



Growth Infrastructure Compact #1

Western Sydney Growth Area

Baseline Infrastructure and Services Assessment



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Executive Summary

The Western Sydney City Deal (the City Deal) is an agreement between the Australian Government, NSW Government, and local governments of the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly to deliver the new Western Parkland City (WPC).

The Greater Sydney Commission (the Commission) is undertaking a Western Sydney Growth Infrastructure Compact (GIC) Program as a key commitment under the City Deal.

This report provides a baseline for infrastructure and services performance in the Western Sydney Growth Infrastructure Compact #1 (GIC1) area, which comprises the Western Sydney Aerotropolis Precincts and the rezoned Precincts of Austral and Leppington North. It gives an assessment of each of the 11 Precincts focusing on constraints, emerging pressures and spare capacity of existing infrastructure and services within the GIC1 area. The report consolidates information provided by 15 NSW Government agencies and utilities GIC project partners, which has been summarised into 'Networks and Systems' (transport, water, utilities and green Infrastructure), and 'People and Places' (health, education, justice, culture and social housing) for each of GIC1's Precincts.

The existing infrastructure in the GIC1 area reflects the transformation of rural/agricultural land uses. There are few existing assets with capacity to support growth, except for the Austral and Leppington North Precincts, where utilities infrastructure has been delivered to support growth associated with the rezoned Precincts and the Leppington train station.

Networks and Systems

The road network is a mix of local rural/suburban roads and rural arterial roads. The State and regional road network has spare capacity on most corridors, with the least capacity on parts of Elizabeth Drive and Devonshire Road.

Public transport is limited, and primarily serviced by local bus routes to Leppington station and Liverpool City Centre. Rail infrastructure is limited to the South West Rail Link, which terminates at Leppington station. There is limited active transport infrastructure in the study area, with a shared path recently opened as part of Bringelly Road (Stage 1).

The Transgrid major high voltage network has residual capacity to service growth to 2030, beyond which major investments will be required. Endeavour Energy's network is keeping pace with development in Austral and Leppington but has distribution limitations in the remainder of the GIC1 area.

Sydney Water is investigating options for the servicing of the Western Sydney Aerotropolis and surrounding areas. The size and extent of infrastructure required to adequately service the anticipated growth will take some time to plan, commission and construct, and decentralised systems may be required in the short term to support growth.

Overall, the existing gas infrastructure has capacity for organic growth over the next few years. Beyond this, the network will need to be extended to reach new major growth locations and large users.

There is little formalised passive and active public open space in GIC1, and this reflects the low population density and rural land use zoning and greenfield nature of the Precinct. Existing public space is contained in large land parcels and not well distributed across the GIC area. Figure 1 shows the existing infrastructure in GIC1 for Networks and Systems.

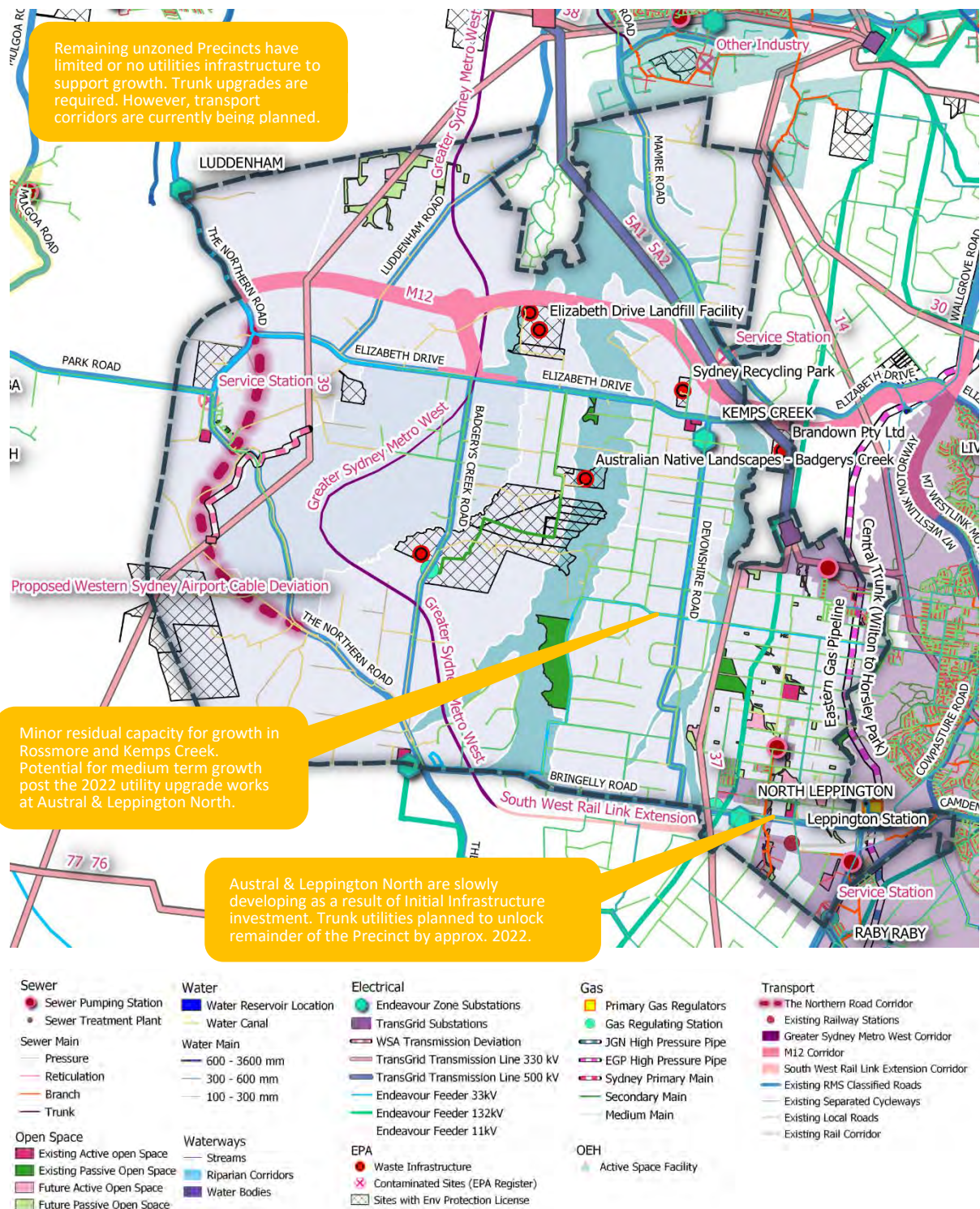


Figure 1: Network and Systems - Existing Infrastructure (GIC1)

People and Places

There are five primary schools and no high schools in the GIC1 area, which reflects land use and population. While the utilisation of schools is mixed, with some already exceeding capacity, the 2036 enrolment projections far outweigh the capacity of the schools, even allowing for future expansion.

TAFE NSW has no assets in the area. Given the need for training facilities close to employment areas/Precincts it is expected there will be a strong case for a number of TAFE locations, including the Western Sydney City Deal's (WSCD) commitment for a TAFE NSW skills exchange at the Aerotropolis construction compound and a permanent vocational educational training facility in the Aerotropolis.

There are no NSW Health-owned facilities, regional or state cultural infrastructure, social housing infrastructure, Justice, Fire and Rescue or Police infrastructure within the GIC1 area or committed infrastructure. All services come from surrounding areas. Figure 2 shows the existing infrastructure in GIC1 for People and Places.

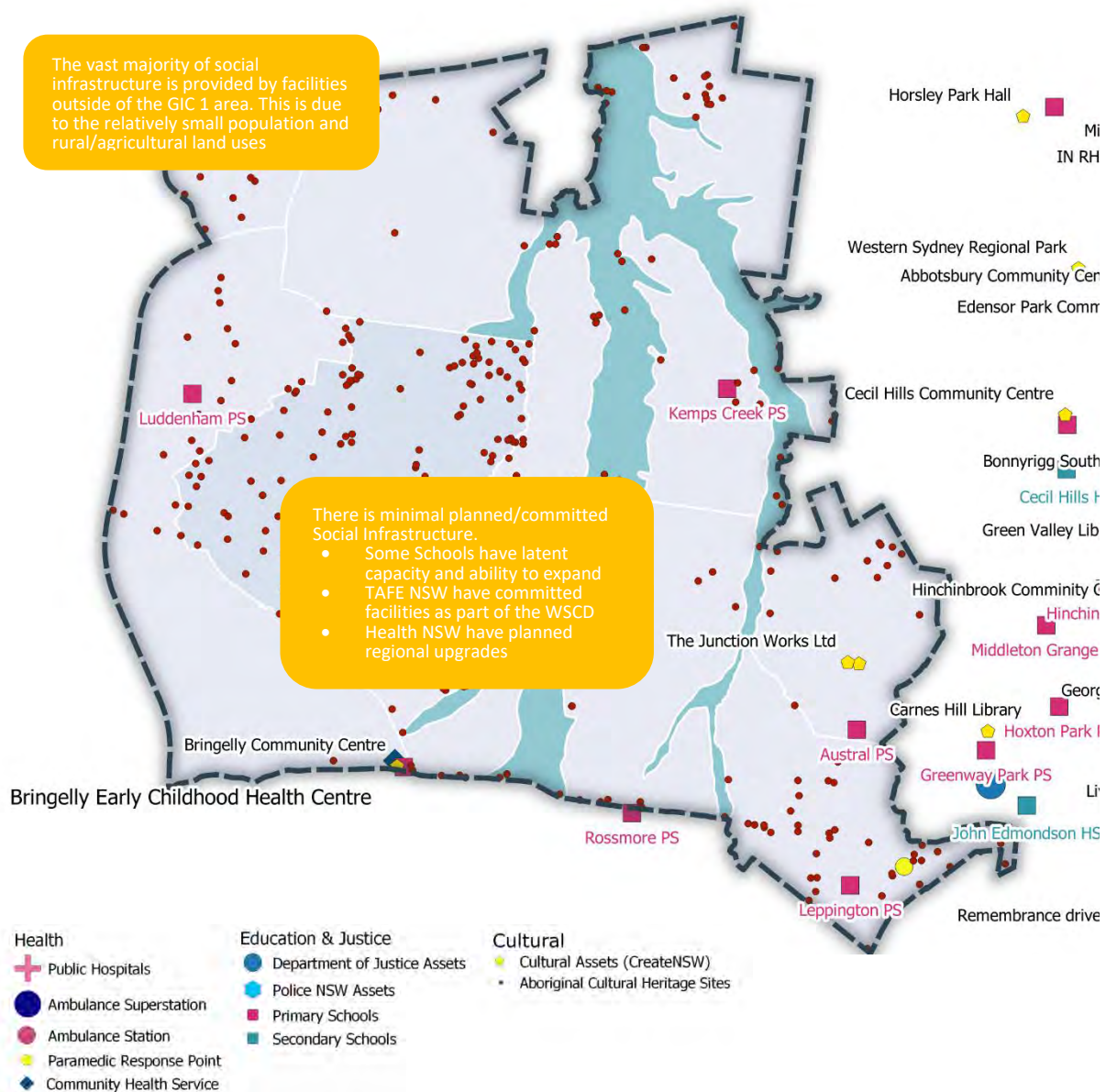


Figure 2: People and Places - Existing Infrastructure (GIC1)

Precinct Findings

The Precincts were categorised based on their planning status and relationship to existing infrastructure:

- Rezoned Precincts
- Aerotropolis Initial Release Precincts
- Unzoned with Initial Capacity
- Remaining Precincts.

The rezoned Precincts of Austral and Leppington North have experienced significant investment in the form of the Leppington train station, water and wastewater assets and new electrical infrastructure. These Precincts are slowly developing, particularly in the catchments of the wastewater infrastructure.

While not yet rezoned, the Precincts most likely to progress in the short term based on limited infrastructure capacity are Rossmore and the eastern portion of Kemps Creek. This is due to the short-term rollout of planned sewer and water infrastructure at Kemps Creek and electricity upgrades at Leppington North. Rossmore is also close to transport and educational facilities.

Significant infrastructure is required to support the Western Sydney Airport (WSA) and committed road upgrades may present opportunities for infrastructure agencies to work collaboratively and provide services for the Initial Release Precincts of the Aerotropolis Core and Northern Gateway Precincts in tandem with the Airport.

All remaining Precincts are generally rural and removed from most forms of trunk infrastructure and will require significant infrastructure investment to support growth.

1. Purpose

1.1. The Western Sydney City Deal

The City Deal is an agreement between the Australian Government, NSW Government, and local governments of the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly to deliver the new Western Parkland City.

The Greater Sydney Commission is establishing a Western Sydney GIC Program to deliver two commitments of the City Deal:

P5 – The NSW Government will establish pilot GICs for the Western Parkland City. They will coordinate planning and delivery of new housing supply and ensure that the required infrastructure is delivered as it is needed.

P7 – The NSW and Australian governments will develop transport and water infrastructure models to innovatively plan for future infrastructure needs. These models will accelerate development application processes and streamline infrastructure delivery, and support GICs.

1.2. GIC Program

The objectives of the Western Sydney GIC Program are to:

1. Work collaboratively to co-create the Western City, including the Aerotropolis as a city supported by infrastructure over the next 20 years and beyond.
2. Support the partnership and commitments of the City Deal to transform Western Sydney, and its focus on connectivity, jobs for the future, skills and education, liveability, environment, planning and housing.
3. Support the vision, objectives and planning priorities of the Western City District Plan, including the creation of a Western Sydney economic corridor.
4. Support the unique metropolitan clusters structure of the Western City, including Greater Penrith, Liverpool, Campbelltown-Macarthur, the Western Sydney Aerotropolis.
5. Support delivery of a range of housing with access to public transport and services to meet the demands of the Western City.
6. Support the South Creek Corridor as the green corridor spine for the Western City, to keep water in the landscape and mitigate urban heat.
7. Identify early the range of infrastructure and services needed to grow and transform the Western City, the costs involved and how this could be coordinated and funded.
8. Identify how to align growth to infrastructure to optimise coordinated outcomes for the Western City and its community.

1.3. Baseline Infrastructure and Services Assessment

This provides a summary of infrastructure and services in the GIC1 area. It details the location and nature of infrastructure, describes its performance, identifies planned investment and outlines its capacity for growth within the next 10 years.

This report was prepared in collaboration with key NSW Government agencies and corporations:

- Transport NSW (including Roads and Maritime Services and Sydney Metro)
- Department of Education
- NSW Health
- Justice NSW
- Land and Housing Corporation
- Create NSW
- NSW Environment Protection Authority
- Office of Environment and Heritage
- TAFE
- Fire and Rescue NSW
- NSW Police
- Sydney Water
- Endeavour Energy
- Transgrid
- Jemena

2. Background

2.1. Study Area

The study area for this report is within the Western Parkland City as shown in Figure 3 below. It encompasses the Western Sydney Aerotropolis Precincts and the rezoned Precincts of Austral and Leppington North.

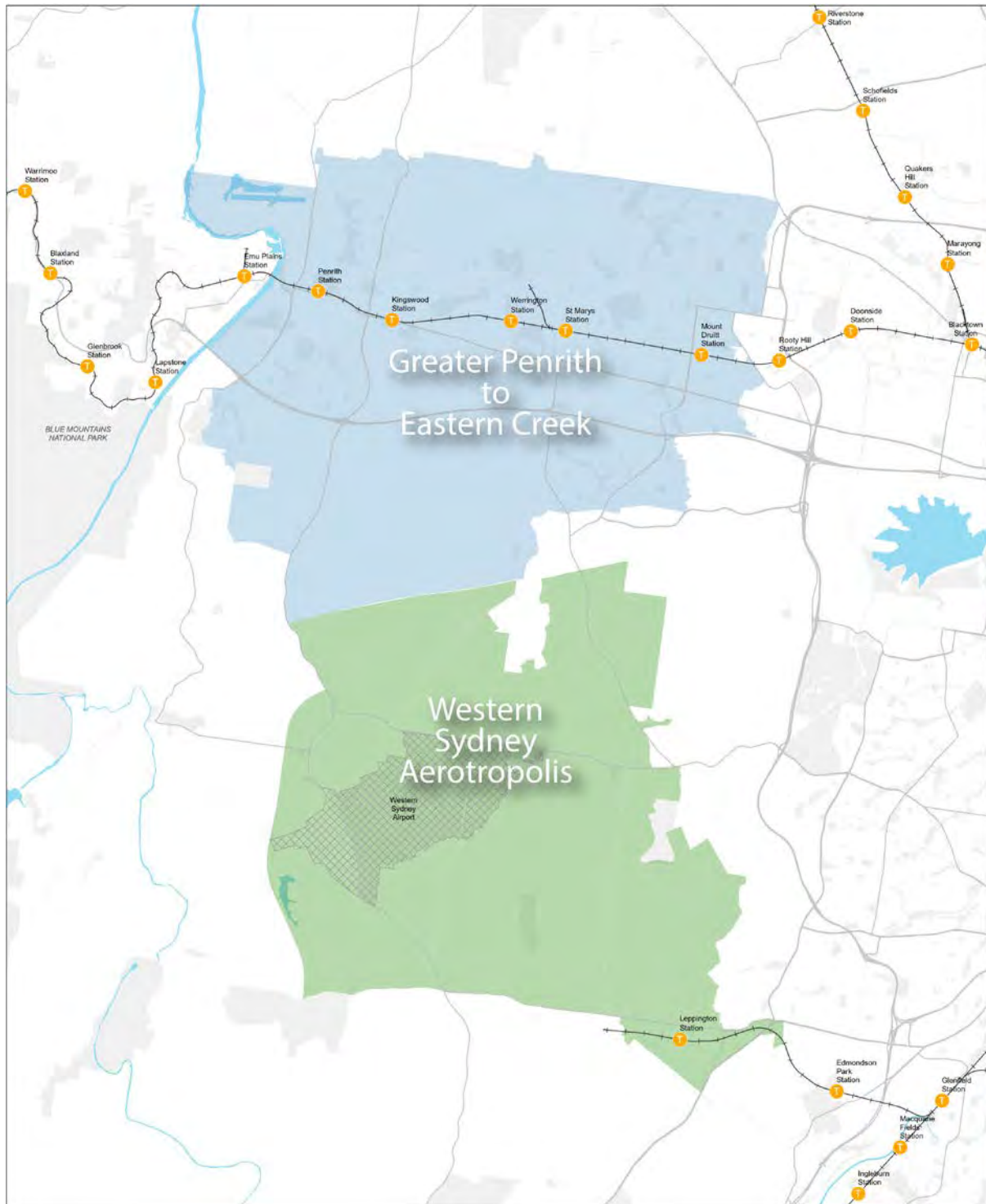


Figure 3: GIC1 and GIC2 Areas

The Western Sydney Aerotropolis GIC1 area has been further broken down into Precincts, based on the respective land uses and characteristics as shown in Figure 4.

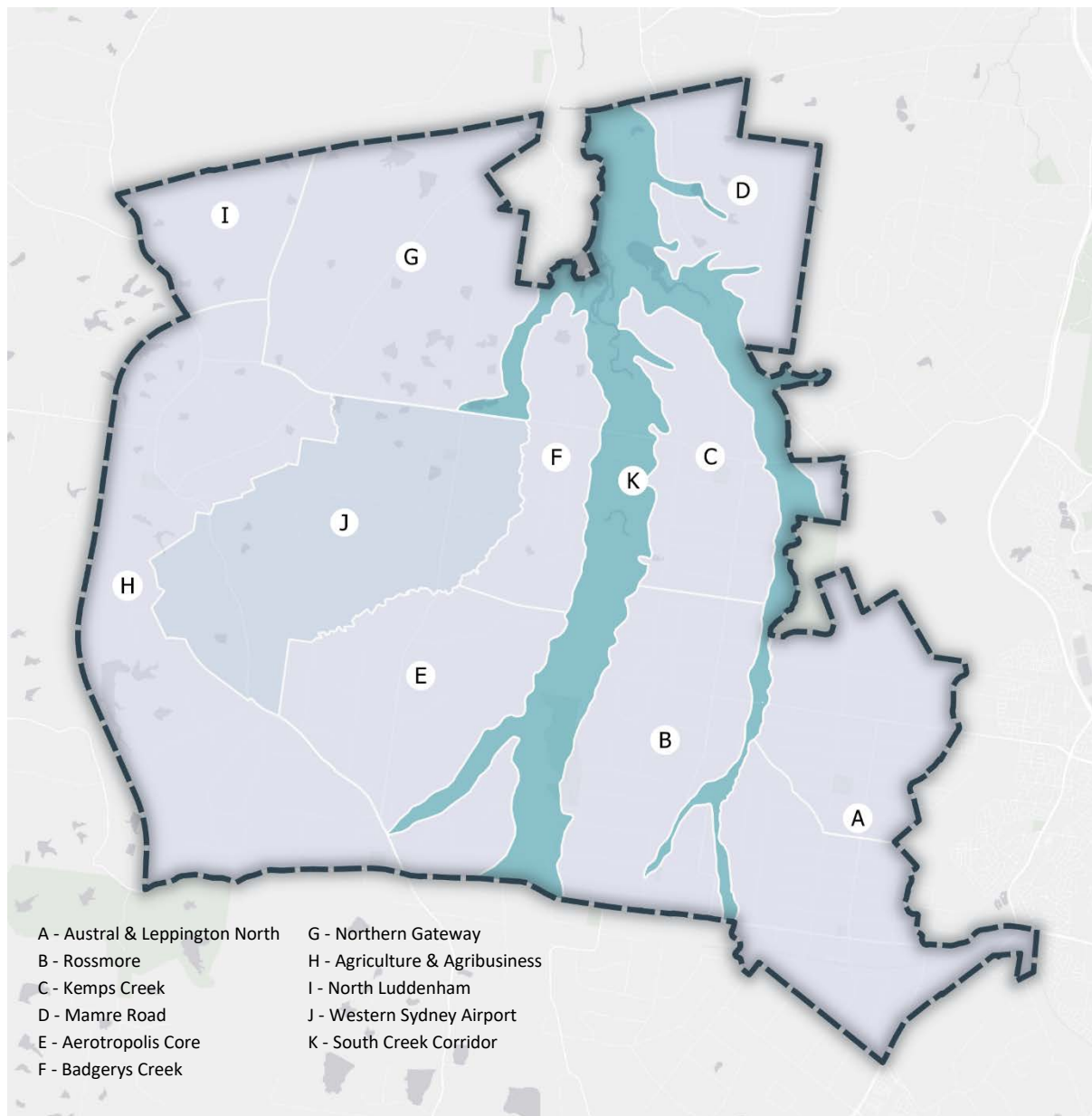


Figure 4: GIC1 Precincts

2.2. Methodology

This baseline report forms part of step two of the GIC methodology as outlined on Figure 5. The Greater Sydney Commission requested government infrastructure and service agencies and utility providers to submit evidence-based information and data outlining:

- The current performance of infrastructure and services
- Planned and committed investment in infrastructure and services and the projected change to capacity and performance
- Opportunities for growth within existing programs and commitments
- Relevant policy positions pertinent to future planning.

Agencies provided information for the GIC1 area and this report examined Precinct level capacity where available. The Precincts, taken from the previous Stage 1 Land Use and Infrastructure Implementation Plan (LUIIP), have been used as a framework for analysing the information and data.

The information has been divided primarily into two sections: Networks and Systems (which includes transport, utilities and open space and recreation assets) and People and Places (which includes education, health, justice, emergency services, social housing and culture).



Figure 5: GIC1 Methodology

3. Sector Findings

3.1. Systems and Networks

3.1.1. Transport

Assessment

The baseline assessment for transport includes roads, public and active transport. The methodologies employed, while fit for purpose, relied on past observed data and strategic traffic models for current and planned projects in the GIC1 area. The Transport Baseline Assessment of Existing Infrastructure and Services is appended to this report.

Metrics

The following data was used:

- Road Network Performance – Based on the Strategic Traffic Forecasting Model (STFM) and Google Travel Time Data
- Public Transport Network Performance – frequency of services was analysed using timetable data.

Findings

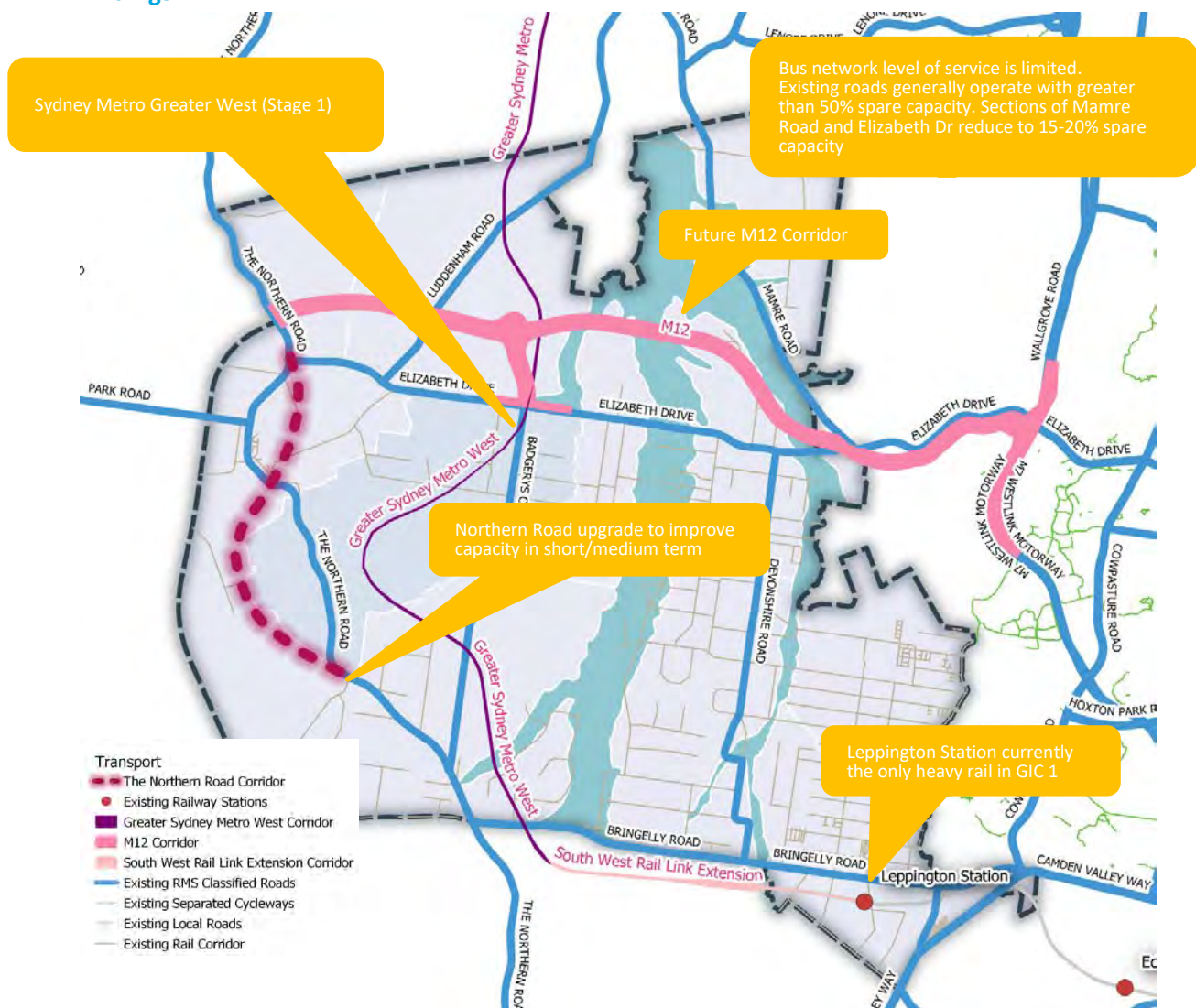


Figure 6: Transport Cluster - Existing Infrastructure

Overview

Rural/agricultural land uses, and long distances have led to private vehicles being the dominant transport mode with the existing roads having capacity to accommodate some of the forecast growth. The public transport system is very limited due to the rural nature of the GIC1 area. Limited local bus services provide connections to Liverpool town centre and Leppington station, which is terminus of both the T2 and T5 lines – the only rail services within the GIC1 area. Figure 6 shows the existing transport infrastructure in GIC1.

