



Glenfield Planned Precinct

Infrastructure and Utilities Report

20 November 2020

Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB
Sydney, NSW 1230
Australia

T +61 (0)2 9098 6800
F +61 (0)2 9098 6810
mottmac.com

6 Bligh Street
Sydney, NSW, 2000

Glenfield Planned Precinct

Infrastructure and Utilities Report

20 November 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	29/09/17	T. Abbot	G. Lee	C. Avis	Draft
B	23/02/18	T. Abbot	G. Lee	C. Avis	Final
C	31/05/18	T. Abbot	G. Lee	C. Avis	Revised to include DPIE feedback
D	19/11/18	R. Higginson	G. Lee	C. Avis	Sydney Water comments included
E	30/10/20	P.Hosri	T.Loder	J.Wukowic	Revised ILP
F	02/11/20	P.Hosri	T.Loder	J.Wukowic	Revised to include DPIE feedback
G	20/11/20	P.Hosri	T.Loder	J.Wukowic	Revised ILP

Document reference: MMD-376722-S-RP-C-0002 [G]

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Executive Summary	1
1 Introduction	4
1.1 Purpose of Report	4
1.2 Scope of Works	4
1.2.1 Infrastructure Strategy	4
1.2.2 Reticulation Schematics and Cost Estimates	4
1.3 Regional Context	5
1.4 Planned Precinct Study Area	6
1.4.1 Western Planned Precinct (NSW Government Owned Site)	6
1.4.2 Eastern Planned Precinct	6
1.5 Proposed Study Area and Re-Zoning Works	8
1.5.1 NSW Government Site	8
1.5.2 DPIE Plan for East of Corridor	10
2 Water	12
2.1 Existing Network	12
2.2 Consultation with Authorities	16
2.3 Proposed Network	16
2.3.1 Western Planned Precinct	16
2.3.2 Eastern Planned Precinct	21
2.4 Internal Reticulation	22
2.5 Required Upgrades	22
2.6 Key Constraints and Opportunities	23
3 Sewer	24
3.1 Existing Network	24
3.1.1 Waste Water Treatment Facilities	24
3.1.2 Sewer Pump Stations	25
3.1.3 Catchments and Existing Sewer Loads	25
3.1.4 Local Trunk and Reticulation Network	28
3.2 Consultation with Authorities	31
3.3 Proposed Network	31
3.3.1 Western Planned Precinct – Catchments 2, 3, 5-7	32
3.3.2 Eastern Planned Precinct – Catchments 8-14	38
3.3.3 Eastern Planned Precinct – Catchments 1 and 4	40
3.3.4 Alternative Strategy	41
3.3.5 Glenfield Water Recycling Plant	41
3.4 Key Constraints and Opportunities	42

4	Electricity	43
4.1	Existing Network	43
4.2	Consultation with Authorities	45
4.3	Proposed Network	45
4.3.1	Increase in load	45
4.3.2	Initial Network – First 4,500 Dwellings	45
4.3.3	Ultimate Network	47
4.4	Funding Mechanisms	52
4.5	Key Constraints and Opportunities	52
5	Gas	53
5.1	Existing Network	53
5.2	Consultation with Authorities	54
5.3	Proposed Network	54
5.4	Key Constraints and Opportunities	54
6	Telecommunications	55
6.1	Existing Network	55
6.2	Consultation with Authorities	55
6.3	Proposed Network	55
6.4	Key Constraints and Opportunities	55
	Appendices	57
A.	Existing Utilities Network	58
B.	Proposed Utilities Network	59
C.	Authority Correspondence	60
D.	RPS Survey	61

Executive Summary

The area nominated as the Department of Planning, Industry & Environment's (DPIE's) Glenfield Planned Precinct is well positioned for transit-orientated development centred on the Glenfield Railway Station. The Planned Precinct is composed of the following two main areas of land separated by the railway corridor:

- The Western Planned Precinct consists of predominately Greenfield land owned by the NSW Government which currently accommodated two schools; and
- The Eastern Planned Precinct consists of predominately low density residential land.

Mott MacDonald were engaged by the Department of Planning, Industry & Environment and Property NSW to assist with the preparation of an Infrastructure Master Plan. The purpose of this plan is to assess the impacts of which rezoning the Glenfield Planned Precinct to a higher residential density has on the potable water, sewer, electricity, gas and telecommunications networks and determine suitable arrangements to cater for the growth. The findings for each of these services are summarized below.

Potable Water

Sydney Water service the region surrounding the Planned Precinct via the Prestons (approximately 950 m to the north), Minto (approximately 5.0 km to the south) and Ingleburn (approximately 3.1 km to the south) reservoirs. Currently:

- The Western side of the Planned Precinct only includes minor reticulation mains to service the schools. Vast areas of the Western Planned Precinct are not serviced by water infrastructure;
- A 375 mm trunk main services the Eastern Planned Precinct from Ingleburn Reservoir, entering from the southern boundary and connecting to an existing pump station. The existing properties are serviced via reticulation mains.

Mott MacDonald have determined the trunk upgrades which would be required to deliver water from Ingleburn Reservoir assuming the existing pipes have no remaining capacity. These are illustrated in Figure 10. As development progresses detailed assessments will need to be undertaken in conjunction with Sydney Water to confirm spare capacities and servicing strategies.

It should be noted that given the nature of growth across Sydney, at this time, high level servicing data is only accurate at the date of issue and may be subject to change prior to zoning plans being finalised.

Sewer

Sydney Water service the region surrounding the Planned Precinct via the Glenfield Water Recycling Plant (WRP) to the south-east. Currently:

- The Western Planned Precinct only is comprised of minor privately owned reticulation pipes to service the existing schools. It is likely these drain into the existing 600mm Glenfield Carrier (which drains to the Glenfield WRP) via a crossing under the rail corridor. Significant areas of the Western Planned Precinct are not serviced by sewer infrastructure as they are rural agricultural land;
- The Eastern Planned Precinct has an existing reticulation sewer network which drains into either the 600 mm Glenfield Carrier or 450 mm Belmont Rd Carrier trunk mains. These trunk mains drain to the Glenfield WRP. Some regions are pumped into the carriers via Sewer Pump Stations (SPS's) SPS0378 and SPS0379 and their associated rising mains.

Mott MacDonald have determined a potential servicing strategy for the proposed development. It is anticipated that trunk upgrades may be required to drain sewer assuming the existing trunk pipes do not have any remaining capacity. As development progresses detailed assessments will need to be undertaken in conjunction with Sydney Water to confirm spare capacities and servicing strategies.

There is a ridge line near the western boundary of the Western Planned Precinct. Possible servicing options include:

- New infrastructure to pump all sewer east to the Glenfield WRP (which would involve construction of a new SPS);
- Drain the sewer on the western side of the ridge line to the Liverpool WWTP (which may require upgrades under the Hume Highway).

These options are illustrated in Figure 15 and Figure 16 respectively. To determine the preferable solution an options analysis will be required to be prepared in consultation with Sydney Water.

Sydney Water's customer service delivery team have prepared an alternative servicing option for the site which would involve servicing the western catchment via a gravity main on the southern boundary of the sub-arterial road. This gravity main would drain to an upgraded pump station on the eastern side of the rail corridor. The pump station would then transfer flows to the trunk gravity sewer network via a rising main. This option could be explored further during the options phase of the project.

Sydney Water have undertaken a preliminary assessment of the Glenfield WRP to determine if there is sufficient capacity to support the proposed development in the Precinct. The assessment indicated that there is insufficient hydraulic capacity to receive the additional flows generated by the Precinct. Consultation with Sydney Water should be prioritised to ensure the required upgrades to the Glenfield WRP can be included in Sydney Water's future capital works program or an alternative servicing option be identified.

It should be noted that given the nature of growth across Sydney, at this time, high level servicing data is only accurate at the date of issue (Friday, 15 October 2020), and may be subject to change prior to zoning plans being finalised.

Electricity

The Glenfield region is serviced by the Endeavour Energy (EE) electrical network via the Prestons, Casula and Macquarie Fields Zone Substations (ZS's). EE have estimated an increase in electrical load of approximately 40 MVA will result from the proposed high yield scenarios. Approximately ten new 11 kV feeders will be required to meet this demand.

It was identified through consultation with EE that a new ZS may be required to meet the demand for the Glenfield Planned Precinct. A site in the Western Planned Precinct has been identified for the new ZS to be closely located with the concentration of extra electrical demand generated by the Planned Precinct.

The presence of two 330 kV transmission lines running west-east will constrain development in the northern portion of the Western Planned Precinct. An easement is in place for this land.

Gas

Gas is supplied to the Glenfield area by Jemena. Gas is supplied to the Hurlstone Agricultural School in the Western Planned Precinct via 1,050 kPa secondary main located within the road reserve of Glenfield Road. Within the Eastern Planned Precinct, gas is supplied along most roads via a 210 kPa residential network, with secondary gas mains located along Trafalgar Street and Canterbury Road.

Under NSW regulation, Jemena is required to ensure that any connection to the natural gas distribution system is commercially viable and therefore must assess each request for supply on an individual basis (as gas supply is a non-essential service). Jemena will be able to assess the individual lots once the final building configurations are prepared and a connection application is made.

Telecommunications

The existing telecommunications network in the study area is provided by Telstra. Within the Western Planned Precinct, optic fibre is provided to the schools via Roy Watts Drive and the internal access road to the south of the Hurlstone Agricultural School. On the eastern side of Western Planned Precinct, Optus conduits traverse Quarter Sessions Road and service Campbell House School.

NBN's Planning Department have reviewed the development. NBN would be required to provide 2 x 576 fibre cables to service this development which will be fed from Liverpool exchange needing 7 kms of hauling. The Backhaul charge has been calculated at \$85,800 to service a development of this size.

1 Introduction

Mott MacDonald has been engaged by the Department of Planning, Industry, and Environment and Property NSW to assist with the preparation of an infrastructure Master Plan for the Glenfield Planned Precinct.

1.1 Purpose of Report

The purpose of this report is to provide the NSW Government with a robust and flexible strategy for utilities servicing that will inform the Master Plan for the NSW Government owned land and the remainder of the Glenfield Planned Precinct. This will involve the preparation of an Implementation Plan to ensure the efficient, logical roll out of infrastructure that takes into account staging, construction sequencing and physical constraints. To provide a robust plan, both the NSW Government owned site and the remainder of the Planned Precinct have been included in this assessment.

Some of the key outcomes are a strategy and plan that:

- Is supported by the service authorities (where possible);
- Is constructible and commercially viable;
- Takes the existing rail line, easements and other physical constraints into account;
- Facilitates land release immediately after gazettal; and
- Is not a fixed, rigid plan but is one that is flexible and able to respond to shifts in demand, housing mix and funding scenarios.

1.2 Scope of Works

To assist in the preparation of the Master Plan, Mott MacDonald has undertaken the following tasks:

1.2.1 Infrastructure Strategy

- An initial precinct review via DBYD to understand services present in the precinct;
- Collected utility authority existing utility assets and undertaken associated desktop review of their services;
- Mapped the extent of existing services and infrastructure in ArcGIS;
- Estimated the capacity of existing trunk utility services to determine capacity limitations to future growth where not provided by the service authorities; and
- Developed an initial conceptual infrastructure servicing strategy to meet demand from the predicted population and employment changes in the Precinct (where possible these strategies are endorsed by the utility authorities).

1.2.2 Reticulation Schematics and Cost Estimates

- Prepare a High and Low Voltage network reticulation schematic Master Plan including 11 kV feeder concept routes;
- Prepare a Potable Water reticulation layout schematic Master Plan including any lead-ins identified;

- Prepare a Wastewater reticulation layout schematic Master Plan including any lead-ins identified;
- Prepare a Telecommunications reticulation layout schematic Master Plan including any lead-ins identified; and
- Prepare a Gas reticulation layout schematic Master Plan including any lead-ins identified.

1.3 Regional Context

The proposed development site forms the Department of Planning, Industry & Environment's (DPIE's) Glenfield Planned Precinct. The site is located within the Campbelltown City Council Local Government Area (LGA), approximately 30 km south-west of Sydney CBD.

Figure 1: Regional Context



Source: Greater Sydney Region Plan – A Metropolis of Three Cities – Greater Sydney Commission (2018)

1.4 Planned Precinct Study Area

The Planned Precinct covers a total area of 597ha and is bisected by a rail corridor running north-south through the site. A large portion of the Precinct is owned by NSW Government, which encompasses most of the Precinct area to the west of the rail line. Therefore, we have adopted the following terminology for the purposes of this report:

- “Western Planned Precinct” – refers to NSW Government owned land west of the rail corridor (shown in red in Figure 2);
- “Eastern Planned Precinct” – refers to non-NSW Government owned land (shown in black in Figure 2 except for the red region). This is mainly land east of the rail corridor. It also includes some non-NSW Government owned land north of NSW Government owned land but DPIE have indicated this land will not be rezoned and no increase in yield will result.

This utilities study assesses the servicing impacts on the full Precinct.

1.4.1 Western Planned Precinct (NSW Government Owned Site)

The Western Planned Precinct is 214.5 ha in size and is currently occupied by Hurlstone Agricultural High School and Campbell House School. A large multi storey commuter carpark is located adjacent the rail corridor. The balance of the site is currently undeveloped. The site is bounded by Railway Parade to the east, the Campbelltown Road-to-Hume Motorway on-ramp to the west, and a low-density residential area to the north. Glenfield train station is located within close proximity to the site, adjacent the buildings within Hurlstone Agricultural High School.

Presently the Western Planned Precinct has two school campuses on it which are referred to as follows:

- The Western Campus is Glenfield Park School;
- The Eastern Campus is Hurlstone Agricultural High School.

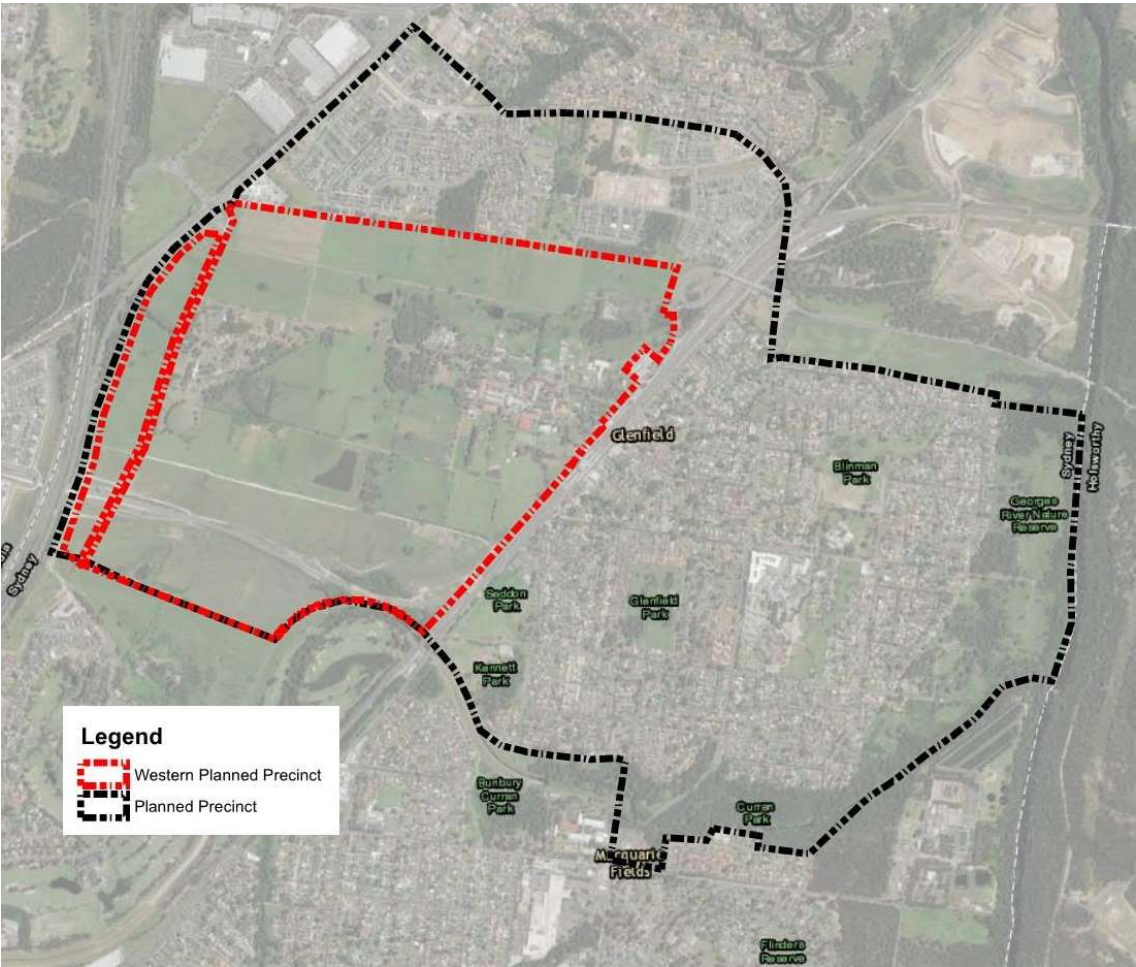
The Western Planned Precinct is shown in red on Figure 2.

1.4.2 Eastern Planned Precinct

The Western Planned Precinct forms part of the DPIE Precinct. The balance of this Precinct is mainly privately owned and occupied by approximately 2,330 low density residential dwellings. An aged care facility is located near the centre of the Eastern Precinct, occupying an area of approximately 10.6 ha.

There are two existing schools on the site. Glenfield Public School is located adjacent the rail corridor on Railway Parade. Glenwood Public School is located near the centre of the Eastern Planned Precinct, north of the aged care facility. The Planned Precinct boundary is shown in black in Figure 2.

Figure 2: Planned Precinct Boundaries



1.5 Proposed Study Area and Re-Zoning Works

1.5.1 NSW Government Site

A concept land use plan has been prepared for the NSW Government as shown in Figure 3. An upper limit of 4,134 new dwellings are proposed for this portion of the Precinct. Required infrastructure upgrades will generally proportionately reduce if the actual yield has been reduced.

Figure 3: NSW Government Land Use Plan



Legend

- | | |
|---|--|
| Site Boundary | Potential Future Transport Facility |
| Low Rise Residential (2 storeys) | Cultural Heritage Tree to be protected |
| Low Rise - Large Lot Residential (1 storey) | Civic Plaza/ Open Space |
| Medium Rise Residential (3-6 storeys) | Shared Street |
| High Rise Residential (7+ storeys) | Proposed Cambridge Avenue Extension |
| Mixed Use/ Residential (7+ storeys) | Potential Pedestrian/ Cycle Links |
| Employment/ Residential (7+ storeys) | Proposed/ Potential Road Connections |
| Schools | Active Transport |
| Substation | Potential Regional Active Transport |
| Hurlstone Agriculture Area | Underpass |
| Open Space/ Local Park | Memorial Forest |
| Detention Basin | Indicative Proposed Trees |
| Potential Future Health Facility | |

The assumed yields for the Western Planned Precinct that this study is based on are tabulated in Table 1.

Table 1: NSW Government Yield

LAND USE	HIGH YIELD DWELLINGS	GFA
Apartments (units)	1,846 units	
Mixed-Use (units)	1,597 units	
Medical/Residential (units)	113 units	
Medium Density Terrace lots	274 lots	
Low Density Dwelling lots	306 lots	
RESIDENTIAL TOTAL	4,134 units + lots	
Employment		36,640 sqm GFA
Mixed-Use		5,817.60 sqm GFA
Medical/Residential		8000 sqm GFA
COMMERCIAL TOTAL		50,457.60 sqm GFA

Source: Group GSA

For the purposes of determining utilities loads from the schools, we have been advised that the maximum number of students in the schools are:

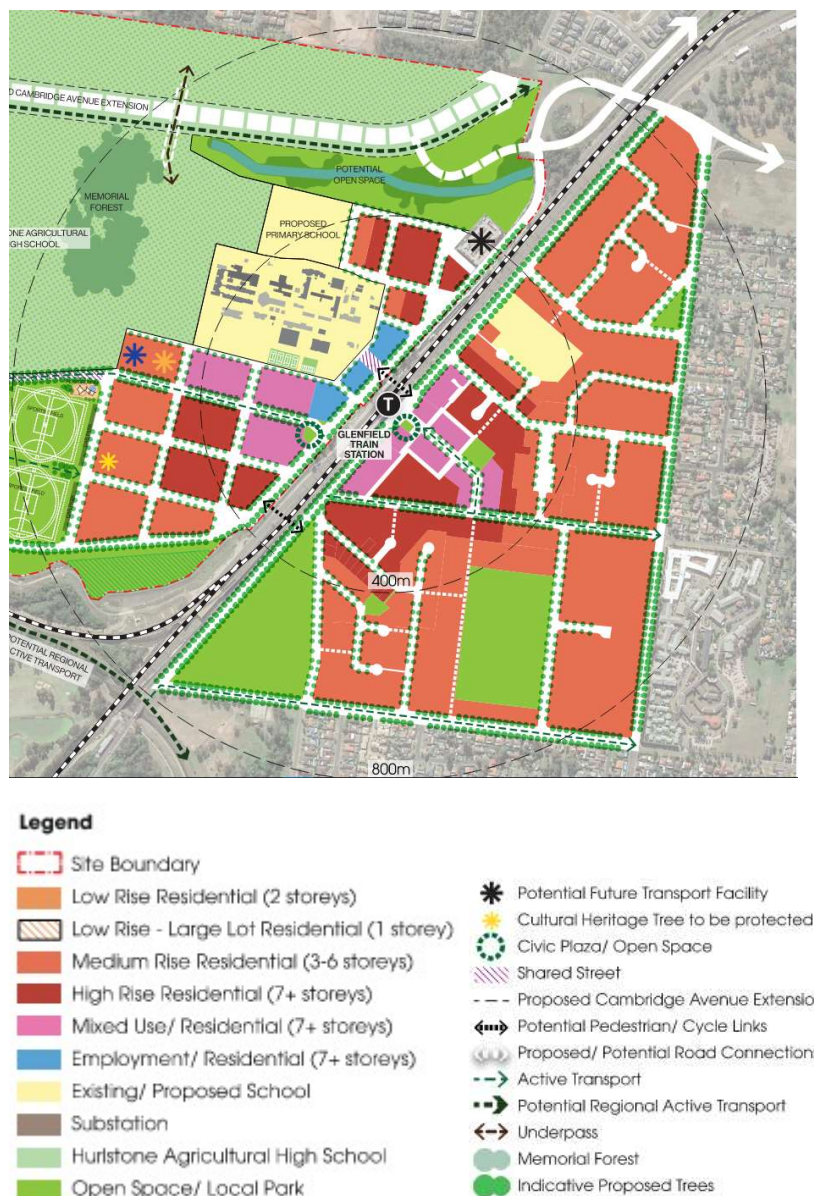
- SSP - maximum capacity of 189 students. (3 schools, 9 classrooms each, maximum of 7 students per classroom);
- Hurlstone Agricultural High School - maximum capacity of 1,100 students.

1.5.2 DPIE Plan for East of Corridor

The land to the east of the rail corridor is part of DPIE's Planned Precinct. The proposed land uses for the Eastern Precinct are shown in Figure 4 below.

No development is proposed for the Precinct area north of the NSW Government site. This area has therefore been excluded from the utilities infrastructure assessments.

Figure 4: DPIE Land Use Plan

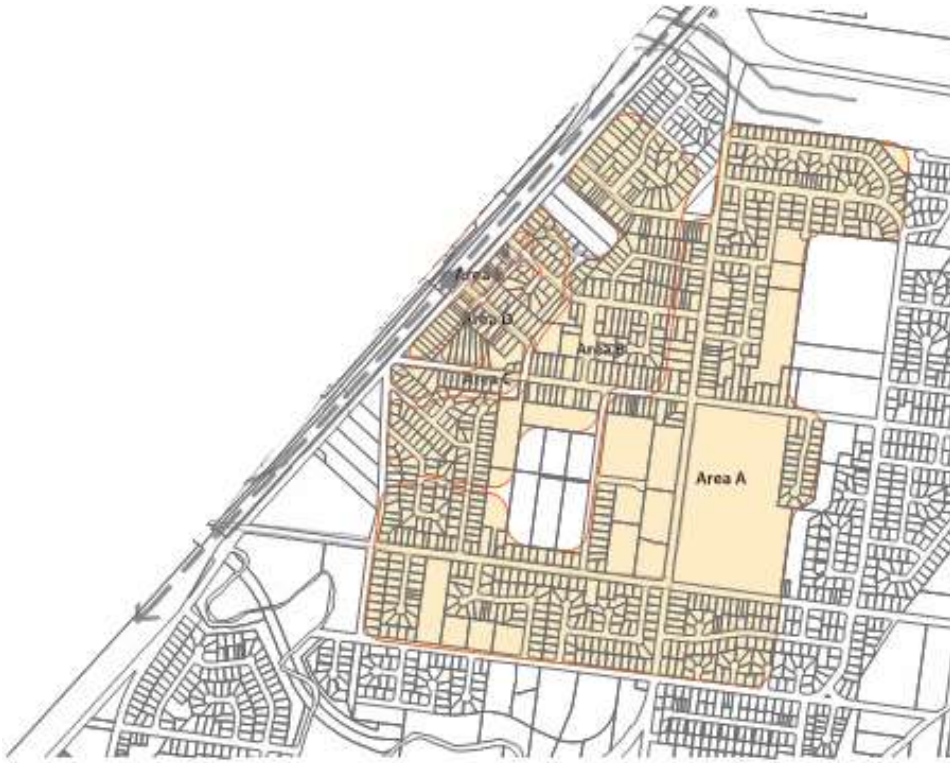


Source: GMU – Glenfield Urban Design Rezoning – Indicative Layout Plan Rev H (16/08/2018)

An additional 4,000 dwellings are to be considered east of the rail corridor for the purposes of an upper limiting yield for this report. DPIE have confirmed that the yield may be lower because property economics will limit how much existing housing stock is redeveloped. This would generally proportionately reduce the magnitude of necessary infrastructure upgrades. This approach is considered conservative.

We have allowed for an increase of commercial GFA of up to a maximum of 165,000m² in the “Mixed Use” area in Figure 4 as agreed with DPIE.

Figure 5: DPIE Planned Precinct East Proposed Densities



Source: GMU (2017)

Table 2: DPIE Planned Precinct East Proposed Densities

Area	Density	Building Typology	Storeys	High Yield Additional Dwelling Estimate
A	Low density	Townhouses/semi	2-3	361
B	Medium density	Residential Flat Building	4-5	2,073
C	High density	Residential Flat Building	6-8	685
D	High density	Residential Flat Building	Up to 14	365
E	High density	Mixed use (2 storey podium with residential above)	Up to 20	516
TOTAL				4,000

Source: GMU (2017)

2 Water

2.1 Existing Network

The Glenfield Precinct is located within the vicinity of six potable water reservoirs. The closest of which are Prestons, Ingleburn and Minto (Ingleburn having the largest capacity). A recycled water reservoir is located approximately 2 km to the south west of the Precinct. The locations of the potable water reservoirs relative to the Precinct are shown in Figure 7.

