUSIC version 6.1 (e-Water Ltd, 2014)

Australian Runoff Quality: A Guide to Water Sensitive Urban Design (Engineers Australia, 2006)

Maintaining Vegetated Stormwater Assets (Water by Design, 2012)

Construction and Establishment Guidelines: Swales, Bioretention Systems and Wetlands (Water by Design, 2010)

Adoption Guidelines for Stormwater Biofiltration Systems (Facility for Advancing Water Biofiltration, Monash University, 2009)

Managing Urban Stormwater: Soils and Construction Volume 2A: Installation of Services (NSW Department of Environment, Climate Change and Water, 2008)

Managing Urban Stormwater: Soils and Construction Volume 2C: Unsealed Roads (NSW Department of Environment, Climate Change and Water, 2008)

Managing Urban Stormwater: Soils and Construction Volume 2D: Main Road Construction (NSW Department of Environment, Climate Change and Water, 2008)

Managing Urban Stormwater: Soils and Construction Volume 2E: Mines and Quarries (NSW Department of Environment, Climate Change and Water, 2008)

Permeable Interlocking Concrete Pavements – Design and Construction Guide (Concrete Masonry Association of Australia, 2010)

Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) - Stormwater Harvesting and Reuse (Natural Resource Management Ministerial Council et al, 2009)

Environmental Management Plans, Controlled Activities & Contaminated Sites

Guideline for the Preparation of Environmental Management Plans (NSW Department of Infrastructure, Planning and Natural Resources, 2004)

Suite of Guidelines for Controlled Activities in waterfront land (NSW Office of Water, 2012)

Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (Office of Environment and Heritage, 2011)

Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination (NSW Department of Environment and Conservation, 2007)

Onsite Sewage Management

AS/NZS 1547:2012 On-site Domestic Wastewater Management (Standards Australia, 2012)

Designing and Installing On-Site Wastewater Systems (Sydney Catchment Authority, 2012)

Environment & Health Protection Guidelines: On-site Sewage Management for Single Households (*'the Silver Book'*) (NSW Department of Local Government, 1998)

Environmental Guidelines: Use of Effluent by Irrigation (NSW Department of Environment and Conservation, 2004)

Solid Waste Landfills and Composting Facilities

Environmental Guidelines for Solid Waste Landfills (NSW Environment Protection Authority, 1996)

Environmental Guidelines for Composting and Related Organics Processing Facility (NSW Environment Protection Authority, 2004)

Agriculture, Horticulture and Livestock

Herbicides: Guidelines for use in and around water (Cooperative Research Centre for Australian Weed Management, 2008)

Spray sense information for users of agricultural chemicals (NSW Department of Primary Industries, 2003)

Nursery Industry Water Management Best Practice Guidelines (Nursery and Garden Industry Australia, 2010)

Managing wastewater from Intensive Agriculture: A wetland system (NSW Agriculture, Agnote 381, 2002)

Guidelines for Environmental Assurance in Australian Horticulture (Horticulture Australia Limited, 2006)

Environmental Management Guidelines for the Dairy Industry (NSW Department of Primary Industries, 2008)

Effluent and Manure Management Database for the Australian Dairy Industry (Dairy Australia, 2008)

Stock and Waterways: A Manager's Guide (Australian Government - Land and Water Australia, 2006)

Horse Property Developments in the Sydney Drinking Water catchment (Sydney Catchment Authority, 2013)

Best Practice Management for Meat Chicken Production in NSW (NSW Department of Primary Industries, 2012)

Best Practice Guidelines for Using Poultry Litter on Pastures (NSW Department of Primary Industries, 2007)

National Environmental Guidelines for Piggeries (Australian Pork Ltd, 2010)

Winery Wastewater Management & Recycling: Operational Guidelines (Australian Government Grape and Wine Research and Development Corporation, 2011)

Forestry

Private Native Forestry Code of Practice - Field Guide for Southern NSW (NSW Department of Environment and Climate Change, 2010)

Private Native Forestry Code of Practice (interim) (NSW Department of Environment and Climate Change, 2008)

Appendix D
Transgrid Subdivision and Development Guidelines

Appendix D outlines the requirements and guidelines for proposed developments within the vicinity of Transgrid's high voltage electricity network applicable to the Williamtown SAP investigation area.

Guidelines

Subdivision and development guidelines

These guidelines provide additional requirements for subdivision and development proposals in the vicinity of TransGrid's high voltage electricity network, to help protect public safety and the network, and maintain TransGrid's access for maintenance and emergencies.

These guidelines are to be read in conjunction with the TransGrid easement guidelines.

In general, to avoid unacceptable risks to public safety and the operation of the network:

> Where the subdivision of transmission line easements cannot be avoided, then **open space uses** - that do not encourage people to congregate under the transmission lines or close to electricity infrastructure - should be given preference over other uses, such as residential or commercial.