Roads

The road network in the GIC1 area is predominantly rural/suburban in nature and serves relatively long-distance trips to surrounding destinations. This network has capacity to accommodate some future growth, with most major roads having more than 50 per cent spare capacity. The exception are sections of Mamre Road (Bakers Lane to Elizabeth Dr), Luddenham Road, Elizabeth Drive (The Northern Road to Badgerys Creek Road) (15% - 20%) and parts of The Northern Road (5% - 10%).

Current performance of key roads in the GIC1 area provide a satisfactory level of service, with relatively high speed ratios of at least 85% of the posted speed limit and reliability above 90% reliability in the AM peak, providing efficient and consistent journeys.

Table 1 Current status of road projects

Road Name	Location	Scope	Scope Funded
Bringelly Road (Stage 2)	King St to The Northern Rd	Capacity and safety upgrades (4 lanes)	Delivery
The Northern Road (Stage 2)	Peter Brock Dr to Mersey Rd and Bringelly Road between The Old Northern Road and King Road	Capacity and safety upgrades	Delivery
The Northern Road (Stage 3)	Glenmore Parkway to Jamison Road	Capacity and safety upgrades	Delivery
The Northern Road (Stage 4)	Mersey Road to Eaton Road	Capacity and safety upgrades	Delivery
Elizabeth Drive (Stage 1)	M7 Motorway to Badgerys Creek	Capacity and safety upgrades (6 lanes)	Planning
Elizabeth Drive (Stage 2)	Badgerys Creek to The Northern Road	Capacity and safety upgrades (6 lanes)	Planning
Fifteenth Avenue	Cowpasture Road to Western Sydney Airport	Capacity and safety upgrades including bus priority investigations	Planning
M12 Motorway	M7 Mwy to The Northern Road	New road	Design
Mamre Road (Stage 1)	M4 to Erskine Park Rd	Capacity and safety upgrades	Planning
Mamre Road (Stage 2)	Erskine Park Rd to Kerrs Rd	Capacity and safety upgrades	Planning
Rickard Road	From Bringelly to Oran Park	Capacity and safety upgrades	Planning

Table 1 summarises the current committed, announced and planned road upgrades and new corridors in the GIC#1 area. It is noted that several the key road corridors which have been identified as critical traffic, freight and bus links in the GIC#1 area are currently only funded for planning only.

Figure 7 shows the status of projects (as at September 2018) which have or are being delivered through the \$3.6 billion Western Sydney Infrastructure Plan.

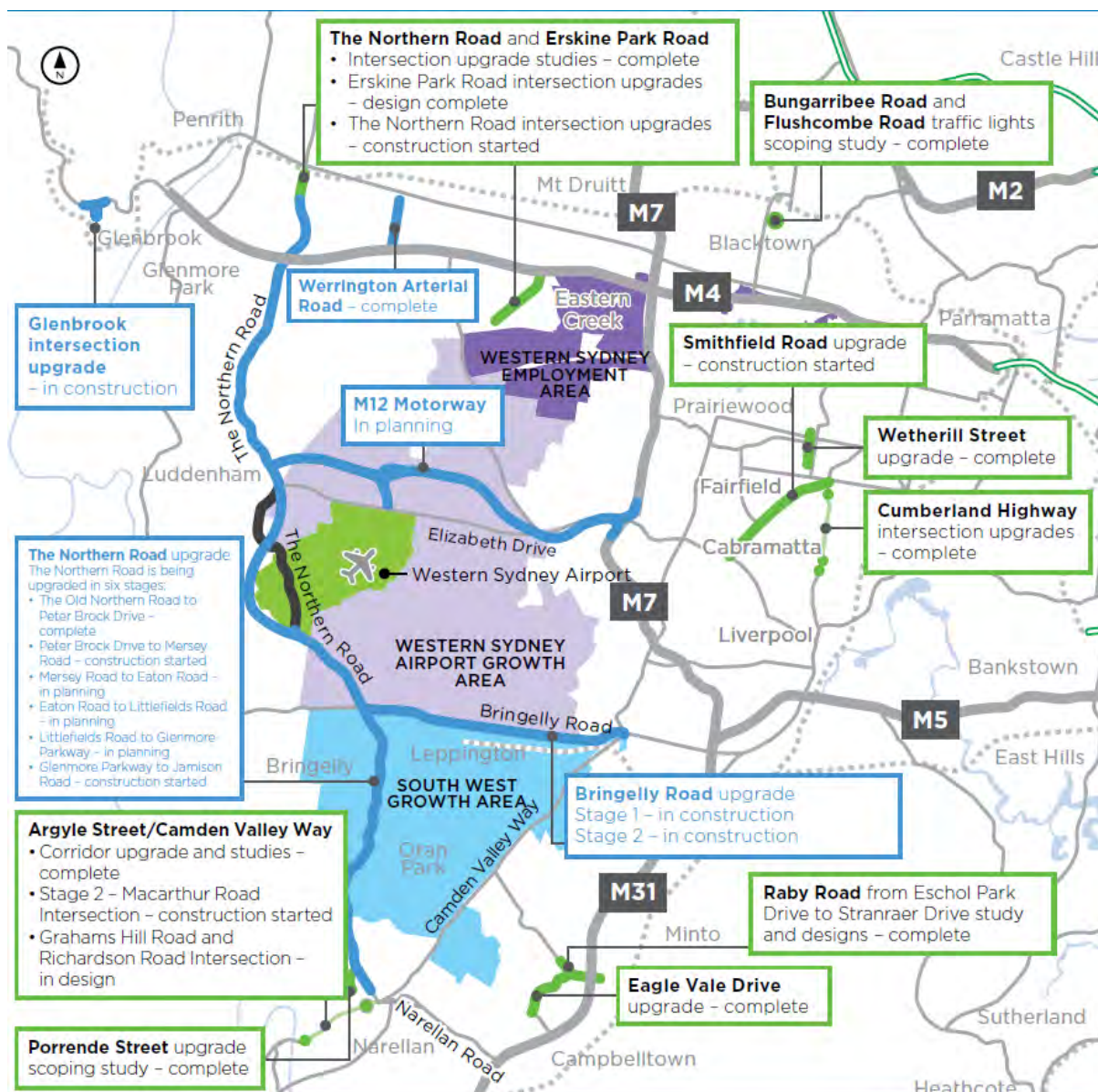


Figure 7: Transport Cluster – Western Sydney Infrastructure Plan

Future Corridors

Figure 8 shows the key Future Western Sydney Corridors. These include:

- M12 Motorway
- North South Rail Line corridor (Sydney Metro Greater West)
- Outer Sydney Orbital (OSO) corridor
- South West Rail Link extension corridor
- Western Sydney Freight Line (WSFL) corridor.

Alignment for the North South Rail Line corridor (Sydney Metro Greater West), South West Rail Link, and the M12 motorway are being refined as part of their current business case processes. The OSO and WSFL are being refined as part of current processes for statutory protection.

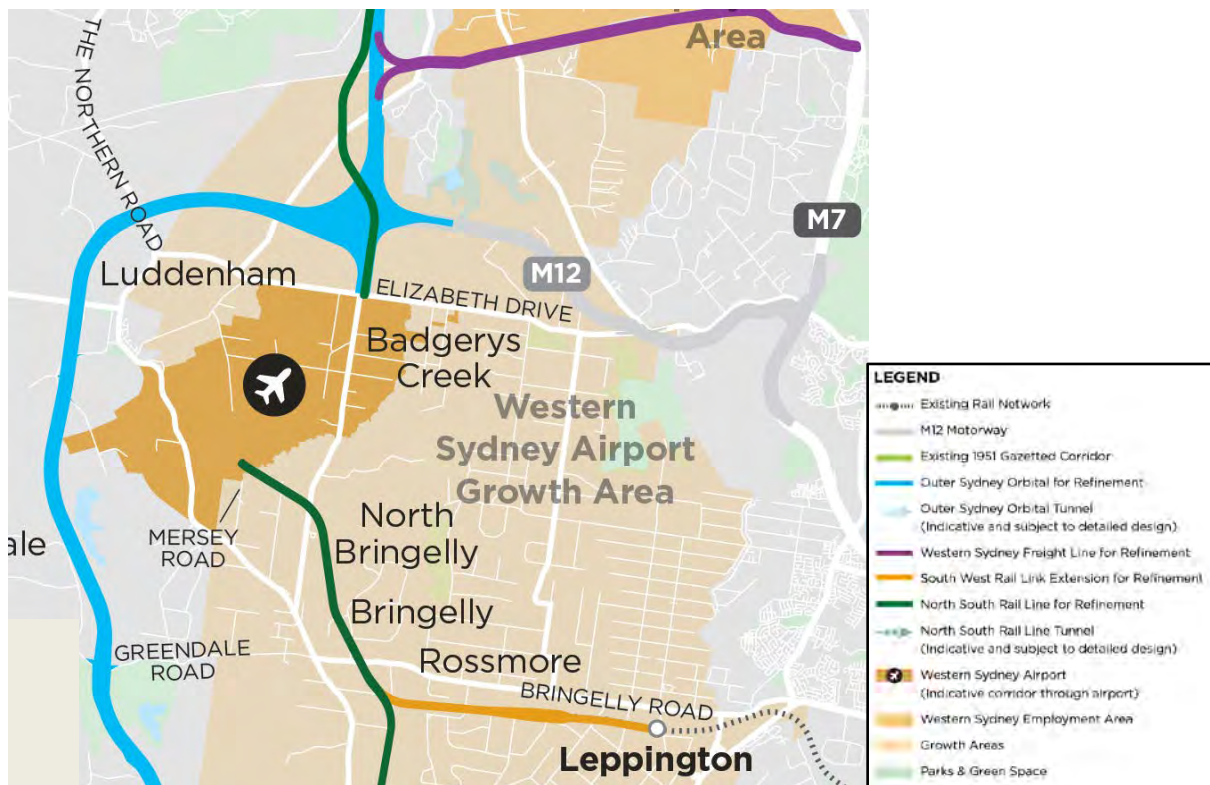


Figure 8: Transport Cluster – Future Western Sydney Corridors

Passenger Rail

Leppington station is in the GIC1 area and is the terminus of the Inner West and Leppington (T2) and Cumberland (T5) lines. It is well serviced with over 155 outbound services per weekday and 114 outbound services on weekends and public holidays. As the terminus, the frequency of inbound direction operates on a similar level of service as the outbound direction, at 15 to 30min headways. On a typical weekly AM peak, over 1590 passengers board rail services at Leppington Station, with 60% growth between 2016-2018. Patronage for the 2017/18 financial year was 33.3 million passengers for the T2 line and 6.6 million passengers for the T5 line.

The Leppington stabling yards are about two kilometres west of Leppington station. It has 10 roads and capacity for up to 20 eight-car train sets. The South West Rail Link extension to the Aerotropolis is being investigated by Transport for NSW as part of Integrated Transport for the Western Parkland City.

Metro Rail

There is no Metro Rail infrastructure in the GIC1 area. However, committed is the delivery of the Sydney Metro Greater West line from T1 St Mary's station to the Aerotropolis by 2026 for the opening of the airport. The project is currently subject to business case investigations with the route alignment and station locations yet to be confirmed. Investigations have been divided into two parts:

- Sydney Metro Greater West (Stage 1) – St Marys to Western Sydney Airport and Aerotropolis .
- Sydney Metro Greater West – full route investigations:
 - Tallawong/Schofields to St Mary's: to connect the North West line with Greater West line (Stage 1) at St Mary's.

- Aerotropolis to Macarthur/Campbelltown: to extend the Greater West line to the south.

The Greater Western Line (Stage 1) final business case is due to be completed by late 2019 and is expected to be operational by 2026. Figure 9 shows possible future rail connections.

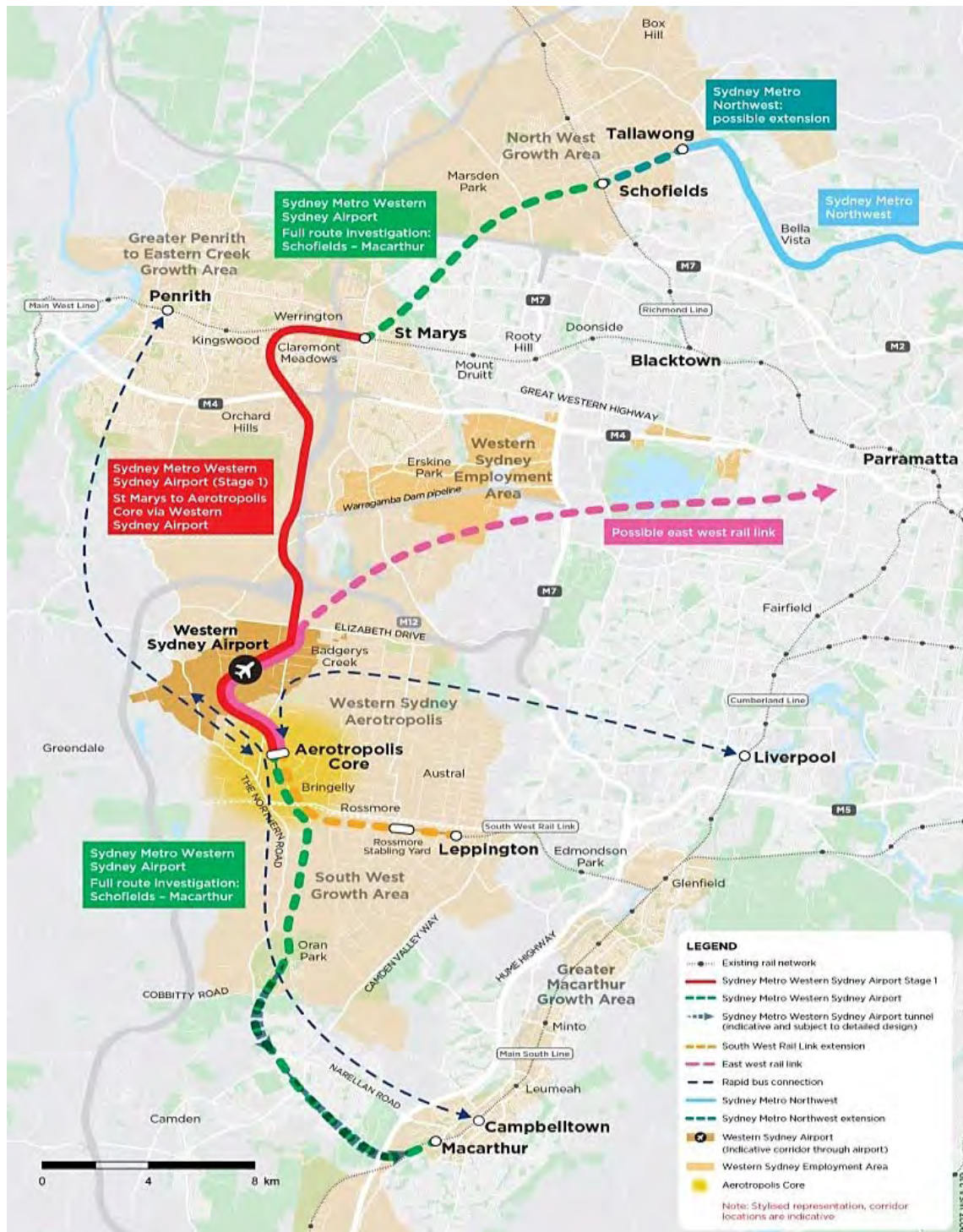


Figure 9: Transport Cluster – Future Rail Infrastructure

Bus

Table 2 shows the bus routes that service GIC1.

Table 2 Bus routes that service the GIC#1 area, their frequency and patronage

Route	Origin - Destination	Timetabled Travel Time	Average Daily Patronage (March 2018)	
			Weekday	Weekend
801	Badgerys Creek to Liverpool	87 minutes	44	-
841	Leppington Station to Narellan	45 minutes	357	72
855	Liverpool to Rutleigh Park via Austral and Leppington Station	74 minutes	199	49
856	Liverpool to Bringelly via Leppington Station	64 minutes	160	39
857	Narellan to Liverpool	55 minutes	321	54
858	Leppington Station to Oran Park	24 minutes	265	83
789	Penrith to Luddenham	30 - 41 minutes	17	-

These services provide relatively few services to Leppington station and Liverpool town centre for the emerging residential communities and existing rural residential communities within and to the south of the GIC1 area. The level of service is limited due to rural land use and low demand for bus services.

Future Transport Strategy 2056 establishes the concept of City Serving and Centre Serving corridors. City serving are higher density corridors with more frequent stopping patterns, while Centre Serving are higher density corridors that shape local decisions of residents and businesses. More specifically in Western Sydney, the Strategy identifies the need for infrastructure to support rapid and improved bus connections between key centres and the Western Sydney Airport, the Aerotropolis, and a Western Parkland City Bus Interchange.

Consistent with the City Deal commitment C2, three rapid bus services along City Serving corridors are being planned:

- Penrith to Western Sydney Airport via the Northern Road and Elizabeth Drive
- Liverpool to Western Sydney Airport via Fifteenth Avenue
- Campbelltown to Western Sydney Airport via Gregory Hills Drive and Jersey Road.

Other key Centre Serving corridors which may support bus services include:

- Mamre Road
- Elizabeth Drive
- Edmondson Avenue / Rickard Road
- Bringelly Road
- Luddenham Road.

Active Transport

There is limited cycling and walking infrastructure in the study area, with a shared path recently opened as part of Bringelly Road (Stage 1), and bike racks at Leppington station. Shared paths are being delivered as part of road upgrades under construction or planned, including Bringelly Rd (Stage 2), The Northern Road and the M12 motorway.

Freight Network

There is no dedicated infrastructure in the GIC1 area. However, the freight network surrounding the GIC1 area includes major roads (M7 Westlink, Hume Motorway and M4/Great Western Highway) and rail (Southern Sydney Freight Line and Main West Line). Other road freight corridors include Old Wallgrove Road/Lenore Drive and Mamre Road.

3.1.2. Water and Energy

Assessment

The baseline utilities assessments are consistent with the understanding of projected growth and known major projects/developments. While appropriate for current planning purposes, they will require revision as detail around future land uses and timing become available.

Sydney Water's ongoing studies will ultimately dictate the methodology for rollout of short and long-term integrated solutions. This assessment should be revisited as further strategies become available.

Metrics

Endeavour Energy has undertaken an assessment of the level of service and available residual capacity using a partial network failure scenario. The forecast load assessment is based on demand forecasts and known projects in the region to 2035.

Sydney Water has used its Urban Growth Intelligence forecasts, which are sourced from its own data and data provided by the Department of Planning and Environment. The report provides qualitative assessment of existing and planned drinking water, recycled water, wastewater and stormwater networks. Recommendations on committed and planned projects are also outlined in the study.

Findings

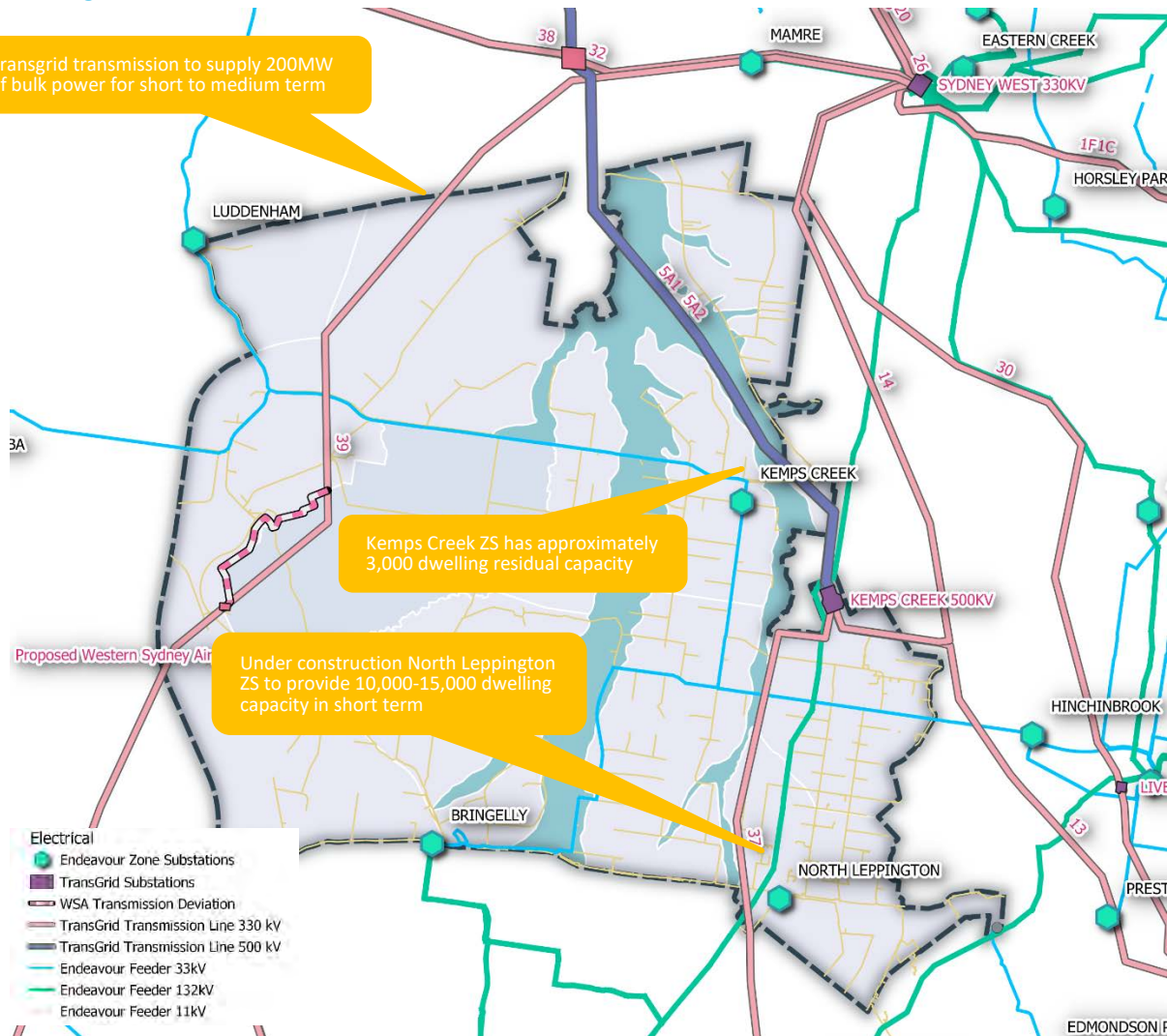


Figure 10: Energy - Existing Infrastructure (Transgrid and Endeavour Energy)

Transgrid

TransGrid operates the major high voltage electricity transmission networks in NSW and the ACT, connecting generators, distributors and major end users. It works collaboratively with distributors such as Endeavour Energy and Ausgrid in Sydney to supply them with bulk electricity. Transgrid's assets typically consist of high voltage transmission lines and bulk supply substations. Figure 10 outlines the seven major Transgrid assets within the GIC1 area, all of which are above ground and include:

- Kemps Creek 500/300kV substation north of Austral Precinct is one of the few 500kV assets within the Greater Sydney and Hunter Region and is unlikely to move
- Associated with the Kemps Creek Substation there are five high voltage transmission lines that impact the Precinct
- Kemps Creek to Macarthur 330kV transmission line traverses the western edge of the Austral and Leppington North Precincts but generally follows the creek alignment.
- The Kemps Creek to South Sydney and Kemps Creek to Sydney North 330kV transmission lines traverse west-east along the northern portion of Austral in a

combined corridor. Current land use planning has considered these in the Indicative Layout Plan (ILP) for Austral.

- Two 500kV transmission lines from Erarang to Kemps Creek pass through the GIC1 area between Mamre Road and Kemps Creek Precincts. They are generally located within flood liable land.
- The 330kV Bannaby to Sydney West transmission line passes through the Agriculture/Agribusiness, Western Sydney Airport and Northern Gateway Precincts. A deviation project to relocate the Western Sydney Airport segment around the future airport site is underway. This section will be run underground.

Transgrid has confirmed there is capacity along the 330kV Sydney West to Bannaby transmission line to cater for load growth of 200MW, which will provide bulk supply to the area beyond 2030. Longer term additional supply can be generated with the creation of a new bulk supply point either beneath the existing Sydney West to Bannaby 330 kV transmission line (most likely towards the Airport) or augmentation to the Kemps Creek substation. This could generate an additional 900MW of power and create a new 132kV injection point for Endeavour Energy.

In addition to the above, Transgrid will require a 500kV transmission line to be built to connect the Southern Tablelands with Western Sydney. This is likely to require a 70m wide easement. Its alignment has not been determined but is expected to traverse the western boundary of the Agriculture/Agribusiness Precinct. The land required for the 500kV transmission line and potential bulk supply point should be considered in planning for future land use.

Endeavour Energy

Previously, the land was mainly used for agriculture, with the existing electricity infrastructure commensurate with low density electrical load associated with this type of activity. Similarly, demand in the region has been relatively minor with existing networks covering sprawling catchment areas. While 11kV feeders can be established, existing capacity in distribution feeders and zone substations is the limiting factor. Endeavour Energy only has two zone substations within the GIC1 area and supplies the remaining areas of the GIC through zone substations outside the GIC. Table 3 outlines the zone substations that service GIC1 and their available capacities at the time of writing this report. One MVA equates to approximately 250 low density homes.