Table 3 includes the approximate elevation of the reservoirs as shown from LIDAR. We note this approximation does not include factors such as elevated stands which could increase the water elevation.

Table 3: Potable Water Reservoirs

Reservoir Number	Reservoir Name	Water Type	Capacity (ML)	Approximate distance from Precinct	Full Service Level
WS0172	Prestons	Potable	45.0	950m	79.7m
RS0472	Hoxton Park Recycled Water Scheme	Potable	2	2.1km	80m
WS0257	Ingleburn	Potable	45.4	3.1km	86.2m
WS0264	Carnes Hill	Potable	20	5.3km	105.5m
WS0100	Raby 1	Potable	2.7	4.2km	149.2m
WS0164	Raby 2	Potable	9.3	4.1km	143.2m
WS0256	Minto	Potable	45.5	5.0km	111.9m

Source: Sydney Water (2017)

The existing NSW Government site is serviced by Sydney Water with a private reticulation network within the site. The school is currently connected to the Minto Water Supply Zone via a DN100 reticulation main off Campbelltown Road. Water valves in Figure 6 appear to show connections to Sydney Water's surrounding network.

Figure 6: Connections of Western and Eastern Schools within NSW Government site to Sydney Water

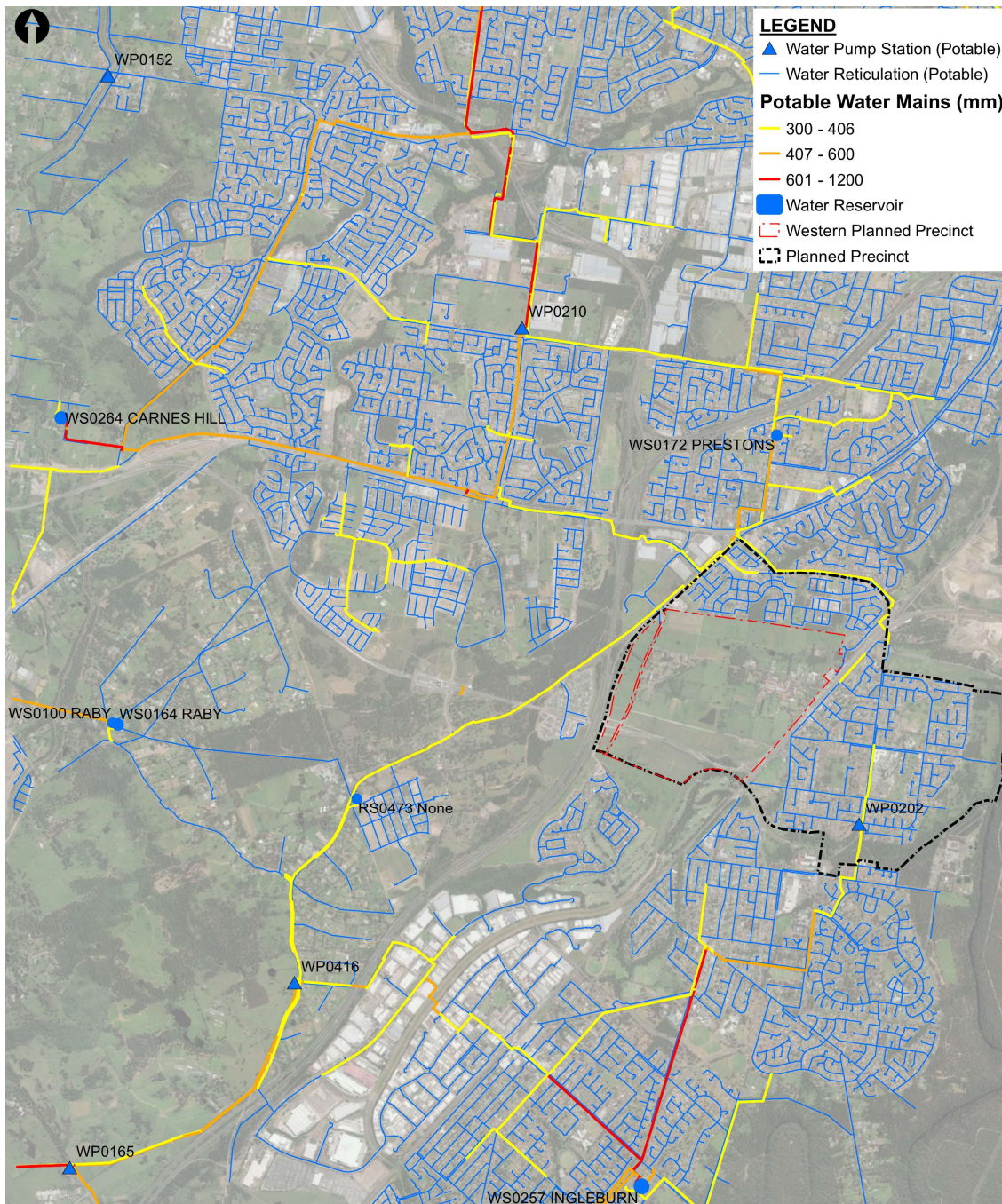


To the west of the site, a 300mm main traverses Campbelltown Road. From this main, a 100mm and a 150mm cast iron cement lined mains extend towards the site and terminate at the western boundary.

To the east of the Western Planned Precinct, a 200mm PVC pipe traverses Glenfield Road to the roundabout at the Western Planned Precinct boundary. A 150mm PVC pipe extends slightly north before terminating. A DN150 ductile iron cement lined (DICL) main extends to the south, traversing Roy Watts Road. This main terminates near the train station car park.

The balance of the Planned Precinct is serviced by a series of trunk and reticulation water mains. A 375mm trunk main enters the Eastern Planned Precinct from the southern boundary and connects to a pump station. From the pump station, the trunk water main moves north to a crest in the middle of the Eastern Planned Precinct and terminates at Belmont Road. A series of smaller 100-150mm reticulation mains extend from the trunk main and service the dwellings. The existing Sydney Water owned potable water network is shown in Figure 7.

Figure 7: Surrounding Sydney Water Potable Network



Source: Sydney Water Hydra (2017)

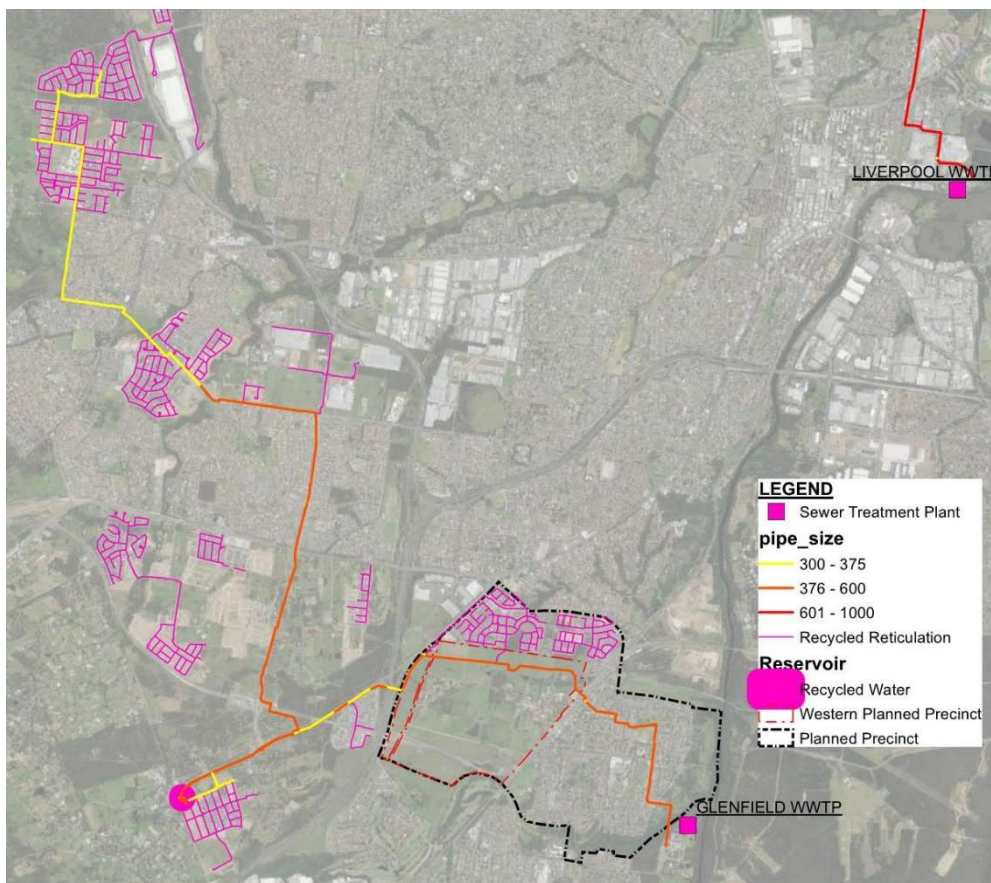
Recycled water is also available in the region. Water is treated at the Hoxton Park Water Recycling Plant (WRP), located within the Glenfield WRP site adjacent the south east corner of the Precinct. From the Hoxton Park WRP a 450 mm main moves north through the site to Blinman Park where it moves west through the northern portion of the Western Planned Precinct. From the Western Planned Precinct boundary, a 375 mm main traverses Soldiers Parade to Campbelltown Road. The main is then amplified to 600 mm in size and traverses Campbelltown until it connects to the reservoir on the corner of Zouch Road and Campbelltown

Road. From the reservoir, a series of recycled water mains connect to developments in the surrounding region. This is shown in Figure 8.

At present, the scheme is not in operation due to water quality issues resulting from an insufficient number of properties connected to the network. At present 4,000 properties are already connected, however a further 2,500 are required to ensure water quality requirements can be met within the network. Until such a time that the scheme comes online the recycled water pipes have been filled with potable water. Sydney Water have advised that the target delivery date for this product is 2021.

Sydney Water completed an options assessment for including the Glenfield Precinct in the Hoxton Park recycled water scheme. In lieu of more detailed information, the assessment was based on the 2015 Glenfield to Macarthur Urban Renewal Corridor Strategy. While the Western Precinct has significantly higher residential yields than previously anticipated, it is likely development in this catchment is could be serviced with recycled water. This would need to be confirmed with hydraulic modelling. Sydney Water have expressed that this would be an excellent outcome for the recycled water scheme.

Figure 8: Trunk recycled water mains



Source: Sydney Water Hydra

2.2 Consultation with Authorities

Sydney Water have provided comment on the proposed water and sewer servicing strategies for the Glenfield Precinct. Their feedback has been incorporated throughout the following sections. It is noted and agreed that as development progresses detailed assessments will need to be undertaken in conjunction with Sydney Water to confirm servicing strategies.

2.3 Proposed Network

The proposed developments will likely receive potable water from the Ingleburn and Minto reservoirs. Prestons is the closest reservoir to the site, however it has a significantly smaller capacity than the Ingleburn and Minto reservoirs. The capacities of these reservoirs are shown in Table 3. Servicing will also be dependent upon confirmation of the site servicing requirements under Sydney Water's due diligence process.

2.3.1 Western Planned Precinct

The existing school within the Western Planned Precinct is currently serviced by the Minto Reservoir via a DN100 reticulation main. Trunk water mains are also located in proximity of the site. Due to the significant increase in demand, it is likely that upgrade lead-in works will be required to service any future development.

Sydney Water have undertaken a high-level assessment which has indicated that there is limited capacity within the system to service the development.

Mott MacDonald have undertaken a desktop analysis which aims to provide a worst-case estimate of the potential water requirements for the Western Planned Precinct. This assessment was undertaken using the Water Supply Code of Australia (WSA) assuming there is no spare capacity within the existing network.

This involved calculating the peak hourly demand for the site to determine the maximum pipe size required to service the entire development. The maximum water demand rates for each land use were extracted from Table 2.1 of the WSA. The rates provided are conservative and can be updated when detailed modelling is undertaken and system demand rates can be evaluated.

The demand rate for each land use was then multiplied by the number of proposed dwellings or the total GFA to determine the average daily demand. This assessment assumes a total increase of 4,134 dwellings for the site. The average demand was then multiplied by the peak day factor of 1.5 to determine the peak daily demand.

The peak hourly demand was then calculated using the average hour demand for the peak day and a peak hour factor of 2. Assuming a design velocity of 1.2 m/s for the pipe, the minimum pipe size required to meet the total demand is 450 mm. The results of this assessment are shown in Table 4.

Table 4: Water Main Calculations – NSW Government Site

Parameter	Result
Average Daily Demand (L/s)	37.6
Peak Daily Demand (L/s)	56.4
Peak Hourly Demand (L/s)	113
Velocity (m/s)	0.92
Pipe Size Required (mm)	450

Assuming there is no capacity within the existing network to meet this additional demand, the equivalent of a 450 mm main would need to be constructed from the reservoir to the site. This could be achieved through a series of smaller, reticulation mains or through a singular 450 mm main.

It is noted that the site is a potential candidate for a dual reticulation system through the use of recycled water. The implementation of a dual reticulation system is expected to reduce the demand on potable water. Consultation with Sydney Water will be undertaken to clarify if the land is serviced by a Recycled Water Plant, given requirement in Growth Centres SEPP to connect. However, for the purpose of this assessment, as a baseline we have assumed no connection to the recycled water network. Detailed modelling and financial feasibility analysis would need to be undertaken to support mandating a dual reticulation system. This may be appropriate for larger land holdings/developments.

A review of the bulk water supply to the Precinct has not been prepared in this high-level assessment but is recommended to be undertaken in conjunction with Sydney Water as designs progress. Particularly if recycled water is to be adopted.

Due to topography constraints, there are challenges in providing potable water to the Western Planned Precinct. A ridge line exists near the western boundary of the Western Planned Precinct, with the areas to the west significantly higher than the balance of the site. These areas have an elevation between 50-60 m.

The Eastern Planned Precinct is serviced by the Ingleburn supply zone which operates at a full service level of 86.2 m. While this service level is sufficient to supply the higher elevation areas of the site, it may prove more efficient to supply these areas from the Minto reservoir.

A preliminary review by Sydney Water has indicated that there is likely to be sufficient head in the Minto and Ingleburn supply zones to provide sufficient head to the elevated areas of the site. Detailed analysis would need to be undertaken to confirm whether pipe losses would limit the ability to service the elevated areas without the assistance of an additional pump.

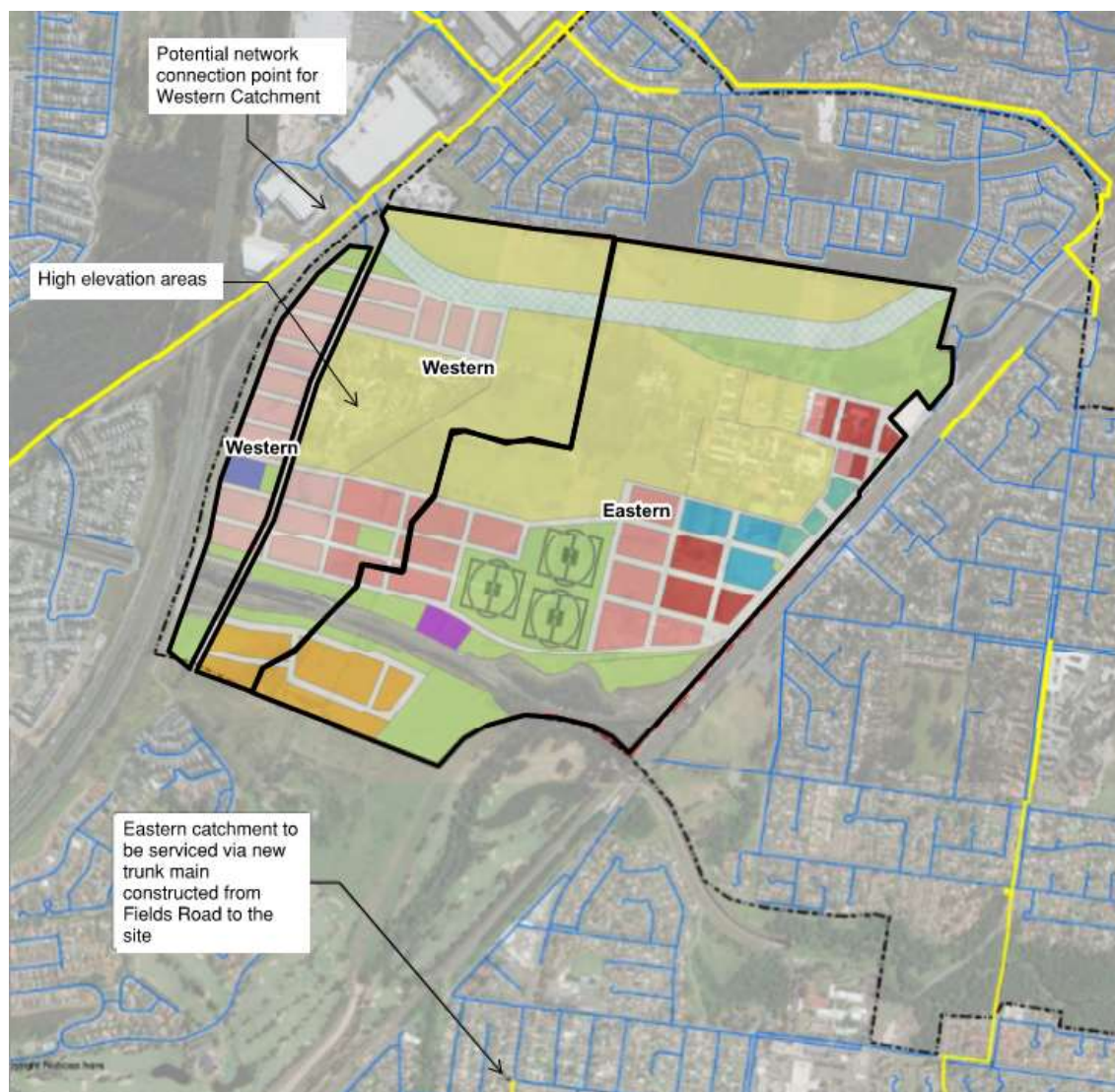
As the existing capacity within the potable water network is unknown, an options analysis has been undertaken to determine potential servicing strategies for the site. Two servicing options have been explored for the Western Planned Precinct, these options are detailed in the Sections 2.3.1.1 and 2.3.1.2.

2.3.1.1 Option 1 – Catchment Based Servicing

There is potential to supply the high elevation areas in the western portion of the Western Planned Precinct via the existing Minto trunk water network to the west of the Western Planned Precinct. The Minto and Ingleburn reservoirs have a full service level of 111.9 m and 86.2 m respectively. The Minto reservoir may therefore prove more suitable for servicing this area of the site.

The Western Planned Precinct was separated into western and eastern catchments to determine the feasibility of supplying each area separately. The proposed catchments are shown in Figure 9.

Figure 9: Western Planned Precinct Potential Servicing Catchments



To determine the servicing requirements for each catchment, the total demand calculated in Section 2.3.1 was separated to determine the demand generated by each catchment. The results are shown in Table 5 below.

Table 5: Catchment Based Servicing Requirements

Western Planned Precinct Catchment	Total Demand (L/s)	Pipe Size Required (mm)	Velocity (m/s)
Western Catchment	27	250	0.55
Eastern Catchment	152	450	0.95

If sufficient capacity is available, the western catchment will be serviced via the existing 300mm trunk main located to the west of the Western Planned Precinct. A new 250mm main will connect from this main and provide the main supply point for this catchment.

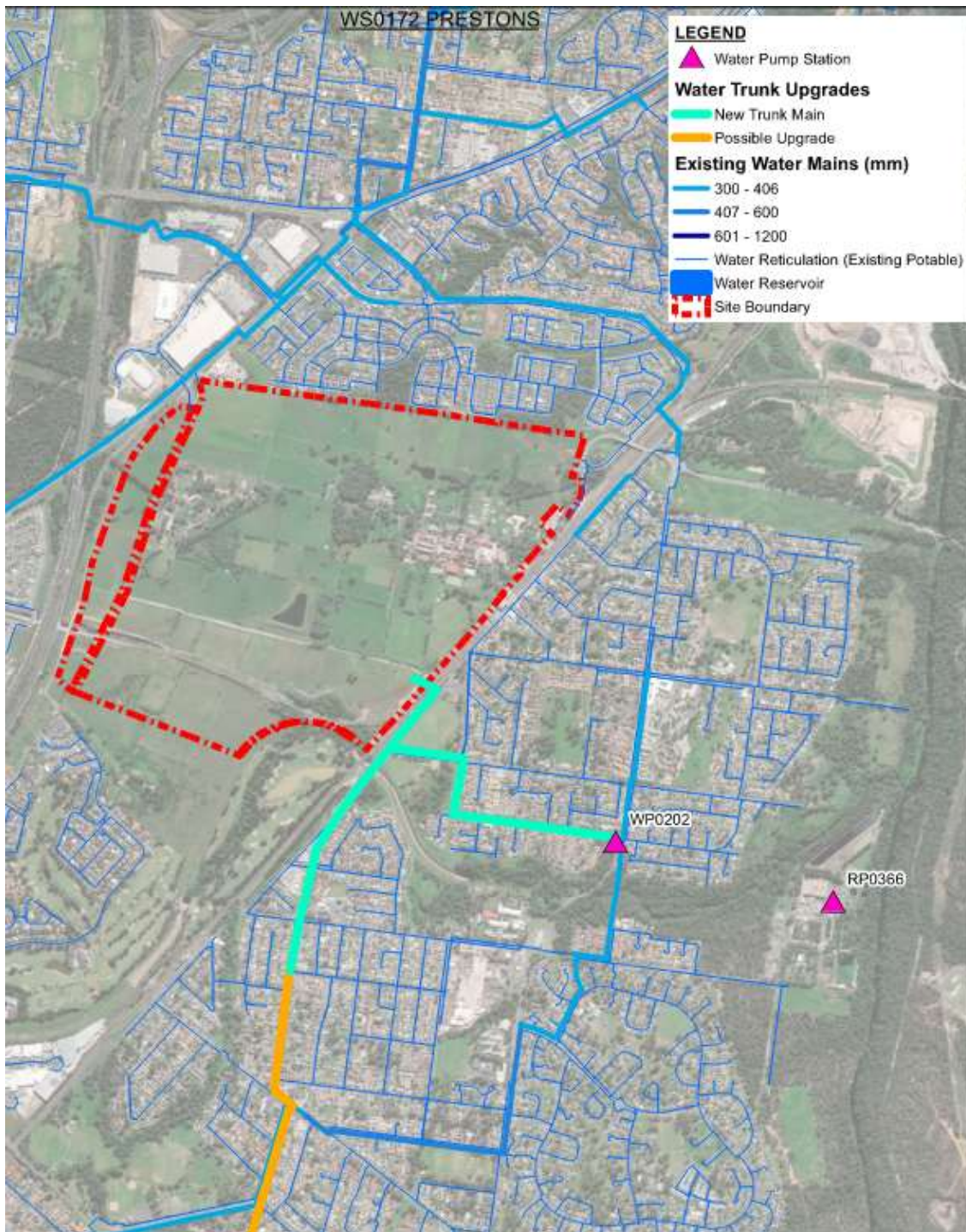
The balance of the site could be serviced by the Ingleburn reservoir. This would require extension of the existing 750 mm trunk main located on Fields Road, 1.5 km south of the site. To service the eastern catchment a 450 mm main will be required, however should there be

insufficient capacity in the existing network servicing the Eastern Planned Precinct, a larger pipe will be installed to service the full Planned Precinct. The main would be extended up Atchison Road to the Eastern Planned Precinct boundary, and underneath the rail line to enter the Western Planned Precinct.

Sydney Water have suggested that further assessment should be undertaken to evaluate if amplifying the existing main from Minto reservoir would be more cost effective than supplying the Western Precinct from the Ingleburn supply zone via a railway crossing. This is subject to detailed modelling.

The proposed trunk upgrades are shown in Figure 10.

Figure 10: Proposed Trunk Upgrades (Indicative only)



2.3.1.2 Option 2 – Entire Site Servicing

Should there be no spare capacity in the 300 mm Minto main to supply the western catchment, the entire Western Planned Precinct could be serviced by the Ingleburn network. This is dependent on the availability of sufficient spare capacity in the Ingleburn network to supply the development. The same network arrangements outlined above would be adopted, with a larger

trunk main required to support the entire demand of the Western Planned Precinct. A 450mm would be constructed to the Western Planned Precinct boundary and smaller reticulation mains would be constructed within the road reserves to supply development.

2.3.1.3 Western Planned Precinct Recycled Water

As discussed in Section 2.1, recycled water is potentially available in the Glenfield region via the recycled water reservoir located approximately 2.1 km south west of the Planned Precinct. The scheme is currently not operational as a further 2,500 dwellings are required to ensure the viability of recycled water supply. As the development of the Western Planned Precinct is expected to generate an additional 4,134 dwellings, this site could be a good candidate for recycled water supply should it prove commercially viable. There is potential for DPIE to mandate the uptake of recycled water in the Precinct. Sydney Water have advised that they would be supportive of this initiative, however feasibility of this option would need to be assessed.

Due to the close proximity of the reservoir and associated trunk mains, there is potential for a dual reticulation water scheme to be implemented at Glenfield. Furthermore, given the anticipated increase in dwellings generated by the Planned Precinct, commitment to providing recycled water reticulation would ensure the Hoxton Park Recycled Water Scheme could proceed.

Dwellings which connect to recycled water are dual reticulated with two separate water meters. Potable water only is supplied for cooking, drinking, bathing, indoor cleaning and swimming pools, while both potable and recycled water are provided for toilet flushing and outdoor uses such as irrigation and car washing.

2.3.2 Eastern Planned Precinct

The Eastern Planned Precinct currently receives potable water supply from the Ingleburn reservoir. As per the Western Planned Precinct, a high level assessment was undertaken using the WSA to determine the worst case servicing requirements for the site. This assessment assumes a total increase of 4,000 dwellings for the Eastern Planned Precinct. It has been assumed that the schools and aged care facilities will remain unchanged. The results of this assessment are tabulated in Table 6.

Table 6: Water Main Calculations – Eastern Planned Precinct

Parameter	Result
Average Daily Demand (L/s)	38
Peak Daily Demand (L/s)	57
Peak Hourly Demand (L/s)	113
Velocity (m/s)	1.01
Pipe Size Required (mm)	375

If the existing trunk network supplying the site is determined to have insufficient capacity to meet the additional demand, the equivalent of a 375 mm main would be required to service the new dwellings. This could be achieved through a series of smaller, reticulation mains or through a singular 375 mm main. Other options exist to create short cross connections, minimising head loss. Detailed modelling would confirm this arrangement.

2.3.2.1 Proposed Upgrades

Should there be no residual capacity within the existing network, new trunk mains will be required to supply the additional demand generated by the Planned Precinct. If trunk upgrades are required to support development on both the Western and Eastern Planned Precincts, a 600mm main would be required to support both the full Planned Precinct. As discussed in Section 2.3.1.1, a new trunk main will be extended from the existing 750 mm trunk main on Fields Road to the Planned Precinct boundary. From the boundary, a smaller 375 mm main will be constructed to service the Western Planned Precinct.