> Subdivision proposals that could encourage unauthorised encroachments (for example, small lot residential subdivisions where the majority, or all, usable outdoor space in a proposed lot is located within a transmission line easement), will not be supported.

> Boundaries for new subdivided properties should not be located within the easement.

Subdivision and development requirements:

Any subdivision or development proposal in the vicinity of TransGrid high voltage transmission line easements must provide:

> **Access** – continuous and unobstructed access to the transmission line and its structures is required at all times for TransGrid plant and personnel.

> **A safe unobstructed working platform** - around transmission line structures for TransGrid's maintenance and emergency works (the **exclusion zone**). Activities and developments (including all structures and obstructions) must:

- where transmission lines are **132kV and below**:
  - be located **at least 20 metres** away from any part of a transmission structure or guy wire;
  - for metallic structures, be located **at least 22 metres** away from any part of a transmission structure or guy wire;
  - be located **at least 10 metres** from the centre of the transmission line;
- where transmission lines are **220kV and above**:
  - be located **at least 30 metres** away from any part of a transmission line structure or guy wire;
  - be located at least **17 metres** from the centre of the transmission line.

  See the Easement Guidelines for more information on the exclusion zone.

> **Roads, streets etc (including kerb to property boundaries) and intersections** - shall not be located within 20 metres of any transmission line structure or guy. Where roads and intersections are proposed within 30 metres of a structure or guy, consideration will need to be given to structure earthing modifications and the need for vehicle impact protection.

> **Intersections** must not be located within the exclusion zone.

> **Clearances** - developments must meet the clearances requirements set out in *AS7000:2010 overhead line design*.

> **Street lighting:**

- Proposed roadway locations must also take into consideration any street lighting requirements to ensure that clearance requirements can be met. The design clearances should include consideration of future maintenance safety issues.
- Transmission line outages will not be provided for street light maintenance.

> **Fencing:**

- Where fences are installed, access gates must also be installed in an agreed location and fitted with a TransGrid lock.
- TransGrid's Fencing Guidelines must be complied with.

> **Electrical safety risks:**

- No metallic fencing, services or other infrastructure shall be located within 22 metres of structures and guys for 132kV and below transmission lines, or 30 metres for 220kV and above transmission lines.
- Subdivisions and other developments shall not encourage the congregation of people under transmission lines or close to electricity infrastructure.

> **Services:**

- All underground services installed within 30 metres of a transmission line structure shall be non-metallic.
- Utility services, whether above or below ground, shall not be installed on the easement without TransGrid's permission.

> **Excavation:**

- Excavation work or other alterations to existing ground levels shall not be carried out within the easement area without TransGrid's permission.
- Permission will not normally be granted for such work within 20 metres of any structure or supporting guy.

> **Boundaries:**

- For new subdivided properties, boundaries should not be located within the easement.
- Fenced boundaries for all new properties in the subdivision shall not be within 30 metres of any transmission line structure and should not restrict access to the easement.

> **New titles:**

- A "Restriction-as-User" (88B Instrument) is required to be placed on the titles of any created lots that may become affected by a transmission line easement.

Plans required to be submitted to TransGrid via the online Easement Portal:

	Proposals that do not change ground levels	Proposals that change ground levels
A detailed, legible and to-scale plan showing property boundaries, proposal and distance of proposal to TransGrid's easement and structures	✓	✓
For large scale subdivisions, a Site Plan showing all new access points and access ways to the easement and structures	✓	✓
A three dimensional CAD drawing in 3D-DXF format (Small scale subdivisions can provide survey levels for any proposed changes to ground levels within the easement)		✓
Description of proposal with height, depth and location of proposed activities/structures/development	✓	✓

Prior to and during construction:

The development plans must provide the following:

> Vehicles, plant or equipment having a height exceeding 4.3 metres when fully extended shall not be brought onto or used within the easement area without TransGrid's permission.

> Where temporary vehicular access or parking (during the construction period) is within 20 metres of a transmission line structure, adequate precautions shall be taken to protect the structure from accidental damage. Plans must be submitted to TransGrid for permission as part of the overall proposal.

> The easement shall not be used for temporary storage of construction spoil, topsoil, gravel or any other construction materials.

Post construction:

> **New titles:**

– Please ensure that the "Restriction-as-User" (88B Instrument) is placed on the titles of any created lots that may become affected by a transmission line easement.

Costs:

The Developer shall bear all costs of any specialist design studies, TransGrid supervision, reconstruction or modification of the transmission line and its components, including consultation and design required to maintain clearances due to proposed ground level changes; road crossings within the easement; or due to any damage to the transmission line arising from the development.

For more information

please go to www.transgrid.com.au
or contact TransGrid on:

Phone: **(02) 9620 0515**
Email: **Easements&Development@transgrid.com.au**

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