Table 3: Existing Zone Substations - Available Capacity (Endeavour)

Zone Substation	Available Capacity (MVA)	Equivalent dwelling capacity
Bringelly ZS	2.1	525
Luddenham ZS	6.7	1,675
Kemps Creek ZS	12.3	3,075
Hinchinbrook ZS	6.8	1,700
South Leppington	0	0
Prestons	20	5,000

However, analysis undertaken by Endeavour Energy indicated that the limiting factor for the region is the 33kV feeder distribution network and not zone substation capacities. The 33kV feeder residual capacity when considering network redundancies is 7.7MVA, which loosely correlates with approximately 2,000 low density residential dwellings. As such there is very limited capacity to accommodate growth of any significance without upgrades.

Endeavour Energy has planned several projects to accommodate the short to medium-term growth. The projects are limited to the current understanding of future growth in the region and known developments such as the WSA, Metro Extension, Science Park, Elizabeth Drive Developments and Agribusiness Precinct. Excluding Austral and Leppington, Endeavour Energy expects an additional load of 160MVA by 2036 and has based its strategy on this expected growth.

Figure 11 below outlines the medium-term infrastructure required to accommodate the projects and growth, with Stage 1 works including:

- 132kV feeder supply to WSA before 2024;
- Establishment of zone substations at the Sydney Science Park, North of Elizabeth Drive, North Leppington (now underway) and Austral (to match growth patterns); and
- Establishment of a new bulk supply point in coordination with Transgrid.

Short-term growth in Austral and Leppington North is not expected to be limited by electricity supply and Endeavour Energy is responding to early growth in the Northern gateway and Science Park regions. It should be noted that when planning for short term growth, creation of a new zone substation (ZS) typically takes between three and five years.

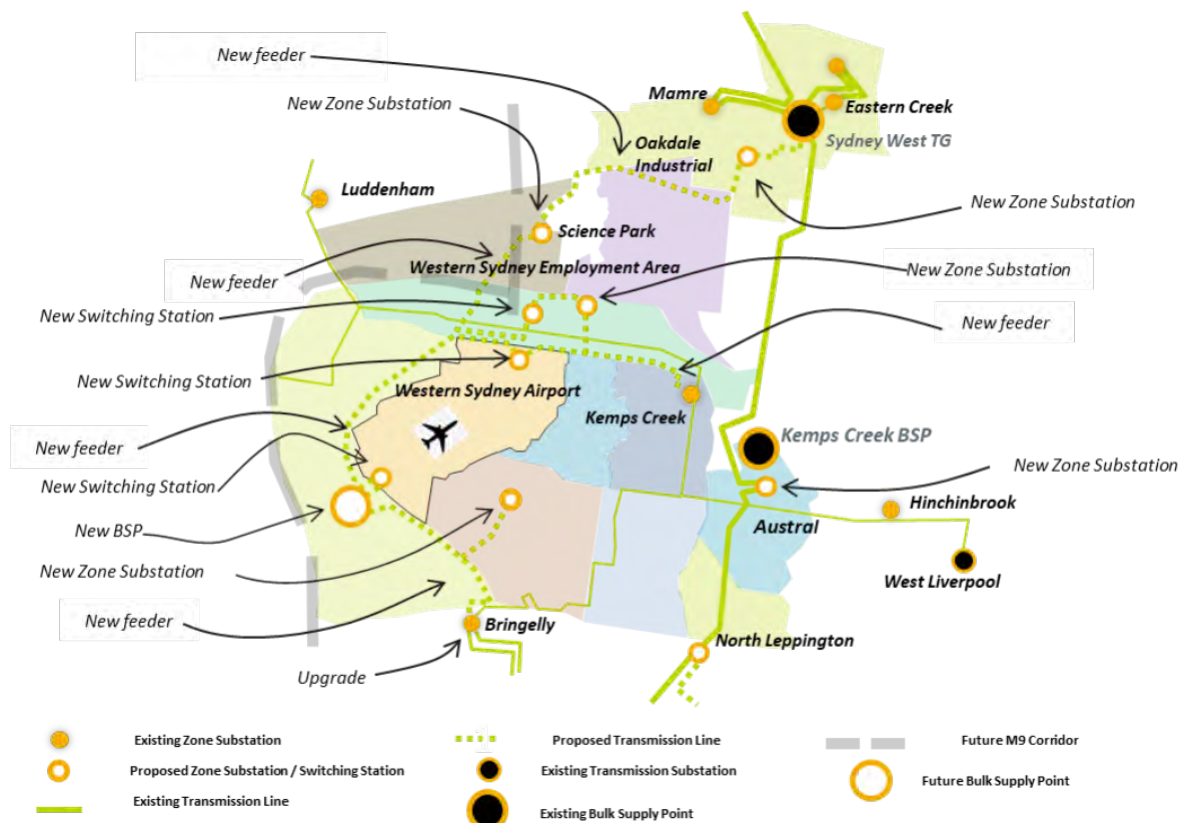


Figure 11: Medium Term Electrical Infrastructure – (Endeavour Energy)

Sydney Water

The GIC1 area is largely unserved for wastewater and drinking water with considerable investment required to support the projected growth in the region. Sydney Water is considering Integrated Water Cycle Management options in the area.

Current Policy and Planning

Sydney Water is currently undertaking a number of strategic and detailed options planning activities for its water and wastewater network, including temporary works to accommodate existing known growth. These are summarised in Table 4.

Table 4: Current Planning and Strategies - (Sydney Water)

Strategic Planning Study	Status	Growth Precincts	Forecast assessed
Western Sydney Regional Master Plan	In progress – Completion mid 2019	WSAGA, SWGA, NWGA and GPEC	2018 DPE forecast (up to 2056)
Water Master Plan	In progress - Completion 2019	Greater Sydney and Illawarra	Strategic pathways for water resilience
WSAGA and SWGA Sub-Regional Planning	Recently commenced – Completion early 2020	WSA (all Precincts) and SWGA (all Precincts)	All products, 2019 UGI* Forecast
Malabar System Plan Review	In progress – Completion early 2020	Consideration of WSA (all Precincts) SWGA (all Precincts)	Wastewater transfer potential impacts 2018 UGI
Cecil Park Water Supply Growth Servicing Investment Plan (GSIP)	Completed 2017	WSA (all Precincts) and SWGA (partial)	2016 UGI forecast
South West Growth Centre Water Strategy Review	Completed 2013	Precincts supplied by Prospect South System	Drinking water only 2011 DPE forecast
South West Priority Growth Area Wastewater Management Strategy	Completed 2016	SWGA	Wastewater only 2015 UGI forecast
South West Growth Centre Area Plan	Completed 2007	SWGA and WSA	Wastewater only
South Creek flood model	Model function ready for test scenarios	WSA, SWGA, GPEC	Land use impacts
South Creek Urban Streamflow Impact Assessment (USIA)	Phase 1 completed Phase 2 part of SWGA Sub-Regional Plan	5 South Creek sites	Baseline geomorphology
Options Planning Study	Status	Growth Precincts	Forecast assessed
Upper South Creek Wastewater Options Assessment	In progress - Completion September 2019	WSAGA (all Precincts) and SWGA (partial)	Wastewater only, 2019 UGI forecast
WSAGA Drinking Water Stage 1 Options	In progress – Completion mid 2019	WSA (all Precincts incl. construction)	2018 UGI ² forecast (up to 2022)
Decentralised WRP Options Assessment	In progress	Growth Precincts <10yr timeframe	Temporary (0-10yr) wastewater servicing

Existing Water Services

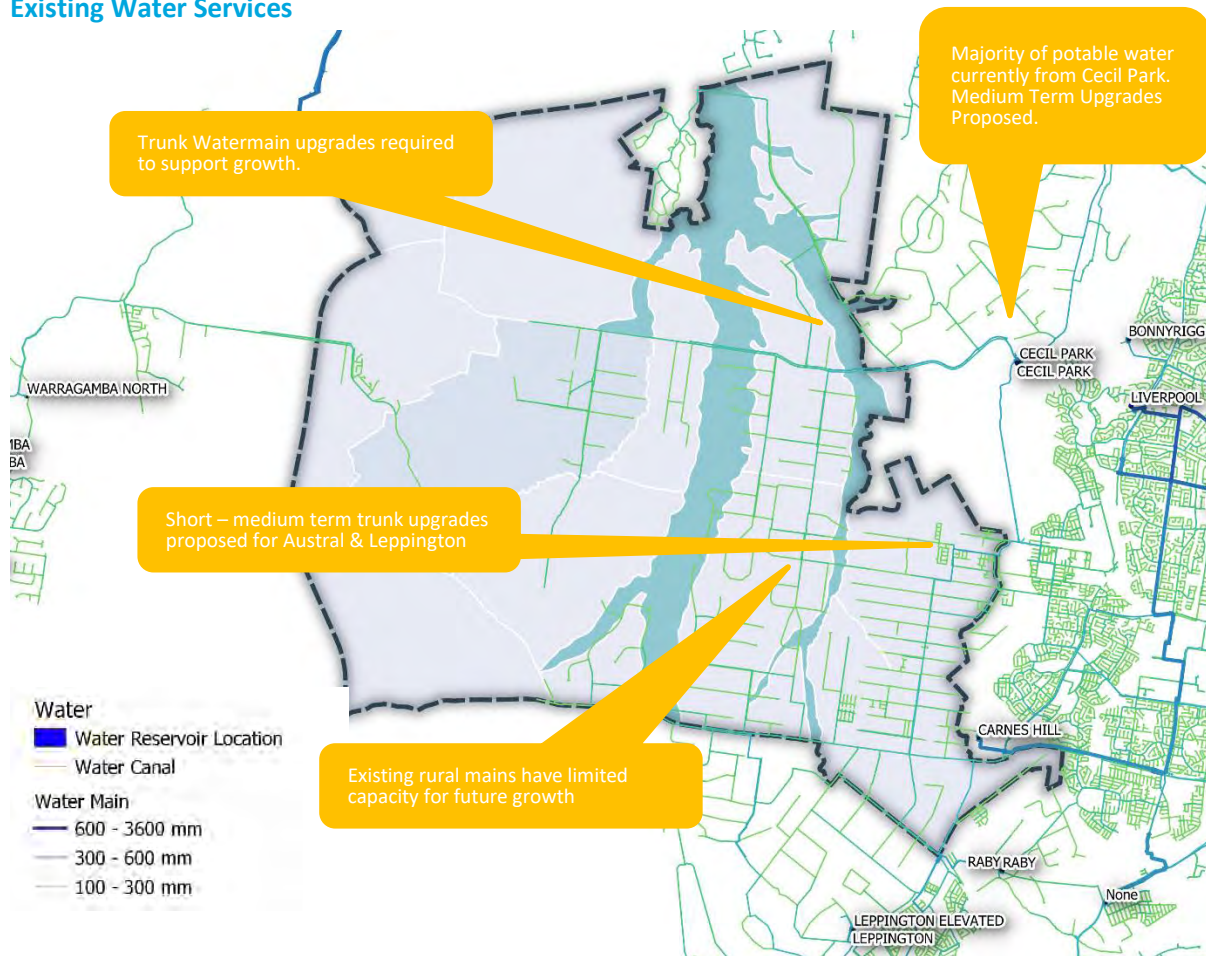


Figure 12: Drinking Water - Existing Infrastructure (Sydney Water)

The WSAGA is serviced by four water supply zones:

- Cecil Park (part of Prospect South delivery system)
- Leppington (part of Macarthur delivery system)
- Raby (part of Macarthur delivery system)
- Warragamba

Most of the forecast growth (about 70 per cent) falls within the Cecil Park water supply zone, which is supplied from Prospect Reservoir (seven kilometres north east).

The water supply system has no capacity to service development within the WSAGA and upgrades are in progress to service growth until 2021. Staged delivery of trunk water assets is required from 2021. The current drinking water reticulation is designed to service a largely rural population and cannot be augmented to support growth (Figure 12). Forecast upgrades are at various stages of the planning and design process. Current water upgrades include:

- Stage 1 trunk drinking water assets to provide 10ML of water for construction of the Airport. Expected delivery 2022.
- SWGA Eastern Front: New 60ML reservoir at Liverpool and associated new 900/1200mm main and pumping station to transfer additional drinking water to Cecil Park reservoir. Expected delivery 2020.
- South Western front (Package 2A): As an extension to the Oran park system, a 600mm main will extend along the Northern Road to the Aerotropolis Core. Expected delivery mid-2020.

Cecil Park water supply zone is the main zone for the WSAGA GIC area. Growth forecast in the short term has already triggered major capacity upgrades as outlined in the baseline assessment. The WSAGA and adjacent Precincts will be subject to supply rezoning as new assets are built. Forecasts for the area have significantly increased since the 2017 GSIP (growth servicing investment plans) so this is subject to change through our sub-regional planning process. Any growth that could impact the system capacity (regardless of whether it is contained within the nominated WSAGA boundary) will be considered by this planning work (due for completion in late 2019).

These works, along with reticulation amplifications, are expected to support initial growth at WSA, Aerotropolis Core and potentially the Northern Gateway Precincts. An additional \$300 million in upgrade works are also expected before 2026 to accommodate growth in the GIC1 area.

There are no recycled water assets in the GIC1 area. However, Sydney Water is exploring options as part of the Western Sydney Regional Masterplan.

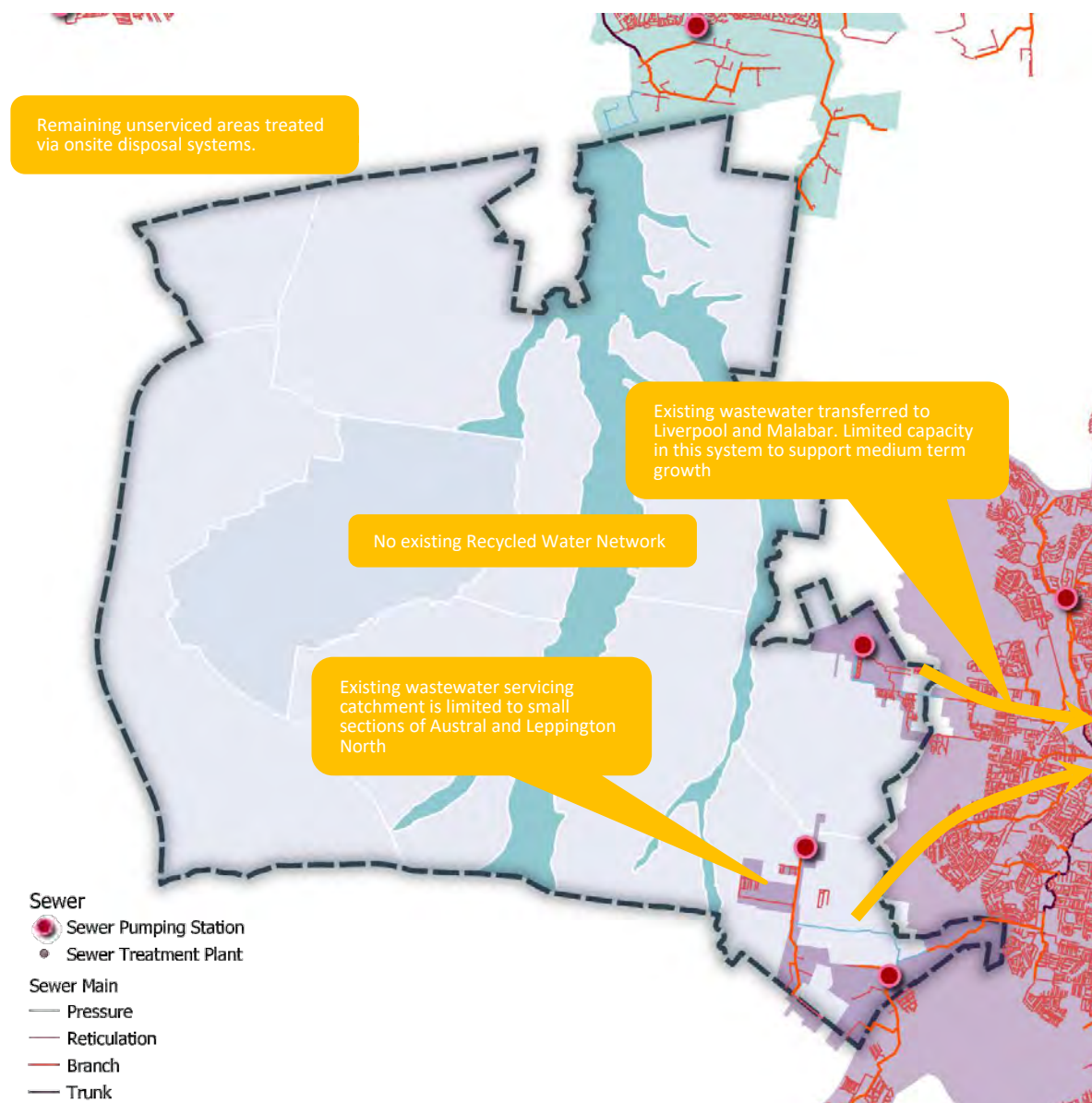


Figure 13: Wastewater - Existing Infrastructure (Sydney Water)

Sydney Water only provides wastewater services to the Austral and Leppington North Precincts in the GIC1 area. There are no assets in the remaining Precincts, with all areas managed through individual on-site disposal systems (Figure 13). Significant investment and environmental approvals are required for the establishment of new facilities in the region.

The Austral and Leppington North systems have an interim connection to the Malabar System. However, this is approaching capacity. Strategies include transferring the wastewater to a new treatment facility to be built in the Upper South Creek catchment by 2026. An additional pumping station and associated gravity mains are being designed to unlock the remainder of the Austral and Leppington North Precincts, with an expected completion date of 2022.

New developments in the Aerotropolis will ultimately be serviced by a new treatment facility in Upper South Creek (Figure 14) at an estimated cost of \$400-500 million. Excess discharge from the water recycling facility that cannot be recycled or reused will be transferred to the Nepean River. This facility is planned for 2026 and Sydney Water is exploring options for temporary interim decentralised solutions implemented by developers. These works will open two growth fronts on the Eastern and Western portions of the Precinct.

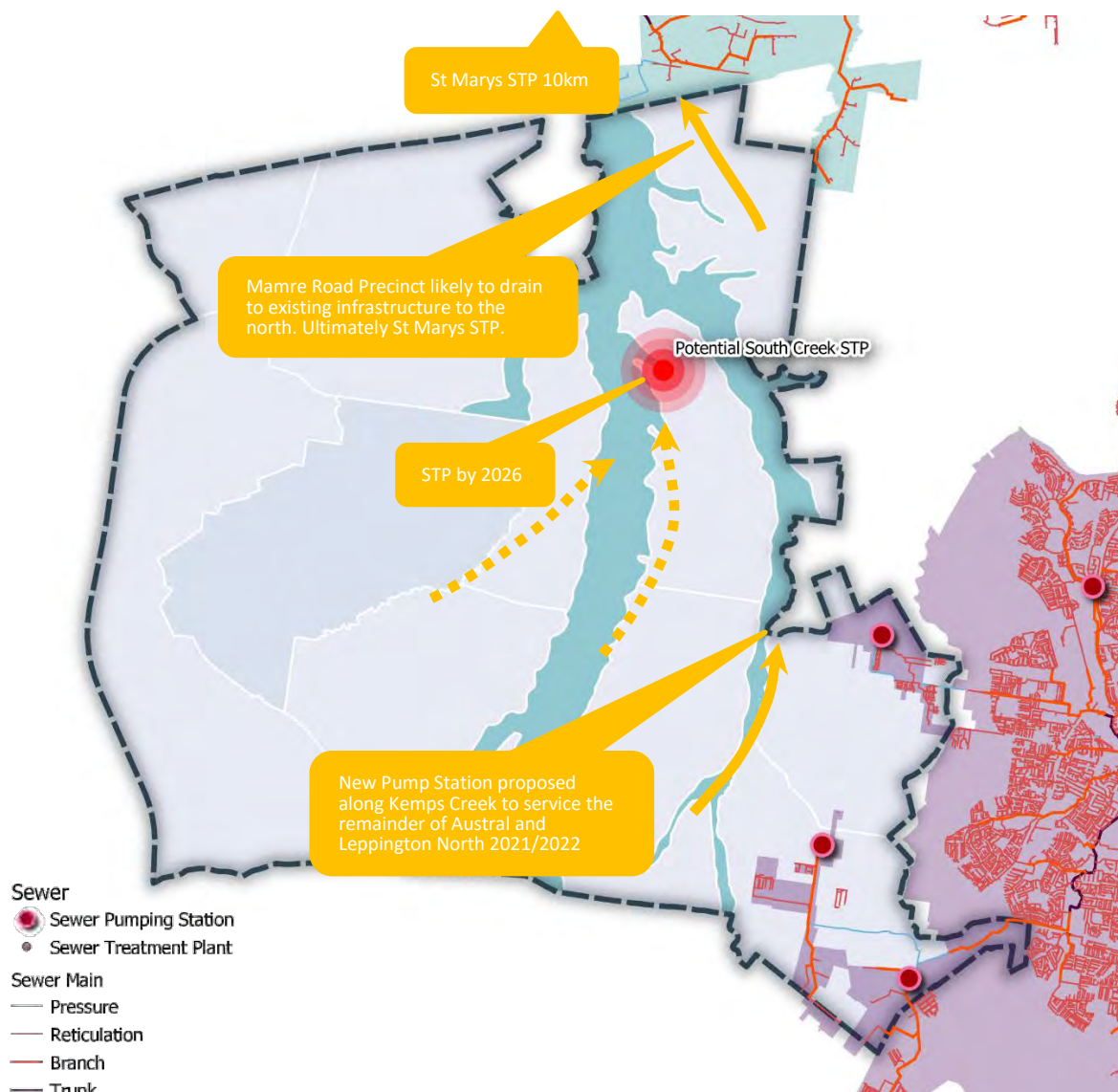


Figure 14: Potential Location of South Creek STP - (Sydney Water)

Jemena

Assessment

Jemena supplies gas to residential, industrial and commercial facilities in the GIC1 area. Its gas supply network consists of primary regulating stations (PRS), secondary mains, secondary regulating sets (SRS) and medium pressure mains.

There are two PRS facilities supplying gas to the GIC1 area - Horsley Park and West Hoxton. There are also SRS facilities in Leppington and Badgerys Creek (Figure 15).

Secondary and medium pressure mains are sparsely distributed around the GIC1 area due to the existing low intensity land use.

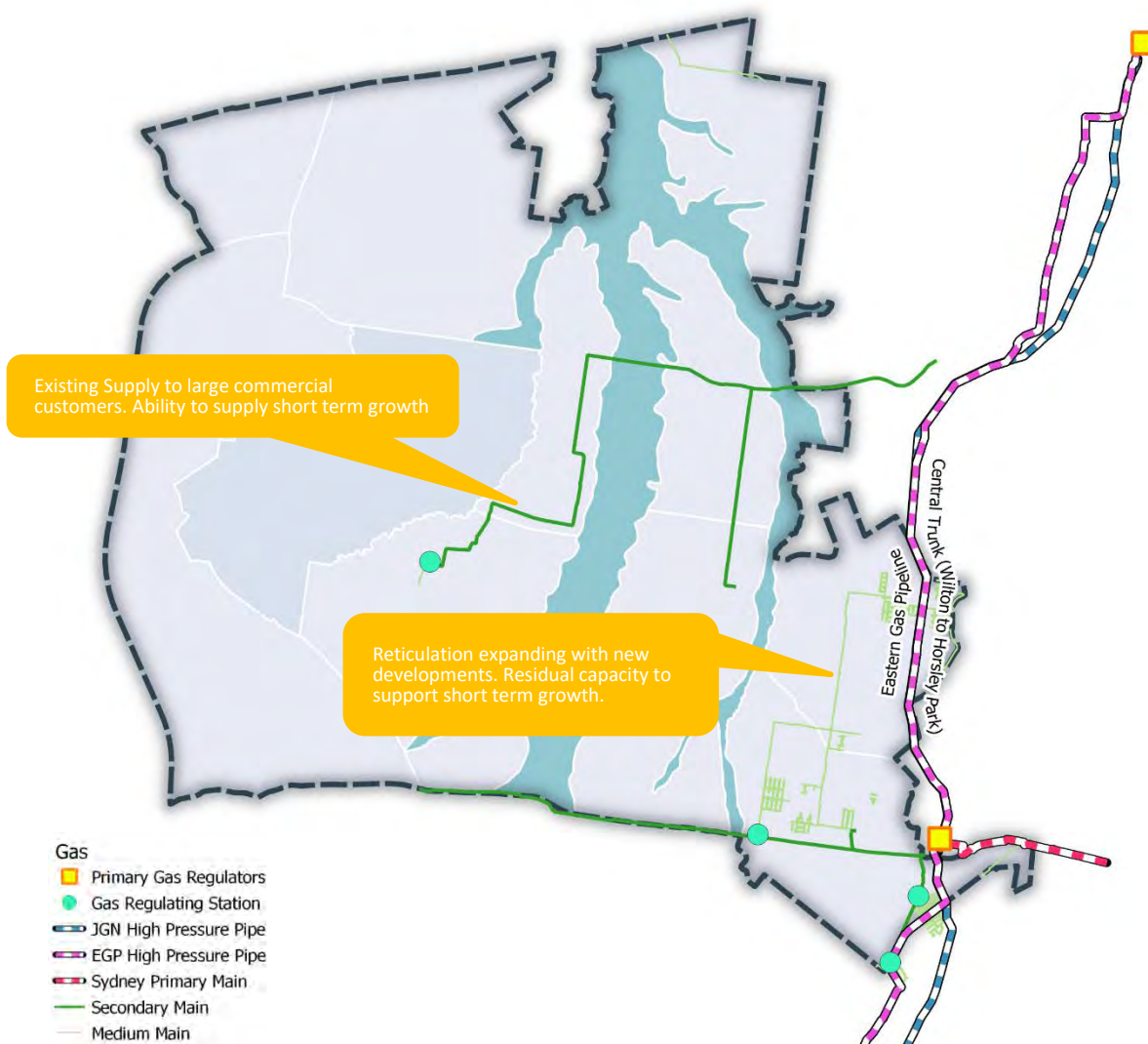


Figure 15 Gas - Existing Infrastructure (Jemena)

Metrics

Jemena has undertaken an assessment of the level of service and available residual capacity including:

- Analysis of infrastructure
- Analysis of future prospects
- Modelling and validation of current infrastructure
- Forecast of future prospects augmented through modelling.