To service the Eastern Planned Precinct, a new 375 mm main will be constructed from this trunk main and service the adjacent developments, before connecting to the existing pump station on Canterbury Road. This will require construction of 1.2 km of new pipe. The existing trunk main traversing Canterbury Road will be utilised to support the additional growth in the area. The proposed upgrades are shown in Figure 10.

The above proposed upgrades are considered to be a worst-case scenario of the servicing requirements for the site. More servicing options will be generated during the detailed design phase. The viability of providing cross connections within the same system or another system will be assessed to determine the most cost-effective method of servicing the Precinct.

2.4 Internal Reticulation

Within the Eastern Planned Precinct, minor reticulation servicing the existing dwellings will be decommissioned and removed as required.

For the Western Planned Precinct minor water reticulation will be installed along the proposed road alignments within the standard trench allocation of the road reserve. It is possible that the existing non-Sydney Water owned reticulation assets within the Western Planned Precinct could be leveraged off.

2.5 Required Upgrades

Based on the servicing strategy proposed in Sections 2.3.1 and 2.3.2, the upgrades required to support the additional load generated by the Planned Precinct are tabulated in Table 7. As mentioned above, this is one possible option for servicing the development. Further options will be explored in the next phase of the project to refine these strategies.

Table 7: Required Trunk Upgrade Works

Site	Infrastructure	Length (m)	Size (mm)
Western Planned Precinct	Trunk Main	1415	600
Western Planned Precinct	New Pump Station		
Eastern Planned Precinct	Trunk Main	1200	375
Eastern Planned Precinct	Pump Station (potential upgrade)		

2.6 Key Constraints and Opportunities

- The existing trunk recycled water mains located within the site boundary will need to be maintained. These mains transfer recycled water from the Glenfield WRP to the reservoir;
- Due to the close proximity to the recycled water reservoir, there is potential to provide dual reticulation to the development. This will be dependent on the financial feasibility of supplying recycled water. Sydney Water have indicated that they would be supportive of DPIE mandating the uptake of recycled water for the Precinct;
- Two options have been explored for provision of potable water to the Western Planned Precinct. The uptake of these options will be dependent on the available spare capacity within the existing network. Should there be insufficient capacity to supply the western catchment separately, the whole site could potentially be serviced via the Ingleburn network. This will require significant lead in works, with a new 600 mm trunk main constructed from Fields Road to the Planned Precinct boundary, with a total length of 1.4 km. Sydney Water suggest there are other feasible servicing options available that should be explored in a further detailed assessment;
- There are significant costs associated with the trunk upgrade works required. The trunk main will need to be under bored beneath the rail corridor to reach the Western Planned Precinct, and a new pump station will be constructed to allow the high elevation areas to receive potable water supply;
- As the capacity of the existing network is unknown, there is potential for further upgrades of mains/pump stations to be required. Sydney Water were unable to confirm existing capacities as part of this study. The requirements will be confirmed by Sydney Water in their feasibility assessment during the planning proposal and development application phases;
- Existing trunk recycled water mains located within the Planned Precinct boundary will need to be maintained.

3 Sewer

3.1 Existing Network

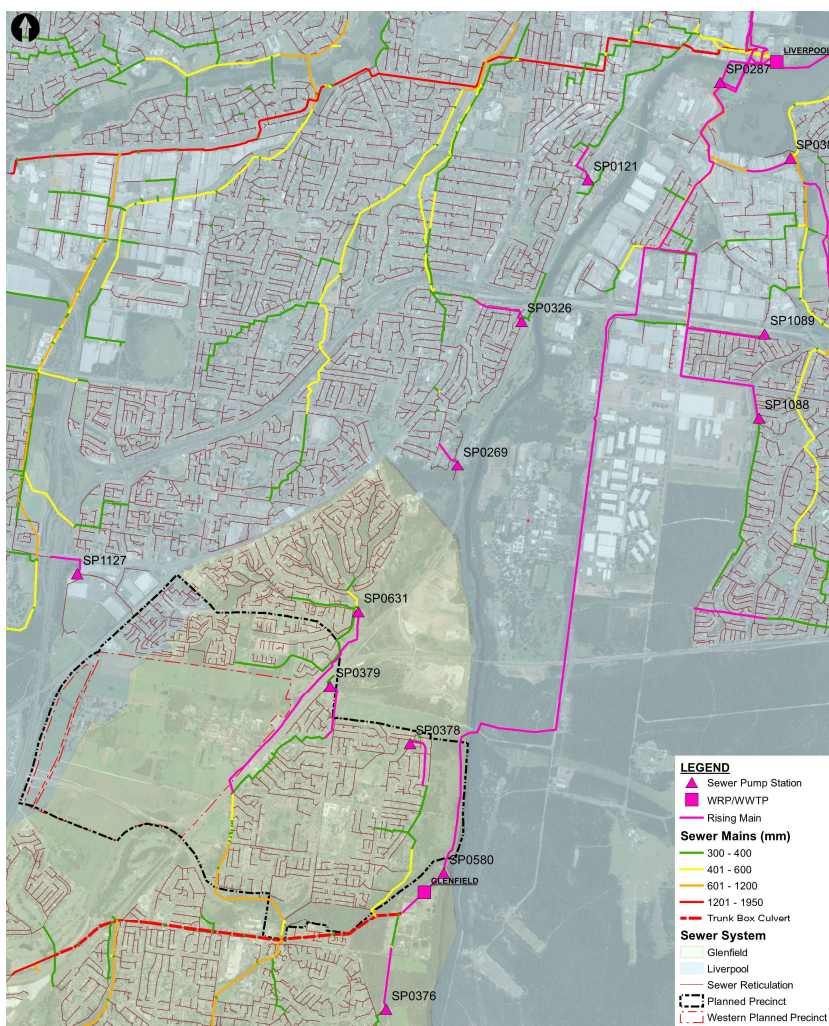
3.1.1 Waste Water Treatment Facilities

The Glenfield Planned Precinct is located in the vicinity of two water treatment plants:

1. Glenfield Water Recycling Plant (WRP) - located approximately 150 m east of the site;
2. Liverpool Waste Water Treatment Plant (WWTP) - located approximately 6 km N/NE of the site.

Wastewater flows generated by the existing dwellings in the Precinct are transferred to sewer pump station SP0353, where they are pumped to the Glenfield WRP. Effluent is treated and then transferred via sewer pump station SP0580 to the Liverpool WWTP or, if there is insufficient capacity, Malabar Sewage Treatment Plant for discharge.

Figure 11: External Sewer Trunk Network



Source: Sydney Water Hydra 21-08-2017

The majority of sewer in the Planned Precinct drains to Glenfield WRP. The following observations are made:

1. The existing sewer networks currently drain to Glenfield WRP via gravity and/or via pumps SP0631, SP0379 and SP0378. The exception is the north west corner of the Planned Precinct which drains to Liverpool WWTP;
2. It is noted that there is limited existing sewer reticulation in the precinct west of the rail corridor. Based on topography the majority of the Western Planned Precinct will drain via gravity to the Glenfield WRP. There is a ridge line along the western edge of the Western Planned Precinct. This portion of development would drain via gravity to SP1127 and ultimately Liverpool WWTP.

3.1.2 Sewer Pump Stations

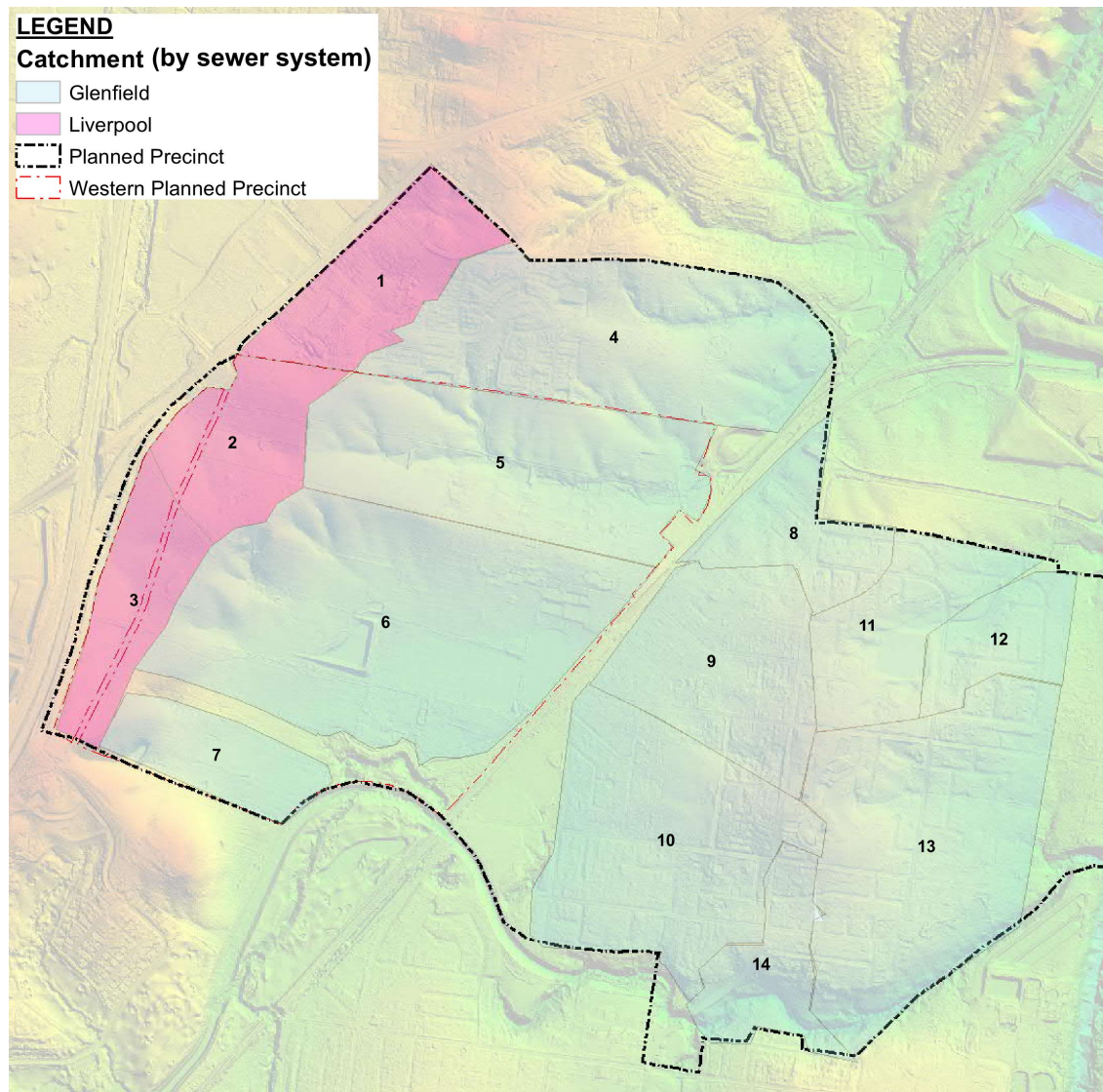
SP0631, SP1127, SP0379 and SP0378 currently service the Precinct as shown in Figure 11.

3.1.3 Catchments and Existing Sewer Loads

Sewer sub catchments were delineated based on sewer gravity flows, the site is broken into the catchments shown in Figure 12 based on the existing topography.

Figure 12 shows the crest near the Western Planned Precinct's western boundary which results in small catchments 1-3 draining to Liverpool WWTP unless pumped over the crest. The remainder of the catchments are east of this crest and consequently drain to Glenfield WRP:

Figure 12: Sewer Catchments



Source: LIDAR

The Sewerage Code of Australia's *WSA 02-2002-2.2 Sydney Water Edition Version 3 Table A1* has been used to estimate sewerage loads for land uses the Planned Precinct is subject to. These are shown in Equivalent Persons (EP) terms in Table 8.

Table 8: Sewerage Loads (EP) per land use

Development Type	Unit	EP/Unit	Table A.1 Classification
Low-Medium Density Lots	Lots	3.5	Single occupancy lots
High Density Apartments	Lots	2.5	Single occupancy high density dwelling units
Commercial	GFA sqm	0.0075	Local commercial
Schools	Students	0.2	Educational institutions

Source: Sewerage Code of Australia's *WSA 02-2002-2.2 Sydney Water Edition Version 3 Table A1*

The catchments shown in Figure 12 have been estimated for their respective existing sewerage load in EP terms as per Table 9. The number of existing lots has been estimated based on the Sydney Water Lot Coverage Hydra File. Only “Single dwellings” and “flats” were counted and were assigned EP based on an assumption of low-medium density lots given the general existing land use in the region. This should be treated a guide for the total existing EP in the region.

Table 9: Catchments and Proposed Changes in Sewer Loads

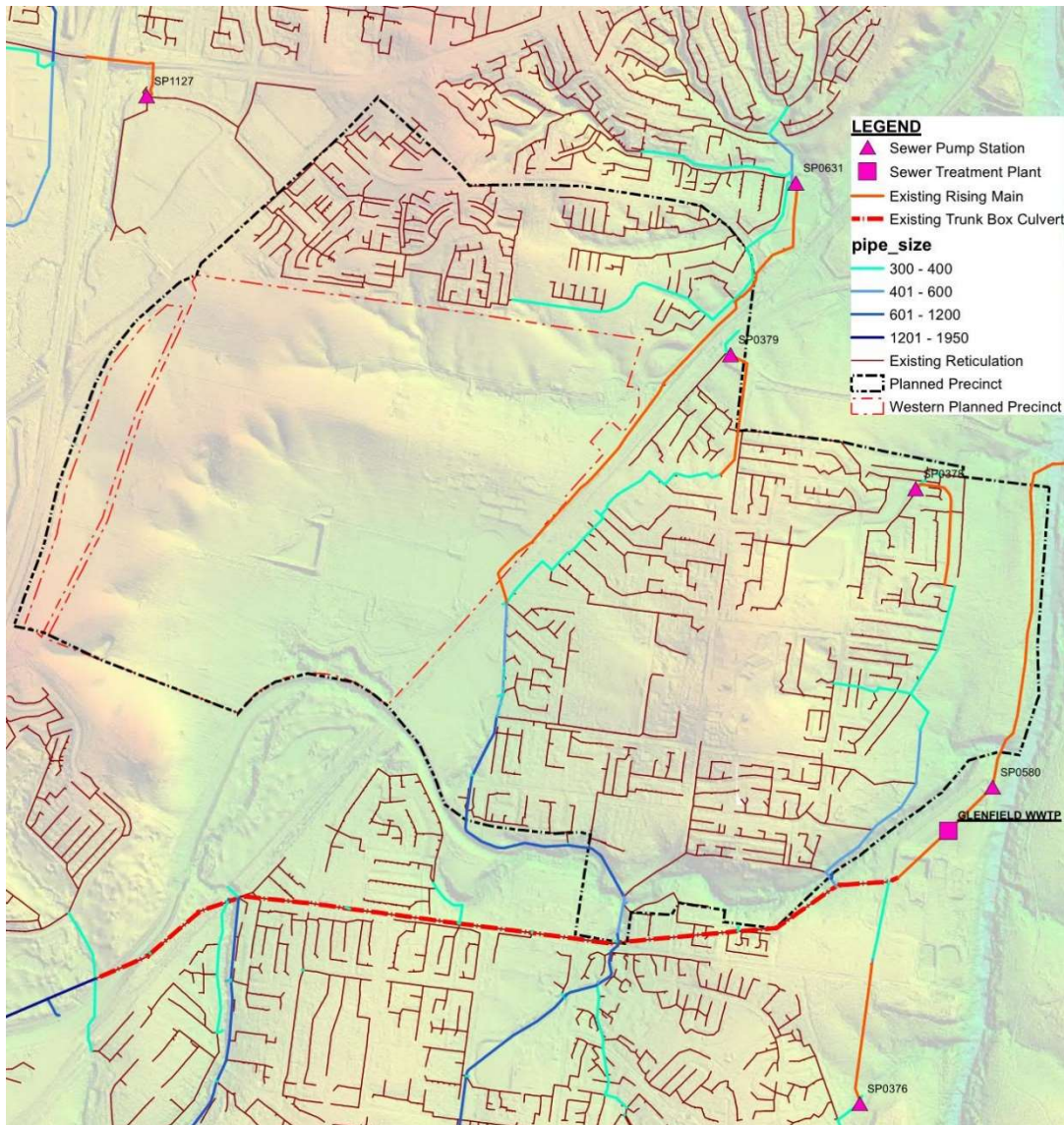
Catchment	Location	Currently serviced by SW owned assets?	Treatment Facility	Sewer Pump Station (if applicable)	Approximate Existing Lots	Approximate Existing EP
1	Planned Precinct - North	Yes	Liverpool	SP1127	313	1,096
2	Western Planned Precinct	No	Liverpool	SP1127	0	0
3	Western Planned Precinct	No	Liverpool	SP1127	0	0
4	Planned Precinct - North	Yes	Glenfield	SP0631	515	1,803
5	Western Planned Precinct	No	Glenfield	SP0631	0	0
6	Western Planned Precinct	No	Glenfield	Gravity only	0	0
7	Western Planned Precinct	No	Glenfield	Gravity only	0	0
8	Eastern Planned Precinct	Yes	Glenfield	SP0379	81	284
9	Eastern Planned Precinct	Yes	Glenfield	Gravity only	171	599
10	Eastern Planned Precinct	Yes	Glenfield	Gravity only	413	1,446
11	Eastern Planned Precinct	Yes	Glenfield	SP0378	198	693
12	Eastern Planned Precinct	Yes	Glenfield	SP0378	145	508
13	Eastern Planned Precinct	Yes	Glenfield	Gravity only	430	1,505
14	Eastern Planned Precinct	Yes	Glenfield	Gravity only	64	224
TOTAL					2,330	8,155

Source: Group GSA and GMU

3.1.4 Local Trunk and Reticulation Network

The local Sydney Water owned sewer network overlaid on the site's topography is shown in Figure 13. This shows the areas outside the Western Planned Precinct are currently serviced via reticulation pipes. The existing network is further detailed in Sections 3.1.4.1 to 0.

Figure 13: Existing Sewer Network



Source: Sydney Water Hydra 21-08-2017

3.1.4.1 Western Planned Precinct – Catchments 2, 3, 5-7

At present, there are no Sydney Water owned reticulation sewer mains located within the Western Planned Precinct. This indicates that the existing school sites are not serviced by Sydney Water owned assets. However, a site visit has indicated there are likely sewer pipes present which drain into the Sydney Water network.

A 375 mm DICL rising main traverses from SP0631 the eastern boundary of the Western Planned Precinct and connects to a 600 mm vitrified clay trunk gravity main (Glenfield Carrier) on Newtown Road which drains to the Glenfield WRP.

3.1.4.2 Western Planned Precinct – Catchments 1 and 4

To the north of the Western Planned Precinct, the existing dwellings form two catchments (Catchments 1 and 4 as shown in Figure 12) are serviced by the Sydney Water sewer network.

In the east (Catchment 4), reticulation mains drain to a pump station (SP0631) to the north of the site boundary via a 300-375 mm trunk main. This pump station connects to the 600 mm Glenfield Carrier trunk main adjacent the rail corridor.

In the west (Catchment 1 and part of Catchment 4), a 225 mm reticulation main drains to sewer pump station SP1127. This then pumps sewer uphill via a 140 mm rising main to the 900 mm Ash Road Carrier. This is illustrated in Figure 13.

3.1.4.3 Eastern Planned Precinct– Catchments 8-14

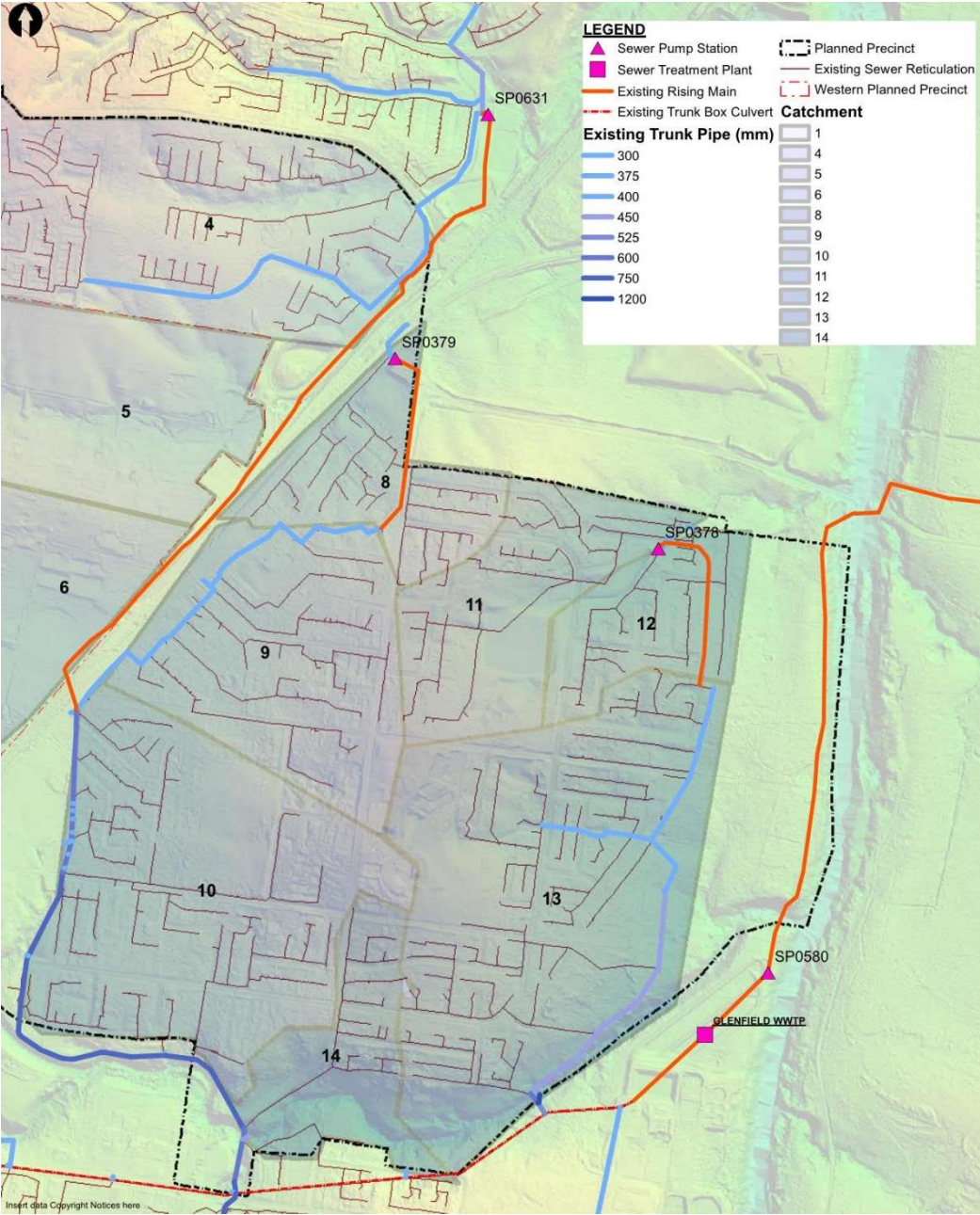
To the east of the railway, the Precinct is split into two main catchment groups (one including Catchments 8-10 and the other comprised of Catchments 11-14), separated via a ridge running through the middle of the Eastern Planned Precinct. These are illustrated in Figure 14.

To the west of the ridge, a series of reticulation mains drain Catchments 9 and 10 to the Glenfield Carrier trunk main of varying size near the rail corridor. Catchment 8 drains to the north to pump station SP0379.

In the eastern Catchments 13 and 14, reticulation mains drain to the 450 mm Belmont Rd Carrier trunk main located adjacent the Georges River Reserve. Catchments 11 and 12 to the north drain to a pump station SP0378, which connects to the Glenfield Carrier trunk main via a 200 mm rising main.

Table 9 indicates whether reticulation mains for each catchment drain to a pump station or directly into a gravity trunk main.

Figure 14: Catchments 8-14 Existing Network



Source: Sydney Water Hydra

3.2 Consultation with Authorities

A feasibility application was lodged with Sydney Water to confirm the network arrangements. They were unable to provide an assessment for the site but confirmed that as the site is located outside their declared urban release area, there is no formal planning proposal to consider potential rezoning of the site.

Since the first revision of this report, Sydney Water have provided comment on the proposed water and sewer servicing strategies for the Glenfield Precinct. Their feedback has been incorporated throughout the following sections. It is noted and agreed that as development progresses detailed assessments will need to be undertaken in conjunction with Sydney Water to confirm servicing strategies.

3.3 Proposed Network

The proposed increases in loads (not including existing development) for the western and eastern sides of the rail are presented in Table 10.

Table 10: Catchments and Proposed Changes in Sewer Loads

Catchment	Location	Currently serviced by Sydney Water owned assets?	Treatment Facility	Sewer Pump Station (if applicable)	Approx. Increase in Load (EP)
1	Planned Precinct - North	Yes	Liverpool	SP1127	0
2	Western Planned Precinct	No	Liverpool	SP1127	349
3	Western Planned Precinct	No	Liverpool	SP1127	447
4	Planned Precinct - North	Yes	Glenfield	SP0631	0
5	Western Planned Precinct	No	Glenfield	SP0631	1,641
6	Western Planned Precinct	No	Glenfield	Gravity only	9,700
7	Western Planned Precinct	No	Glenfield	Gravity only	231
8	Eastern Planned Precinct	Yes	Glenfield	SP0379	1,988
9	Eastern Planned Precinct	Yes	Glenfield	Gravity only	6,590
10	Eastern Planned Precinct	Yes	Glenfield	Gravity only	2,529
11	Eastern Planned Precinct	Yes	Glenfield	SP0378	229
12	Eastern Planned Precinct	Yes	Glenfield	SP0378	0
13	Eastern Planned Precinct	Yes	Glenfield	Gravity only	184
14	Eastern Planned Precinct	Yes	Glenfield	Gravity only	78
TOTAL					23,966

3.3.1 Western Planned Precinct – Catchments 2, 3, 5-7

As per Figure 15, Catchments 2, 3, 5, 6 and 7 are all within the Western Planned Precinct. Given these five catchments would drain via gravity to two separate treatment plants, there are two main options for servicing the site:

1. Option 1: Drain entirely to the Glenfield WRP by pumping the relatively small loads from Catchments 2 and 3 east over the crest;
2. Option 2: Drain Catchments 2 and 3 via gravity to Liverpool WWTP and Catchments 5-7 to Glenfield.

These options for the Western Planned Precinct have been investigated in Sections 3.3.1.1 and 3.3.1.2.

3.3.1.1 Western Planned Precinct Option 1

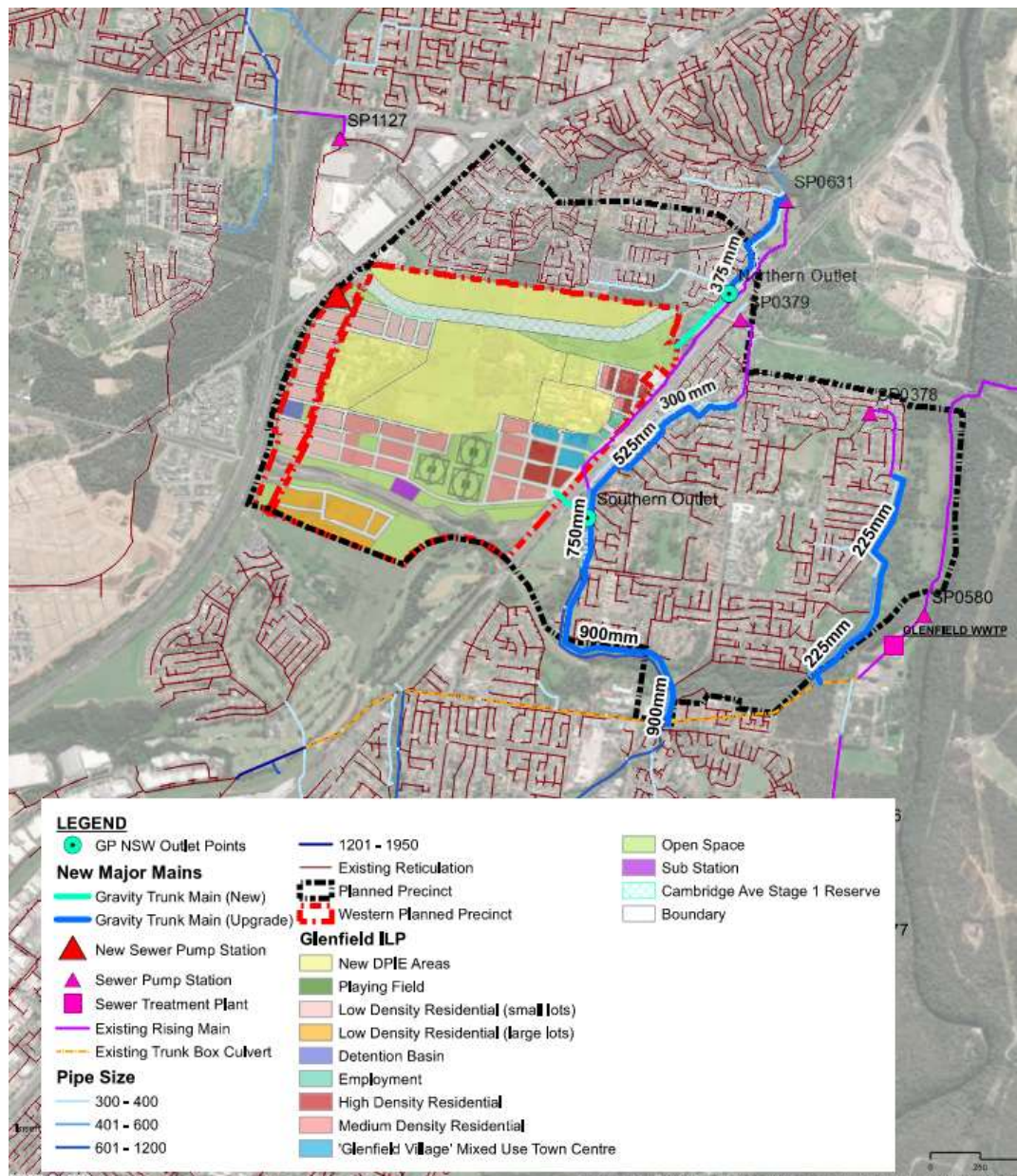
Our proposed sewer network Option 1 for the Western Planned Precinct is illustrated in Figure 15. This does not include minor reticulation mains as these will be subject to change as the layout progresses.

The key components of sewer strategy Option 1 are as follows:

- All sewer ultimately drains to the Glenfield WRP. This requires a new sewer pumping station and rising main to be built as shown in Figure 15;
- Catchments 2 and 3 are pumped east over the crest, and consequently there is no change in load for SP1127 or for a new sewer main to cross Campbelltown Road. As such this option has no net impact on Liverpool WWTP;
- Catchments 2, 3, 5, 6, 7 are proposed to drain into the existing network in two directions, to the Northern (Catchment 5) and Southern Outlets (Catchments 2, 3, 6, 7) highlighted in Figure 15;
- The Northern Outlet drains to an existing 300 mm reticulation main which drains via gravity to SP0631. SP0631 then pumps sewer uphill via the existing 375mm rising main to the 600mm Glenfield Carrier. In the absence of Sydney Water feedback, we have made the following assumptions and high level supporting calculations which will affect the appropriateness of this strategy:
 - It is unlikely the existing 300 mm reticulation main will have spare capacity to accommodate the additional load. This main is subject to an extra load of approximately 1,641 EP (Equivalent Persons). Given its grade is approximately 1.3%, this additional load alone would require approximately a 300 mm reticulation main;
 - It is unknown whether SP0631 or its 375mm rising main have sufficient capacity to accommodate the additional load without Sydney Water feedback. Detailed modelling will be required to adequately assess the capacity of this infrastructure. Therefore, we have assumed the pump station and associated infrastructure would need to be upgraded such that the approximate 1,641 EP can be catered for.
- The Southern Outlet drains directly into the 600 mm Glenfield Carrier (which is also drains the Northern Outlet). It is noted that the start of this main is subject to additional load from the Eastern Planned Precinct Catchments 8 and 9 which has been accounted for in these high level calculations and is explained in Section 0. In the absence of Sydney Water feedback, we have made the following comments and high-level supporting calculations which will affect the appropriateness of this strategy:

- It is unlikely the 600mm Glenfield Carrier has sufficient capacity to service the development. It will be required to service an additional 20,946 EP which at a grade of around 1.12% would require a 675mm pipe for the additional load notwithstanding the load to which it is currently subject. Detailed modelling will be required to adequately assess the capacity of this infrastructure.;
- It is unlikely the 750mm Glenfield Carrier has sufficient capacity to service the development. It will be required to service an additional 20,946 EP which at a grade of around 0.34% would require a 900mm pipe for the additional load notwithstanding the load to which it is currently subject. Detailed modelling will be required to adequately assess the capacity of this infrastructure.

Figure 15: Western Planned Precinct proposed sewer network Option 1 (Indicative Only)



Source: Sydney Water Hydra

Some key challenges for Option 1 are as follows:

1. A new sewer pump station and rising main would need to be built. These would be subject to a load of approximately 796 EP. An alternative for this is proposed in Option 2 (refer to Section 3.3.1.2);
2. The most costly item with respect to trunk gravity sewer upgrades is likely to be the crossing of the railway corridor by underboring. There are alternative crossings further south of the location shown in Figure 15 which may be considered more favourable at a later phase in the project development.

We note that the increase in density is not expected to have an impact on the 1.8m*1.8m box culvert south of the site. Given this is a significant item for a wider surrounding region, its adequacy is outside the scope of this study.

A treatment plant is proposed at Menangle Park. This facility is currently planned for delivery in 2026. Should this facility not be constructed, the existing box culvert may need to be upgraded to accommodate growth in the areas surrounding the Precinct. Detailed modelling in later stages of the project in consultation with Sydney Water would confirm if this is required.

3.3.1.2 Western Planned Precinct Option 2

Our proposed sewer network Option 2 for the Western Planned Precinct is illustrated in Figure 16. This does not include minor reticulation mains as these will be subject to change as the layout progresses.

The key changes between sewer strategy Option 2 as opposed to Option 1 are as follows:

- Sewer in Catchments 2 and 3 drains to the Liverpool WWTP. This means no new sewer pumping station and rising main are required to be built;
- Figure 16 illustrates sewer being drained via gravity under Campbelltown Road to a new outlet point (the Western Outlet);
- At the Western Outlet the sewer drains into the existing 225 mm reticulation main which drains via gravity to the SP1127 to be upgraded or for a new sewer main to cross Campbelltown Road;
- SP1127 pumps sewer west uphill via a 140 mm rising main to the 900 mm Ash Road Carrier Section 2 trunk main which ultimately drains to Liverpool WWTP.

In the absence of Sydney Water feedback, we have the following assumptions and high level supporting calculations for infrastructure that was not required in Option 1 which will affect the appropriateness of this strategy:

- It is unlikely the existing 225 mm reticulation main at the Western Outlet will have spare capacity to accommodate the additional load. This outlet point is subject to an additional sewer load of around 796 EP and has a grade of approximately 0.7%. This additional load alone would require approximately a new 225 mm main. Detailed modelling will be required to adequately assess the capacity of this infrastructure;
- It is unknown whether SP1127 or its 140 mm rising main have sufficient capacity to accommodate the additional load in the absence of Sydney Water feedback. Detailed modelling will be required to adequately assess the capacity of this infrastructure. Therefore, we have assumed the pump station and associated infrastructure would need to be upgraded such that the approximate 796 EP can be catered for.

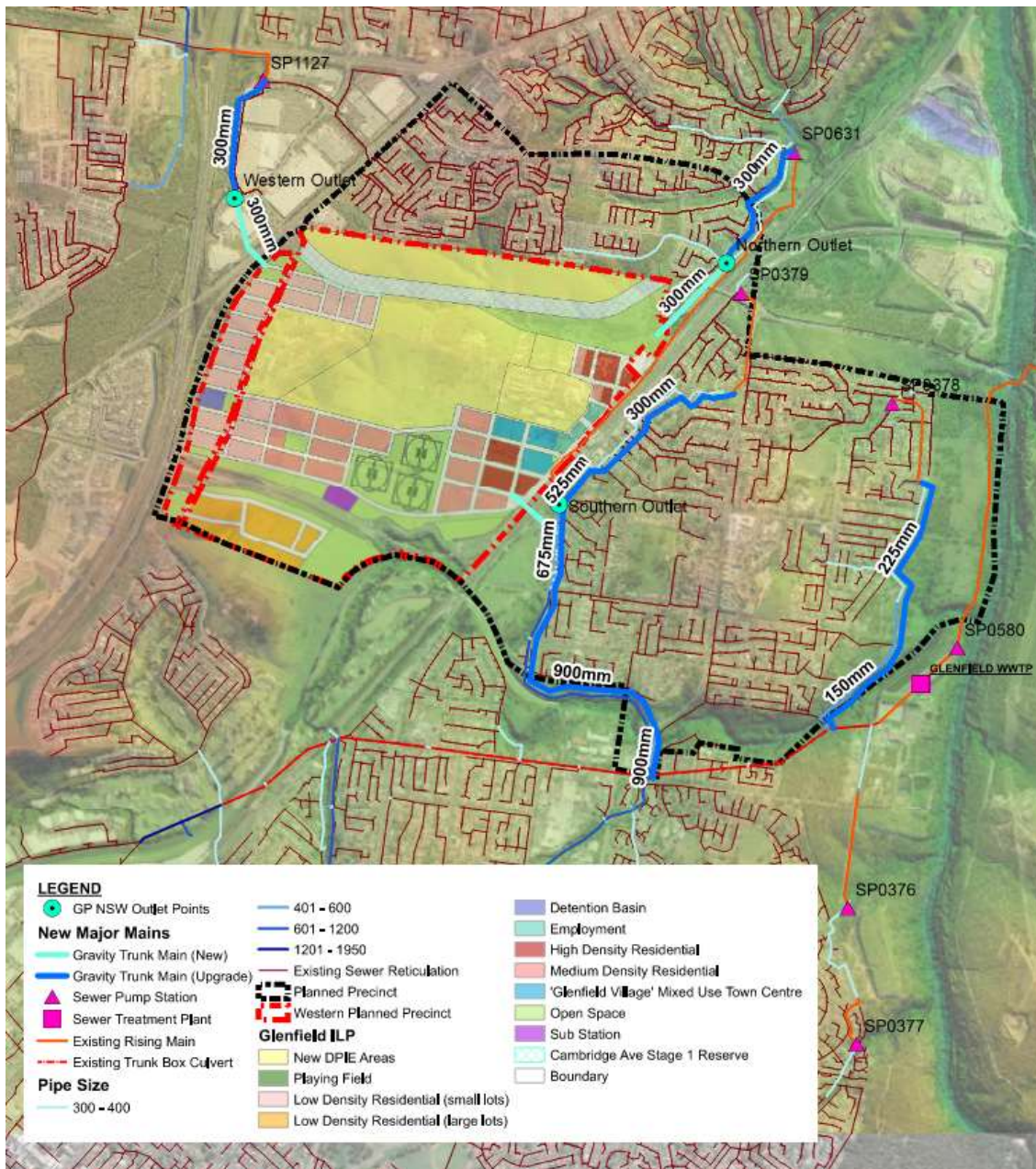
It is likely the 900mm Ash Road Carrier will have sufficient capacity. Detailed modelling will be required to adequately assess the capacity of this infrastructure.

- Option 2 has the same impact on infrastructure at the Northern Outlet as Option 1 (i.e. existing 300 mm gravity main, SP0631 and 375 mm rising main).

Option 2 has a slightly lower impact in EP terms on the Southern Outlet than Option 1. It is noted that the start of this main is subject to extra load from the Eastern Planned Precinct Catchments 8 and 9 which has been accounted for in these high level calculations and is explained in Section 0. In the absence of Sydney Water feedback, we have the following assumptions and high-level supporting calculations for infrastructure that was not required in Option 1 which will affect the appropriateness of this strategy:

- It is unlikely the 600 mm Glenfield Carrier will have spare capacity to accommodate the additional load. It will be subject to 20,150 additional EP which at a grade of around 1.12% would require a 675 mm pipe for the extra load notwithstanding the load to which it is currently subject;
- It is unlikely the 750 mm Glenfield Carrier will have spare capacity to accommodate the additional load. It will be subject to 20,150 additional EP which at a grade of around 0.34% would require a 900 mm pipe for the extra load notwithstanding the load to which it is currently subject.

Figure 16: Western Planned Precinct proposed sewer network Option 2 (Indicative Only)



Source: Sydney Water Hydra

3.3.1.3 Comparison/Recommendation of Options

Table 11 details the benefits of Option 1 vs Option 2. The preferable option is likely to depend on the feasibility of constructing a new pump station (Option 1) versus spreading the load onto an extra catchment (Option 2).

Table 11: Comparison of Western Planned Precinct Options

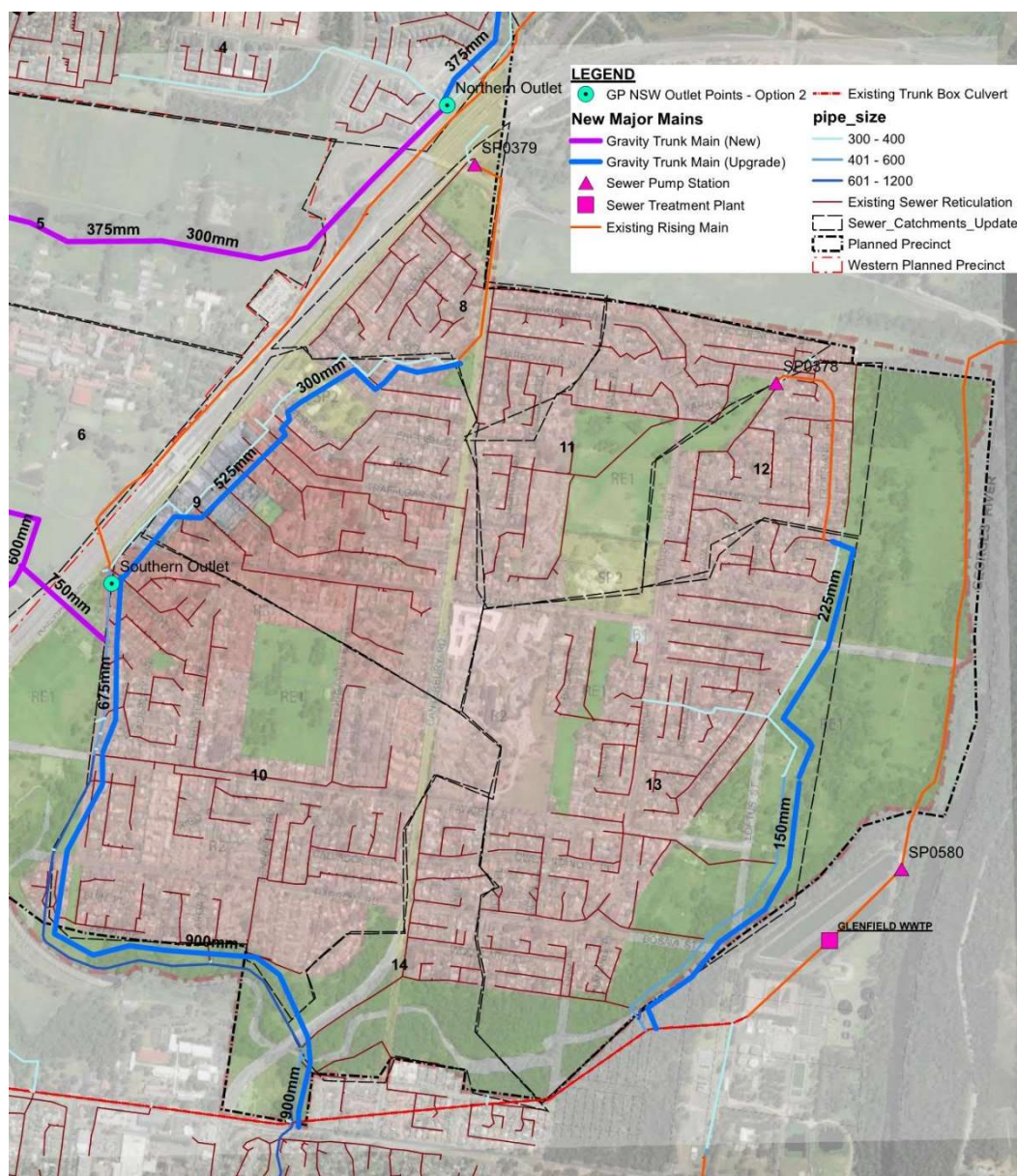
Difference	Option 1	Option 2
Change in load on Western Outlet existing downstream assets: (225mm reticulation main, SP1127, 140mm rising main and 900mm Ash Road Carrier)	Option has no impact on these assets, however a new Smaller SPS is required.	Increase by Catchment 2 and 3 load. Upgrade to SP1127 is required. Underboring Hume Hwy on ramp is required.
Requirement to build new main under Campbelltown Road	Not required	Required
Requirement to construct new pump station and rising man	Required	Not required
Load on new east-west trunk main delivering sewer to Southern Outlet	Required	Not required

In lieu of Sydney Water advice, we believe Option 1 would be the preferable option as upgrading SPS1127 would have a similar total cost to installing a new smaller SPS within the site for catchments 2 and 3. This also keeps the project works for catchments 2 and 3 to within the project boundary and no crossing of the Hume Hwy on ramps would be required.

3.3.2 Eastern Planned Precinct – Catchments 8-14

Given Catchments 8-14 are already serviced by sewerage infrastructure, proposed works would aim to leverage off the existing network where sufficient capacity exists. Figure 17 shows the proposed Eastern Planned Precinct layout with the existing sewer mains and pump station locations. It also shows proposed upgrades to trunk mains for some of the Western Planned Precinct as explained in Section 3.3.1.2 and upgrades to the Eastern Planned Precinct explained below.

Figure 17: Existing Sewer Network and Proposed Layout



Source: 20170822_Draft high density land use plan and estimated yield[2].pdf

In the event that sewer pump stations SP0379 and SP0378 or any of the pipes (gravity or rising) are considered to have no available capacity by Sydney Water, it is likely that upgrading their size would be the most preferable upgrade option.

The key components of the existing sewer strategy and upgrades to accommodate the increase in load are as follows:

- All sewer ultimately drains to the Glenfield WRP;
- Catchment 8 drains via a 225 mm reticulation main to SP0379 where it is pumped via a 200 mm rising main to the 300 mm section of the Glenfield Carrier. In the absence of Sydney Water feedback, we have the following assumptions and high-level supporting calculations which will affect the ability of the existing network to support the increased load;
 - It is unlikely the 225 mm reticulation main has spare capacity to accommodate the additional load. It will be subject to an extra load of approximately 1,988 EP. Given its grade is around 0.38%, this load additional load would require approximately a 375 mm reticulation main notwithstanding the existing load it is subject to. Detailed modelling will be required to adequately assess the capacity of this infrastructure;
 - It is unknown whether SP0379 or its 200 mm rising main has spare capacity to accommodate the additional load in the absence of Sydney Water feedback. Therefore, we have assumed the pump station and associated infrastructure would need to be upgraded such that the approximate 1,988 EP can be catered for. Detailed modelling will be required to adequately assess the capacity of this infrastructure;
 - It is unknown whether the 300 mm section of the Glenfield Carrier will have sufficient capacity to accommodate the additional load in the absence of Sydney Water feedback. This main is subject to an extra load of approximately 1,988 EP. Given its grade is around 1.1%, this load alone would require approximately a 300 mm reticulation main notwithstanding the existing load on the main and extra load from Catchment 9 as the main progresses downhill. Detailed modelling will be required to adequately assess the capacity of this infrastructure.
- Catchment 9 drains via the same 300 mm section of the Glenfield Carrier as Catchment 8. In the absence of Sydney Water feedback, we have the following assumptions and high-level supporting calculations which will affect the ability of the existing network to support the increased load;
 - It is unlikely the 300 mm section of the Glenfield Carrier has spare capacity to accommodate Catchment 9's additional load. This main is subject to an additional load of approximately 8,578 EP. Given its grade is around 1.1%, this load additional load would require approximately a 525 mm trunk main notwithstanding the existing load it is subject to.
- Catchment 10 drains generally into the downstream sections of same 600 mm and 750 mm sections of the Glenfield Carrier as Catchment 8, 9 and the Western Planned Precinct (Catchments 2, 3, 5, 6, 7, 8 for Option 1; Catchments 5, 6, 7, 8 for Option 2). In the absence of Sydney Water feedback, we have the following assumptions and high-level supporting calculations which will affect the ability of the existing network to support the increased load;
 - It is unlikely the 600 mm section of the Glenfield Carrier has spare capacity to accommodate Catchment 10's load. This main is subject to an extra load of up to 23,966 EP (if Western Planned Precinct Option 1 is adopted) or 23,170 EP (if Western Planned Precinct Option 2 is adopted). Given its grade is around 1.1%, this load alone would require approximately a 750 mm trunk main notwithstanding the existing load it is subject to. Detailed modelling will be required to adequately assess the capacity of this infrastructure;

- It is unlikely the 750 mm Glenfield Carrier has spare capacity to accommodate the additional load. This main is subject to an additional load of approximately 23,966 EP (if Western Planned Precinct Option 1 is adopted) or 23,170 EP (if Western Planned Precinct Option 2 is adopted). Given its grade is around 0.34%, this load additional load would require approximately a 900 mm trunk main notwithstanding the existing load it is subject to. Detailed modelling will be required to adequately assess the capacity of this infrastructure.
- Catchment 11 and 12 drain via a series of reticulation mains to SP0378 where it is pumped via a 200 mm rising main to the 300 mm section of the Belmont Road Carrier. In the absence of Sydney Water feedback, we have the following assumptions and high-level supporting calculations which will affect the ability of the existing network to support the increased load;
 - There could be upgrades to the reticulation mains. Given there are a number of these that contribute to SP0378, these upgrades will depend on final lot layouts;
 - It is unknown whether SP0378 or its 200 mm rising main have sufficient capacity to accommodate the additional load in the absence of Sydney Water feedback. Therefore, we have assumed the pump station and associated infrastructure would need to be upgraded such that the approximate 229 EP can be catered for;
 - The adequacy of the 300 mm section of the Belmont Road Carrier is considered in addition to Catchment 13's small increase in load below.
- Catchment 13 drains generally into the downstream sections of same 300 mm section of the Belmont Road Carrier as Catchments 11 and 12. In the absence of Sydney Water feedback, we have the following assumptions and high level supporting calculations which will affect the ability of the existing network to support the increased load;
 - It is unknown whether the 300 mm section of the Belmont Road Carrier will have sufficient capacity for sections that receive Catchment 11-13's load. This main is subject to an extra load of up to 413 EP. Given its grade is around 0.63%, this load alone would require approximately a 225 mm reticulation main notwithstanding the existing load on the main;
 - It is unknown whether the 450 mm section of the Belmont Road Carrier will have sufficient capacity for sections that receive load from Catchments 11-13. This main is subject to an extra load of up to 413 EP. Given its grade is around 1.07%, this load alone would require approximately a 150 mm reticulation main notwithstanding the existing load on the main.

3.3.3 Eastern Planned Precinct –Catchments 1 and 4

This area has not been shown to include development by DPIE's draft precinct plan. Therefore no upgrades to the network for this region have been considered.

3.3.4 Alternative Strategy

Sydney Water's customer delivery team have prepared an alternative servicing option for the site. This would involve:

- Replacement of SP0379 with a new pump station sized to receive the existing flows and flows generated by the proposed development;
- Construction of a new gravity sewer main on the south side of the proposed sub-arterial road from Campbelltown Road to Railway Parade with an underbore beneath the rail line to connect the sewer main to the new SPS;
- A new rising main from the pump station will follow Railway Parade and connect to the trunk sewer main located on Chesham Parade.

This option could prove challenging given the potential earthwork requirements to drain the western catchment underneath the existing crest within the site. This option should be further explored when detailed information regarding bulk earthworks and road alignments becomes available.

3.3.5 Glenfield Water Recycling Plant

Sydney Water have undertaken a preliminary assessment of the Glenfield WRP to determine if there is sufficient capacity to support the proposed development in the Precinct. The results of the assessment indicated the following:

- There is sufficient biological treatment capacity to receive the additional loads generated by the Glenfield Precinct assuming that both the Glenfield bioreactor and the Hoxton Park Intermittently Decanted Aerated Lagoon are operational;
- There is insufficient hydraulic capacity to receive the additional flows generated by the Precinct. Sydney Water have indicated that the proposed development may impact the emergency storage at SP0353. This pump station currently operates with one hour emergency storage time. Due to the proposed development, this emergency storage time may be reduced to less than one hour.

A detailed investigation is required to confirm the above assessment. Extensive consultation with Sydney Water should be prioritised to ensure the required upgrades to the Glenfield WRP can be included in Sydney Water's future capital works program or an alternative servicing option be identified.

3.4 Key Constraints and Opportunities

- Timing and staging of trunk upgrades will be subject to growth/uptake in the region. The bulk of the trunk upgrades will be in the Eastern Planned Precinct which is largely a brownfield development. Continuity of servicing while upgrades take place are a key constraint;
- Funding of carrier upgrades will require further negotiations with Sydney Water as development occurs;
- There is a need for a large (approximately 750 mm diameter) gravity main to be underbored under the railway corridor. This is expected to be a costly component of the required works, however no alternative options exists to connect the site sewer to the Glenfield Carrier;
- Sydney Water have provided a potential alternative servicing strategy for the western catchment. This option should be further assessed during the next phase of the project;
- Sydney Water have advised that there is insufficient hydraulic capacity at the Glenfield WRP to service the development. Further consultation with Sydney Water should be prioritised to ensure the required upgrades to the Glenfield WRP can be included in Sydney Water's future capital works program or an alternative servicing option be identified.
- Detailed modelling will be required to confirm the above upgrades as development occurs.