Inputs to the planning process include performance data from the network, gas load forecasts from developers and prospective users in the area, and internal forecasting.

Jemena has provided a qualitative assessment of existing and planned gas networks and recommendations on committed and planned projects.

Findings



Figure 16: High level Growth Plan for Aerotropolis – (Jemena)

The gas network has minimal residual capacity. Overall, the infrastructure in the Austral and Leppington North Precinct has capacity for organic growth over the next few years, but growth in more distant Precincts or large users in the GIC1 area will require extensions in the secondary network.

Jemena has devised a strategy for the short to medium term including:

- Extending the secondary mains network along Elizabeth Drive and Luddenham Road to supply the Airport and the Northern Gateway Precinct
- Connecting the existing secondary network in Bringelly, providing capacity and reliability of supply for the Aerotropolis Core Precinct, Rossmore and Austral

- SRS and medium pressure networks to be built around the Northern Gateway Precinct and the Aerotropolis Core to supply residential and light commercial areas.

Timing for each of these network extensions is dependent on confirmed users, their location, gas demand and ongoing performance of the network. Figure 16 shows a high-level Growth Plan for GIC1.

The planned infrastructure as shown above will cater for growth in the next 10 years, depending on the actual gas loads and rate of connection of commercial/residential users. However, there will be a requirement of additional SRSs to supply downstream networks towards residential and light commercial areas; their location will be dependent on detailed design for the area once more details are known.

3.1.3. Green Infrastructure Baseline Infrastructure and Service Assessment

Assessment

The Green Infrastructure assessment includes analysis on the provision of passive and active open space, tree canopy, bushland, waterways and green grid corridors. The following definitions were used for the assessment:

- Passive open space - land set aside for parks, gardens, linear corridors, conservation bushland and nature reserves. These areas are made available for recreation, play and unstructured physical activity. (Greater Sydney Public Open Space Audit, GSC)
- Active open space - land set aside for the primary purpose of formal outdoor sports for the community. It supports team sports, training and competition and typically features sports facilities such as playing fields, change rooms, grandstand and car parks. (Greater Sydney Public Open Space Audit, GSC)
- Private open space – land used for sporting or recreational use, typically associated with sporting clubs or privately-run sporting or recreation facilities.
- Urban Canopy and Green Ground Cover - canopy trees (over three metres), shrubs and grass on public and private land in urban areas. (Office of Environment and Heritage Urban Vegetation Cover dataset, 2016)
- Urban Bushland - remnant vegetation on public or private land which is either a remainder of the natural vegetation of the land or, if altered, is representative of the structure and floristics of the natural vegetation, and therefore not including all grasslands.
- Waterways - streams, riparian corridors and water bodies including wetlands, chain of ponds, dams and lakes. The assessment was undertaken jointly by the Office of Environment and Heritage and the Commission.

Metrics

As the GIC area grows and transitions to low and medium density residential areas, the provision and accessibility of public space should be improved.

The rezoning of the Austral and Leppington North Precincts includes areas rezoned for open space. Provision of public space in this Precinct was determined using a metric of 2.83 hectares per 1,000 people.

The NSW Government has set a target to achieve 40 per cent urban tree canopy across the Greater Sydney Region by 2036. The Office of the Government Architect has broken this into three urban conditions:

- minimum 15 per cent tree canopy cover in CBD areas
- minimum 25 per cent tree canopy cover in urban residential (medium to high-density) and light commercial areas
- minimum 40 per cent tree canopy cover in suburban areas

Findings

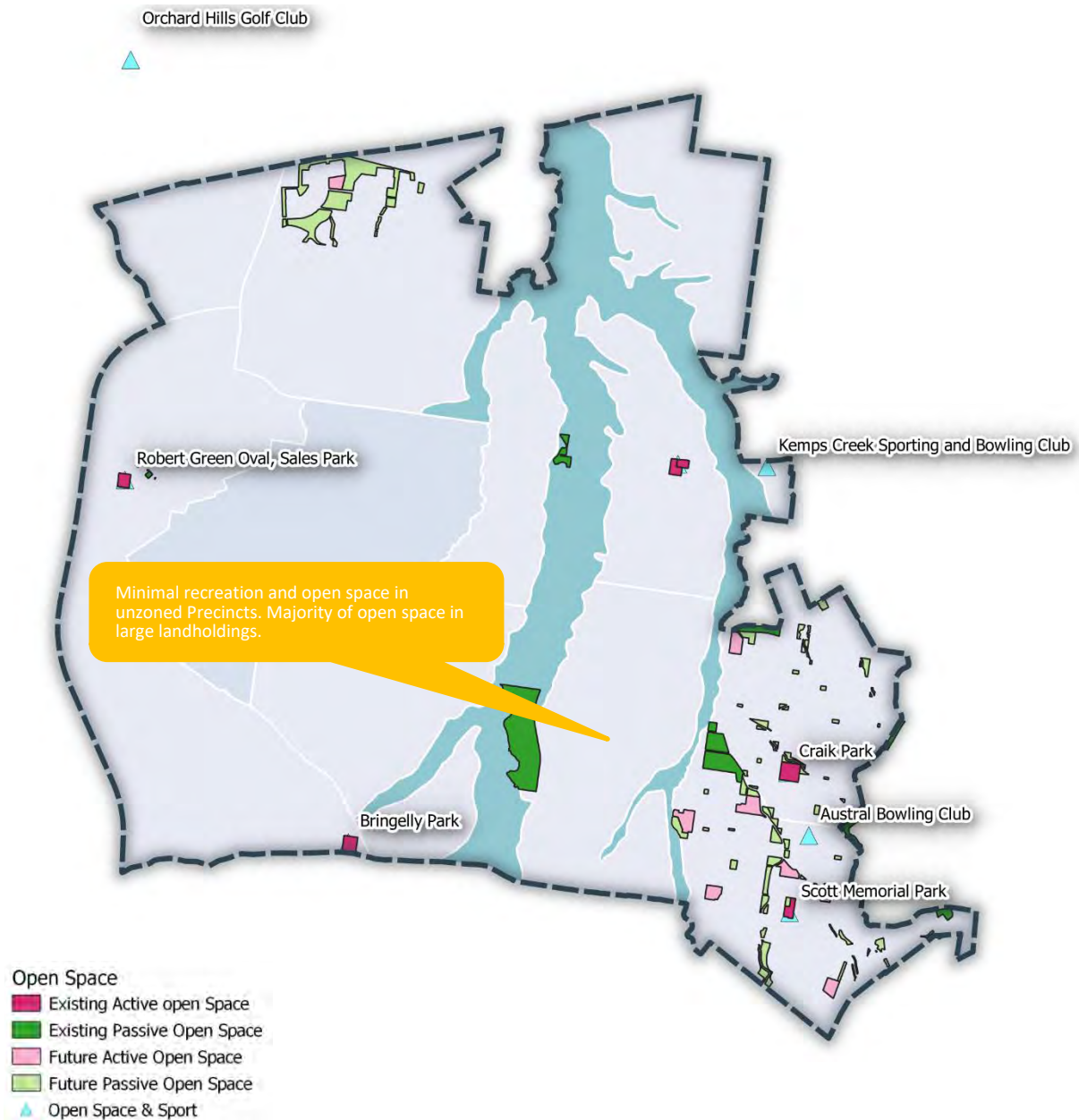


Figure 17: Green Infrastructure – (OEH)

Passive Open Space

There are 323 hectares of open space zoned in the GIC1. Of this, 142 hectares have been identified as passive open space. This is mostly contained in large land parcels, is predominantly areas of bushland and is not well distributed across the GIC area. Some of this land may include areas of high environmental value which may not be suitable for use as passive open space.

There is little formalised passive and active public open space in GIC1, which reflects low population density and rural land use zoning. In residential areas, including Austral and Leppington North Precincts, there is a greater provision of areas zoned for open space, which is better distributed

across the Precinct. Data showing the visitation and use of passive open space is not available. Figure 17 shows areas of passive and active open space, and areas zoned for recreation in the future.

Active Open Space

Analysis by the Office of Sport showed there are 31.6 hectares of active space in GIC1. All facilities identified are outdoors. Two facilities, the Austral Bowling Club and the Kemps Creek Sporting and Bowling Club, were identified as private open space. Table 5 outlines the sporting facilities in GIC1 and this table corresponds to Figure 17.

Table 5: Facilities in GIC1 provided by the Office of Sport

Site Name	Street Address	Facilities
Austral Bowling Club	Cnr Eighth and Edmondson avenues, Austral	2 lawn bowls greens, which may be in private ownership
Bill Anderson Park	1662 Elizabeth Drive, Kemps Creek	2 full size soccer fields plus one mod/mini
Bringelly Park	5-7 Greendale Road, Bringelly	2 soccer fields and 2 netball courts
Craik Park	Eleventh Avenue, Austral	1 playing field used for Athletics, cricket, rugby league and 2 tennis courts
Kemps Creek Sporting and Bowling Club	1490 Elizabeth Drive, Cecil Park	1 playing field, 2 lawn bowls greens, which may be in private ownership
Robert Green Oval, Sales Park	Roots Avenue, Luddenham	1 cricket field
Scott Memorial Park	380-390 Bringelly Road, Austral	2 playing fields used for soccer and cricket, 1 netball court

Capacity analysis completed for little athletics, netball and softball shows that while there are few facilities, these are not at capacity and there is potential to accommodate growth. Hockey and Oztag facilities in the District are at medium or high capacity and have a reduced potential for growth.

Canopy Cover

The urban canopy cover for GIC1, using trees of more than three metres, is 10.6 per cent. This is well below the NSW Government target but reflects the fragmented nature of bushland and vegetation cover across the GIC area and the predominantly rural/agricultural land uses. Figure 18 shows canopy cover across GIC1.

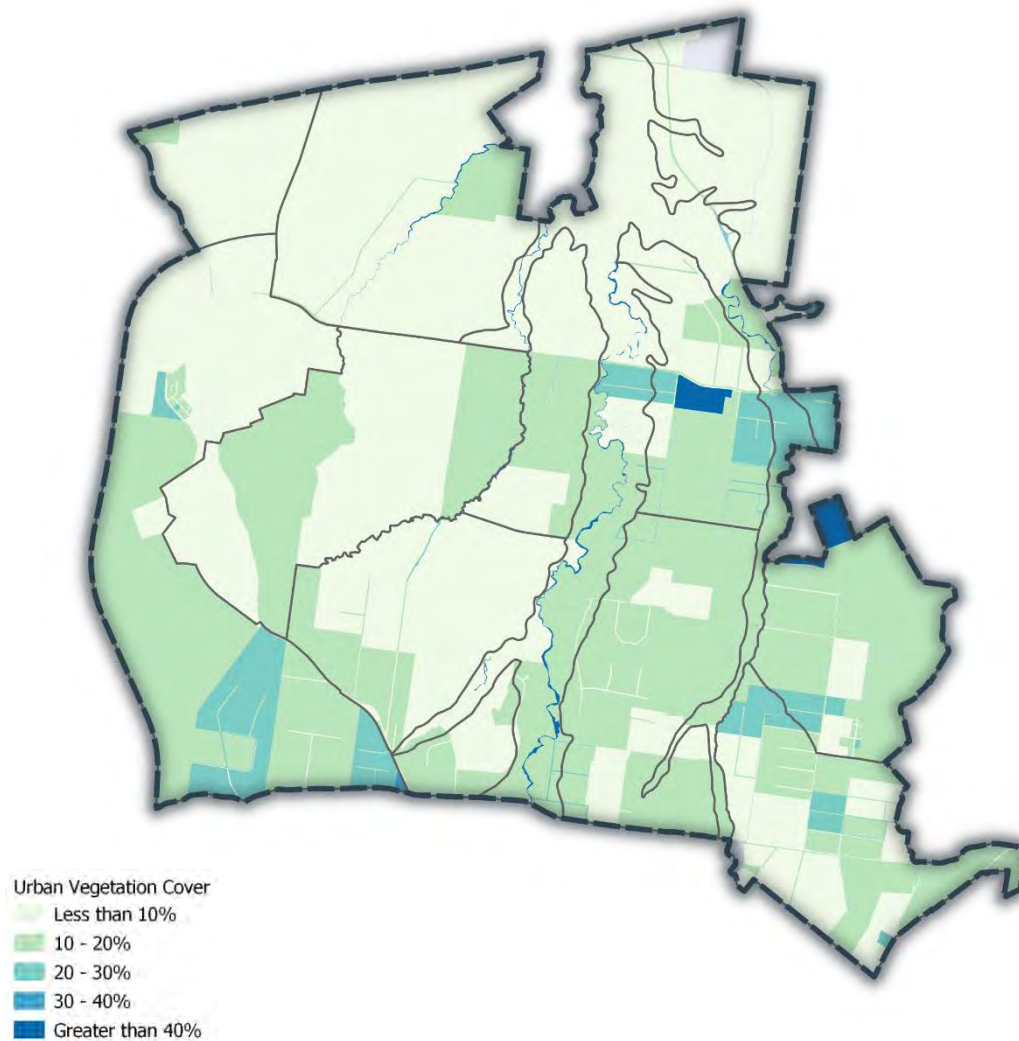


Figure 18: Existing Canopy Cover in GIC1

Bushland

There were 4,182 hectares of bushland on public and private land, covering approximately 28 per cent of the GIC area.

Work completed by the Office of Environment and Heritage (OEH) shows there is a network of riparian vegetation corridors, but bushland and vegetation cover throughout the GIC area is fragmented and there is a lack of connected corridors.

The entire GIC area is subject to assessment under the strategic biocertification process and will be considered in the Cumberland Plain Conservation Plan. This process will determine places that should be conserved for biodiversity value.

Once complete the biodiversity certification of land in GIC1 under *the Biodiversity Conservation Act 2016* will identify areas of high environmental value and direct programs and projects. It is likely that the entire GIC1 will have been through the bio certification process within 12 months.

This is designed to ensure biodiversity conservation outcomes on the Cumberland Plain and appropriate offsetting to avoid direct impacts on biodiversity in the GIC area. Figure 19 shows the urban bushland, green grid links and waterways in GIC1.

Green Grid links

The assessment identified a network of indicative desire lines that will be subject to further refinement. No formal agreements associated with green grid on private land are known to exist. Approximately three kilometres of green grid corridors identified in the Western City District Plan are in government ownership.

Green grid outcomes may be easier to achieve on publicly owned land.

Waterways

There are 1,993 hectares of waterways identified in the GIC, covering 13.3 per cent of the area.

South Creek and its tributaries are in a degraded condition, with high pollution levels in urban areas and downstream reaches, and deterioration in aquatic and riparian habitats. Challenges include additional volumes of water needed to support the urban tree canopy, maintain shaded, open and green spaces and support water features in the landscape.

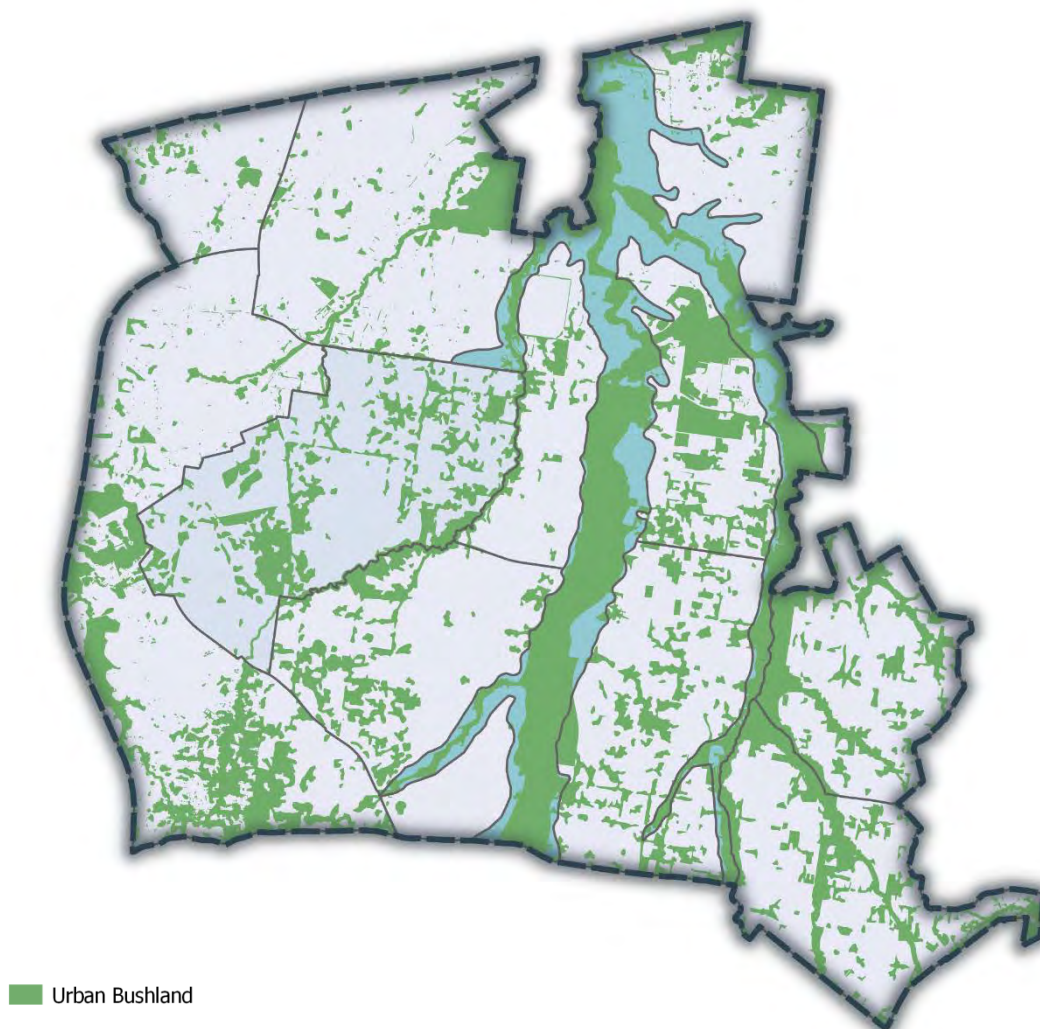


Figure 19: Urban Bushland in GIC1

Committed, announced and planned investment

There are various programs and initiatives that will improve the quality of public passive and active open space and vegetation in the GIC area. These include:

1. Strategic biocertification under the Biodiversity Conservation Act

The Department of Planning and Environment is preparing new proposed strategic biodiversity certification which will include land within the GIC which is not certified.

Where land is subject to existing certification, development can occur without threatened species assessment, though this does not prevent the vegetation from being retained. In non-certified areas, the existing native vegetation is required to be retained and conserved in perpetuity. The proposed certification has not yet been exhibited or approved but will inform future land use.

2. Five Million Trees Program

This program was created to improve canopy cover across Greater Sydney. It aims to plant five million trees, increase canopy cover to 40 per cent across Sydney and expand cover in suburbs with the lowest existing canopy cover.

3. Metropolitan Greenspace Program

An annual grants funding program for planning and improvement of regional open space in the greater metropolitan Sydney region.

Through the program, Liverpool Council has received funding to prepare a masterplan for priority green grid corridors. The Kemps Creek and Kemps Creek Nature Reserve Priority Corridor is partially within GIC1.

4. Greater Sydney Open Space Program

The NSW Government has providing \$4 million to upgrade 7.6 hectares of government land in Leppington to provide improved accessibility to quality open space for the growing residential areas. Proposed embellishments may include pathways, wayfinding, play spaces, general landscaping and car park facilities.

3.1.4. Environment and Waste Infrastructure

Assessment

This assessment was made by the NSW Environment Protection Authority (EPA).

It considers existing air quality and potential land use conflicts in GIC1, and the capacity of waste infrastructure.

Metrics

The EPA has assessed existing waste infrastructure and capacity of facilities in GIC1, and the potential conflict between existing land use and future development.

It has assessed air quality in Sydney and metrics that should be used to measure air quality.

The Greater Sydney Region Plan and Western Sydney District Plan recognise air pollution as an urban hazard with significant impacts on public health. The Plans recognise that planning and design of urban areas can help to reduce exposure to air pollution. The Plans include goals and objectives, including:

- Objective 37 – Reducing exposure to natural and urban hazards
- Action 87 – Avoid new urban development in areas exposed to natural and urban hazards and consider options to limit the intensification of development in existing urban areas most exposed to hazards

NSW air quality is measured against national health-based standards under the National Environment Protection (Ambient Air Quality) Measure (NEPM). Air quality in Western Sydney is generally good but does not always meet national standards and some pollutants have harmful health effects at extremely low levels (particulates).

The NSW Government has set a target for air quality across the state to improve average air quality. The Clean Air Metric (CAM) is the measure for tracking progress against this goal. The CAM methodology has been peer reviewed and published in the proceedings of an international conference.

Findings

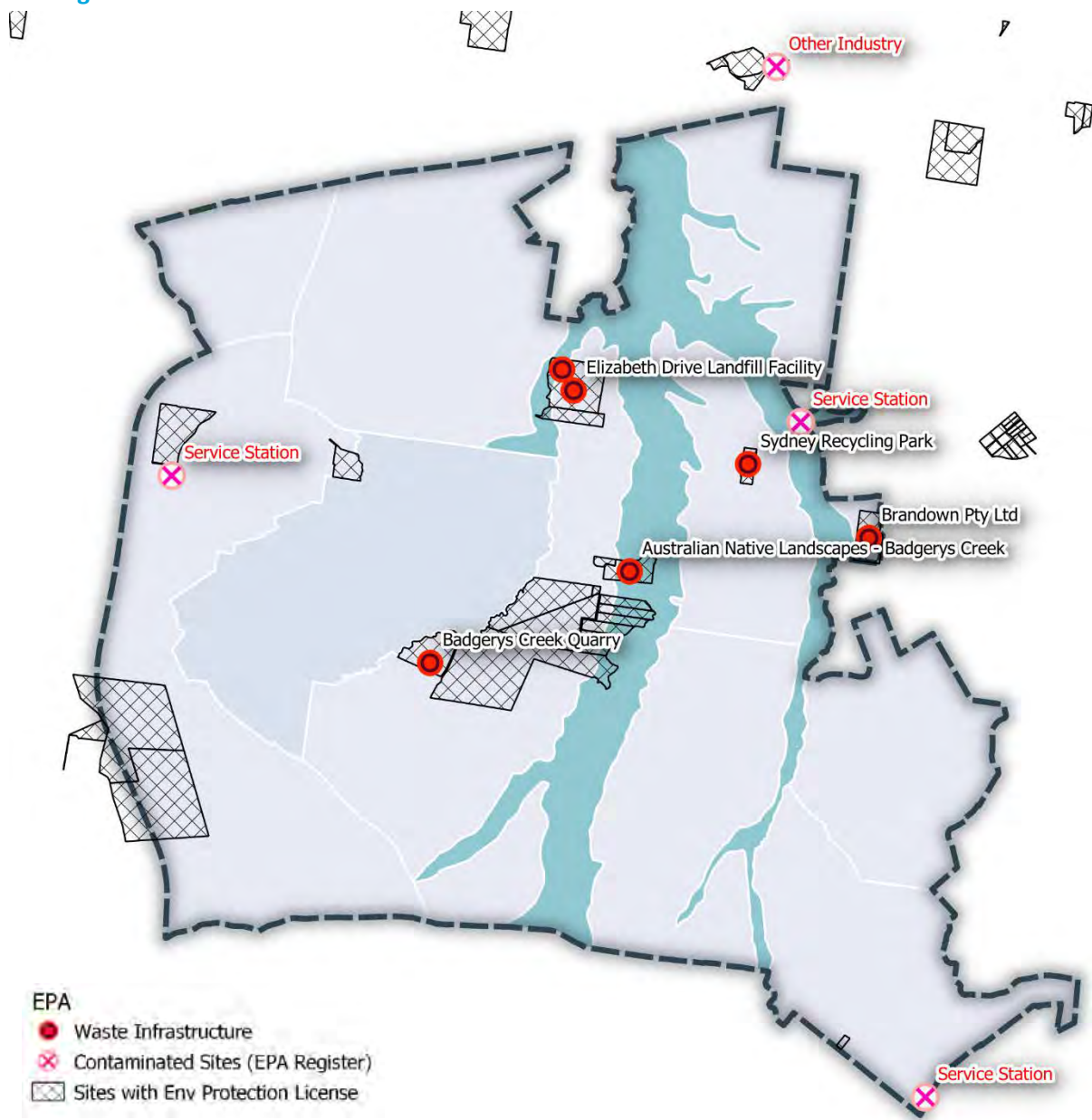


Figure 20: Waste Facilities, Contaminated Sites and Environment Protection Licence Sites – (EPA)

Waste infrastructure

The EPA has identified all facilities within GIC1 and the processing capacity of facilities, where available. These facilities are shown in Figure 20 and Table 6.

Each of these facilities service beyond the GIC region, including the broader Greater Sydney Region and in some cases the entire state. Therefore, relocation of any existing facilities will have broader implications for the waste network in Greater Sydney.

Table 6: Waste Infrastructure Facilities - (EPA)

Licence No	Facility Name	Licensed capacity	Licensed waste activities	Waste types allowed at the facility	Known expansion plans
4068	Elizabeth Drive Landfill Facility	No annual disposal limit on licence	Waste disposal Waste storage	General solid waste (non-putrescible) Asbestos Waste tyres Restricted solid waste	Proposed expansion to extend life of landfill by 6 years, to 2030 (according to their website - no evidence of this yet on the Dept of Planning's Major Projects Planning Register)
12901	Sydney Recycling Park	No annual disposal limit on licence	Waste disposal, Waste processing Waste storage	General solid waste (non-putrescible) Asbestos	
5186	Brandown Pty Ltd	No annual disposal limit on licence	Waste disposal	General solid waste (non-putrescible) Asbestos Waste tyres	Preparing an EIS to include a Refuse Derived Fuel Production Facility, Mechanical Biological Treatment Facility and a Cement Stabilisation Facility at the site (according to the Dept of Planning's Major Projects Planning Register)
4625	Australian Native Landscapes –	>50,000 tonnes per annum tpa	Composting, Waste processing	Organics, including food waste, wood	

Licence No	Facility Name	Licensed capacity	Licensed waste activities	Waste types allowed at the facility	Known expansion plans
	Badgerys Creek		Waste storage	waste, garden waste and biosolids	
12618	Brandown Pty Ltd	Max 550,000 tpa	Composting Resource recovery Waste storage	Soils Asphalt Building and demolition waste Garden and wood waste Concrete slurry	See notes against Licence No 5186
12889	SITA Advanced Waste Treatment Facility	Max 134,400 tpa	Composting Resource recovery Waste storage	General solid waste (putrescible and non-putrescible) Biosolids	
20498	Badgerys Creek Quarry	Max 168,000tpa	Resource recovery Waste storage	Soils	

EPA produced estimations of waste generation for both Municipal Solid Waste (MSW) and Commercial and Industrial (C&I) Waste, based on current population projections (TZP16) (Table 7). EPA was not able to produce estimations for Construction and Demolition Waste, as there will be a significant amount of construction in the GIC area, due to the construction of major infrastructure including Western Sydney Airport, which may skew the estimations.