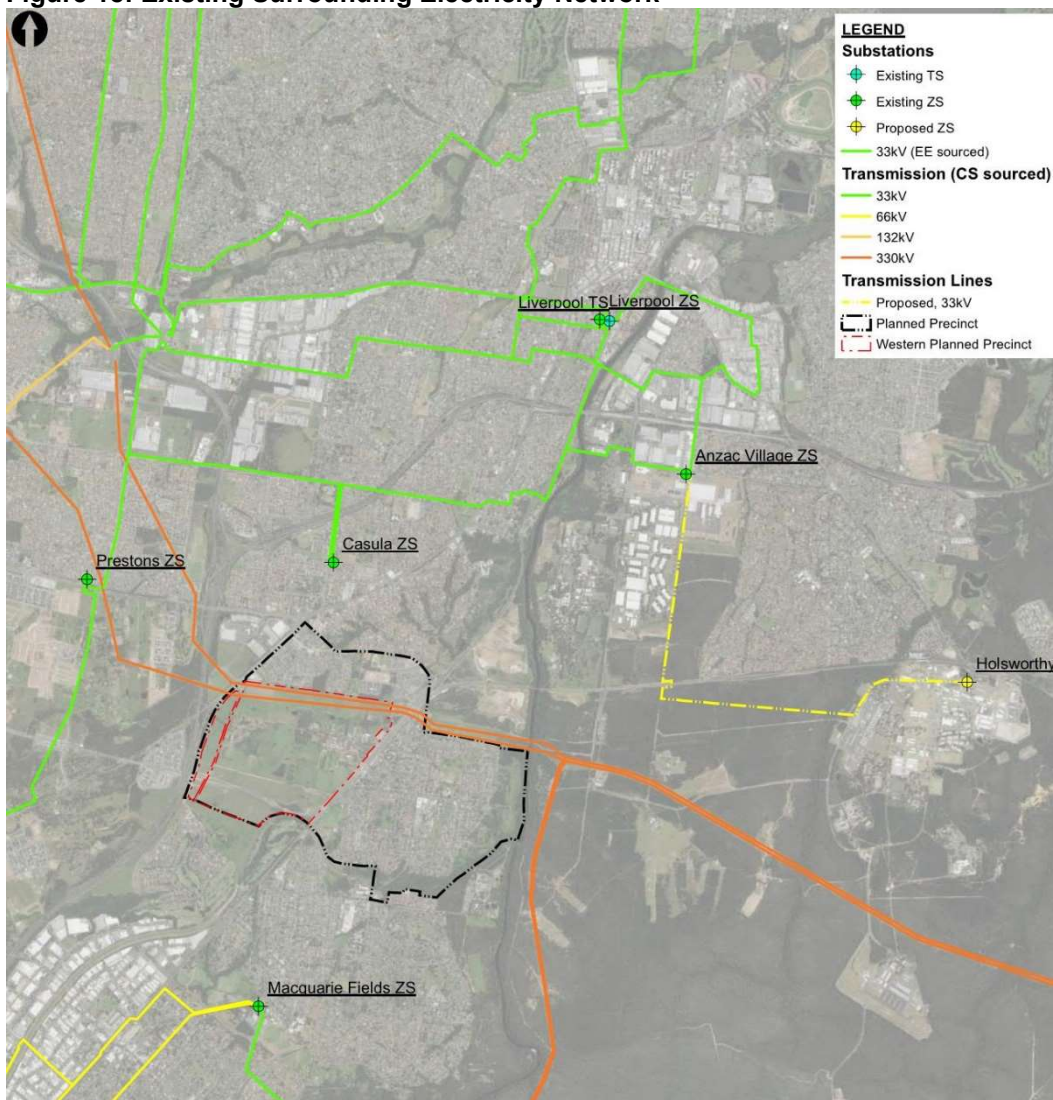
4 Electricity

4.1 Existing Network

The Glenfield region is serviced by the Endeavour Energy (EE) electrical network. At present, there is minimal trunk electrical infrastructure located in the vicinity of the Western Planned Precinct in particular. EE's 2015 growth servicing strategy did not consider servicing requirements for the Glenfield to Macarthur Growth Area.

There are several existing zone substations (ZS) in the vicinity of the Planned Precinct at Edmondson Park, Prestons, Casula and Macquarie Fields. Figure 18 shows existing and proposed Endeavour Energy zone substations surrounding the Planned Precinct.

Figure 18: Existing Surrounding Electricity Network

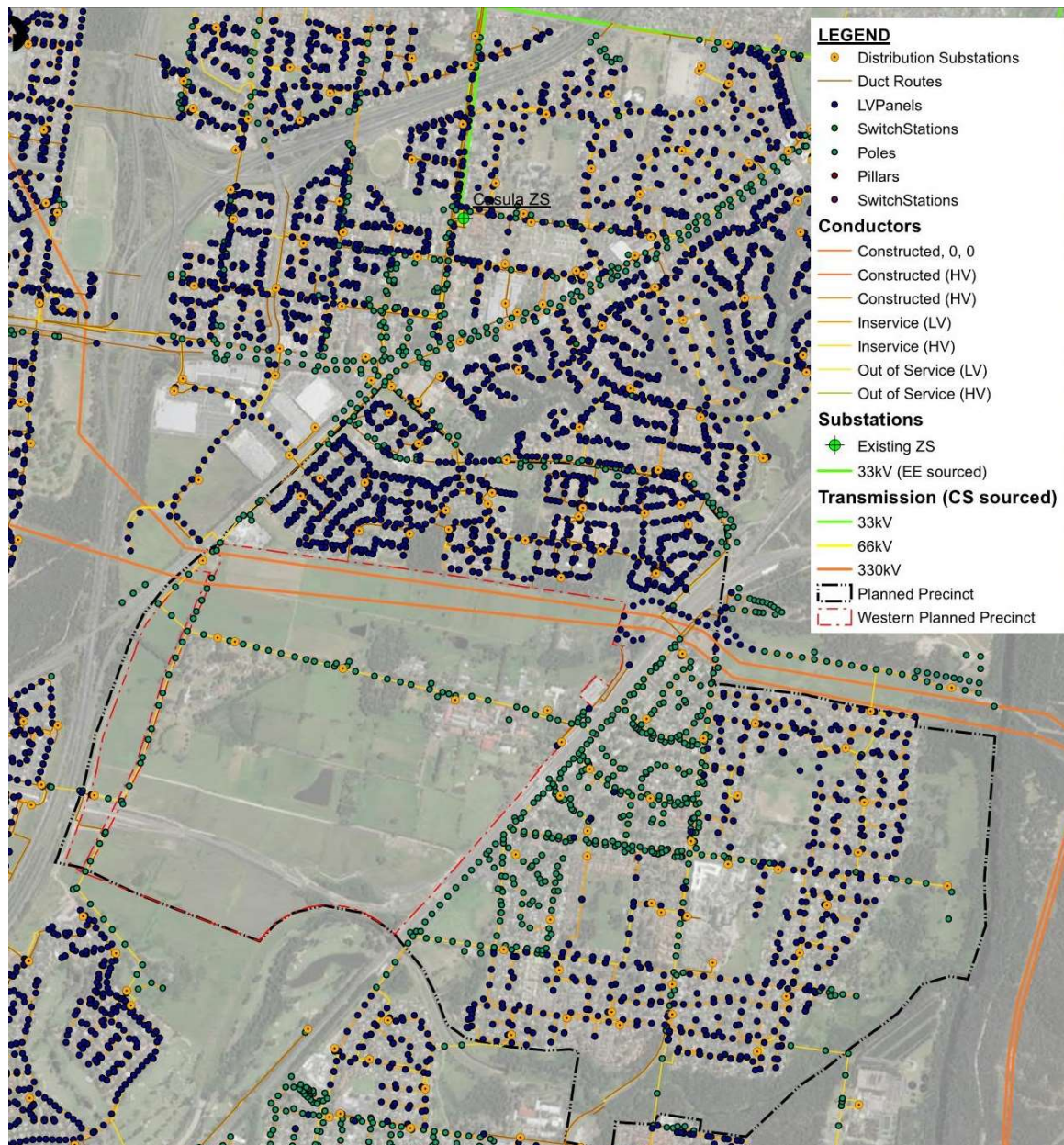


Source: Endeavour Energy Servicing Strategy 2014-2019, NSW Globe Clip & Ship

There are two existing 330 kV transmission lines which run through the Planned Precinct along the north boundary of the Western Planned Precinct as shown on Figure 18. These lines will need to be maintained and will have associated easements of minimum 30 m where no development can occur.

Electrical reticulation is supplied by Endeavour Energy to limited sites in the Western Planned Precinct and widely throughout the Eastern Planned Precinct. This existing network is shown in Figure 19.

Figure 19: Internal Electrical Network



Source: Endeavour Energy Digital file 17/10/2017

4.2 Consultation with Authorities

A feasibility application was lodged with Endeavour Energy (EE) to determine the available network capacity and required upgrade works to support growth. Their response on the 22nd of September 2017 forms the basis of the proposed network and is provided in Appendix C.

We have since liaised with EE to communicate options for proposed zone substation locations.

4.3 Proposed Network

4.3.1 Increase in load

Endeavour Energy have estimated an increase in electrical load of 40 MVA will result from the development high yield scenarios. Ten new 11 kV feeders will be required to meet this demand. In addition, if there is insufficient capacity in the existing zone substations to meet this demand a new zone substation may be required.

4.3.2 Initial Network – First 4,500 Dwellings

Endeavour Energy have estimated that there is capacity for 4,500 dwellings to be serviced via the existing zone substations. This will be achieved via a series of 11 kV feeders from the Edmondson Park, Prestons and Macquarie Fields substations.

The first 1,000 dwellings will be serviced by one new 11kV feeder from Edmondson Park ZS. It is likely the initial development within the Precinct will occur within the Western Planned Precinct given the relative ease in divesting NSW Government owned land compared to rezoning land in the east and waiting for developers to amalgamate and develop blocks. To reach the Western Planned Precinct the feeder would run along Campbelltown Road from the ZS to the Precinct boundary as shown in Figure 20. Within the site the feeder would be extended to reach the early stages of development near the rail corridor.

To service an additional 2,000 dwellings, two 11 kV feeders will be brought to the site from the Prestons ZS. A new underbore will need to be established under the M5 Motorway for the feeders to reach the site. The assumed route of these feeders is shown in Figure 20. It is likely the majority of initial development will occur within the Western Planned Precinct as explained above. These feeders will therefore be delivered to the Western Planned Precinct as per the first feeder.

Two feeders will also be brought to the Planned Precinct from the Macquarie Fields ZS. These feeders will supply an additional 1,500 dwellings, 24,894 m² GFA mixed use space and 165,000 m² GFA commercial space. These feeders will run along Fields and Atchison Roads to reach the Precinct, and will extend along Railway Road on the eastern side of the railway to reach the commercial space within the Precinct. These feeders will supply residential and commercial development within the Eastern Planned Precinct, as well as the mixed-use site to the west of the rail corridor.

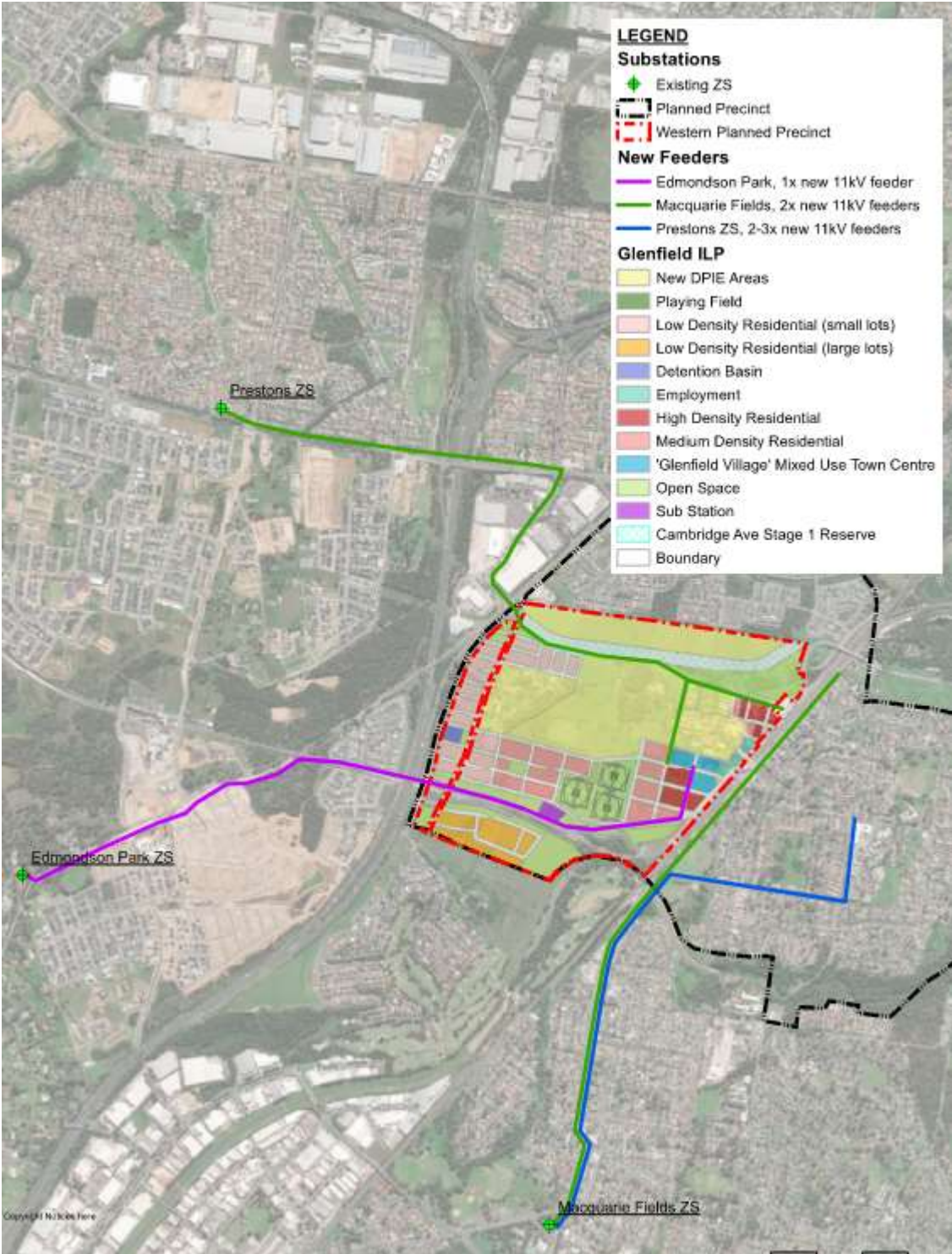
A summary of the initial servicing strategy is shown in Table 12 below.

Table 12: Initial Servicing Strategy Summary

Delivery Order	Number of Feeders	Zone Substation	Precinct Served
1	1	Edmondson Park	Western Planned Precinct
2	2	Prestons	Western Planned Precinct
3	2	Macquarie Fields	Western & Eastern Planned Precincts

Source: Endeavour Energy (2017)

Figure 20: Initial Electrical Servicing Strategy



4.3.3 Ultimate Network

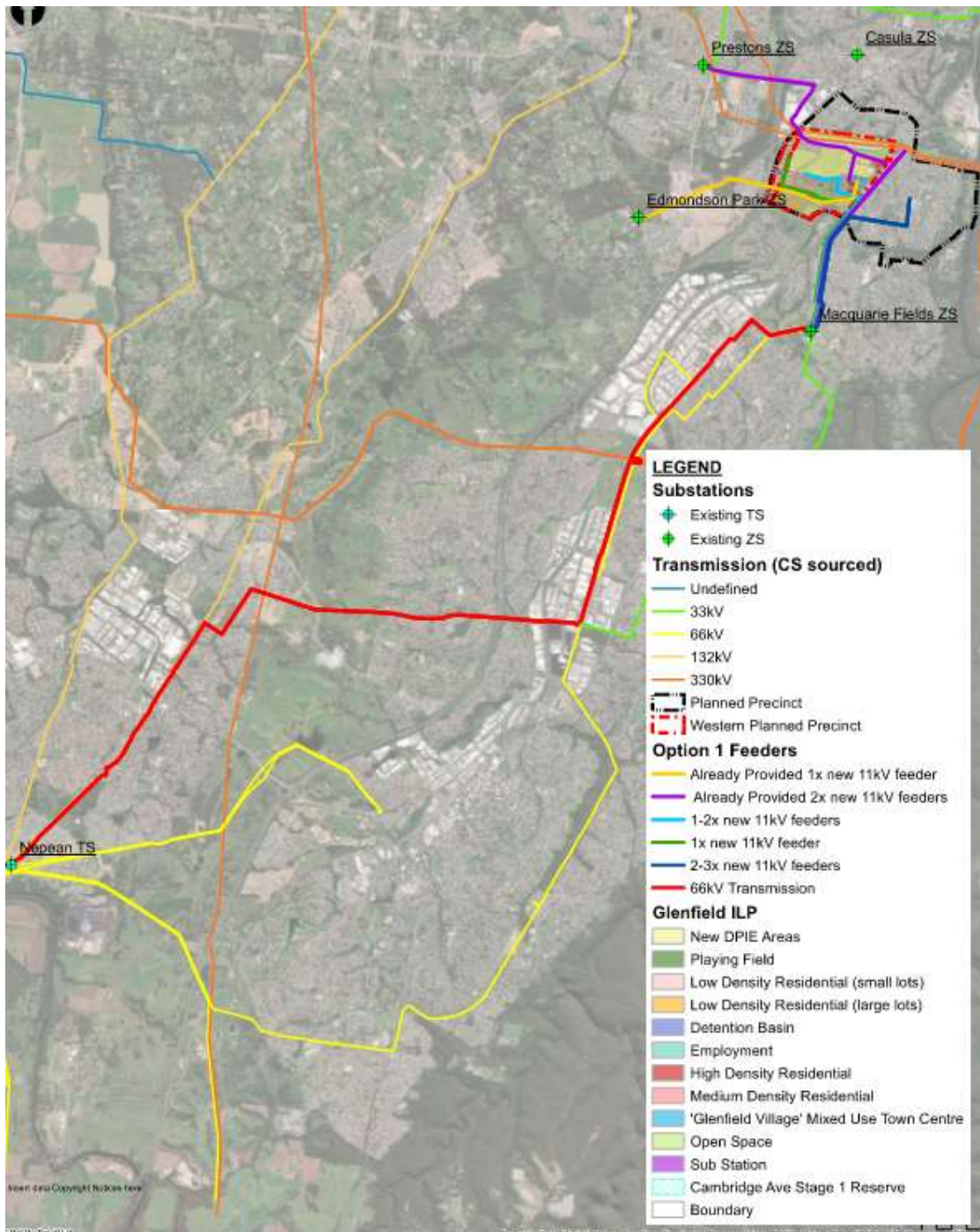
To service the remaining 3,634 dwellings two options have been considered:

1. Augmentation of Macquarie Fields Zone Substation and upstream 66 kV network and extend a further five feeders from this substation;
2. Establish a new 25 MVA zone substation within the Glenfield Planned Precinct in some of the currently unused NSW Government land in the Western Planned Precinct.

4.3.3.1 Option 1

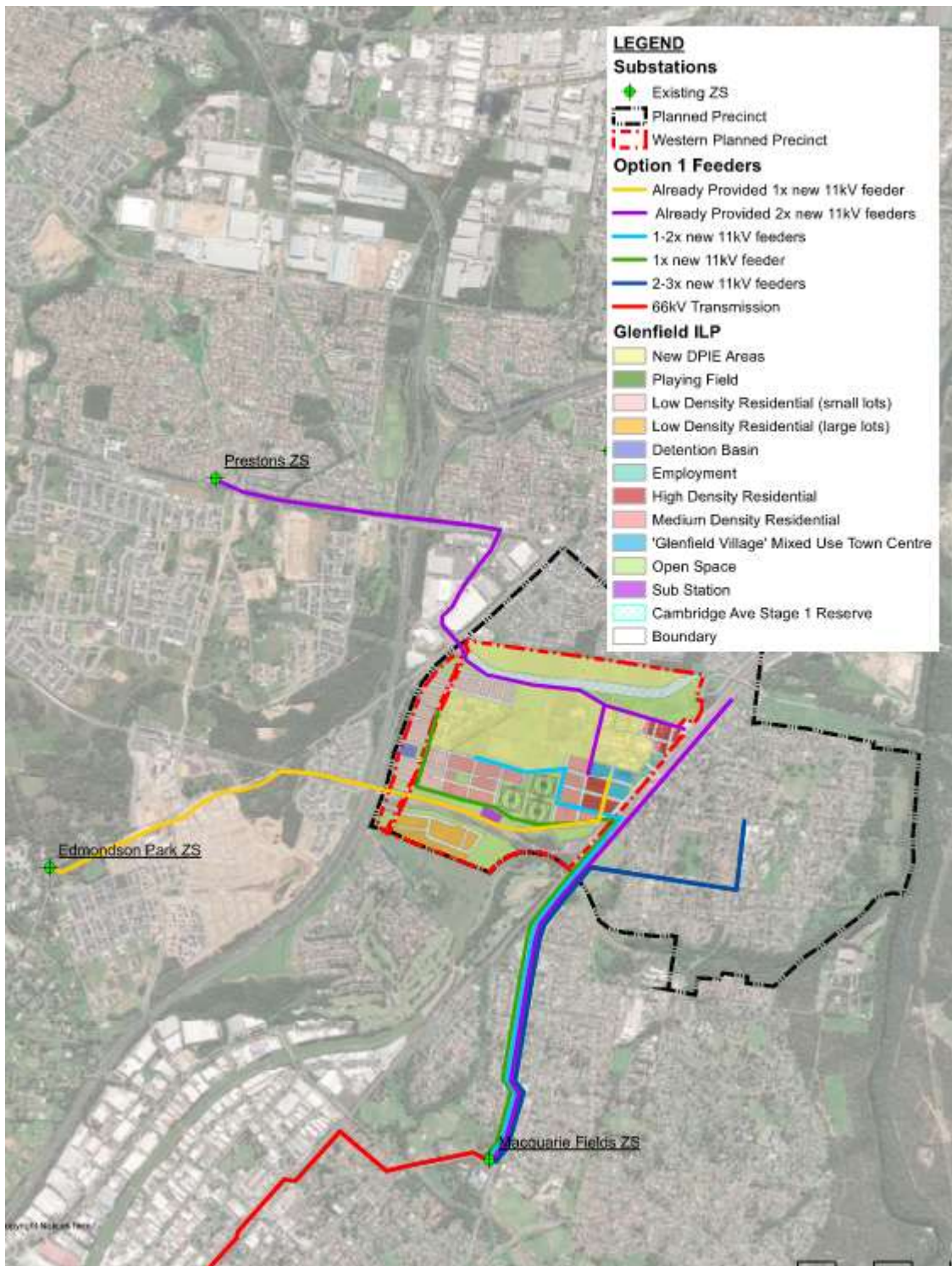
To supply the remaining 3,634 dwellings, the Macquarie Fields zone substation could be augmented to allow for a further five 11 kV feeders to be delivered to the site. To achieve this, new 66 kV transmission lines would need to be brought to the Macquarie Fields ZS from the Nepean Transmission Substation (TS), located approximately 19.5 km to the south. These works would be funded and delivered by Endeavour Energy. An indicative connection route between the substations is shown in Figure 21.

Figure 21: Option 1 – Potential 66kV Network Augmentations



From the Macquarie Fields ZS, five new feeders would be brought to the Precinct via the route proposed in Section 4.3.2. Two to three of these feeders would extend to the centre of the Eastern Planned Precinct to supply the proposed development. The remaining feeders would need to be underbored beneath the rail corridor to reach the Western Planned Precinct. Conduits beneath the rail line should be constructed for all feeders in the same body of work, regardless of when the feeders are required, to reduce the associated costs. These feeders would then supply the remaining development in this area. The proposed servicing strategy is outlined in Figure 22.

Figure 22: Ultimate Electricity Servicing Strategy – Option 1



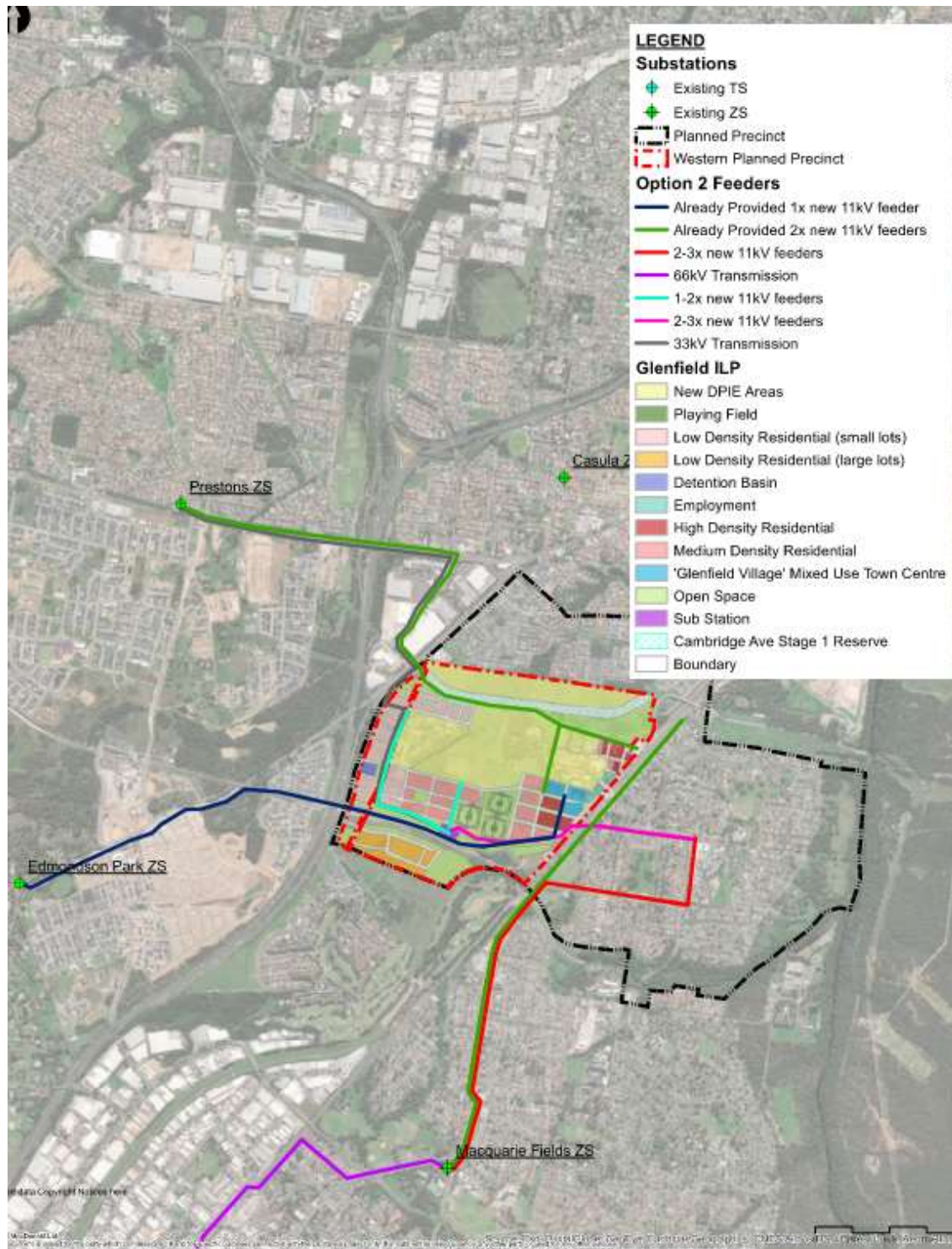
Source: Endeavour Energy Servicing Strategy 2014-2019, NSW Globe Clip & Ship

4.3.3.2 Option 2

Endeavour Energy also proposed the development could be serviced by constructing a new 25 MVA zone substation within the Western Planned Precinct boundary. EE have advised that the zone substation will require a site no smaller than 1 Ha in size, and should be located on a corner block to allow for the installation of incoming and outgoing cables. Group GSA initially included an appropriate site for the ZS in the south west corner of the Western Planned Precinct. However, consultation with EE led to a revised ZS location in closer proximity to the increased electrical load density which is planned closer to the rail corridor. The new substation will connect to the surrounding ZSs via a series of 33 kV transmission lines and up to five new 11 kV feeders will be established to service the remaining 3,634 dwellings.