Table 7: Waste Generation Estimates - (EPA)

Waste Stream	2019 (tonnes)	2029 (tonnes)	2039 (tonnes)	2059 (tonnes)
MSW	7,000	19,000	35,000	43,000
C&I	7,000	23,000	51,000	85,000

As rates of waste generation increase with population growth in the GIC1 area, waste facilities across Greater Sydney, and NSW more broadly, will be required to absorb the increase in waste generation.

Limitations of Waste Assessment

The EPA was unable to provide an assessment on the capacity of the waste network to accommodate population growth in the GIC area. Although more waste may be generated in the GIC boundary (estimations provided above), it will be transferred to and processed in facilities around the Greater Sydney Region or NSW, depending on the waste stream. Therefore, the capacity of existing waste infrastructure to accommodate growth isn't contained to a geographical boundary and needs to be considered on a wider basis.

It is estimated a long-term waste strategy being developed by EPA will be completed by the end of 2019. The EPA is assessing the capacity of the Greater Sydney waste network to absorb population growth more broadly than the GIC area.

Air quality

Western Sydney experiences elevated air pollution when national health-based standards for fine particles and ground-level ozone are exceeded.

Unless there is intervention in the future, the increase in population, business and transport in Western Sydney over the next 40 years is likely to significantly increase the number of people exposed to air pollution.

Although Sydney experiences relatively good air quality, fine particles (PM2.5) and ozone pollution have an important public health impact, causing approximately two per cent of deaths and 1.8 per cent of life-years lost. Especially for fine particle pollution, there is no known safe threshold for exposure, and public health impacts and costs still occur at levels below the standards. Young children, the elderly and those with existing health conditions are most affected. Health costs due to fine particle exposures in the Greater Sydney area have been estimated to be \$6.4 billion each year.

Climate change is predicted to result in increased high pollution days, including high ozone days resulting from increased temperatures (which result in more ozone being formed in the air) and high particle days from more extreme weather events such as bushfires and dust storms.

Air emission sources contributing to Western Sydney's air pollution include wood heaters, industry, transport and other diesel and emission sources associated with the construction and operation of infrastructure. Some sources make a continuing or increasing contribution to air pollution and threaten gains made over time through actions such as regulating vehicles, fuels and industry.

Policy positions and metrics to be included in future planning for air quality include:

- 100% of population enjoys ambient air quality, meeting the Ambient Air Quality NEPM
- NSW Clean Air Metric below 100 for the Local Government Area.

Implications for the GIC

The Commission will continue to work with the EPA on metrics for assessing impacts on air quality as we progress through future stages in the GIC.

3.2. People and Places

3.2.1. Education Baseline Infrastructure and Service Assessment

Assessment

Assessments were prepared by the Department of Education/Schools Infrastructure NSW (SINSW).

This report covers primary and secondary schools within and servicing the GIC1 area. Asset capacity and key performance indicators have been provided, as well as high level qualitative analysis of upgrade/expansion potential and commentary on known commitments.

Metrics

The following data has been considered by SINSW in the preparation of the report:

- 2019 student enrolments
- permanent student capacity: The number of students that can be accommodated in existing permanent facilities using 23 students per teaching space for primary school and 20 for secondary schools

- projected 2036 enrolments based on Department of Planning and Environment 2018 population forecasts
- permanent and demountable teaching spaces
- permanent teaching space utilisation rate: A ratio of the number of enrolled students to permanent teaching spaces
- a ranking of the overall condition of school facilities
- play space to student ratio
- potential for expansion based on physical constraints such as land size and heritage
- an assessment of the enrolment capacity based on thresholds of 1,000 students for primary schools and 2,000 students for secondary schools, where practical.

Findings

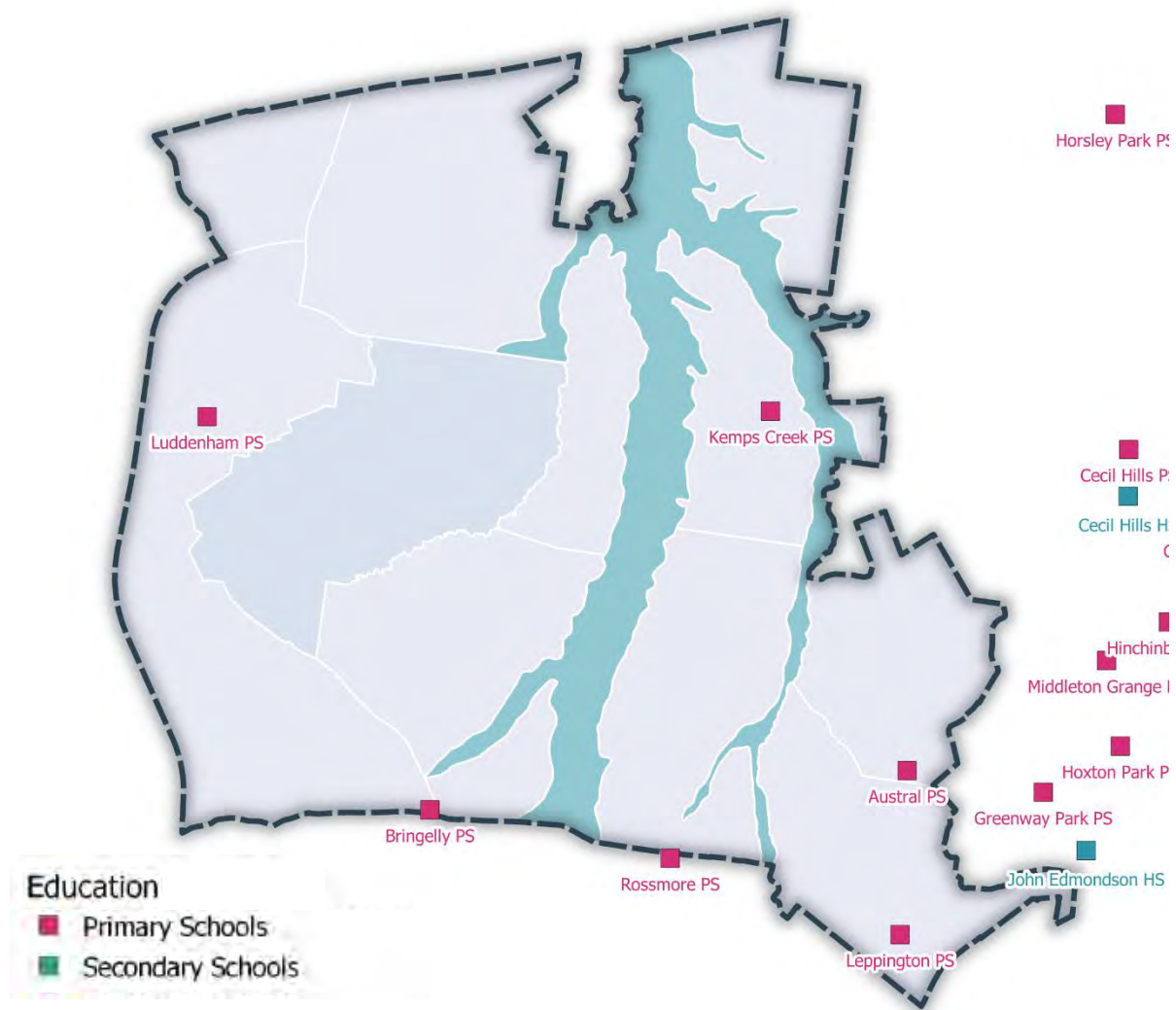


Figure 21: Education - Existing Infrastructure (SINSW and TAFE NSW)

The assessment indicates there is a small number of schools within the GIC1 area though most have capacity for increased enrolments. Some are at capacity but can expand. Figure 21 shows existing schools in GIC1.

Historically, GIC1 area and surrounding communities are principally comprised of large- lot residential and rural lands with a relatively low population. Until recently, the region was adequately

served by its seven primary schools and four high schools, each with sprawling catchment areas. However, residential development has intensified, particularly in Austral and Leppington North, placing strain on existing school facilities.

Public Primary Schools

The area has approximately 1,000 primary school students. The Permanent Teaching Space (PTS) utilisation rate is an indicator of student utilisation of permanent facilities. A PTS over 100 per cent indicates a reliance on demountable teaching spaces to meet demand, and constraints on facilities such as libraries, halls, administration and bathrooms. Luddenham and Leppington primary schools operate at 200 per cent and 120 per cent utilisation respectively.

As of 2019 there is capacity for approximately 288 primary student places in the region (380, when including demountable facilities). However, most short-term population growth is expected in the South East of the GIC1 region where school utilisation rates are *at or over* capacity. Table 8 outlines capacity indicators including Permanent Teaching Space Utilisation Rates, whether it exceeds standard school size and the school's ability to expand.

The 2018 Department of Planning and Environment growth projections were used in the baseline assessment by SINSW. Table 8 also indicates the expected enrolment projection to 2036 as well as the ability to expand each site. Austral, Leppington and Rossmore primary schools are expected to exceed the enrolment capacity of 1,000 students before 2036. No upgrades to primary schools are currently committed and to accommodate 2036 growth forecasts plus any additional expected growth would require in the upgrade of existing facilities and/or the establishment of new primary schools in the region.

Four of the schools can expand; the other three have limited growth potential due to small land area.

Table 8: Existing Primary Schools Servicing the GIC1 Area

Primary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 enrolments	Exceeds Standard Size	PTS Utilisation rate 2019	Ability to Expand
Schools within the GIC1 Area						
Austral Public School	414	1340	276	No	67%	Yes to 1,000 to students
Bringelly Public School	138	784	115	No	83%	Yes
Kemps Creek Public School	161	216	154	No	86%	Yes
Luddenham Public School	46	73	80	No	200%	Limited due to small site
Leppington Public School	230	1654	276	No	120%	Yes to 1,000 students
Schools outside the GIC1 Area (Whose Catchment Overlaps the GIC1 Area)						
Rossmore Public School	207	1191	75	No	67%	Limited due to small site
Wallacia PS	138	88	70	No	50%	Limited due to small site

Public Secondary Schools

There are no secondary schools in the GIC1 area. The majority of GIC1 is serviced by four high schools to the east, in Liverpool and Campbelltown. A total of 4,189 students are enrolled in the four schools. Two of the schools, John Edmondson and Cecil Hills, operate at a PTS utilisation rate of approximately 110 per cent and 119 per cent respectively, indicating there is no further residual capacity in the schools. The student population in these four schools is expected to increase to approximately 8,850 by 2036 (based on 2018 growth projections) requiring upgrade of existing facilities and/or the establishment of new schools in the region.

Table 9 outlines utilisation rates and indicates the expected enrolment projection to 2036 as well as the ability to expand each site. John Edmondson High School is a Public Private Partnership (PPP) school and will not be returned to Department of Education (DoE) until 2032 thus making upgrades challenging in the short term. Cecil Hills has been recently announced for planning funding for exploration of potential upgrades. Cecil Hills and John Edmondson will exceed the enrolment capacity of 2,000 students before 2036. Other than Cecil Hills no upgrades or new facilities are committed in the GIC1 area, however based on current capacities upgrades are likely to be required to meet growth over the next 10 years. It should also be noted that there are no secondary schools in the vicinity of the western portion of the GIC1 area and any growth in this region would likely trigger the need for a new facility. The City Deal includes a new public high school located at the Aerotropolis with vocational links to the Airport delivered in line with population growth.

Table 9: Existing Secondary Schools Servicing the GIC1 Area

Secondary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 Enrolments	Exceed Standard Size	PTS Utilisation rate 2019	Ability to Expand
John Edmondson High School	980	3729	1156	No	110%	Limited until after 2032
Hoxton Park High School	880	1519	714	No	86%	Yes, for up to 2,000 students
Cecil Hills HS	1140	2016	1412	No	119%	Yes, for up to 2,000 students
Glenmore Park HS	1040	1592	907	No	87%	Yes, for up to 2,000 students

New primary and secondary schools are likely to be developed as a mix of both public and private ownership to cater for the expected growth.

Refer to attached Education baseline assessment for school catchment maps.

3.2.2. TAFE NSW Baseline Infrastructure and Service Assessment

Assessment

Assessments were prepared by TAFE NSW.

Metrics

The following data was considered in the preparation of the reports:

- TAFE NSW has assessed future demand on baseline maps, public data, policy documents and internal interviews with key TAFE NSW stakeholders.
- Assessment of demand based on the number of students enrolled at TAFE NSW campuses in the Western Sydney/Blacktown District (disaggregated by age) against the number of residents of the same age groups within the region. This is extrapolated and based on 2016 NSW DPE population projections.
- An overview of future industries, job typology and changes in teaching expected within the GIC1 aerotropolis region and the corresponding effect on TAFE NSW.
- Funding announcements and committed infrastructure.

Findings

TAFE NSW has no assets in the GIC1 area. However, it is identified as a strategic centre for future expansion. GIC1's central location to existing TAFE facilities, future development and jobs created in the aerotropolis core, means TAFE NSW is well placed to have a high-profile role in the region.

GIC1 is geographically surrounded by four large TAFE facilities located at Nepean, Mt Druitt, Liverpool and Campbelltown. TAFE NSW has 67,500 students enrolled in the Western Sydney/Blacktown district, equating to 7.2 per cent of the overall usual resident population. Half the students are under the age of 29 and 25 per cent are between 15-19 years old. Younger age enrolments are declining while mature age students are on the rise, which is believed to be associated with retraining to suit the changing workforce.

TAFE NSW has reviewed the overall population growth within the Western Sydney District and Blacktown (based on 2016 Population projections) and identifies that an additional 329,500 residents in the 15 to 54-year-old bracket are expected by 2036. The demand for TAFE NSW services arising from retraining mid-career highlights the population drivers affecting current and longer-term needs for services.

The projected job typologies expected in the aerotropolis are complementary to the service offerings of TAFE NSW with a significant rise in construction, machinery operators, trades and technicians, airport services, warehouse managers and to health and education. This is expected to place continued pressure on TAFE NSW.

There are three announced TAFE/VET projects within the Western Parklands City:

- An \$80 million, state-of-the-art TAFE campus. Choosing a site for the campus presents an opportunity to identify a location that aligns with other infrastructure development in Western Sydney.
- A commitment to a permanent Vocational Educational Training (VET) facility in the Aerotropolis with a focus on construction, aviation and aeronautical engineering, as part of the Western Sydney City Deal.
- A commitment for a TAFE NSW Skills Exchange near the new airport to local training for construction workers, as part of the Western Sydney City Deal. The site of the skills exchange is expected to be at the Aerotropolis construction compound, located on the corner of Badgerys Creek Road and Elizabeth Drive.

This assessment does not provide quantitative data relating to the residual capacity at regional facilities. TAFE NSW is preparing a 20-year infrastructure strategy which will be ready in 2020 and will include an audit of infrastructure and whether it meets its capacity.

The key requirements and opportunities for consideration in the GIC1 planning include:

The need for TAFE NSW to strategically align and work collaboratively with key government agencies to identify key opportunities early in the strategic land use planning process.

- Future ICT requirements: TAFE NSW will require appropriate utilities infrastructure to support an increased demand on bandwidth.
- Opportunities to leverage partnerships with other infrastructure owners: Growth in new employment Precincts and associated industries will allow TAFE NSW to explore partnerships and opportunities to co-locate with other infrastructure owners.

3.2.3. Health Baseline Infrastructure and Service Assessment

Assessment

This report was compiled by the Ministry of Health, Health System Planning and Investment Branch with consultation and input from the following Health organisations:

- South Western Sydney Local Health District
- Nepean Blue Mountains Local Health District
- Western Sydney Local Health District
- Ambulance NSW

It contains an assessment of NSW Health state funded public health services and infrastructure only. It includes information relevant to services provided to the resident population of the Western Sydney GIC1 area. Health NSW noted that the achievement of the place-based outcomes related to health relies on effective service delivery by the whole health system, along with a host of other determinants of health, not just state funded services referred to in this report.

Metrics

The following criteria was considered in the evaluation of health services:

- Existing levels of public health service provision relevant to the GIC area.
- An assessment of current performance of services against the (health related) outcomes measures developed by the commission during the GPOP GIC.
- Information on pressure points, emerging pressures and existing/committed capacity for growth relevant to the GIC area.
- An estimate of the capacity of the existing infrastructure to accommodate future growth within the GIC area.
- Review and commentary of place-based outcomes influencing health.

Findings

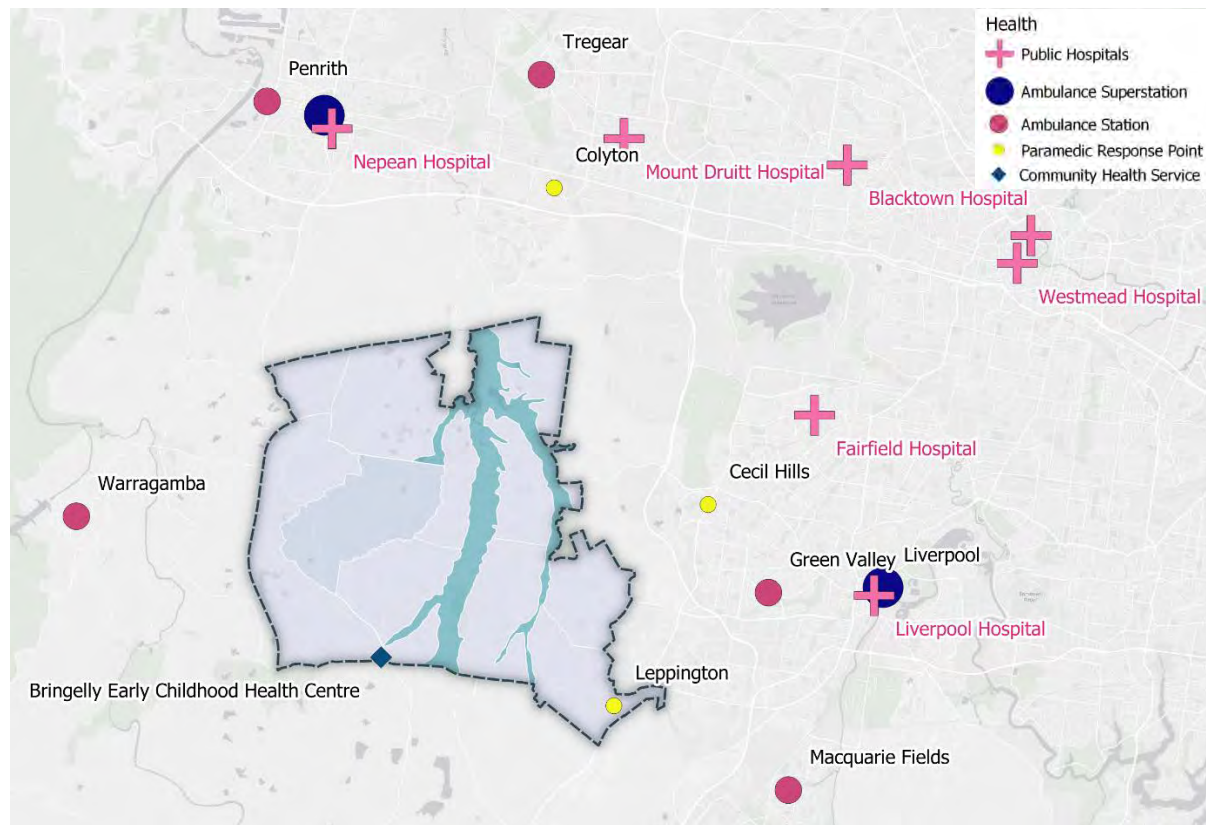


Figure 22: Health - Existing Infrastructure (Health NSW)

Overview

Due to the relatively low population in the GIC1 area, there is only one NSW Health service delivery point– the Bringelly Early Childhood Health Centre and Community Nursing Service (SWSLHD) (Figure 22). This is not an NSW Health-owned asset. The Leppington Ambulance Response Point is the only other facility in the area. Several additional services are delivered in residents' homes though most residents travel outside the GIC to access NSW Health Services.

Residents access services across three Local Health Districts (LHD). Not all services are supplied in all LHD's and patient referral patterns impact the location and accessibility of services more broadly.

Acute Hospital Services

South West Sydney Local Health District (SWSLHD) and Nepean Blue Mountains Local Health District (NBMLHD) provide approximately 83 per cent of admitted patient care to the GIC area residents. Between 2015-2018 the number of GIC1 resident visits for Acute Hospital Services (AHS) increased by approximately 22 per cent, which corresponds with the increase in population in the area. The average travel time for AHSs was between 20-50 mins. Table 10 below provides an overview of the current outbound trips by hospital.

Emergency Medical Services

Ambulance NSW provides the public emergency response to the GIC1 area. The Blacktown, Bankstown and Liverpool Ambulance Superstations were recently upgraded. The program of works is planned to meet anticipated community need based on current common planning assumptions.

SWSLHD and NBMLHD cater for approximately 87 per cent of emergency department visits from the GIC1 area. Between 2015-2018 the number of GIC1 resident visits for Emergency Department services increased by approximately 19 per cent with most of that increase being in 2017/2018. This

corresponded with an increase in construction and population in the area. The average travel time for Emergency Department services was between 20-40 mins. Figure 23 show the existing health network in GIC1 and Western Sydney.

Table 10: Hospital and Emergency Facility Visits from GIC1 Residents

Hospital Name	Acute Hospital Services 2017/2018	Emergency Departments 2017/2018	Committed Investment/Completion Date
Nepean	3945	7030	Y - 2023
Liverpool	2472	2672	Y - 2026
Campbelltown	1813	2588	Y - 2024
Camden	*	637	N
Children's Hospital Westmead	403	526	Y – 2020-2025
Fairfield	395	538	N
Westmead	378	253	Y – 2020-2025
Mount Druitt	*	218	Y - 2021
Blacktown	*	130	Y - 2021
Concord	184	*	Y - 2023

*numbers not reported

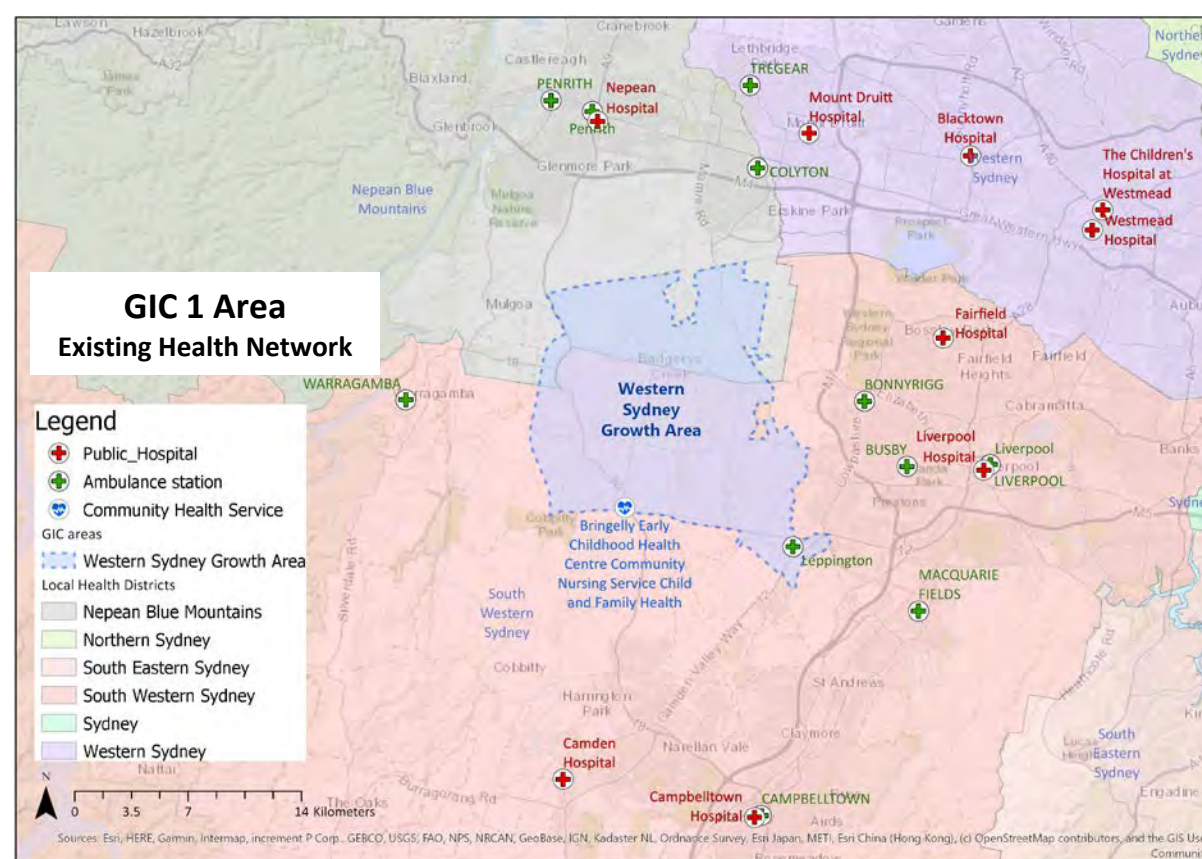


Figure 23: Existing Health Network - (GIC1 Source Health NSW) *CHS's Outside the GIC are not shown

In addition to the AHC and Emergency Department services, a vast network exists of Community Health Services (CHS) that provides a range of community-based early intervention, assessment, acute/post-acute treatment, health maintenance and continuing care (including palliative care) services designed to improve or maintain the health and wellbeing of individuals and communities.

Planned Projects and Capacity

Several hospitals surrounding the GIC1 area are committed for redevelopment, including Campbelltown, Liverpool, Nepean and Westmead hospitals. This infrastructure investment is planned to meet growth in population and demand for public funded health services to 2026 for some facilities (e.g. Liverpool Hospital) and 2031 for others (e.g. Nepean Hospital), based on the NSW Government Common Planning Assumptions. Capacity beyond these timeframes is not yet planned or funded.

In the future, the shift from inpatient models to ambulatory, primary and community models and non-hospital services will decrease admission rates and length of stay for some groups of patients as well as reduce reliance on hospitals as the major providers of health care. Virtual care technologies are also expected to be implemented, increasing the need for improved ICT services in the region.