As outlined in Option 1, two to three feeders will be required to service the Eastern Planned Precinct, with the remaining feeders servicing the Western Planned Precinct. Feeders supplying the eastern side of the Precinct would need to be underbored beneath the rail corridor. Indicative feeder routes are outlined in Figure 23.

Figure 23: Ultimate Electricity Servicing Strategy – Option 2



4.3.3.3 Preferred Option

Endeavour Energy have recommended that construction of a new zone substation is the preferred option due to the cost and complexity of augmenting an older existing substation site. This ZS has limited transmission line capacity and would require significant augmentation to meet the servicing requirements of the site.

In addition, EE have outlined concerns regarding the cost and feasibility of developing seven new 11 kV feeders from Macquarie Fields ZS. The ZS is 2 km from the site boundary and would require rail crossings to service the Western Planned Precinct.

4.4 Funding Mechanisms

Endeavour Energy's funding arrangements for the various types of work are outlined in Table 13.

Table 13: Electricity upgrade funding responsibilities

Works	Delivery Responsibility	Funding
Low voltage reticulation	Developer to engage ASP Contestable Works	Developer
11 kV reticulation and padmount substations	Developer to engage ASP Contestable Works	Endeavour Energy reimbursement as per Company Policy
11 kV feeders from zone substations	Developer to engage ASP Contestable Works	Endeavour Energy reimbursement as per Company Policy – if applications are noted as for a new subdivision
New zone substation and transmission lines	Endeavour Energy	Endeavour Energy

Source: Endeavour Energy Letter 22/09/2017

As the proposed works are contestable, NSW Government will need to obtain advice from an Accredited Service Provider (ASP) for the costs associated with low voltage reticulation and 11kV works. For 11kV cable works, Endeavour Energy reimburses at a standard rate per metre, with the developer funding any gap that may result which includes costs associated with railway/motorway crossings.

4.5 Key Constraints and Opportunities

- There is capacity within the Edmondson Park, Prestons and Macquarie Fields ZS to supply 4,500 dwellings. A new underbore for the M5 Motorway will be required to deliver the Prestons ZS feeders to the site. This may involve significant costs and time delays for the relevant approvals to be granted from the motorway owners;
- The preferred ultimate development proposal requires a new zone substation to be built within the NSW Government owned land. The ZS requires a 1 Ha site. Funding and construction of the ZS will be the responsibility of Endeavour Energy;
- Railway crossings will be required to ensure all development can be serviced. This is expected to be a costly component of the required works.

5 Gas

5.1 Existing Network

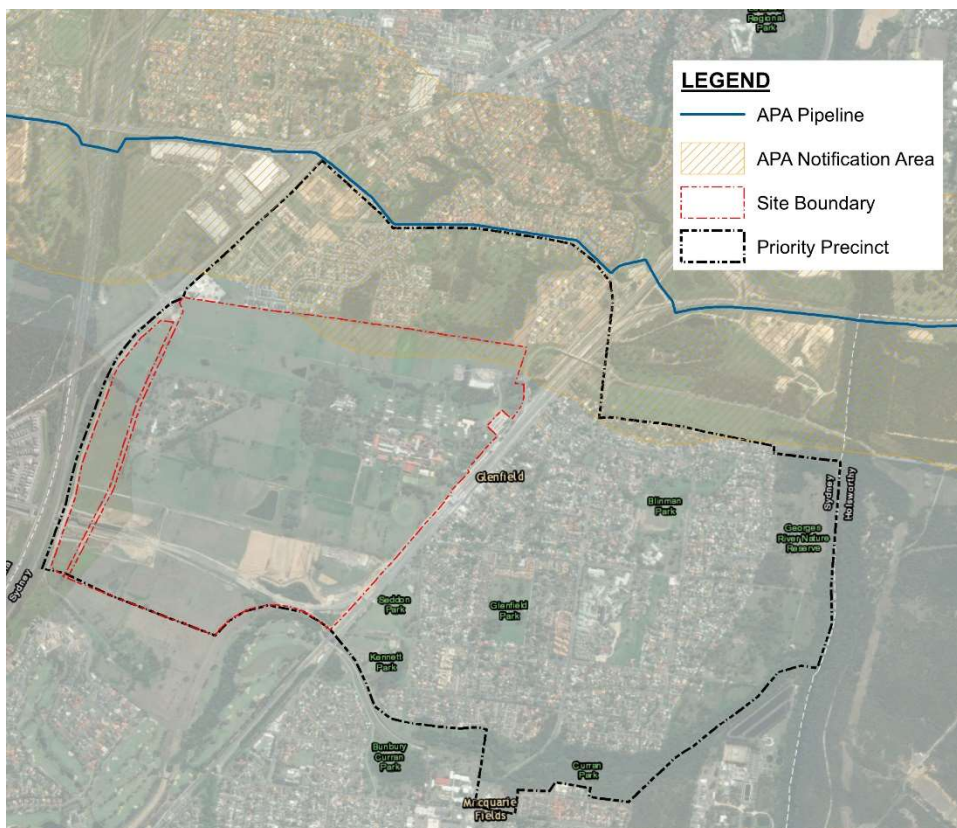
Gas is supplied to the Glenfield area by Jemena. Gas is supplied to the Hurlstone Agricultural School in the Western Planned Precinct via 1,050 kPa secondary main located within the road reserve of Glenfield Road.

Within the Eastern Planned Precinct, gas is supplied along most roads via a 210 kPa residential network, with secondary gas mains located along Trafalgar Street and Canterbury Road.

APA operate an ethane pipeline which runs from Botany in Sydney's east to Leppington and then south where it terminates near Goulburn. The pipeline traverses the northern boundary of the Planned Precinct as shown in Figure 24. The pipeline is subject to a notification zone which covers a radius of 500 m either side of the pipe. While the pipeline itself does not cross the site, this notification zone intersects with the northern boundary of the site as shown on Figure 24.

Within the notification zone, sensitive land uses such as aged care facilities, childcare centres and schools may require a safety management study. As these land uses are only proposed outside the notification zone, no further studies will be required. APA have also confirmed that utilities infrastructure such as sewer pump stations do not qualify as a sensitive land use and can therefore be located within the notification zone.

Figure 24: APA gas pipeline and notification area



5.2 Consultation with Authorities

A feasibility enquiry was lodged with Jemena to determine the gas servicing options for the development. Jemena have advised that a high pressure 1,050 kPa gas main is located to the west of the rail line which supplies the existing school site. It crosses the railway corridor just south of Roy Watts Road and continues in the eastern site along Trafalgar Street and Canterbury Road.

To service the proposed development, this main would require tapering through a below ground district regulator station to reduce the pressure to 210 kPa to be suitable for residential connection. The reduced pressure mains would be reticulated through public roads.

To the east of the railway line, the existing network does not have sufficient capacity to service the development. To meet the additional demand, a gas main would need to be brought under the rail corridor to the development site. As per the Western Planned Precinct, a district regulator will be required to taper the main down to an appropriate size. The existing reticulation mains east of the corridor will be retained.

Jemena have advised that a minimum budget of \$300,000 should be allowed for each district regulator.

5.3 Proposed Network

As outlined above, the proposed developments will be serviced via a series of 210 kPa residential network mains. Existing mains within the Eastern Planned Precinct should be retained where possible.

Under NSW regulation, Jemena is required to ensure that any connection to the natural gas distribution system is commercially viable and therefore must assess each request for supply on an individual basis (as gas supply is a non-essential service). Our experience is that Jemena will be able to assess the individual lots once the final building configurations are prepared and a connection application is made.

5.4 Key Constraints and Opportunities

- Due to the additional demand generated by the development, two district regulators will be required to ensure gas can be provided to all developments. Jemena have advised that \$300,000 should be budgeted per district regulator.
- As most of the Eastern Planned Precinct is already connected to the gas network, there is an opportunity to retain existing gas pipelines where road alignments remain unchanged.

6 Telecommunications

6.1 Existing Network

The existing telecommunications network in the study area is provided by Telstra. Within the Western Planned Precinct, optic fibre is provided to the schools via Roy Watts Drive and the internal access road to the south of the Hurlstone Agricultural School. On the eastern side of Western Planned Precinct, Optus conduits traverse Quarter Sessions Road and service Campbell House School.

Within the Eastern Planned Precinct site, Optus's major optic fibre network traverses Railway Parade. Optus also have conduits along the length of Canterbury Road as well as portions of Belmont Road and Cambridge Avenue at the northern boundary of the site.

Telstra services all existing dwellings within this portion of the Precinct via a series of underground cables located in the road reserve. Many of these cables are optic fibre. Within the aged care facility and residential flat buildings, internal reticulation is provided from the street connection to each building.

6.2 Consultation with Authorities

Feasibility applications were lodged with both NBN Co. and Telstra to determine the servicing requirements for the site.

Telstra have advised that telecommunications services will be provided to the precinct by NBN Co. Telstra will remain responsible for servicing school sites and commercial centres. During construction, separate conduits will need to be provided for Telstra to connect to these sites.

6.3 Proposed Network

Telecommunications servicing will be provided to the Precinct by NBN Co. Some lead-in work may be required to service the development and an associated backhaul fee may be applicable, this will be confirmed by NBN Co. in their feasibility assessment. A standard fibre connection fee of \$400 per unit will apply.

NBN's Planning Department have reviewed the development. NBN would be required to provide 2 x 576 fibre cables to service this development which will be fed from Liverpool exchange needing 7 kms of hauling. The Backhaul charge has been calculated at \$85,800 to service a development of this size.

During the development phase, developers will be required to install NBN conduits and where schools and commercial areas are proposed, provide a separate conduit within the shared trench in the road reserve for Telstra to service these sites.

All existing internal reticulation will be decommissioned and removed, with new cables provided in the shared trench allocation of the road reserve. If road alignments remain unchanged in the Eastern Planned Precinct, existing cables should be retained where possible. Care should also be taken when working near existing optic fibre that must be retained.

6.4 Key Constraints and Opportunities

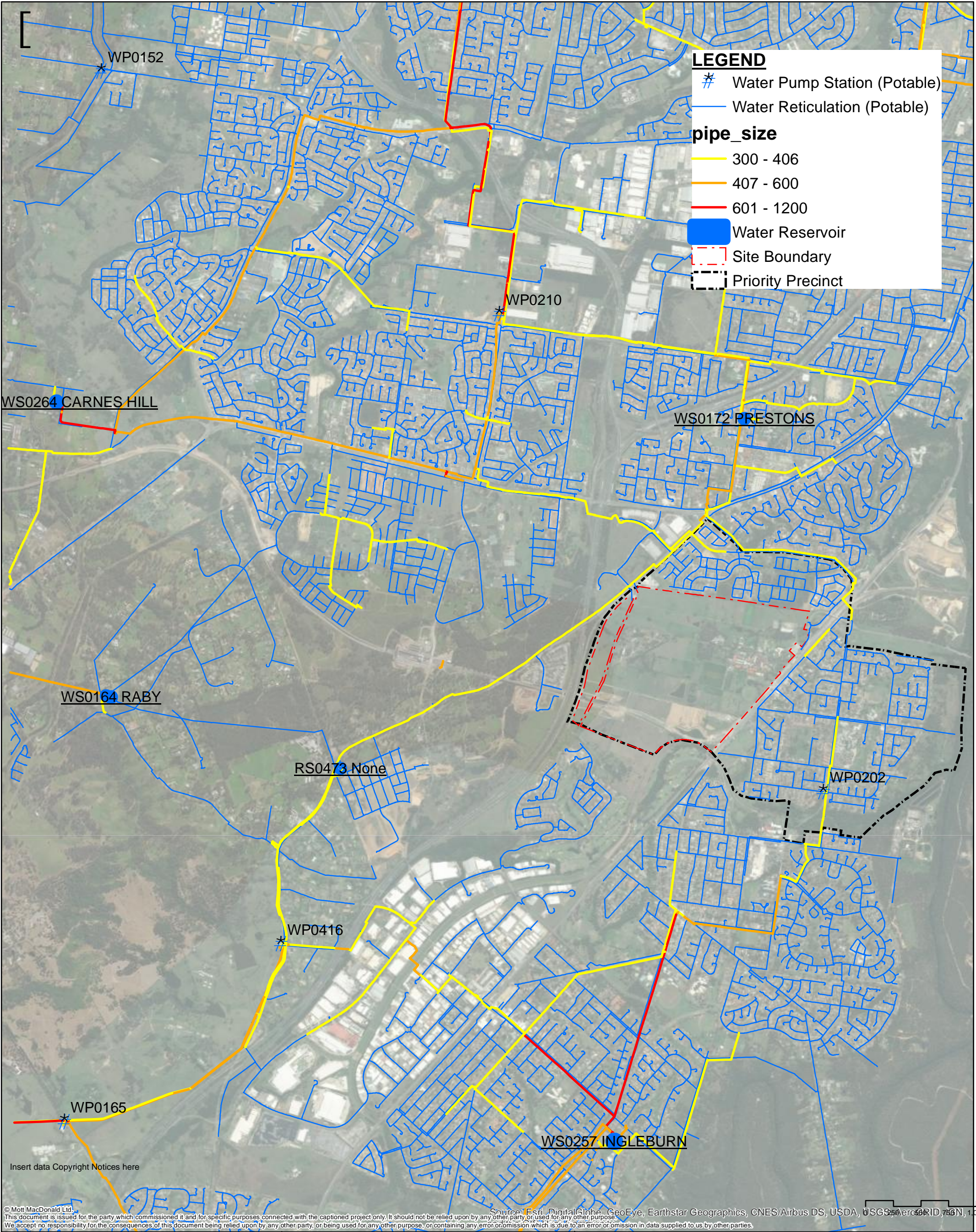
- The Planned Precinct will be serviced via the NBN Co. network. A connection fee of \$400 per unit will apply.

- Optus's major optic fibre network traverses Railway Parade. These cables will need to be maintained during construction works.
- There is potential to retain the existing telecommunications network within the Eastern Planned Precinct where road alignments will remain unchanged.
- Where possible, removal/relocation of existing optic fibre cables should be avoided.

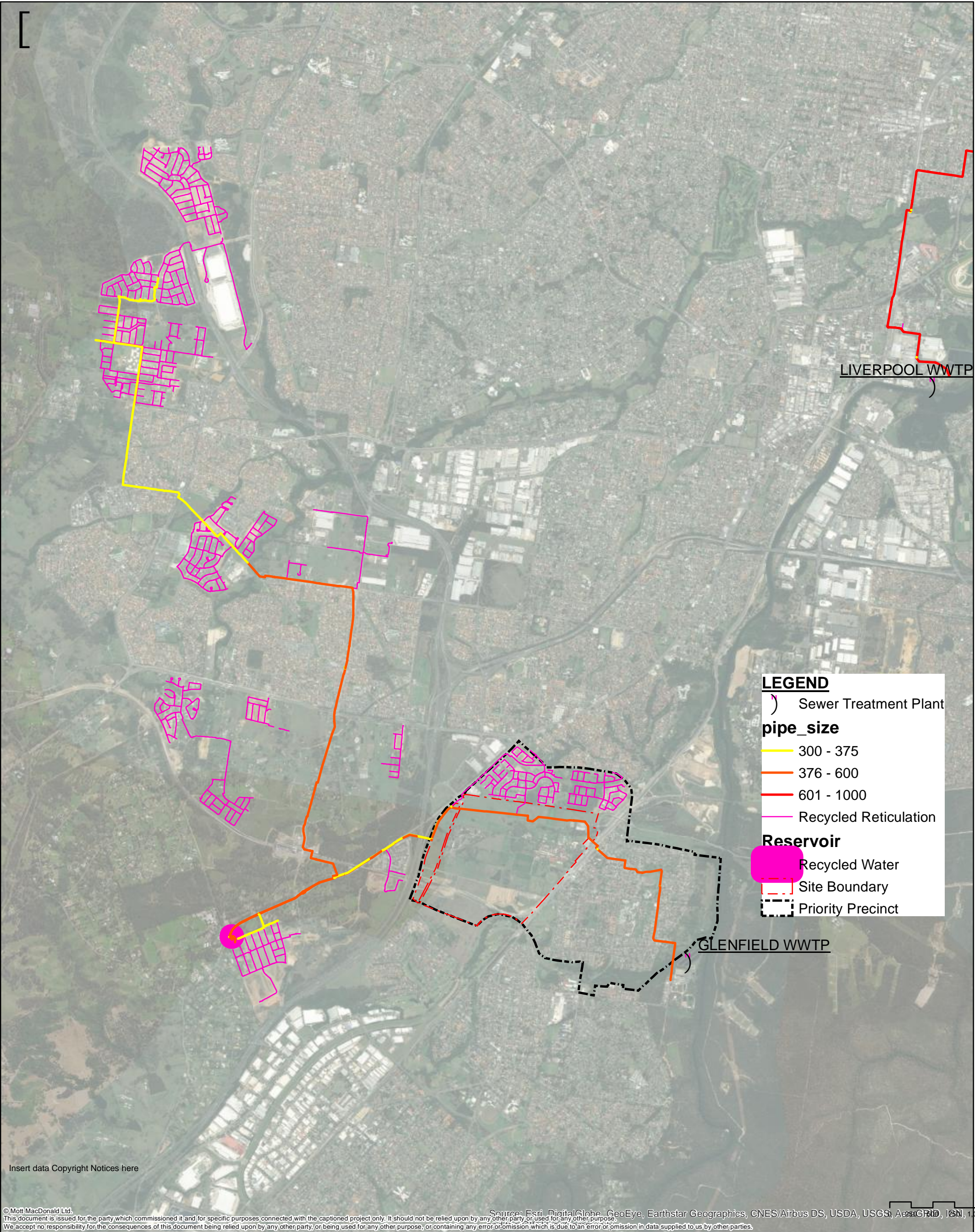
Appendices

A.	Existing Utilities Network	58
B.	Proposed Utilities Network	59
C.	Authority Correspondence	60
D.	RPS Survey	61

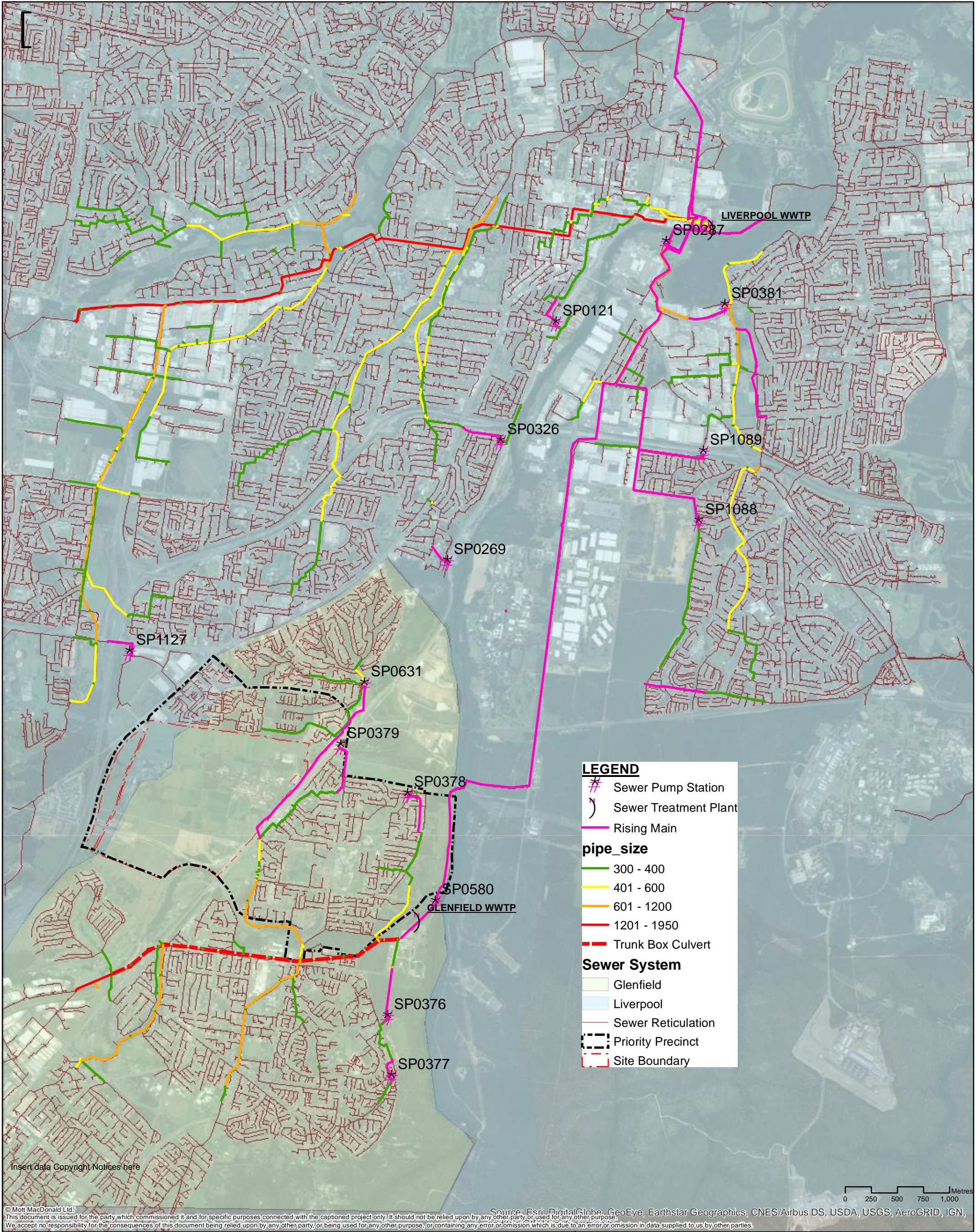
A. Existing Utilities Network



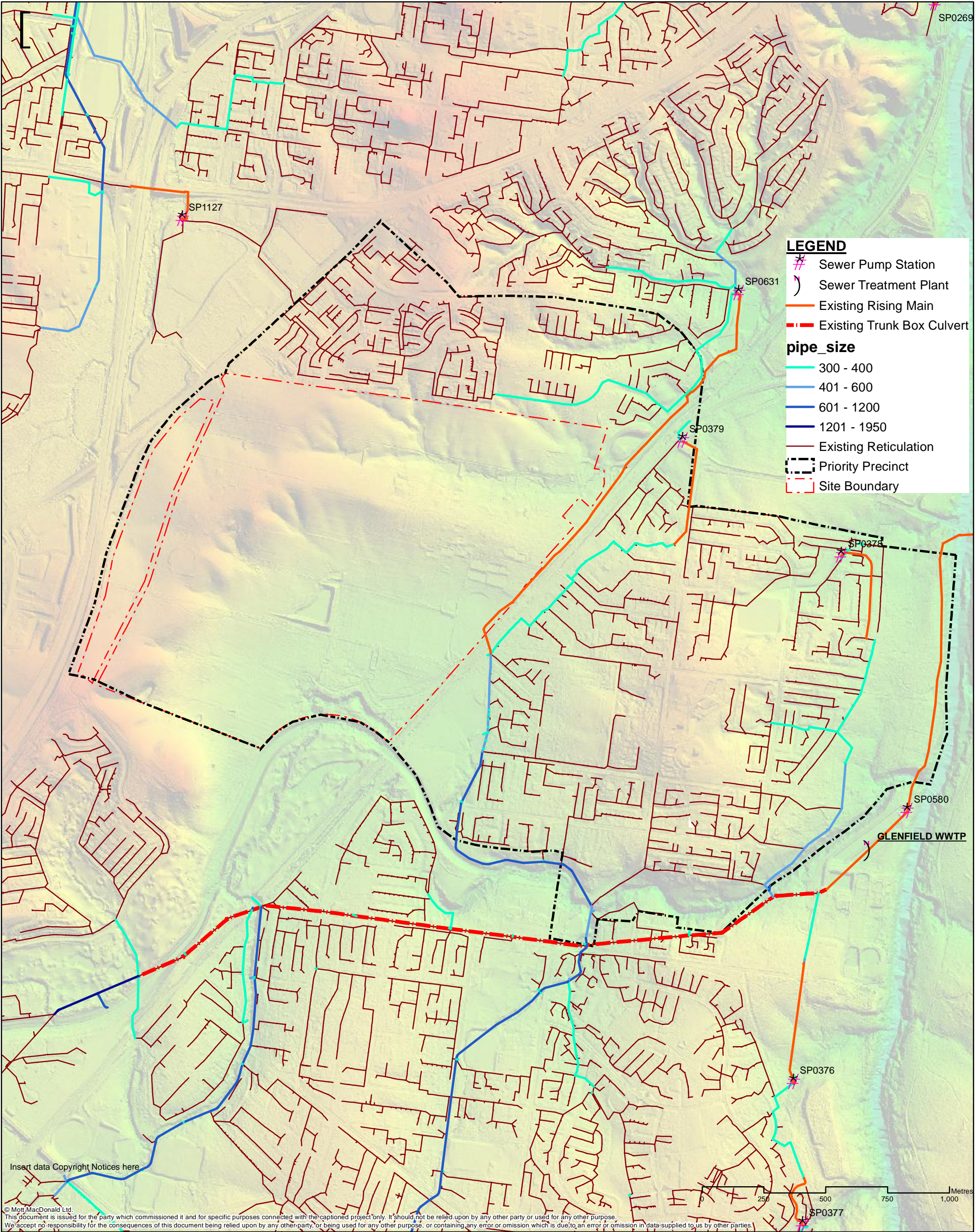
<div><div>M</div><div>M</div><div>MOTT MACDONALD</div></div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	Client GOVERNMENT PROPERTY NSW					Title HURLSTONE EXISTING WATER		Drawn	T. Abbot	
								Checked	G. Lee	
	Approved	G. Lee								
	Scale at A3 1:31,262									
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number MMD-376722-C-SK-GIS-0110		Security	Status
P1	29/09/2017	TA	FOR INFORMATION	GL	GL	STD			PRE	P1



<div><div>M</div><div>MOTT MACDONALD</div></div> <div><div>Mott MacDonald</div><div>383 Kent Street,</div><div>Sydney NSW 2000</div><div>PO Box Q1678 QVB</div></div> <div><div>T +61 (0)2 9098 6800</div><div>F +61 (0)2 9098 6810</div><div>W mottmac.com</div></div>	<div>Client</div> <div>GOVERNMENT PROPERTY NSW</div>					<div>Title</div> <div>HURLSTONE EXISTING RECYCLED WATER</div>		Drawn	T. Abbot	
								Checked	G. Lee	
								Approved	G. Lee	
								Scale at A3 1:40,000		
	Rev	Date	Drawn	Description	Ch'k'd	App'd	<div>Drawing Number</div> <div>MMD-376722-C-SK-GIS-0111</div>		Security	Status
P1	29/09/2017	TA	FOR INFORMATION	GL	GL	STD			PRE	P1

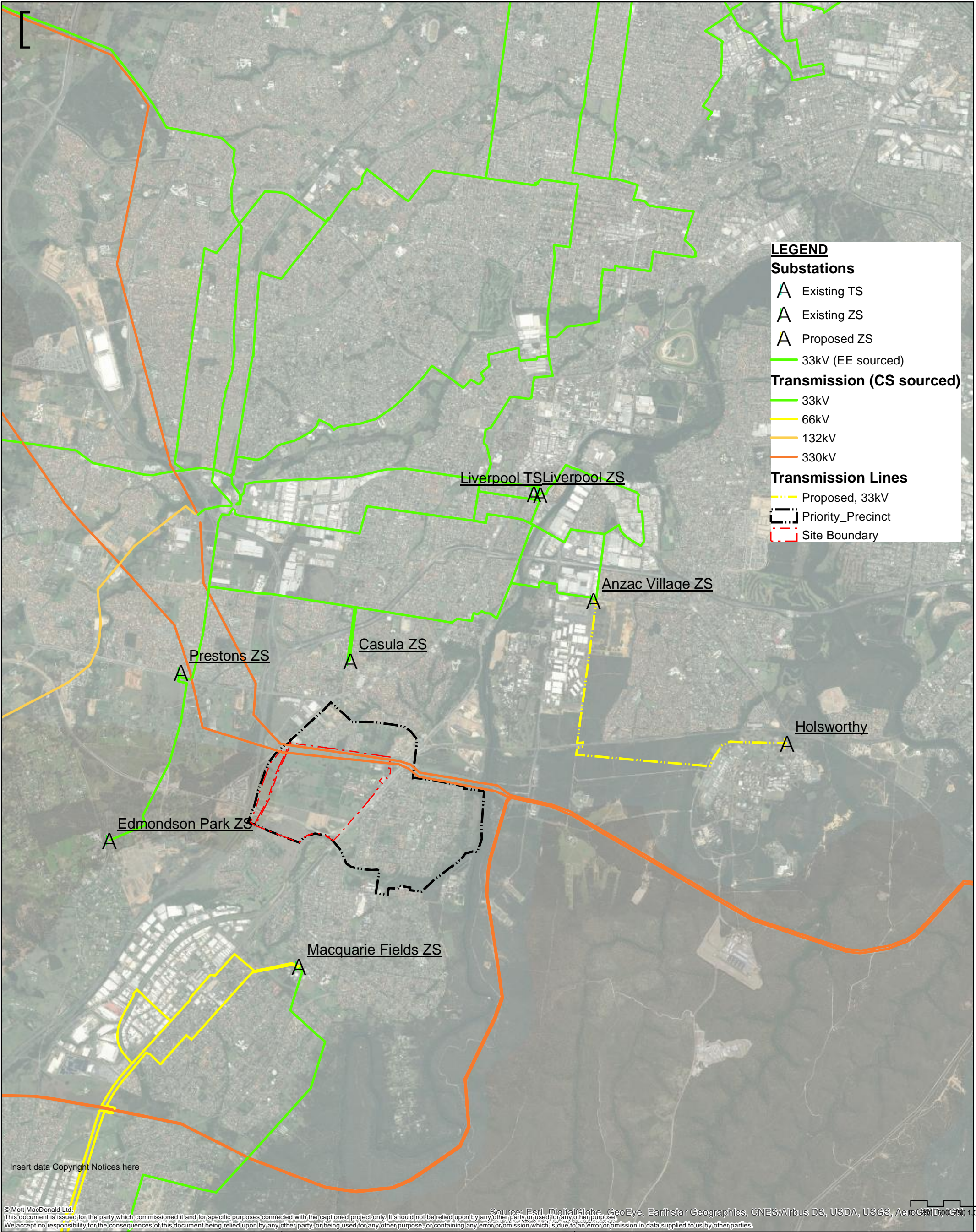


<div><div>M</div><div>MOTT MACDONALD</div></div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	<div>Client</div> <div>GOVERNMENT PROPERTY NSW</div>					<div>Title</div> <div>HURLSTONE EXISTING SEWER SURROUNDING NETWORK</div>		Drawn		T. Abbot			
								Checked		G. Lee			
								Approved		C. Avis			
								Scale at A3 1:33,223					
	Rev		Date		Drawn		Description		Ch'k'd		App'd		
P1		29/09/2017		TA		FOR INFORMATION		GL		CA			
						Drawing Number		Security		Status		Rev	
						MMD-376722-C-SK-GIS-0100		STD		PRE		P1	



<

Drawn	T. Abbot	
Checked	G. Lee	
Approved	C. Avis	
Scale at A3		
1:14,015		
Security	Status	Rev
STD	PRE	P1

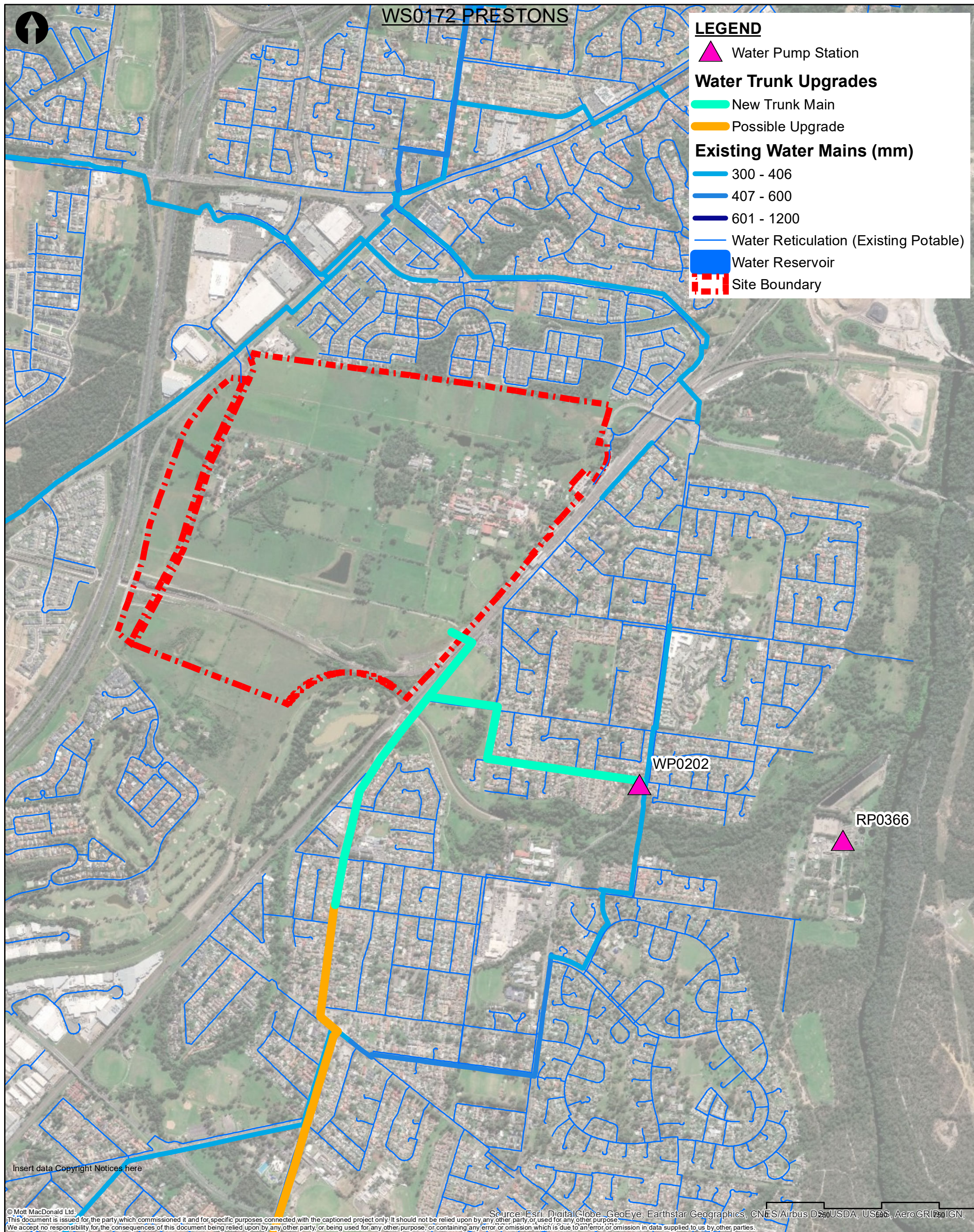



<div><div>M</div><div>MOTT MACDONALD</div></div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	<div>Client</div> <div>GOVERNMENT PROPERTY NSW</div>					<div>Title</div> <div>HURLSTONE EXISTING ELECTRICITY</div>		<div>Drawn</div>	<div>T. Abbot</div>		
								<div>Checked</div>	<div>G. Lee</div>		
								<div>Approved</div>	<div>G. Lee</div>		
								<div>Scale at A3</div> <div>1:52,651</div>			
	<div>Rev</div>	<div>Date</div>	<div>Drawn</div>	<div>Description</div>		<div>Ch'k'd</div>	<div>App'd</div>	<div>Drawing Number</div> <div>MMD-376722-C-SK-GIS-0130</div>		<div>Security</div> <div>STD</div>	<div>Status</div> <div>PRE</div>
<div>P1</div>	<div>29/06/2017</div>	<div>TA</div>	<div>FOR INFORMATION</div>		<div>GL</div>	<div>GL</div>					

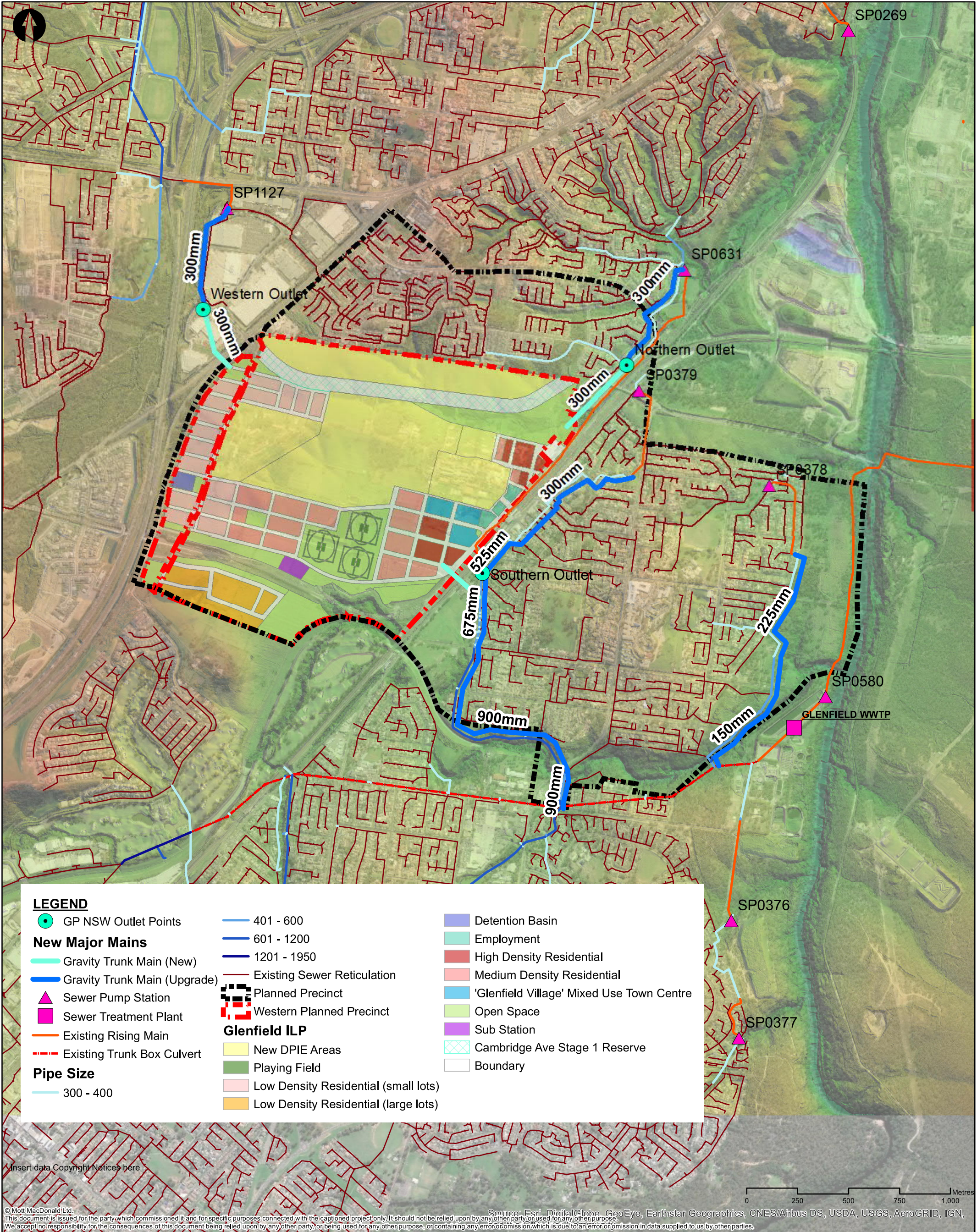


<div><div>M</div><div>M</div><div>MOTT MACDONALD</div></div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	Client GOVERNMENT PROPERTY NSW					Title HURLSTONE EXISTING (INTERNAL) ELECTRICITY		Drawn	T. Abbot	
								Checked	G. Lee	
	Approved	G. Lee								
	Scale at A3 1:15,000									
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number MMD-376722-C-SK-GIS-0131		Security	Status
P1	17/10/2017	TA	FOR INFORMATION	GL	GL	STD			PRE	P1

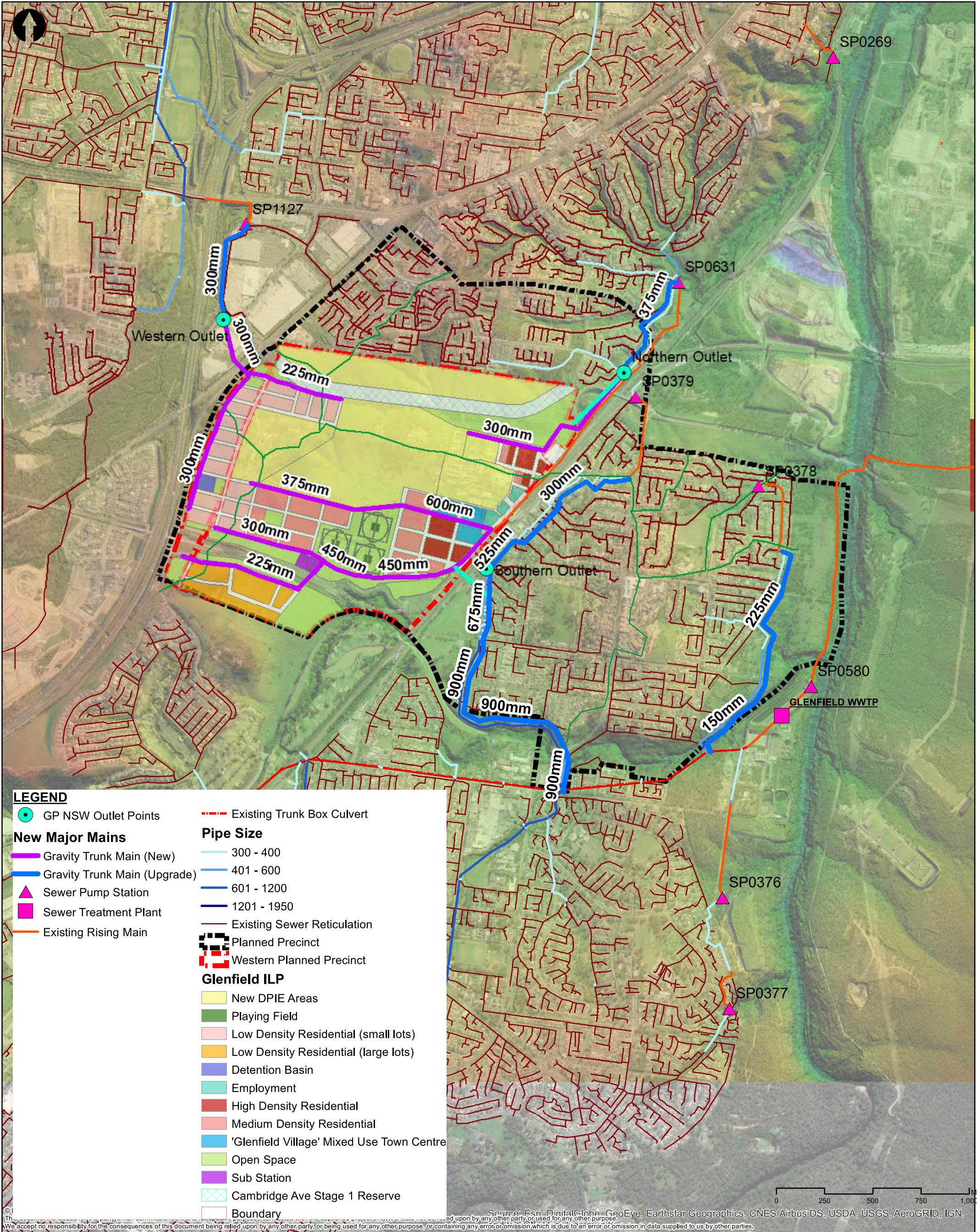
B. Proposed Utilities Network



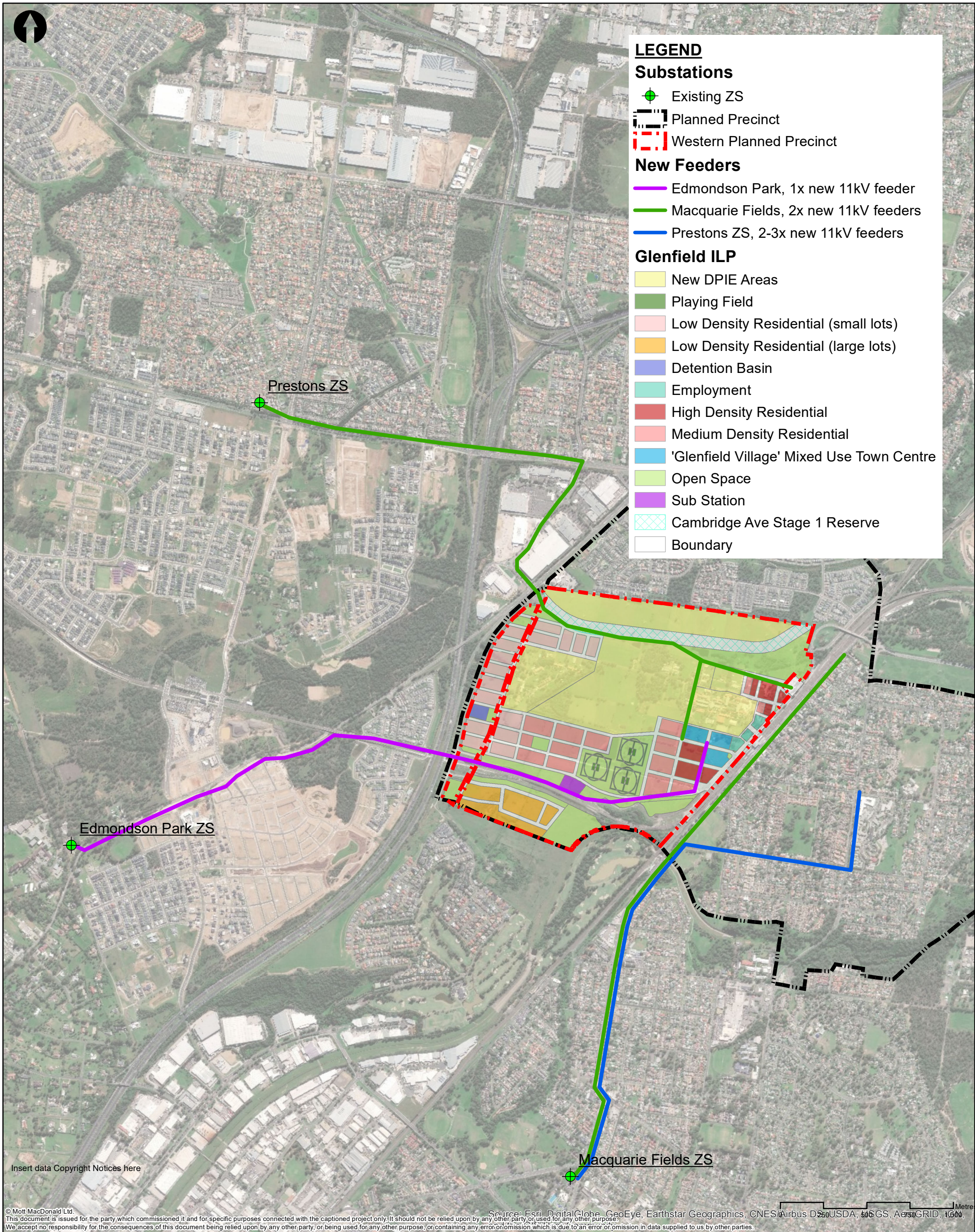
 <p>MOTT MACDONALD</p>	<p>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB</p> <p>T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</p>		<p>Client</p> <p>GOVERNMENT PROPERTY NSW</p>						<p>Title</p> <p>HURLSTONE PROPOSED WATER UPGRADES - RETICULATION</p>			Drawn	T. Abbot		
												Checked	G. Lee		
												Approved	G. Lee		
									Scale at A3			1:15,000			
			Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number			Security	Status	Rev	
P1	29/09/2017	TA	FOR INFORMATION	GL	GL	MMD-376722-C-SK-GIS-0211			STD	PRE	P1				



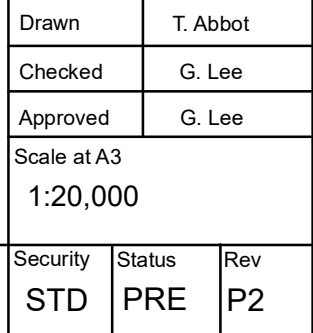
<div><div>M</div><div>M</div><div>MOTT MACDONALD</div></div> <div><div>Mott MacDonald</div><div>383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB</div><div>T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div></div>	Client <div>GOVERNMENT PROPERTY NSW</div>						Title <div>HURLSTONE PROPOSED GP NSW SEWER NETWORK OPTION 2</div>			Drawn	T. Abbot					
										Checked	G. Lee					
										Approved	G. Lee					
	<div>Rev</div> <div>Date</div> <div>Drawn</div> <div>Description</div> <div>Ch'k'd</div> <div>App'd</div>									Scale at A3 1:17,000						
P1						29/09/2017	TA	FOR INFORMATION	GL	GL	Drawing Number MMD-376722-C-SK-GIS-0202			Security STD	Status PRE	Rev P2
P2						23/02/2018	TA	FOR INFORMATION	GL	GL						



<div><div>M</div><div>MOTT MACDONALD</div></div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	<div>Client</div> <div>GOVERNMENT PROPERTY NSW</div>						<div>Title</div> <div>HURLSTONE PROPOSED GP NSW SEWER NETWORK OPTION 2</div>			Drawn		T. Abbot	
										Checked		G. Lee	
										Approved		G. Lee	
										Scale at A3 1:18,000			
	Rev	Date	Drawn	Description	Ch'k'd	App'd	<div>Drawing Number</div> <div>MMD-376722-C-SK-GIS-0202</div>			Security	Status	Rev	
P1	29/09/2017	TA	FOR INFORMATION	GL	GL	STD				PRE	P2		
P2	23/02/2018	TA	FOR INFORMATION	GL	GL								

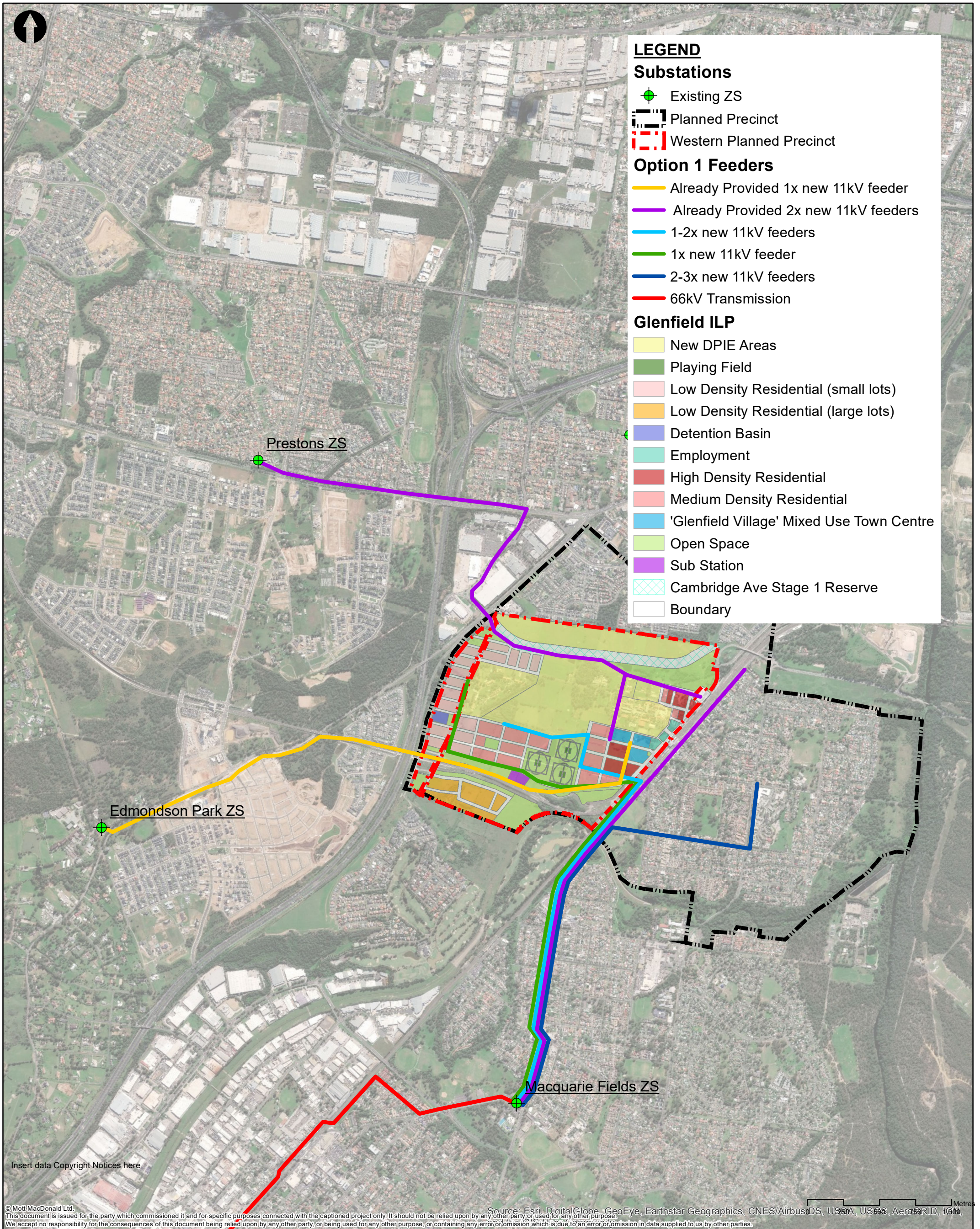


© Mott MacDonald Ltd.
This document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. It should not be relied upon by any other party or used for any other purpose.
We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.