An upgrade to the Leppington Paramedic Response Point has also been committed. This is expected to be completed by 2020.

3.2.4. Cultural Infrastructure Baseline Infrastructure and Service Assessment

Assessment

Mapping shows that there is no state or regional significant cultural infrastructure in GIC1, which is consistent with the findings of the Cultural Infrastructure Plan 2025+.

Metrics

Create NSW conducted the assessment GIC1 using cultural infrastructure mapping data that was gathered during the development of the NSW Government's Cultural Infrastructure Plan 2025+. This database maps cultural infrastructure by types, which have been defined based on the site's principle or predominant cultural activity. These cultural infrastructure types include Aboriginal Cultural Infrastructure, arenas, arts centres, cinemas, galleries, museums and the like.

This data has been further categorised into local, regional and state significant infrastructure. Local cultural infrastructure has not been assessed as part of this study as it is outside of the remit of the GIC program.

Findings

Create NSW has no committed projects within GIC1 that will deliver new infrastructure or improve capacity of existing infrastructure.

In addition to planning for cultural infrastructure that supports liveability for incoming residents, opportunities exist to plan and deliver major projects that will contribute to productivity and job creation in the region.

The Cultural Infrastructure Plan 2025+ identifies that there is potential for an iconic cultural facility to be created as part of the Aerotropolis.

Detailed analysis further outlines:

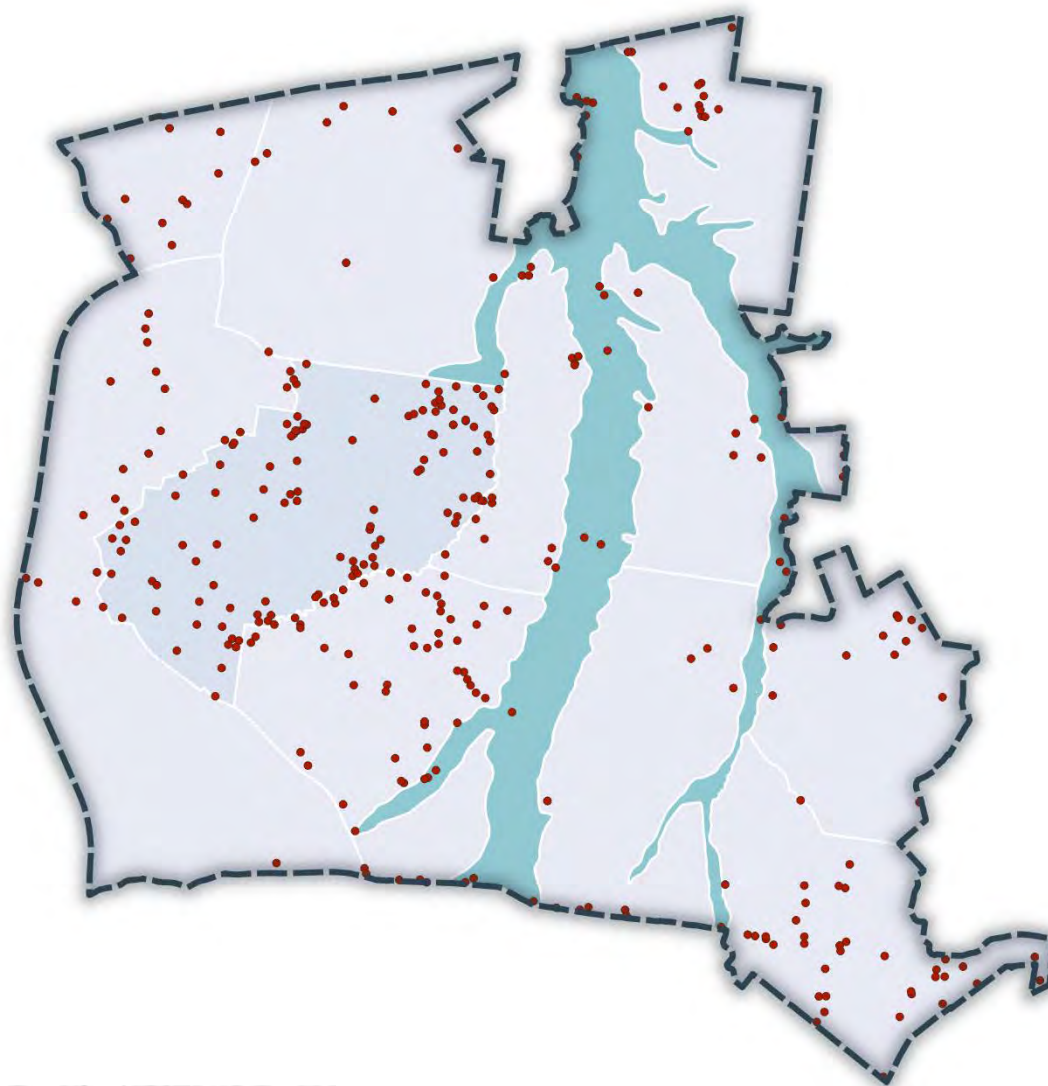
- Almost no cultural infrastructure in GIC1, and no state or regional significant infrastructure.
- There may be capacity for cultural infrastructure outside the borders of GIC1 to cater to some of the demand of the area in the short term, but this cannot be a strategy for meeting the medium and long-term needs of the area.

- The local, community-based infrastructure is already inadequate for meeting the demand of GIC1 and local government will need to be supported to plan and deliver new infrastructure as an immediate priority and to plan for the late-night economy.
- Productivity can be supported through new cultural infrastructure, across all scales. This should be explored for GIC1 across all growth scenarios.
- Opportunities to deliver cultural infrastructure and joint use facilities alongside and integrated into other major infrastructure such as schools, universities, transport, health and the new Western Sydney Airport and to align planning for cultural infrastructure within growth centres.
- Opportunity to plan for the establishment of creative industries alongside planning for other industries.
- Significance of Aboriginal culture and heritage in the region and that delivering cultural infrastructure and access to country where culture can be practiced should be a priority of the GIC.
- Opportunity to deliver an iconic cultural facility for the Western Parklands City should be considered for both GIC1 and GIC2 to ensure its delivery maximises the benefits for the entire Western City Parklands region.
- Opportunity for a research institution aligned with a major cultural organisation and which supports industry and jobs in the Aerotropolis.

Aboriginal Cultural Heritage

Consideration and respect for the location of known Aboriginal Cultural Heritage sites will be an important part of mapping constraints to future development and must be acknowledged early in the development process to ensure quality planning and development outcomes.

Figure 24 identifies objects or sites, which that have been reported to the Government's Aboriginal Heritage Information Management database. None of the items identified in the GIC area are classified as restricted, under legislation.



- Aboriginal Cultural Heritage Sites

Figure 24: Aboriginal Cultural Sites: Aboriginal Heritage Information Management Database

3.2.5. Social Housing Baseline Infrastructure and Service Assessment

Assessment

The NSW Land and Housing Corporation (LaHC) has provided the assessment as part of the new Planning and Industry cluster. It outlines:

- The role and need for social housing
- The NSW Government's 10-year vision for social housing, *Future Directions*
- LaHC's Communities Plus program
- The state of social housing stock, both regionally and within the GIC1 area; and policy and funding limitations.

The key qualitative data relates to social housing assets and demand for social housing.

Metrics

The following data was assessed in formulating the social housing response:

- NSW Government Future Directions for Social Housing in NSW (Future Directions) policy, which sets out the government's vision over the next 10 years
 - Future Directions seeks to transform the social housing system in NSW
 - As part of this strategy, the government aims to increase the number of households successfully transitioning from social housing to affordable
- The availability of social housing
- Demand and waitlist times
- Total social housing stock
- Age of assets.

Policies

LaHC operates under an overarching *Future Directions* government policy that is underpinned by three strategic priorities:

- more social housing
- more opportunities, support and incentives to avoid and/or leave social housing
- a better social housing experience.

Under the *Future Directions* policy, Communities Plus was established to deliver integrated communities and improved social outcomes. Communities Plus is a 10-year building program of large-scale redevelopments comprising of mixed tenure, urban transformation, and major transformation projects. LaHC's primary source of funding is generated from the rental and the sale of properties, with a reliance on partnership with the private sector to deliver integrated renewals through higher densities that provide a mix of 70 per cent private and 30 per cent social and affordable dwellings.

Communities plus has committed to deliver 23,000 social, 500 affordable and 40,000 private dwellings, predominately achieved through urban renewal.

Findings

LaHC owns approximately 126,000 dwelling in NSW, of which a portion is managed by community housing providers. Eighty per cent of the social housing stock is in the Greater Sydney metropolitan area. No assets sit within the GIC1 area. As part of the Communities Plus program the closest renewal sites to the GIC1 area include,

- neighbourhood sites at Warwick Farm and Liverpool.
- new communities at Rosemeadow to the West and Bonnyrigg, Claymore and Airs Bradbury to the South East

Key metrics used when selecting potential sites included good amenity, access to transport, employment and educational opportunities with the projects aligning with Transport for NSW's Future Transport 2056.

Furthermore, LaHC indicates there is a significant need for more social housing in all regions as the demand for social and affordable housing is expected to grow. Demand for social and affordable rental housing in NSW far exceeds supply with more than 60,000 people on the waiting list and waitlists of up to 10 years, depending on their location.

Housing diversity, including social and affordable housing, should be considered while planning for Western Sydney Aerotropolis. LaHC sees an opportunity to increase the supply of social and affordable housing as well as to deliver on the government's initiative.

3.2.6. Justice and Emergency Services Baseline Infrastructure and Services Assessment

GSC contacted the following agencies in the preparation of this assessment.

- Department of Justice
- Fire and Rescue NSW
- NSW Police

Given the limited infrastructure within the GIC1 area the assessments undertaken are of a regional nature.

Assessment

There are no Department of Justice, Fire and Rescue or Police facilities in the GIC1 area. Figure 25 shows existing assets in Western Sydney, near GIC1.

Metrics and Policy

A high-level qualitative assessment of existing facilities was prepared by the Department of Justice, NSW Fire and Rescue and NSW Police. The following data was considered in the assessment in relation to emergency services infrastructure (noting that ambulance services are included in the Health section of this report):

- existing capacity at courthouses and correctional facilities within the region
- location of existing NSW Police and Fire and Rescue facilities
- known committed, announced and planned infrastructure services within the region.

It is understood there are no regulatory or policy issues relating to the implementation of required infrastructure within the GIC areas.

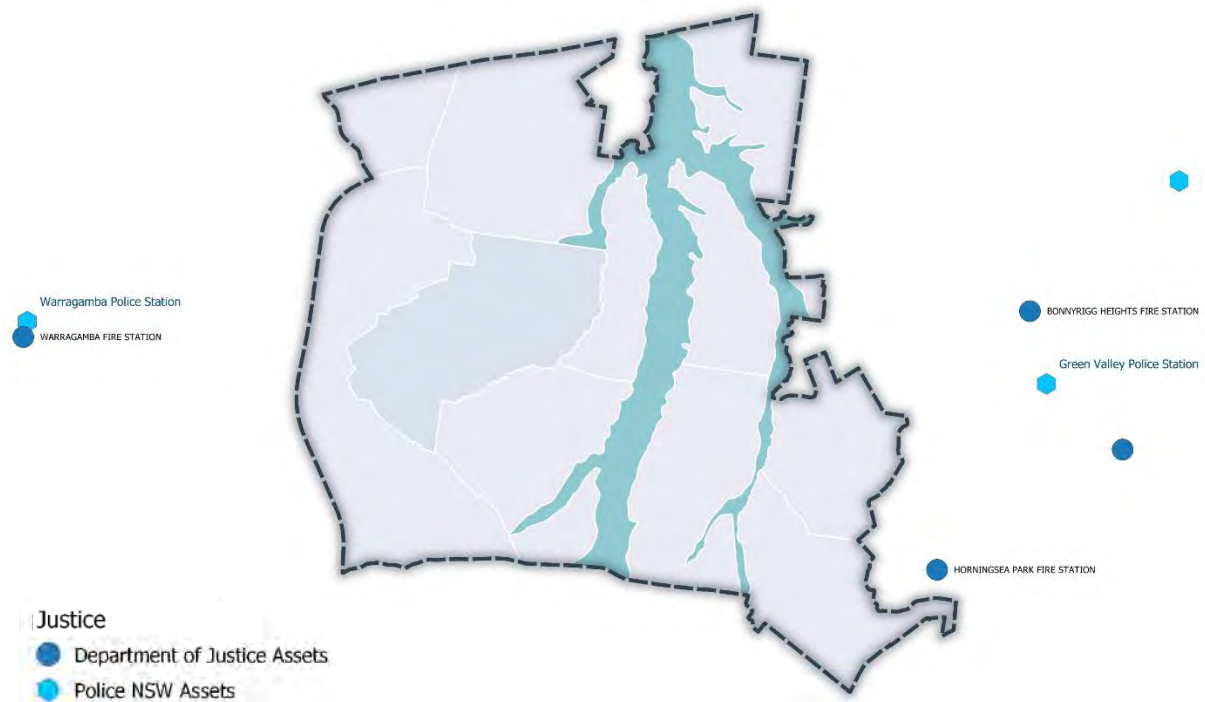


Figure 25: Emergency Services - Existing Infrastructure (NSW DoJ, Fire and Rescue and Police Force)

Justice NSW

The GIC1 area is primarily serviced by the Campbelltown Courthouse. Forecast growth in the region is likely to exceed the capacity of the courthouse. Initial options for consideration include the expansion of the existing courthouse and/or the creation of a new facility within the Leppington Civic Precinct.

Based on the risk of initial growth exceeding capacity and the lack of supporting complementary facilities, the preferred option is to expand the courthouse. This would address the current need and foreseeable future demand for the South-West region. This would push back the development of the Leppington Courthouse by approximately 10-20 years dependant on growth and crime in the region.

Further to the above, the service need is a new Outer Sydney Metropolitan Correctional Precinct to meet forecast prison population projections over the next 10 to 20 years, however unlikely that the GIC1 area will be suitable.

Fire and Rescue

Fire and Rescue has no planned infrastructure, but that will likely change as urban development proceeds and negotiations are undertaken to transfer that development from Rural Fire Services (RFS) district to urban Fire and Rescue services. Depending on the final development extent and yield, there may be a need for two or three new stations in the GIC1 area.

NSW Police

NSW Police Force has no planned infrastructure but is expected to grow with the population growth.

No further known committed, announced and planned investment in infrastructure and services in the GIC1 area is proposed.

4. Findings – Rezoned Precincts – Austral and Leppington North

4.1. Networks and Systems

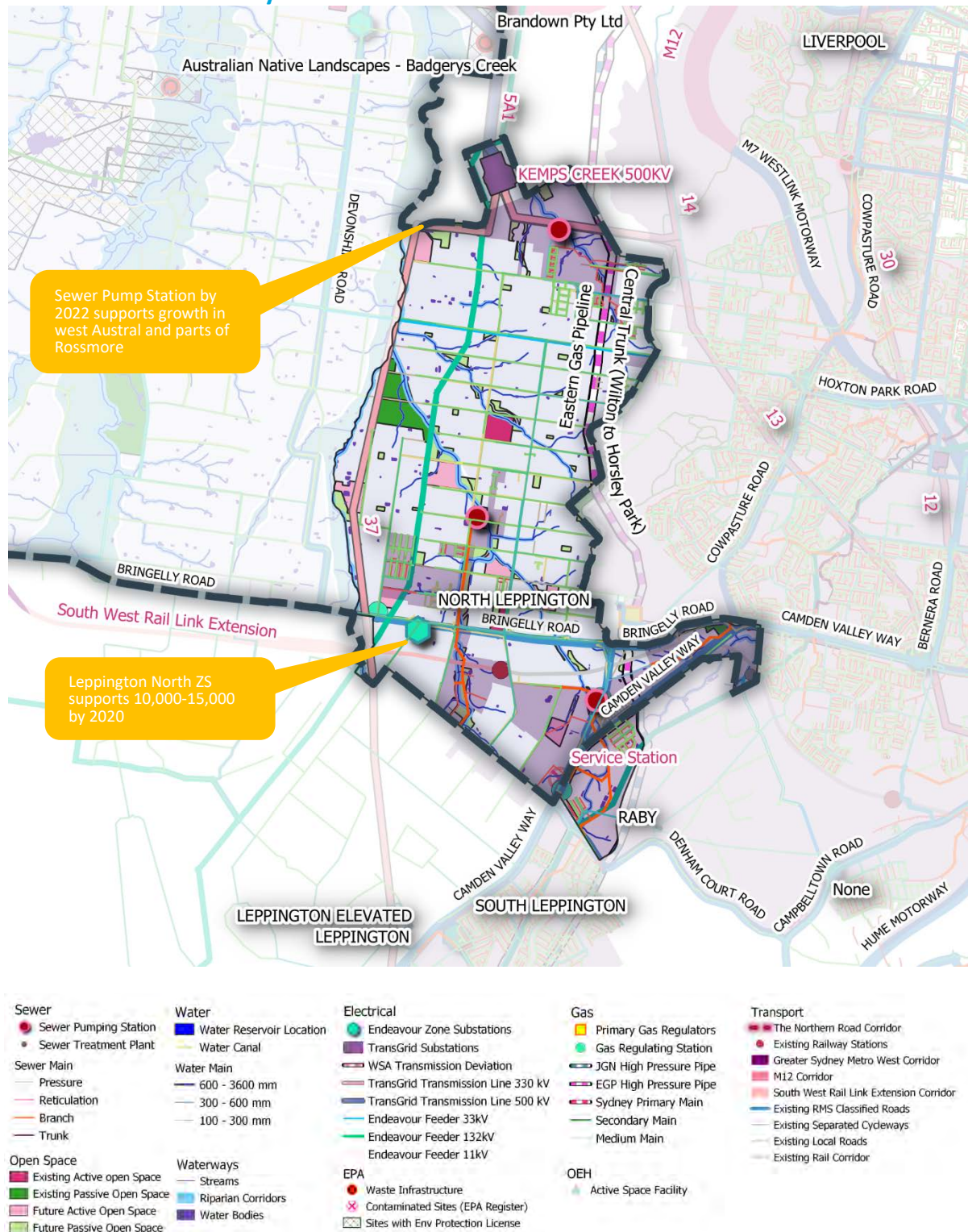


Figure 26: Network and Systems - Existing Infrastructure (Austral and Leppington)

The Austral and Leppington North Precinct includes land from the Austral and Leppington North Precincts that was rezoned as part of the former South West Growth Centre. Infrastructure within the Precinct is the most established in GIC1, albeit quite limited as development has been modest, and is outlined in Figure 26.

Rail

Leppington station, part of the South West Rail Link (SWRL) provides the only rail services in the Precinct. It is the only station in GIC1 and provides 155 services per weekday. The Leppington Stabling Yard situated west of this station, will ultimately become part of the South West Rail Link extension, connecting to the Aerotropolis station.

Roads

The network predominately consists of rural/suburban roads that will be upgraded to urban road standards as development occurs. The current/planned road network is designed to accommodate current zoning.

Key State roads include Bringelly Road (which has recently been upgraded to three lanes each direction for the Leppington segment), Camden Valley Way and Cowpasture Road. All operate with greater than 50 per cent residual capacity. Significant local roads include the East-West Austral connection of Fifteenth Avenue, North-South Edmondson Avenue and Rickard Road. These roads will require upgrades as development occurs.

Bus

Networks operate along Fifteenth Avenue, Edmondson Avenue and Rickard Road. Routes 841, 885, 856, 867 and 858 service the Precinct, connecting residents to Leppington station, Narellan and Liverpool City Centre. Network coverage and level of service is limited.

Active Transport

There is limited active transport infrastructure in the study area, with a shared path recently opened as part of Bringelly Road (Stage 1).

Water

No water reservoirs exist within the Precinct and it is serviced by Cecil Park, Leppington and Raby reservoirs. There is a mixture of existing rural domestic reticulation mains and trunk mains as a result of recent upgrades to accommodate growth, mainly in the southern and eastern portions of the Precinct.

Sewer

Existing services are limited, with onsite disposal systems on undeveloped and rural lots and new sewer reticulation mains to support growth in the rezoned areas. New sewer services are transferred via pump stations to Malabar via the Liverpool Wastewater Treatment Plant. Once the proposed downstream treatment plants are operational, these pump stations will likely be decommissioned. They are in Leppington North, East Leppington and Austral, but do not service the

entire Precinct. Sydney Water is delivering new infrastructure in the western portion of the Precinct for operation in 2020/2021. The Liverpool WWTP has limited residual capacity.

Electrical

TransGrid has three 330kV transmission lines within the Precinct and a substation/bulk supply point in the north of the Precinct. The transmission lines have been considered in the current Indicative Layout Plans undertaken by DPE.

The northern portion of the Precinct is serviced by the Kemps Creek ZS and Hinchinbrook ZS. To date 1,500 lots have been applied for and are under construction, this equates to approximately 6MVA of electrical load. Kemps Creek ZS and Hinchinbrook ZS have 12.3 and 6.8 MVA residual capacity respectively; this equates to approximately 4,750 low density residential dwellings. However, any residual capacity beyond this can be utilised in surrounding areas and is not reserved for the Precinct.

In the south of the Precinct, services are provided by the South Leppington, Hinchinbrook, Prestons and Kemps Creek ZS. To date, applications have been received for 2,377 lots, 2,015 apartments and 1.5MVA of commercial load. In total, this equates to approximately 15.3MVA. The residual capacity in the ZS totals is just under 40MVA. Residual capacity can be utilised in other Precincts. Physical and financial constraints recently prompted Endeavour Energy to proceed with construction of North Leppington zone substation, which will supply 10,000-15,000 new dwellings from 2020.

Gas

The regional gas network has minimal residual capacity. However, the existing infrastructure in the Austral and Leppington Precinct does have capacity for organic growth over the next couple of years. But growth in surrounding Precincts or large user connections in the GIC1 area will require extensions in the secondary mains network. Two high pressure gas pipelines pass through the eastern portion of Austral and the location of these has been considered in the current ILP.

Open Space

Active and passive open space was rezoned in the recent land release areas in accordance with social planning studies as part of the rezoning process. This will continue as more land is released and acquired by Council under the Section 7.11 plans.

There are 142.5 hectares of land zoned for public recreation and one hectare zoned for private recreation within the Precinct. There are 103 hectares zoned for environmental conservation and 141 hectares for environmental living.

Tree canopy in the Precinct is 13.1 per cent.

Environment & Waste

There are no assets in the Austral and Leppington North Precinct.

4.2. People and Places

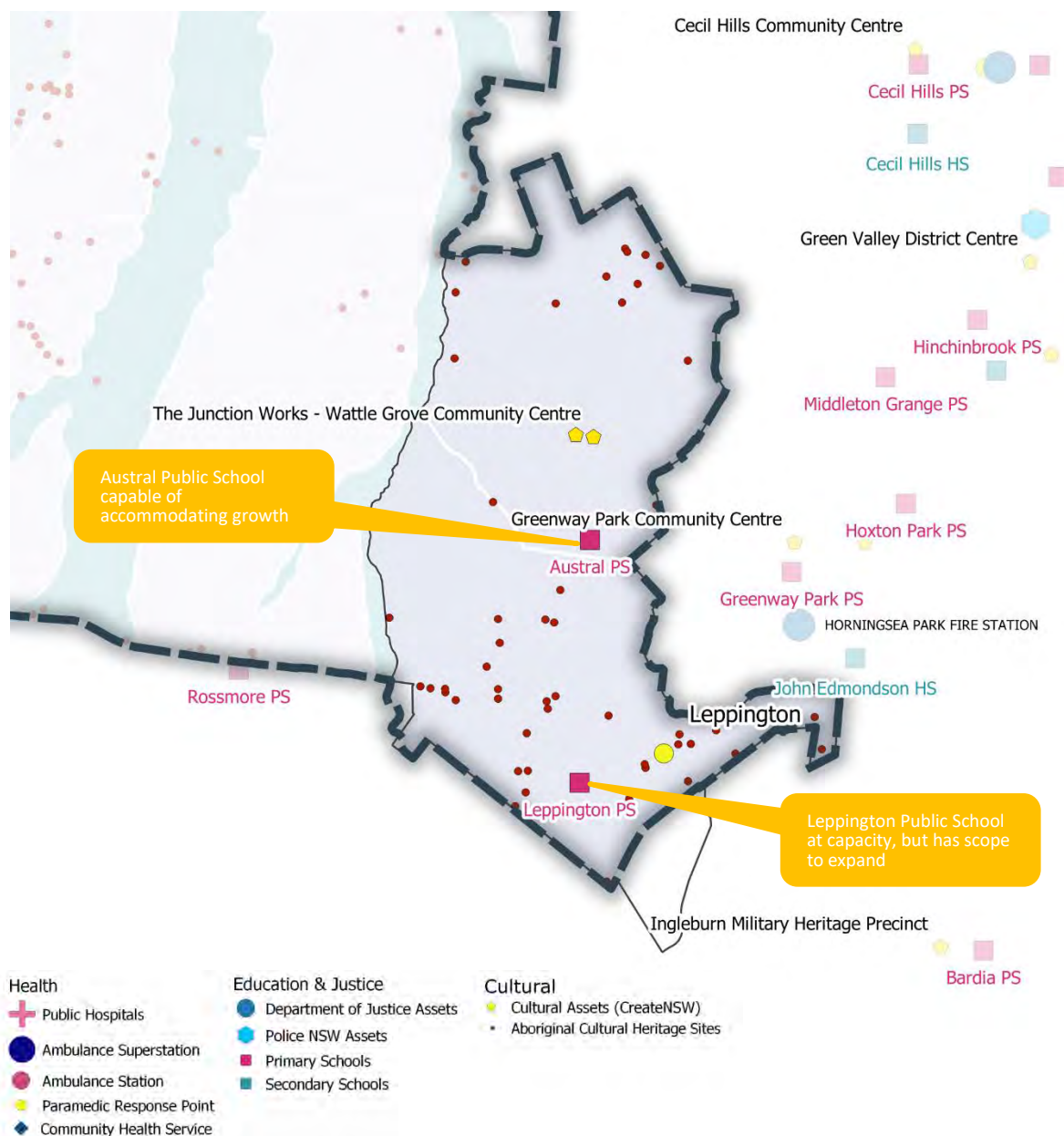


Figure 27: People and Place - Existing Infrastructure (Austral and Leppington North)

Education

There are two primary schools in the Precinct (Figure 27). Austral Public School has capacity in the short term, while Leppington is exceeding Permanent Teaching Space (TPS) capacity. All facilities are capable of expanding to accommodate short term growth, as shown in Table 11, but new schools in the area have been nominated in the Indicative Layout Plan and will be required once this capacity is exhausted.

Other Social Infrastructure

There are no Health, TAFE, Justice, Fire and Rescue, Police, secondary school, social housing or cultural facilities within the Precinct, except for the Leppington Ambulance Response Point (Figure 27). Refer to Section 3 for regional services.

Table 11: Existing School within Austral and Leppington North – Capacity Metrics

Primary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 enrolments	Exceeds Standard Size	PTS Utilisation rate 2019	Ability to Expand
Austral Public School	414	1,340	276	N	67%	Yes to 1,000 to students
Leppington Public School	230	1,654	276	N	120%	Yes to 1,000 students

5. Findings - Aerotropolis – Initial Precincts Aerotropolis Core, Northern Gateway & South Creek

5.1. Networks and Systems

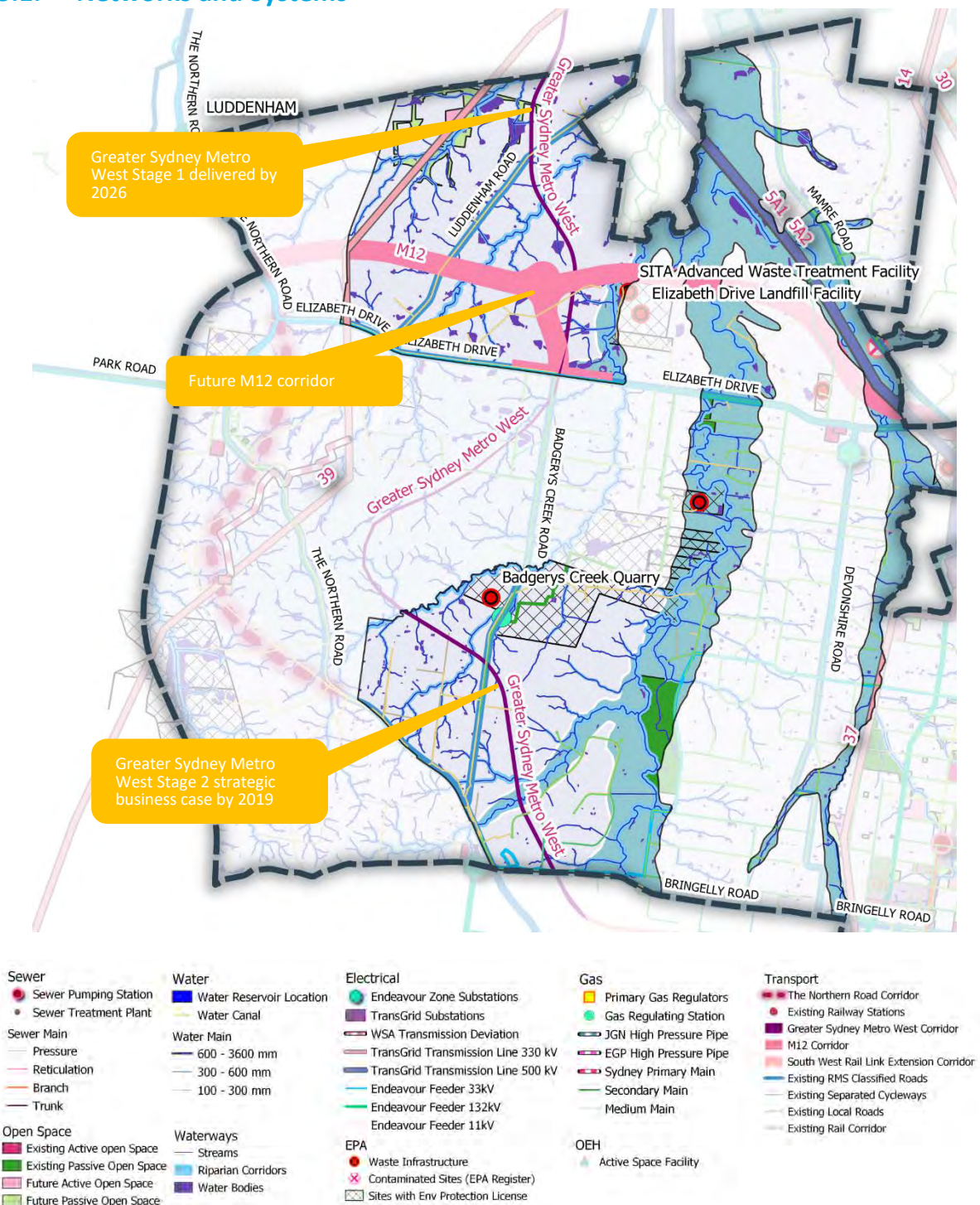


Figure 28: Network and Systems - Existing Infrastructure (Initial Release Precincts)

While two of the initial Precincts (Aerotropolis Core and Northern Gateway) will be the focus of planning growth for the next five years, South Creek will create the parkland spine to the Aerotropolis and the broader Western Parkland City.

Infrastructure within the Precincts is limited (shown in Figure 28), particularly due to its rural residential and agricultural land uses, isolation and distance from existing networks.

Rail

There is no rail infrastructure in either Precinct. The Sydney Metro Greater West is a proposed corridor reservation that passes through both Precincts. The corridor has not been statutorily protected.

Roads

The Aerotropolis core is close to two major roads, The Northern Road and Bringelly Road, both of which are undergoing upgrades. The Precinct is also bisected by Badgerys Creek Road, connecting to Elizabeth Drive to the north. The precinct is bisected by Badgerys Creek Rd, which passes through the WSA site and its future alignment is yet to be determined.

In the Northern Gateway Key State/Regional roads include Elizabeth Drive connecting East-West along the southern border of the site and Luddenham Road through the Precinct. The Northern Gateway segment of Elizabeth Drive has 40 per cent spare capacity in peak periods. A significant portion of the Precinct will accommodate the future Outer Sydney Orbital and associated Interchange, as well as the M12 motorway.

Bus

Bus networks operate along Bringelly Road and local internal roads. Route 856 is the only service in the Aerotropolis Core, connecting to Liverpool via Leppington.

Route 801 along Elizabeth drive is the only service to the northern Gateway, connecting to Liverpool. Network coverage and level of service is limited for both routes.

Active Transport

There is no dedicated active transport in the Precinct.

Water

There is very limited water reticulation within the Initial Release Precincts. A small portion of the Aerotropolis Core adjacent Bringelly Road is serviced from Leppington Reservoir with the Northern portion of the Precinct serviced by Cecil Park reservoir. Other than a minor reticulation main along Elizabeth Drive there is no potable water reticulation within the Northern Gateway Precinct. In both Precincts, the network consists of rural reticulation and is unlikely to accommodate any additional growth given the distance to reservoirs. No reservoirs exist within the Precincts. Reticulation upgrades would be required to realise any capacity along with upgrades to reservoirs. An additional 600mm watermain is being extended from Oran Park to the south as part of the Northern Road upgrade and will provide initial service to the Aerotropolis Core. These works are expected to supply initial development to the Aerotropolis Core.

Sewer

There are no Sydney Water wastewater services. There are onsite disposal systems on undeveloped and rural lots.

Electrical

The Aerotropolis Core is serviced by the Bringelly ZS, located south of the Precinct, with 2.1MVA residual capacity. This equates to approximately 525 low density residential dwellings, and there is very limited ability to support growth. The Northern Gateway is serviced by the Luddenham ZS, located to the north west, with 6.7MVA residual capacity. This equates to approximately 1,675 low density residential dwellings. Residual capacity is not dedicated to the Precinct and can be utilised by other Precincts within the Zone Substation catchment. There are very few 11kV feeders within the Precincts.

TransGrid's 330kV transmission line also passes through the Northern Gateway.

Gas

The network has minimal residual capacity. There are secondary gas mains within Aerotropolis Core along Badgerys Creek Road. The secondary network services large industrial customers and no distribution mains exit. A Secondary Regulating Set (SRS) exists within the Precinct, which steps down pressure to the medium pressure network. Overall, the infrastructure in the Aerotropolis Core has capacity for organic growth over the next couple of years. However, the Northern Gateway has no gas assets.

Open Space

There is no zoned land for environmental uses or public recreation in the Aerotropolis Core and bushland is fragmented. There are 82 hectares of land zoned for public recreation and 61 hectares for environmental conservation, around Cosgrove Creek.

Tree canopy is 9.2 per cent in the Aerotropolis Core and 5.1 per cent in the Northern Gateway Precinct.

Environment & Waste

The Badgerys Creek Quarry (EPA Licence 20498) is in this Precinct. It receives soils and has a limit of 168,000 tpa.

5.2. People and Places

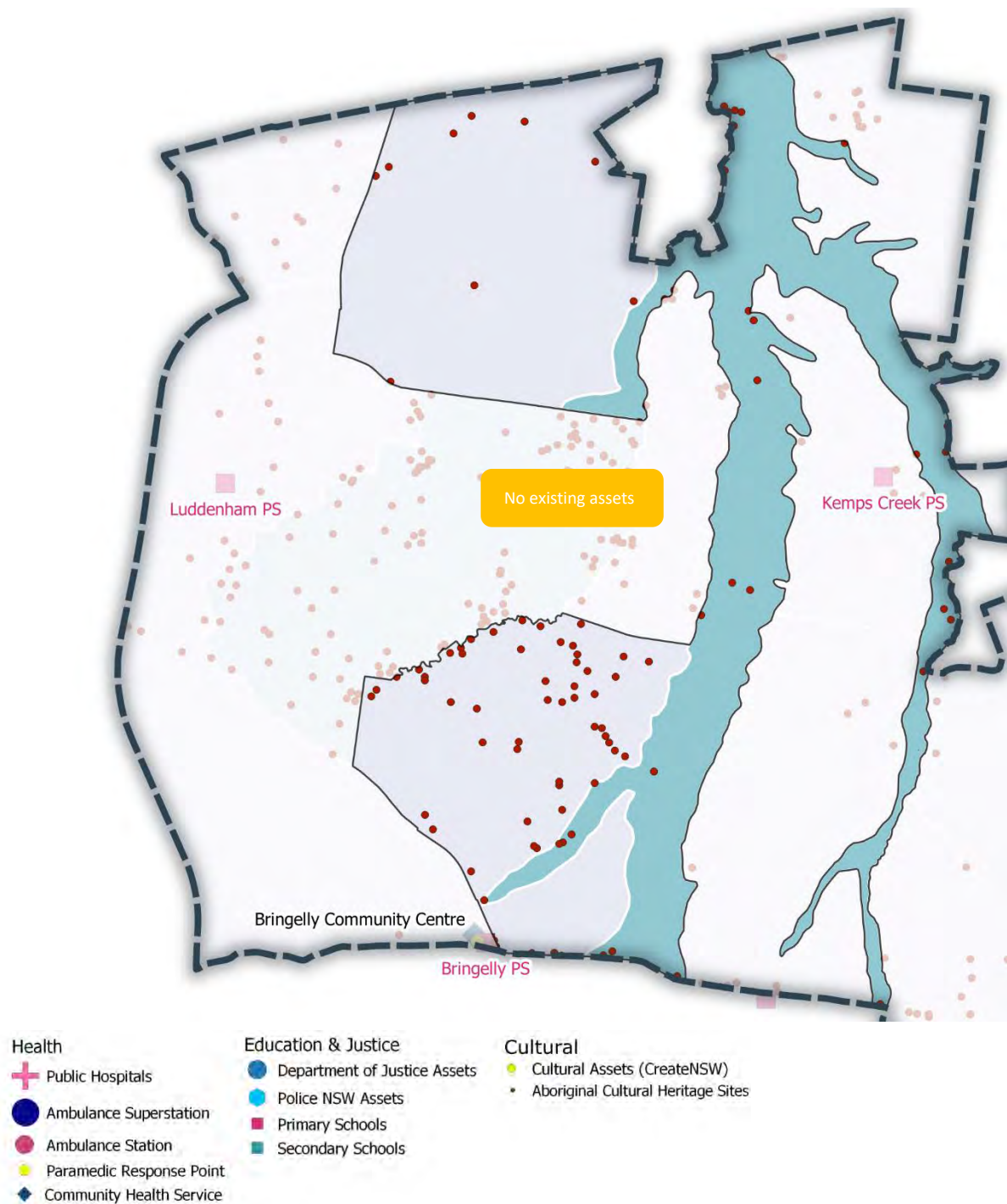


Figure 29: People and Place- Existing Infrastructure (Initial Release Precincts)

Education

Bringelly Primary School is outside the southern boundary of the Aerotropolis Core (Figure 29). It can expand to accommodate short term growth. Table 12 shows the capacity of existing schools.

Table 12: Existing School within the Aerotropolis Core – Capacity Metrics

Primary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 enrolments	Exceeds Standard Size	PTS Utilisation rate 2019	Ability to Expand
Bringelly Public School	138	784	115	N	83%	Yes

Health

The Bringelly Early Childhood Health Centre and Community Nursing Service (SWSLHD) is the only NSW Health service delivery point within the GIC area. However, this is not a NSW Health- owned asset.

Other Social Infrastructure

There are no TAFE NSW, Justice NSW, NSW Fire and Rescue, NSW Ambulance, Police, primary/secondary schools or social housing facilities within the Precinct (Figure 29). Refer to Section 3 for regional services.

6. Findings – Unzoned Precincts with Limited Capacity (Kemps Creek & Rossmore)

6.1. Networks and Systems

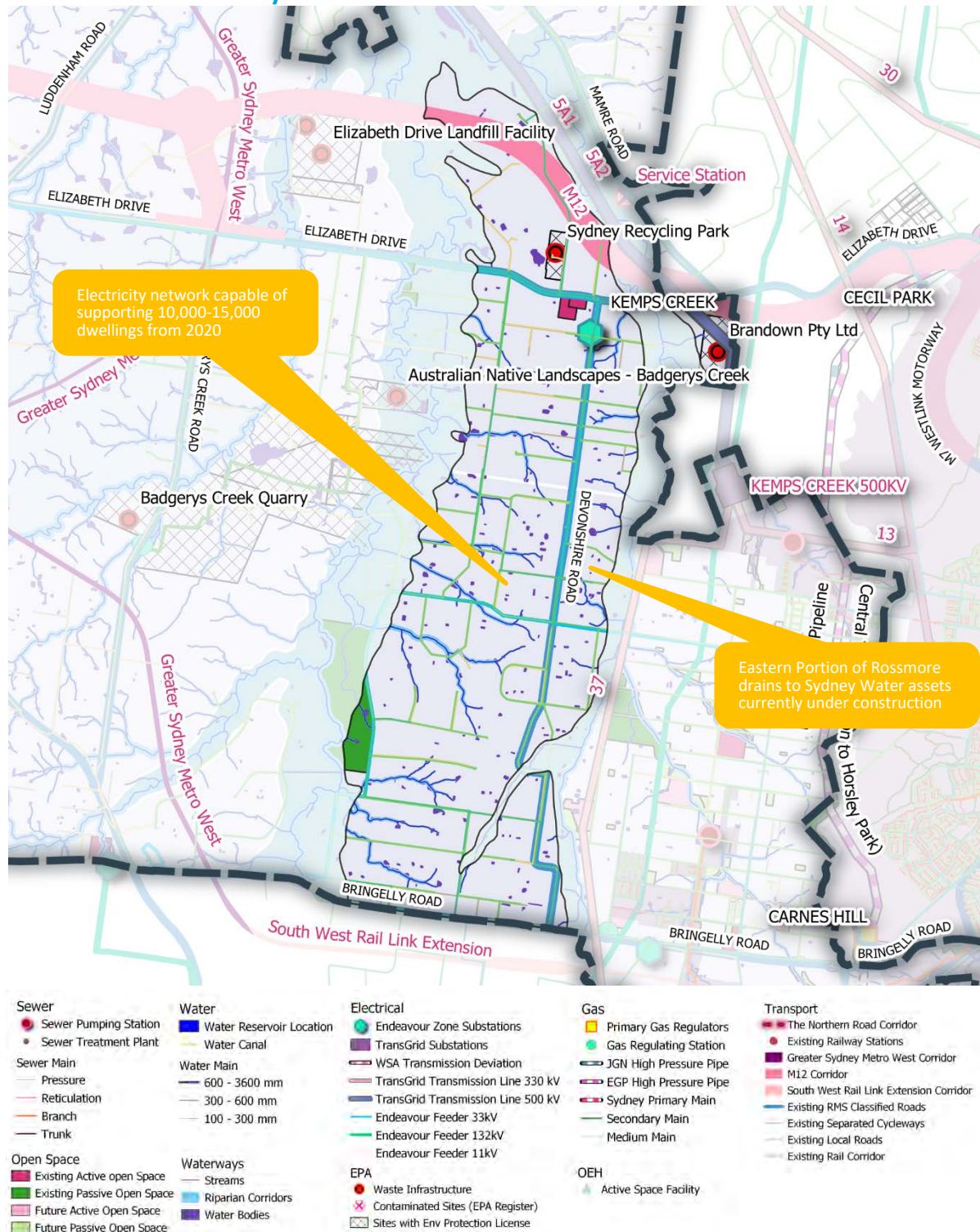


Figure 30: Network and Systems - Existing Infrastructure (Kemps Creek)

Infrastructure within the Precinct is limited, particularly due to its rural residential and agricultural land uses, isolation and distance from existing networks (Figure 30). In addition, connectivity to the north is challenging due to South Creek and potential flooding.

Rail

There is no infrastructure or corridor reservations within the Precincts.

Roads

The network predominately consists of rural/suburban roads. Key State/Regional roads include Bringelly Road (under construction to two lanes each direction for the Rossmore segment and expected to be complete by 2020), Elizabeth Drive in Kemps Creek and Devonshire Road/King Street. They operate with greater than 50 per cent residual capacity. Fifteenth Avenue is the local road of greatest significance, is predominantly used as an East-West thoroughfare and operates at greater than 50 per cent spare capacity. All remaining roads, including Devonshire Road, operate with greater than 50 per cent spare capacity. The M12 motorway corridor cuts through the Kemps Creek Precinct north of Elizabeth Drive and west of Mamre Road, cutting south of Elizabeth Drive at Kemps Creek.

Bus

Networks operate along Fifteenth Avenue, Elizabeth Drive, Bringelly Road and local internal roads. Routes 801, 855 and 856 service the Precincts, connecting residents to Leppington station and Liverpool City Centre. Network coverage and level of service reflects current land uses.

Active Transport

There is limited active transport infrastructure in the study area, with a shared path recently opened as part of Bringelly Road (Stage 1).

Water

There are no reservoirs in the Precincts. They are predominantly serviced by the nearby Cecil Park reservoir. The existing mains are mostly rural domestic reticulation mains and are not capable of supporting growth without augmentation.

Sewer

There are no Sydney Water wastewater services. There are onsite disposal systems on undeveloped and rural lots. New infrastructure is being constructed to the east in Austral which will be capable of servicing some areas to the east of Devonshire Road, draining to Kemps Creek in the short term.

Electrical

The Precincts are serviced by the Kemps Creek and Bringelly ZS, with 12.3 and 2.1 MVA residual capacity respectively. This equates to approximately 3,600 low density residential dwellings. Residual capacity is not dedicated to the Precinct and can be utilised by other Precincts within the Zone Substation catchment. However, the construction of the North Leppington Zone substation will augment supply in the area by approximately 10,000-15,000 new dwellings from 2020. Two 500kV

TransGrid transmission lines bisect a small portion of the eastern side of the Precinct and will need to be considered in any Precinct planning.

Gas

The network has minimal residual capacity. There are secondary gas mains within the Precincts along Bringelly Road and Devonshire Road. The secondary network services large industrial customers and no distribution mains exit. Overall, the existing infrastructure in the Rossmore and Kemps Creek has capacity for organic growth over the short term.

Open Space

There are 3.5 hectares of land zoned for environmental conservation and 6.75 hectares for public recreation. There are areas of more contiguous riparian vegetation around the Kemps Creek Reserve, but bushland is largely fragmented outside the riparian zone. There are approximately 24 hectares of land zoned for public recreation in the Rossmore Precinct, which is predominantly bushland. Tree canopy is 17.3 per cent in Kemps Creek and 12.3 per cent in Rossmore.

Environment & Waste

Sydney Recycling Park (EPA Licence 12901) is located within the Precinct. This facility receives general solid waste (non-putrescible) and asbestos and has no annual limit on its licence.

6.2. People and Places

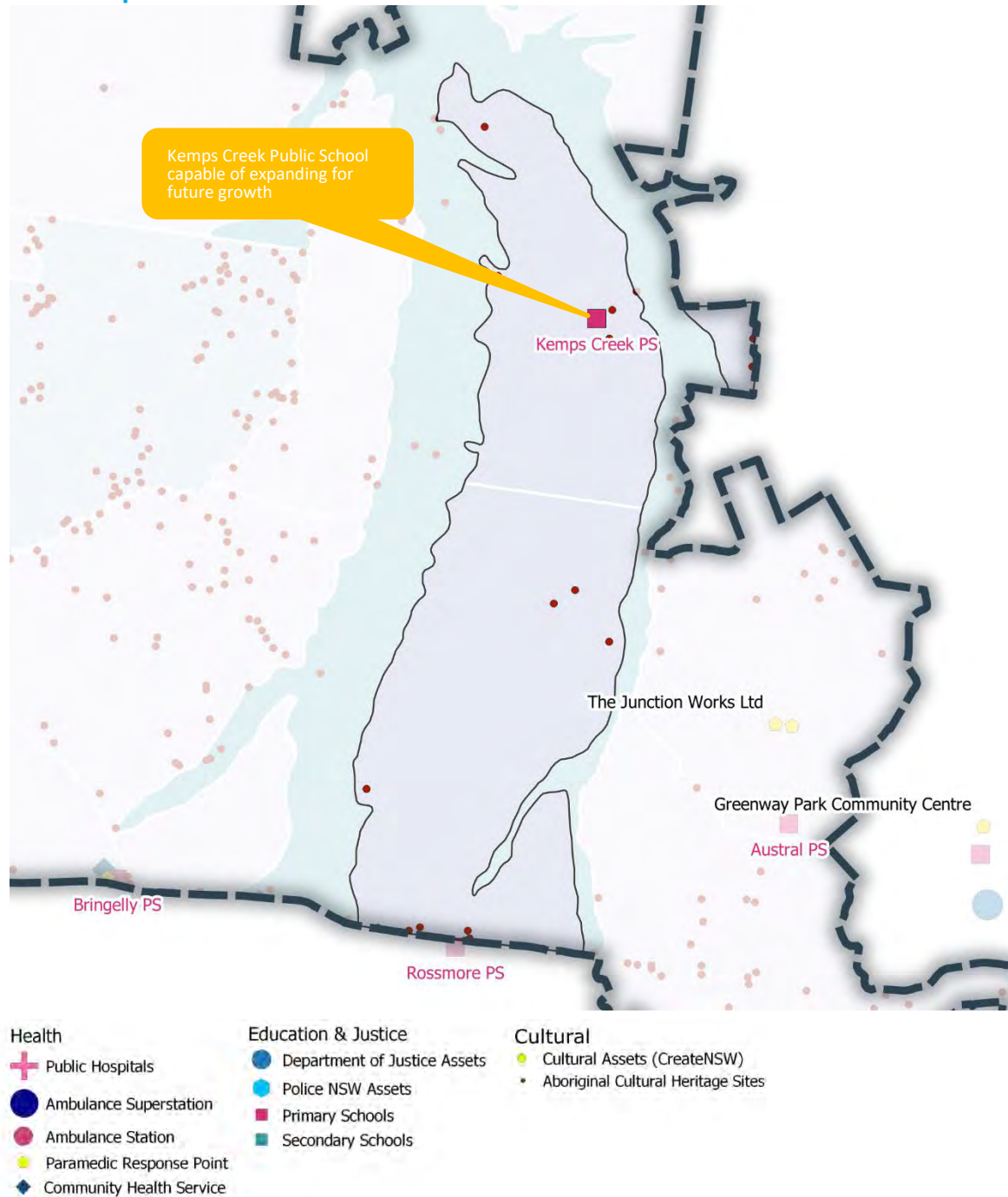


Figure 31: People and Place - Existing Infrastructure (Kemps Creek)

Education

Kemps Creek Primary School is in the Precinct (

Figure 31). It has capacity in the short term, whilst Leppington is exceeding permanent capacity. Rossmore Primary School is located outside the southern boundary of the Precinct. The three schools can expand to accommodate short-term growth. Table 13 shows capacity of existing schools.

Table 13: Existing School within Kemps Creek & Rossmore – Capacity Metrics

Primary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 enrolments	Exceeds Standard Size	PTS Utilisation rate 2019	Ability to Expand
Rossmore Public School	207	1191	75	N	67%	Limited due to small site
Kemps Creek Public School	161	216	154	N	86%	Yes

Other Social Infrastructure

There are no Health, TAFE, Justice, Fire and Rescue, Police, primary/secondary schools, social housing or cultural facilities within the Precinct. Refer to Section 3 for regional service provision.

7. Findings – Remaining Precincts (Mamre Road, North Luddenham, Agriculture & Agribusiness and Badgerys Creek)

7.1. Networks and Systems

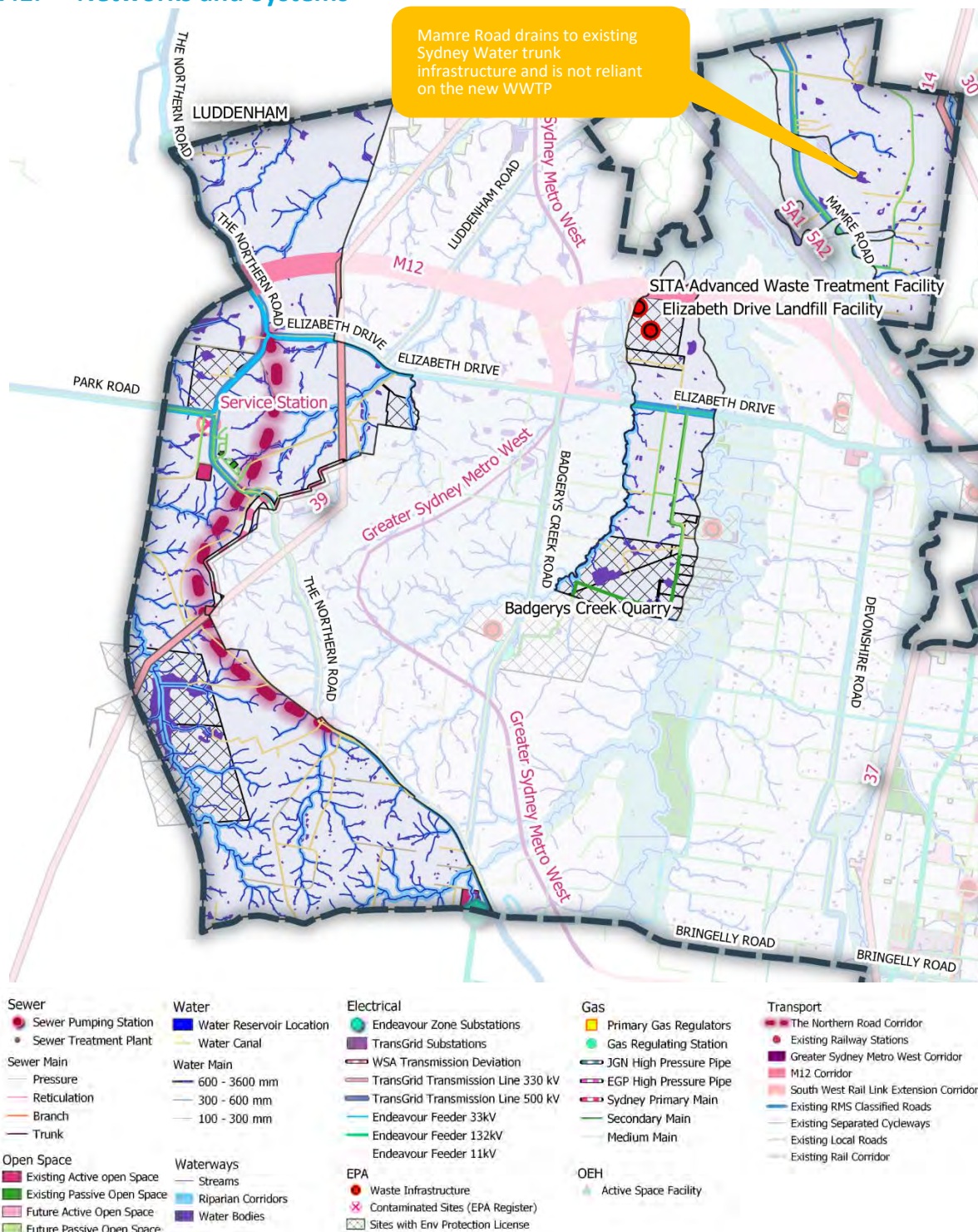


Figure 32: Network and Systems - Existing Infrastructure (Remaining Precincts)

The remaining Precincts within the GIC1 area are predominantly greenfield and withdrawn from trunk infrastructure (Figure 32). These Precincts have little residual capacity to supply development in the short term without significant investment by agencies or third-party operators.

Rail

There is no rail infrastructure within these Precincts. However, the proposed reservation for Western Sydney Freight Line corridor traverses the Mamre Rd precinct.

Roads

The network predominately consists of rural/suburban roads. Key State/Regional roads include Mamre Road, connecting Elizabeth Drive to the M4, Elizabeth Drive connecting East-West, the Northern Road running north-south. A segment of Mamre Road, the Northern Road and Elizabeth Drive reduce to 15-20, 40 and 15-20 per cent respectively. The Northern Road capacity issues are expected to be alleviated as the upgrade progresses. All other roads operate with greater than 50 per cent spare capacity in peak periods. The Northern Road is also being realigned around the WSA through the Agriculture and Agribusiness Precinct.

Future major corridors include the M12 and the OSO. Their alignments are being refined and corridor preservation activities are ongoing.

Bus

Network coverage and level of service is limited; the following services are available in the area.

- **Mamre Road:** There are no services within the Precinct. Route 801 is the closest service to the Precinct, connecting to Liverpool.
- **Badgerys Creek:** Networks operate along Elizabeth Drive and local internal roads. Route 801 is the only service in the Precinct, connecting to Liverpool.
- **Agriculture and Agribusiness:** Route 789 runs from Penrith station to Luddenham via The Northern Road. Route 856 services a small portion of the Precinct at the Bringelly Road and Northern Road Intersection.
- **Luddenham:** Route 789 runs from Penrith station to Luddenham via The Northern Road.

Active Transport

There is no dedicated active transport in the Precinct.

Water

There are no reservoirs in the Precincts. They are predominantly serviced by Cecil Park reservoir. Luddenham Town Centre is serviced from Warragamba. The potable water network has limited capacity to service growth and given the distance from existing trunk infrastructure, significant upgrades would be required to accommodate growth. North Luddenham has no minor reticulation.

Sewer

There are no Sydney Water wastewater services. There are onsite disposal systems on undeveloped and rural lots. Mamre Road is expected to connect to the trunk sewer network to the north and draining to existing facilities. All other Precincts will be serviced by decentralised systems in the short term until the new South Creek Treatment Plant is operational.

Electrical

Mare Road and Badgerys Creek are serviced by the Kemps Creek ZS to the south, with 12.3MVA residual capacity. This equates to approximately 3,075 low density residential dwellings. The Agriculture/Agribusiness and North Luddenham Precincts are serviced by the Luddenham ZS and Bringelly ZS's, located to the north-west and south-east, with 6.7MVA and 2.1MVA residual capacity respectively. This equates to approximately 2,200 low density residential dwellings. Residual capacity is not dedicated to the Precinct and can be utilised by other Precincts within the Zone Substation catchment. There are very few 11kV feeders within all Precincts.

Two 330kV TransGrid transmission lines intersect a small portion of the eastern side of the Mamre Road Precinct and the Agriculture and Agribusiness Precincts. These transmission lines will need to be considered in any Precinct planning.

Gas

The existing network has minimal residual capacity. There are medium gas mains within northern portion of the Mamre Precinct servicing large industrial customers. Overall, the infrastructure in the Mamre Precinct has sufficient capacity for organic growth over the next couple of years. Similarly, there are secondary gas mains within the Badgerys Creek Precinct. The secondary network services large industrial customers and no distribution mains exit. Overall, the infrastructure in Badgerys Creek has sufficient capacity for organic growth over the next couple of years. There is no gas reticulation within the Agriculture/Agribusiness and North Luddenham Precincts.

Open Space

There are 4.94 hectares zoned for environmental conservation, around Badgerys Creek itself, and no land zoned for public recreation. There is no land zoned for public recreation in Mamre Road and 8.5 hectares have been zoned for environmental conservation. There are eight hectares zoned for public recreation and no land zoned for environmental conservation. There is no land zoned for public recreation or environmental conservation in the North Luddenham Precinct. There are fragmented areas of bushland on privately owned properties.

Tree canopy Summary:

- Mamre Road Precinct, 6.5%
- Badgerys Creek Precinct, 9%
- Agriculture and Agribusiness Precinct, 11.8%
- North Luddenham Precinct, 4.2%.

Environment and Waste

The SITA Advanced Waste Treatment Facility (EPA licence 12889) is in the Precinct. It receives general solid waste (putrescible and non-putrescible waste) and biosolids and has a limit of 134,400tpa imposed on its licence.

The Elizabeth Drive Landfill Facility (EPA licence 4068) is also located in the Precinct. It receives general solid waste (non-putrescible), asbestos, waste tyres and restricted solid waste with no annual limits. This facility plans to extend its operation to 2030, although no evidence of a proposal has been sighted.

7.2. People and Places

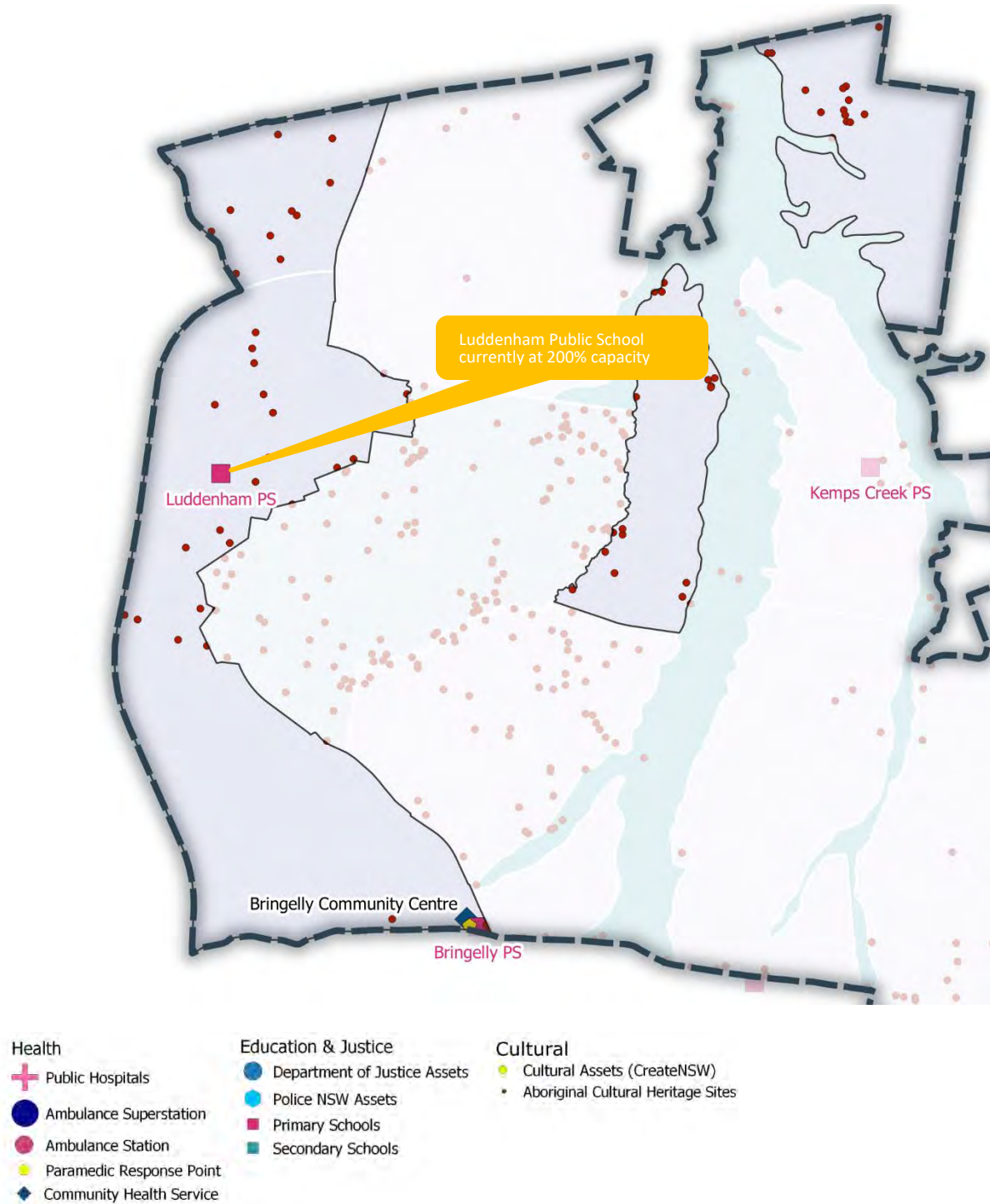


Figure 33: People and Place - Existing Infrastructure (Remaining Precincts)

Other Social Infrastructure

There are no Health, TAFE, Justice, Fire and Rescue, Police, secondary schools, social housing or cultural facilities within the Precincts (Figure 33). Refer to Section 3 for regional service provision.

Education

Luddenham Primary School is inside the southern boundary of the Agriculture and Agribusiness Precinct. The school can accommodate short-term growth, but due to its small size future expansion will be limited. Table 14 shows capacity of existing schools in the remaining precincts.

Table 14: Existing Schools the Remaining Precincts– Capacity Metrics

Primary School Name	Permanent capacity	Current 2036 Projection Enrolments	2019 enrolments	Exceeds Standard Size	PTS Utilisation rate 2019	Ability to Expand
Luddenham Public School	46	73	80	N	200%	Limited due to small site
Bringelly Public School	138	784	115	N	83%	Yes

Health

The Bringelly Early Childhood Health Centre and Community Nursing Service (SWSLHD) is the only NSW Health service delivery point within the GIC area. However, it is not a NSW Health- owned asset.

8. Findings – Western Sydney Airport

8.1. Networks and Systems

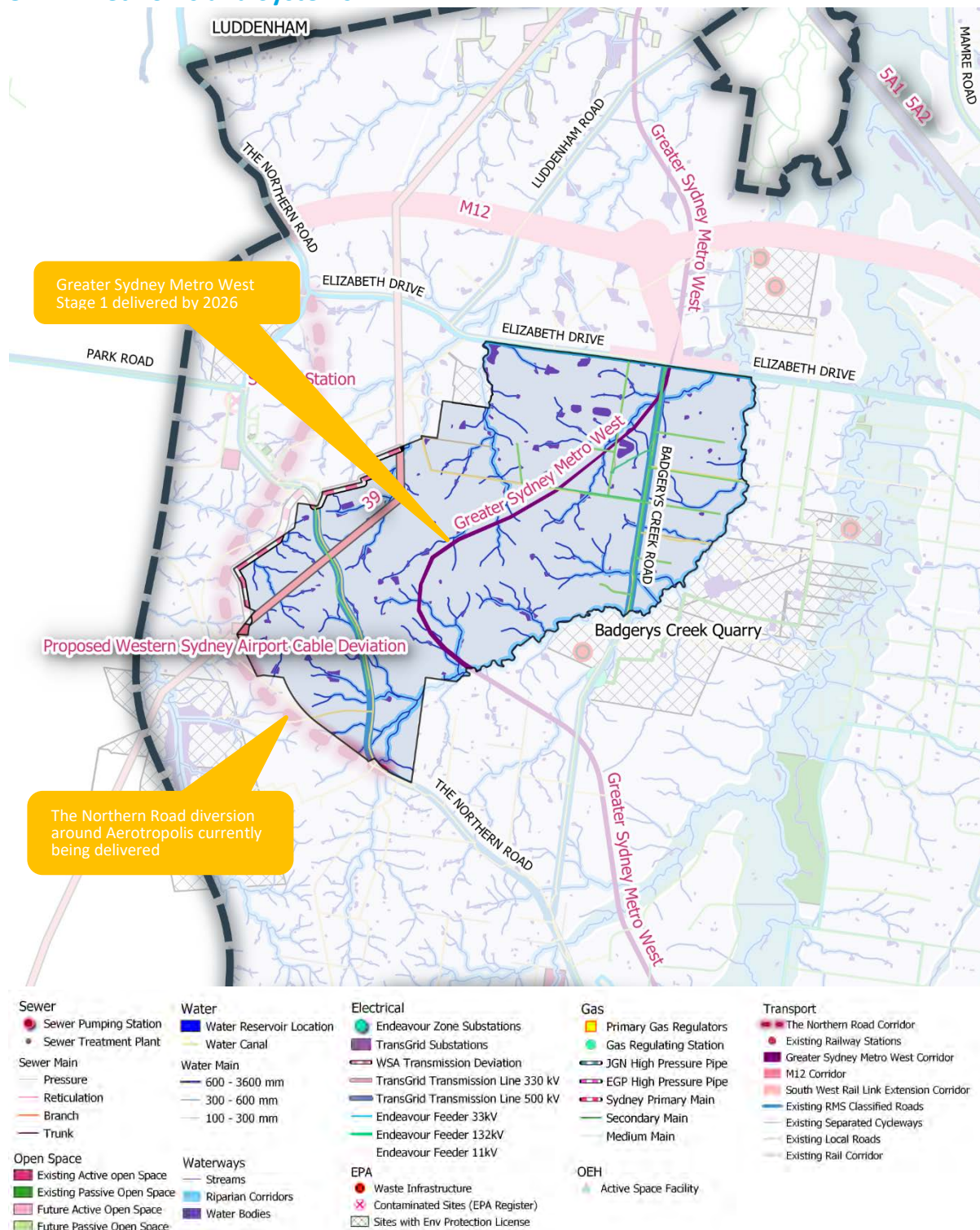


Figure 34: Network and Systems - Existing Infrastructure (Western Sydney Airport)

Infrastructure within the Precinct is limited, particularly due to its rural residential and agricultural land uses, isolation and distance from existing networks (Figure 34).

Rail

There is rail infrastructure within the Precinct however, the future rail alignment is to be accommodated by WSA as part of its delivery.

Roads

The network predominately consists of rural/suburban roads. Key State/Regional roads include Elizabeth Drive connecting East-West along the northern border of the site, the Northern Road and Badgerys Creek Road through the Precinct. The WSA segment of Elizabeth Drive has 40 per cent spare capacity in peak periods. The Northern Road is planned to be deviated around the WSA as part of the Airport Stage 1 Works and is under construction.

Bus

Bus networks operate along Elizabeth Drive. Route 801 is the only service in the Precinct, connecting to Liverpool. Network coverage and level of service is limited.

There is no dedicated active transport in the Precinct.

Water

A small portion of the site is serviced by Cecil Park reservoir. The remainder of the site is unserved. Future water provision will be provided as part of the Airport Stage 1 Works.

Sewer

There are no Sydney Water wastewater services. There are onsite disposal systems on undeveloped and rural lots. Future wastewater provision will be provided as part of the Airport Stage 1 Works.

Electrical

The WSA Precinct is serviced by the Kemps Creek ZS, located to the west, with 6.7MVA residual capacity. This equates to approximately 1,675 low density residential dwellings. Residual capacity is not dedicated to the Precinct and can be utilised by other Precincts within the Zone Substation catchment. There are very few 11kV feeders within the Precinct. A new substation is proposed for the Airport as part of Stage 1 works.

TransGrid's 330kV transmission line also passes through the site; this is being deviated underground around the site.

Gas

There is no gas reticulation within the Precinct. New gas infrastructure will be provided for the Airport as part of Stage 1 works.

Open Space

Tree canopy is 9.9 per cent over the Western Sydney Airport Precinct, however a large majority of this vegetation will likely be removed as part of the airport construction.

There is no land zoned for public recreation or environmental conservation in the Precinct. There are areas of fragmented bushland on the Airport site and there is a planned environmental conservation zone, through the Western Sydney Airport Plan, located along Badgerys Creek.

Environment & Waste

There are no assets in the Western Sydney Airport Precinct.

8.2. People and Places

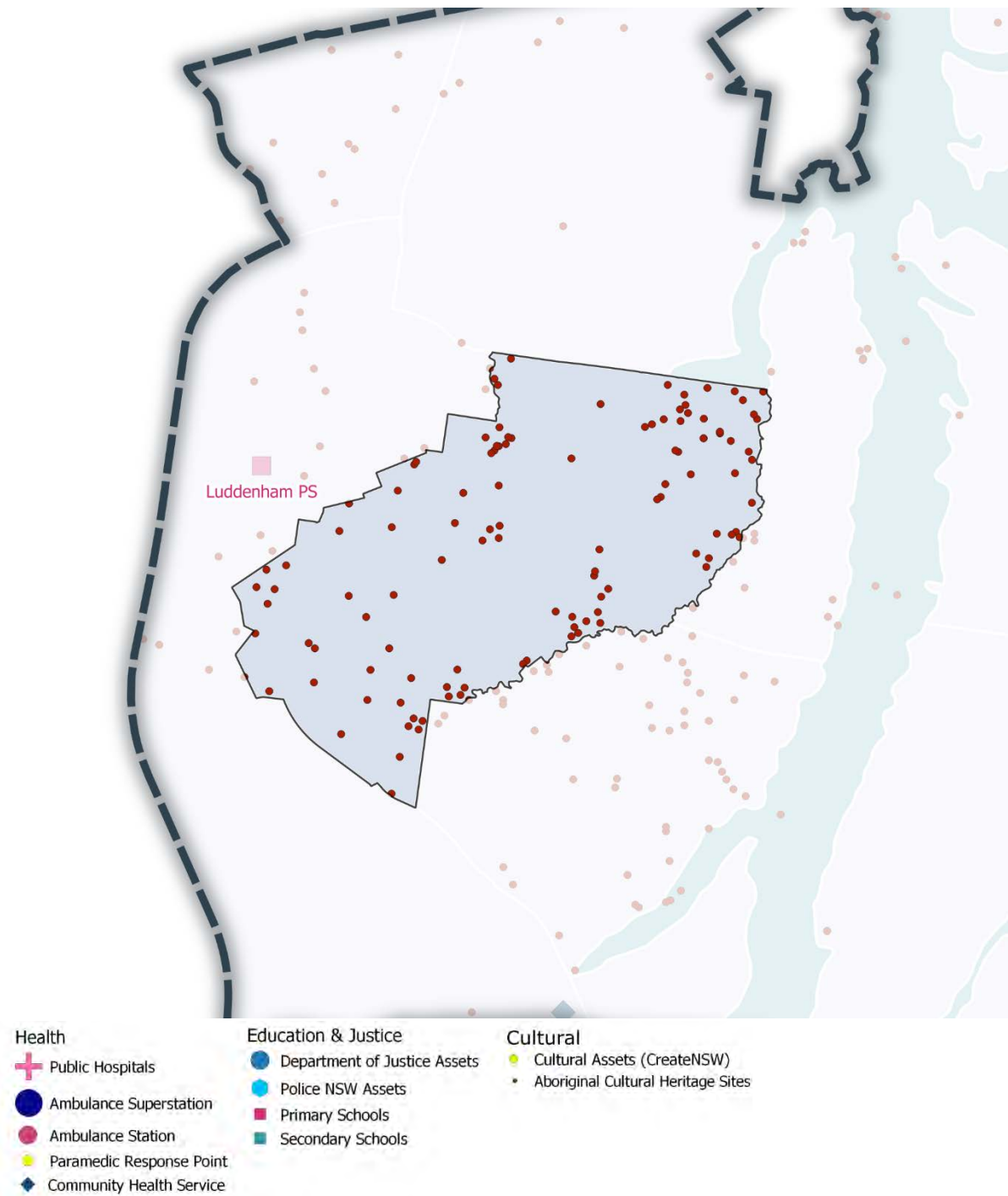


Figure 35: People and Place - Existing Infrastructure (Western Sydney Airport)

Other Social Infrastructure

There are no Health NSW, TAFE NSW, Justice NSW, NSW Fire and Rescue, NSW Ambulance, Police, primary/secondary schools or social housing facilities within the Precinct (Figure 35). Refer to Section 3 for regional GIC services.

9. Summary Conclusion

This baseline report has been prepared with input from NSW infrastructure and servicing agencies to form/construct a consolidated, place-based view of the infrastructure and capacity of the GIC1 area.

The infrastructure provision reflects the predominantly rural land uses within the GIC1 area. The rezoned Austral and Leppington North Precincts are slowly developing with the provision of water and electricity infrastructure.

Sector Findings

Networks and Systems

The road network contains a mix of local rural/suburban roads and rural arterial roads. The State and regional road network has spare capacity on most corridors, with the least capacity on parts of Elizabeth Drive, Mamre Road and Devonshire Road.

Public transport is limited, and primarily serviced by local bus routes to Leppington station and Liverpool City Centre. Rail infrastructure is limited to the South West Rail Link, which terminates at Leppington station. There is limited active transport infrastructure in the study area, with a shared path recently opened as part of Bringelly Road (Stage 1).

The Transgrid major high voltage network has residual capacity to service growth to 2030, beyond which major investments will be required. Endeavour Energy's network is keeping pace with development in Austral and Leppington North but has distribution limitations in the rest of the GIC1 area.

Sydney Water is exploring options for the servicing of the Western Sydney Aerotropolis and surrounding areas. The size and extent of infrastructure required to adequately service the anticipated growth will take some time to plan, construct and commission and decentralised systems may be required in the short term to support growth.

Overall, the gas infrastructure has the capacity for organic growth over the next few years. Beyond this, the network will need to be extended to reach new major growth locations and large users.

There is a low provision of formalised passive and active public open space in GIC1 and this reflects the low population density and rural land use zoning and greenfield nature of the Precinct. Existing public space is also contained in large land parcels and not well distributed.

People and Places

There are five primary schools and no high schools in the GIC1 area, which reflects land use and population. While the utilisation of the schools is mixed, with some already exceeding capacity, the 2036 enrolment projections far outweigh the capacity of the schools, even allowing for future expansion.

TAFE NSW has no assets in the GIC1 area. Given the need to locate vocational training facilities close to employment lands, it is expected that there will be a strong case for a number of TAFE locations, including the Western Sydney City Deal's commitment for a TAFE NSW Skills Exchange at the

Aerotropolis construction compound and a permanent Vocational Educational Training facility in the Aerotropolis.

There are no NSW Health-owned facilities, regional or state cultural infrastructure, social housing infrastructure Justice, Fire and Rescue or Police infrastructure within the GIC1 area. No social infrastructure is committed, and all services come from facilities in surrounding areas.

Precinct Findings

The Precincts were categorised as follows, based on their planning status and relationship to existing infrastructure:

- Rezoned Precincts
- Aerotropolis Initial Release Precincts
- Unzoned with Initial Capacity
- Remaining Precincts.

The rezoned Precincts of Austral and Leppington North have experienced significant investment in the form of the Leppington train station, water and wastewater assets and new electrical infrastructure. These Precincts are slowly developing, particularly in the catchments of the wastewater infrastructure.

When overlaying all existing assets/capacities and short term committed infrastructure, the most likely Precinct to progress in the short term is Rossmore, followed by the eastern portion of Kemps Creek. This is due to the short-term rollout of planned sewer and water infrastructure at Kemps Creek and electricity upgrades at Leppington North. Also, Rossmore is close to transport and educational facilities.

Significant infrastructure is required to support the Western Sydney Airport (WSA) and committed road upgrades may allow opportunities to work collaboratively and provide services for the Initial Release Precincts of the Aerotropolis Core and Northern Gateway Precincts in tandem with the Airport.

All remaining Precincts are generally rural in nature and removed from most forms of trunk infrastructure and will require significant infrastructure investment to support future growth.

Limitations

Work completed by OEH shows there is an existing network of riparian vegetation corridors, but bushland and vegetation cover throughout the GIC area is fragmented and there is a lack of connected corridors. The entire GIC area is subject to assessment under the strategic biocertification process and will be considered in the Cumberland Plain Conservation Plan. This process has not been finalised but will determine areas that should be conserved for biodiversity value in the GIC area.

The EPA was unable to provide an assessment on the capacity of the existing waste network to accommodate population growth in the GIC area. Although more waste may be generated in the GIC boundary (estimations provided above), it will be transferred to and processed in facilities around the Greater Sydney Region or NSW, depending on the waste stream. Therefore, the capacity of existing waste infrastructure to accommodate growth is not contained to a geographical boundary and needs to be considered on a wider basis.

A long-term waste strategy being developed by EPA is estimated to be completed by the end of 2019. It is assessing the capacity of the Greater Sydney waste network to absorb population growth more broadly than the GIC area.

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