Rev	Date	Drawn	Description	Ch'kd	App'd
P1	29/09/2017	TA	FOR INFORMATION	GL	GL
P2	23/02/2018	TA	FOR INFORMATION	GL	GL

Security	Status	Rev
STD	PRE	P2



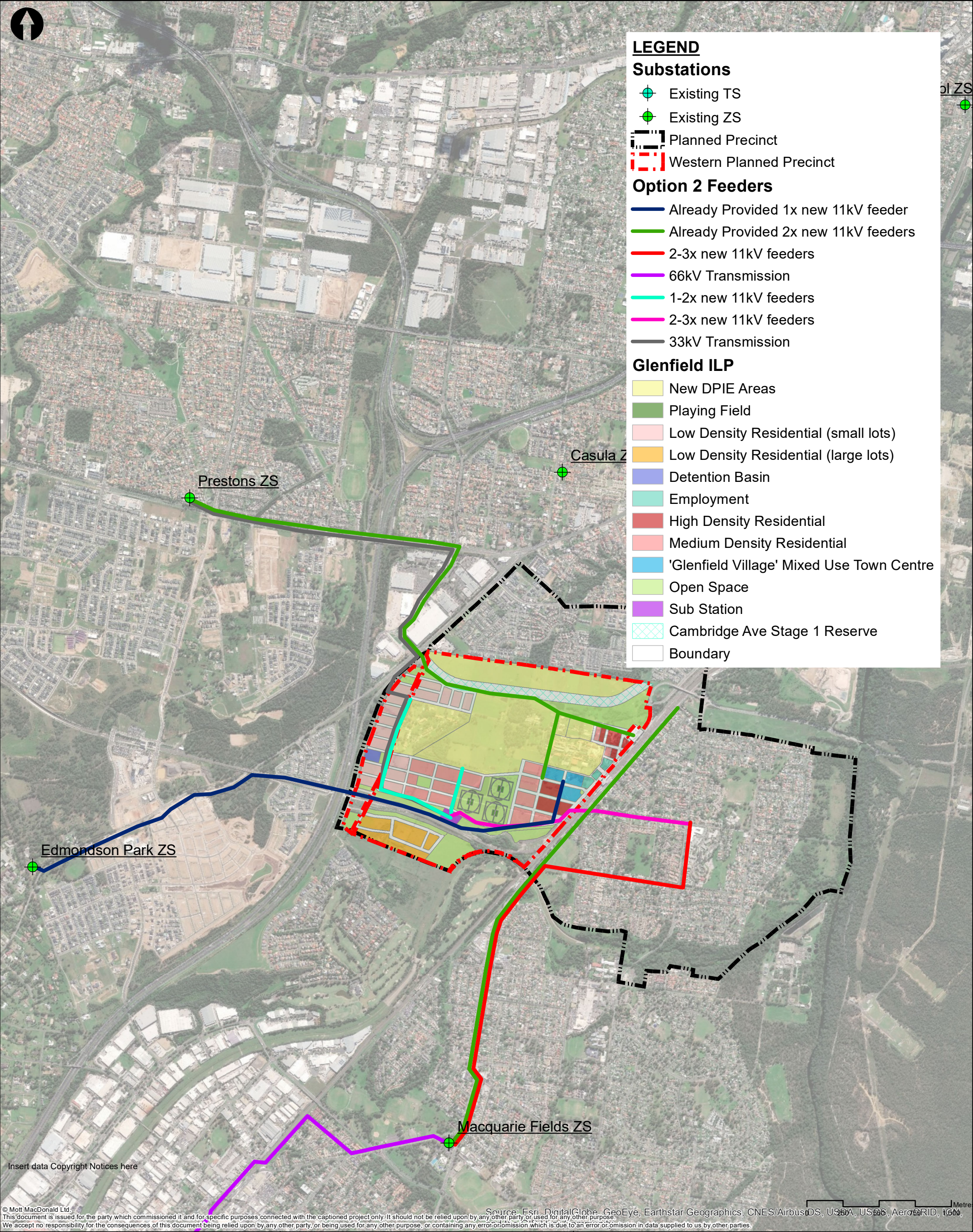
© Mott MacDonald Ltd. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.



Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	29/09/2017	TA	FOR INFORMATION	GL	GL
P2	23/02/2018	TA	FOR INFORMATION	GL	GL

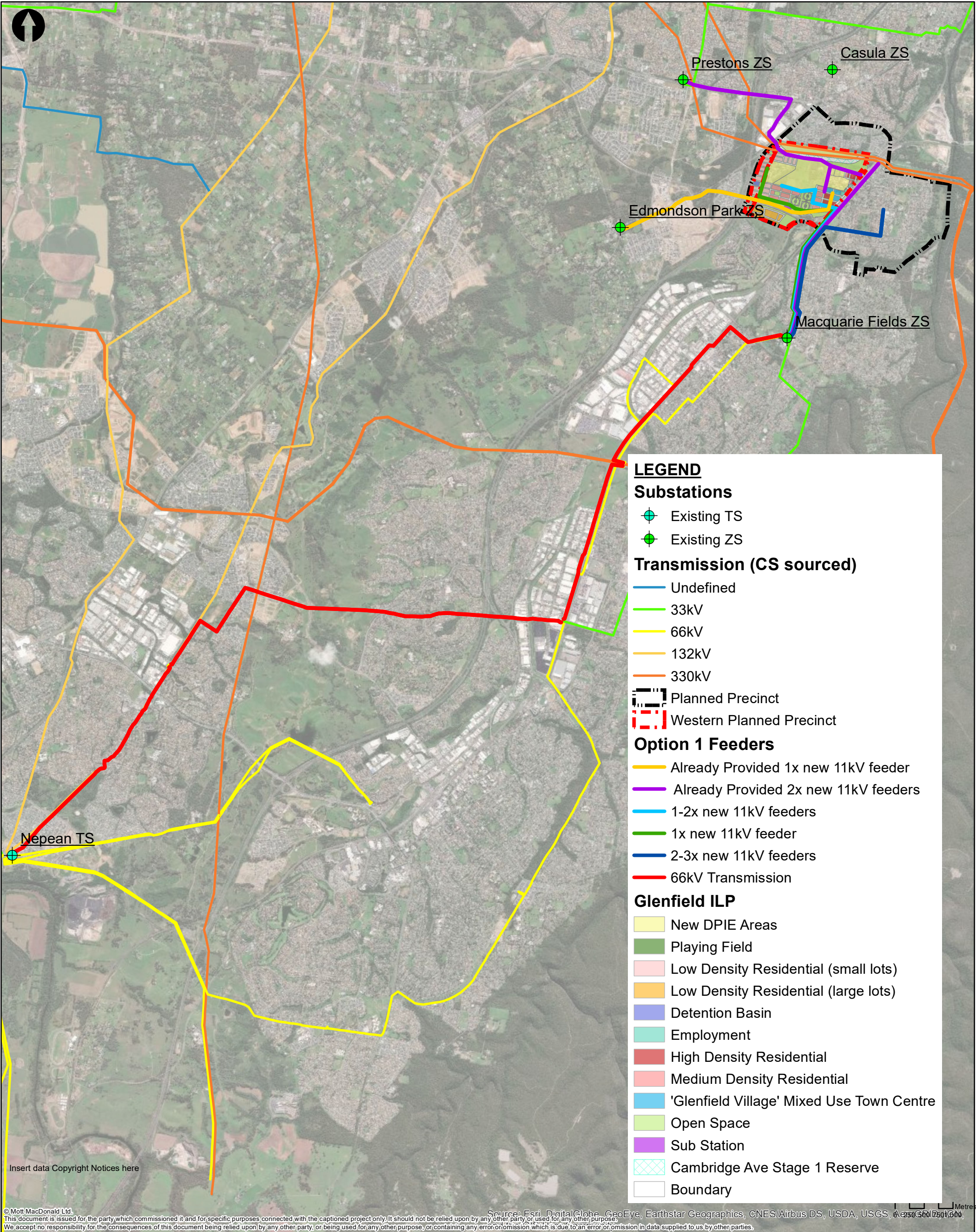
Drawing Number
MMD-376722-C-SK-GIS-0231

Drawn	T. Abbot	
Checked	G. Lee	
Approved	G. Lee	
Scale at A3 1:24,000		
Security STD	Status PRE	Rev P2



© Mott MacDonald Ltd. This document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. It should not be relied upon by any other party or used for any other purpose. Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

<div>MOTT MACDONALD</div> <div>Mott MacDonald 383 Kent Street, Sydney NSW 2000 PO Box Q1678 QVB T +61 (0)2 9098 6800 F +61 (0)2 9098 6810 W mottmac.com</div>	<div>Client</div> <div>GOVERNMENT PROPERTY NSW</div>					<div>Title</div> <div>HURLSTONE PROPOSED ELECTRICITY - LONG TERM OPTION 2</div>		Drawn	T. Abbot	
								Checked	G. Lee	
								Approved	G. Lee	
								Scale at A3 1:24,000		
	Rev	Date	Drawn	Description	Ch'k'd	App'd	Drawing Number		Security	Status
P1	29/09/2017	TA	FOR INFORMATION	GL	GL	MMD-376722-C-SK-GIS-0231		STD	PRE	P2
P2	23/02/2018	TA	FOR INFORMATION	GL	GL					



C. Authority Correspondence

Abbot, Tom J

From: [REDACTED]
Sent: Tuesday, October 24, 2017 5:05 PM
To: [REDACTED]
Subject: FW: Hurlstone Development Feasibility Study
Attachments: image2017-10-24-144624.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Tom, your email fell off this one. I spoke to Greg about this this afternoon. Cheers, Paul

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

-----Original Message-----

From: [REDACTED]
Sent: Tuesday, 24 October 2017 4:59 PM
To: [REDACTED]
Cc: [REDACTED]
Subject: Hurlstone Development Feasibility Study

Hi Greg,

Apologies for the delay with this one. As discussed, we are currently developing a process to provide the information you are seeking - watch this space.

The original is in the mail.

Cheers,
Paul

[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]

[Facebook]<<https://emea01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.facebook.com%2FSydneyWater&data=01%7C01%7CTom.Abbot%40mottmac.com%7C35f04ebad2648e2edf908d51aa53962%7Ca2bed0c459574f73b0c2a811407590fb%7C0&sdata=w%2FSu3fwhUVHl7ZcnQII5vpQGWAYNJwjnkyyTKHPnUWk%3D&reserved=0>

1%7C01%7CTom.Abbot%40mottmac.com%7Cf35f04ebad2648e2edf908d51aa53962%7Ca2bed0c459574f73b0c2a811407590fb%7C0&sdata=lqkvtyTEH6dxxr0QnDoDCeJrKhIlPcjgWFFFKJ%2Barcl%3D&reserved=0> [YouTube]
<https://emea01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.youtube.com%2Fuser%2Fsdneywater%2F&data=01%7C01%7CTom.Abbot%40mottmac.com%7Cf35f04ebad2648e2edf908d51aa53962%7Ca2bed0c459574f73b0c2a811407590fb%7C0&sdata=cfylnfvUFINCjxeYZfgQvH0lsje%2B%2BGzGnK9IOT9oUVs%3D&reserved=0>
[Instagram]
<https://emea01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.instagram.com%2Fexplore%2Ftags%2Fsdneywater%2F&data=01%7C01%7CTom.Abbot%40mottmac.com%7Cf35f04ebad2648e2edf908d51aa53962%7Ca2bed0c459574f73b0c2a811407590fb%7C0&sdata=OjShd4lMEbgsIVBFk%2BnKGEoZJnKAKLrq2TsBc5JfPrQ%3D&reserved=0>

NOTICE: This email is confidential. If you are not the nominated recipient, please immediately delete this email, destroy all copies and inform the sender. Sydney Water Corporation (Sydney Water) prohibits the unauthorised copying or distribution of this email. This email does not necessarily express the views of Sydney Water. Sydney Water does not warrant nor guarantee that this email communication is free from errors, virus, interception or interference.

24 October 2017

Mr Tom Abbot
Mott MacDonald
383 Kent Street
Sydney NSW 2000

Dear Tom,

Re: Hurlstone Development Feasibility Study

I refer to your feasibility application dated 5 September 2017, seeking preliminary advice from Sydney Water for the servicing of a potential development at the Hurlstone High School site.

The subject site is located outside the declared urban release area, and currently there is no formal planning proposal to consider potential rezoning of the site. Sydney Water understands the importance of priority growth areas in an urban context, and is currently developing the *Western Sydney Regional Masterplan* for greater Western Sydney, and sub-regional plans for all priority growth areas.

Sydney Water aligns the provision of water related services with the land use and development plans of the relevant planning authority. Given the current sequencing and staging of release of lands within priority growth areas, there is no Sydney Water commitment for planning, environmental impact assessment, design and delivery of required infrastructure for this site.

On request from relevant planning authorities, Sydney Water provides servicing advice during the planning proposal and development application processes. It is recommended that the appropriate planning and development application is lodged with the relevant consent authority.

Developers wishing to proceed with servicing an area ahead of Sydney Water's planning and delivery program can do so with the support of the consent authority, and in accordance with Sydney Water's funding guidelines outlined in the Growth Servicing Plan and our policy for Funding Infrastructure to Service Growth. These documents are available on our website at www.sydneywater.com.au under *Plumbing, building & developing > Growth Servicing Plan*.

22 September 2017

Mr Tom Abbot
Civil Engineer
Mott McDonald

Dear Mr Abbot,

Hurlstone Development Feasibility Study

Thank you for your letter received on 25 August 2017, regarding the proposed Hurlstone Development being considered by Government Property NSW. We have reviewed the proposal at a strategic level in our role as the monopoly Distribution Network Service Provider and offer comments in relation to electricity infrastructure requirements.

Endeavour Energy has considered the proposal in the context of the priority growth area around Glenfield railway station, which is expected to yield 10,000 dwellings, of which 6,000 dwellings are part of the Government Property NSW proposal. We also note the proposal for a small town centre.

We estimate the ultimate diversified load impact on our zone substations to be 40MVA, this is significant and will require an estimated 10 new 11kV feeders. This would normally require a new zone substation (ZS), however in this instance our analysis indicates that it will be possible to supply some of this development in the short term by extending 11kV feeders from existing zone substations in the surrounding area.

Preliminary analysis has determined a possible supply strategy including:

- Supply for 1,000 homes on 1 x new 11kV feeder from Edmondson Park ZS
- Supply for 2,000 homes on 2 x new 11kV feeders from Prestons ZS – a new underbore is required under the M5 Motorway to develop feeders to Hurlstone.
- We can supply 1,500 homes + 26,000m² mixed use + 165,000m² commercial on 2 x new 11kV feeders from Macquarie Fields ZS
- For the remaining 5500 dwellings two main options have been considered
 - 1) Augmentation of Macquarie Fields Zone Substation and upstream 66kV network and extend a further 5 feeders from this substation.
 - 2) Establish a new 25MVA zone substation within the Hurlstone development area

Endeavour is recommending a new zone substation as the preferred option due the following reasons:

- Cost and complexity of augmenting an older existing substation site, which also has constrained transmission line capacity.
- Concerns about cost and feasibility of developing a total of 7 feeders from Macquarie Fields, which is 3-4km from the new development and includes railway crossings.

New transmission lines will need to be established to the new zone substation.

Casula ZS was considered as a possible source but there are other planned developments that will use the available capacity, therefore it is not proposed to be part of the supply strategy.

In summary, approximately 4,500 new homes can be supplied via new 11kV feeders before a new zone substation is required. It would be desirable to allocate a regular shaped 1 hectare site for an electricity substation on the master plan, ideally on a corner block to allow installation of incoming and outgoing cables. The site should have a minimum width of 80m, and be clear of any other easements and above the 1 in 100 year flood level. Endeavour Energy would appreciate the opportunity to carry out a preliminary assessment on the proposed substation site prior to the developer finalising the masterplan.

With respect to funding for electricity supply to the Hurlstone development the following table outlines responsibilities:

Works	Delivery Responsibility	Funding
Low voltage reticulation	Developer to engage ASP Contestable Works	Developer
11kV reticulation and padmount substations	Developer to engage ASP Contestable Works	Endeavour Energy reimbursement as per Company Policy
11kV feeders from zone substations	Developer to engage ASP Contestable Works	Endeavour Energy reimbursement as per Company Policy – if applications are noted as for a new subdivision
New zone substation and transmission lines	Endeavour Energy	Endeavour Energy

As the works are contestable, NSW Government Property will need to obtain advice from an Accredited Service Provider (ASP) for the costs associated with low voltage reticulation and 11kV works. For 11kV cable works, Endeavour Energy reimburses at a standard rate per metre that it considers efficient to complete typical 11kV cable installation. The developer funds any gap that may result, the developer can seek advice from an ASP as to whether the motorway crossings will result in a gap.

Should you require any additional information, please do not hesitate to contact me directly on (02) 9853 5003.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Abbot, Tom J

From: Abbot, Tom J
Sent: Tuesday, November 7, 2017 12:15 PM
To: 'Jason Lu'
Subject: RE: Hurlstone

Great thanks for your help Jason,

Tom

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
Subject: RE: Hurlstone

Hi Tom

Similar height to a regular 2 storey house, but the facility is only one level plus a basement.

Thanks
Jason

-----Original Message-----

From: Abbot, Tom J [REDACTED]
Sent: Tuesday, 7 November 2017 9:52 AM
To: Jason Lu
Cc: Lee, Greg A; Higgisson, Rachel
Subject: RE: Hurlstone

Hi Jason,

The urban planners are interested to understand approximate height of the substation to see how it fits from a massing perspective.

Do Endeavour have any standard guidance on new zone substation heights / dimensions?

If not, are you able to provide a ballpark figure?

Regards,
Tom

-----Original Message-----

From: Abbot, Tom J
Sent: Thursday, November 2, 2017 2:17 PM
To: 'Jason Lu' [REDACTED]

Subject: RE: Hurlstone

Great thank you Jason.

We have provided your feedback to the urban planners and will let you know if they have any comments.

Regards,
Tom

-----Original Message-----

From: Jason Lu [mailto: [REDACTED]]
Sent: Thursday, November 2, 2017 1:10 PM
To: Abbot, Tom J < [REDACTED]>
Subject: Hurlstone

Hi Tom

Sorry missed your call in Wollongong for meetings

We are proposing another option attached

- closer to centre of load
- not too close to existing substations to the west and north

Abbot, Tom J

From: Higginson, Rachel
Sent: Wednesday, September 6, 2017 4:47 PM
To: Abbot, Tom J
Subject: FW: Feasibility Study - Hurlstone Precinct
Attachments: Glenfield L9B.PDF

FYI

From: Neale Hilton [REDACTED]
Sent: Wednesday, September 6, 2017 4:44 PM
To: Higginson, Rachel <R[REDACTED]>
Subject: RE: Feasibility Study - Hurlstone Precinct

Raechel

Jemena has reviewed the proposed Precincts and our potential to supply. The western side of the existing heavy rail line has a High Pressure 1050Kpa gas main supplying Hurlstone College. This would require amplification by way of a below ground District regulator station to reduce the pressure to a residential 210kPa. From this a plastic 210kPa network would be reticulated throughout new public roads to supply the development.

The same process would need to occur on the eastern side of the rail line as the existing medium pressure network does not have capacity to supply your proposal. Conditional requirements would be that Jemena is provided with the necessary approvals to cross the new South West rail link on the western side to Edmondson Park to reach the additional growth area on plan. I suggest that a minimum budget of \$300k for each District regulator be made available.

Additionally Jemena will require a Developer supplied trench through all new road thoroughfares for the proposed 210kPa network.

For any future residential proposals please send your correspondence to my colleague

[REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



From: [REDACTED]
Sent: Wednesday, 6 September 2017 10:25 AM
To: [REDACTED]
Cc: [REDACTED]
Subject: Feasibility Study - Hurlstone Precinct

Good morning Neale,

Mott MacDonald has been requested to prepare a feasibility study in relation to gas services for a proposed development located within the Hurlstone Priority Precinct at Glenfield. Please find the relevant information in the attached letter.

Your advice on the provision of gas for the site would be greatly appreciated.

Kind regards,

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



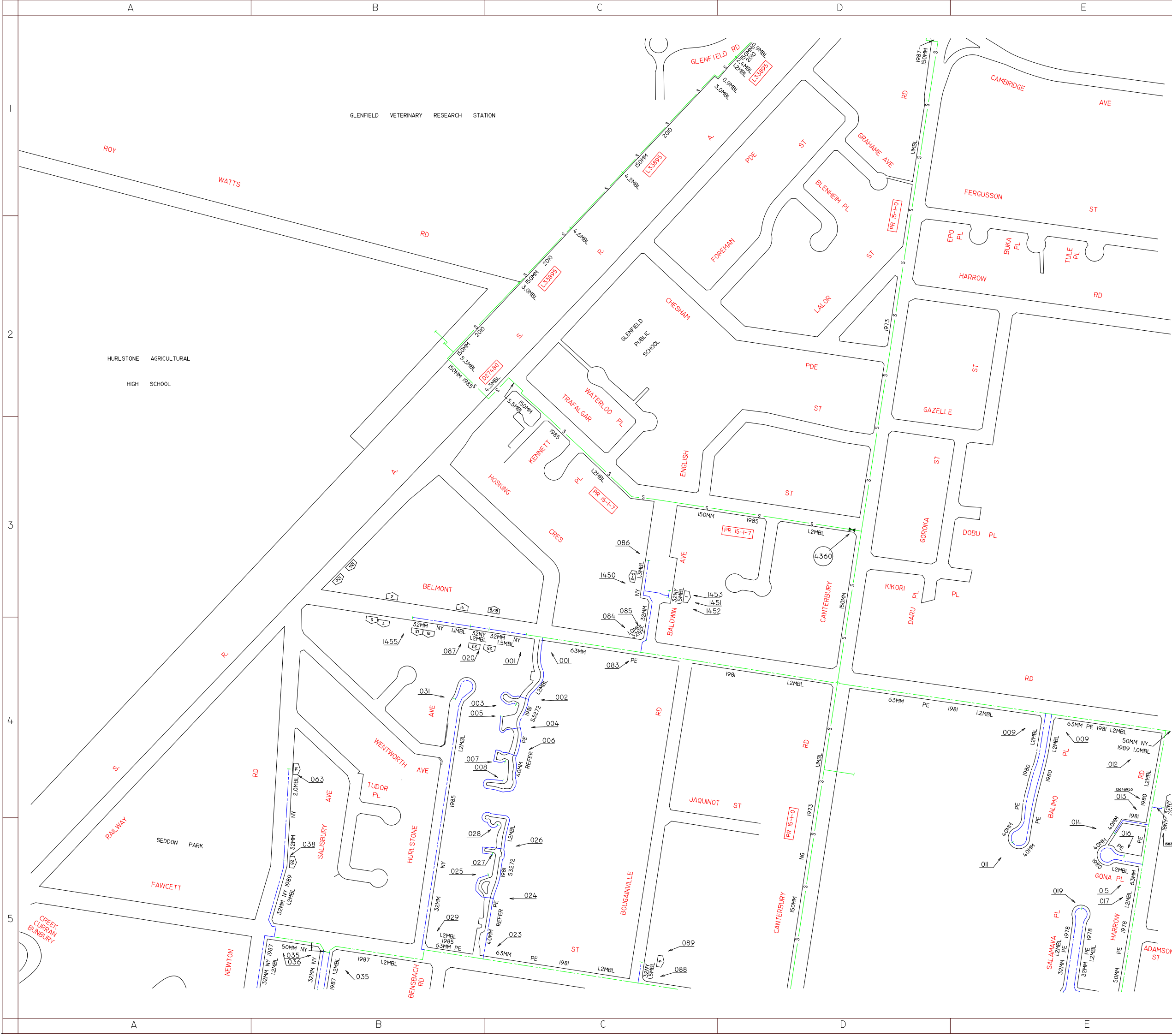
Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia

[Website](#) | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [YouTube](#)

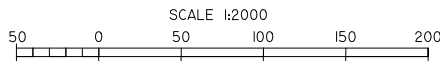
Mott MacDonald Australia Pty Limited is a subsidiary of Mott MacDonald International Limited. Registered in Australia, ABN 13 134 120 353

The information contained in this e-mail is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. If you are not the intended recipient of this e-mail, the use of this information or any disclosure, copying or distribution is prohibited and may be unlawful. If you received this in error, please contact the sender and delete the material from any computer.

This is a confidential message intended for the named recipient(s) only. The contents herein are privileged to the sender and the use thereof is restricted to the intended purpose. If you have received this e-mail in error, please do not use, disclose, distribute, copy, print or relay on this email. If receipt is in error, please advise the sender by reply email. Thank you.



LEPPINGTON 9B



THIS MAP UPDATED ON 27/06/2017
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES
SCALED FROM THIS PLAN MAY NOT BE ACCURATE.
DATE ALTERED:..... BY:.....

L6C	L6D	EH4C
L9A	L9B	EH7A
L9C	L9D	EH7C

ADJOINING MAPS

820	CAMPBELLTOWN
NETWORK AREA	MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE		
T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
300	NETWORK MAIN	300 kPa
210	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
7	NETWORK MAIN	7 kPa
2	NETWORK MAIN	2 kPa
PROPOSED MAINS	NETWORK MAIN WITH MAIN STUBS	
PR 11-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
V	VALVE	
SR	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
N23	NETWORK NODE	
N23S	NETWORK VALVE NODE	
V23	VALVE NUMBER	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE	
1957	YEAR LAID	
++ ++ ++	MUNICIPALITY BOUNDARY	
=====	NETWORK BOUNDARY	
123	HOUSE NUMBER	

Abbot, Tom J

From: Higginson, Rachel
Sent: Wednesday, September 6, 2017 4:47 PM
To: Nietoski, Les P
Cc: Abbot, Tom J; Angulo, Rhoel
Subject: RE: Feasibility Study - Hurlstone Precinct

Thanks for your prompt response Les, much appreciated.

Kind regards,

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia

[Website](#) | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [YouTube](#)

Mott MacDonald Australia Pty Limited is a subsidiary of Mott MacDonald International Limited. Registered in Australia, ABN 13 134 120 353

The information contained in this e-mail is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. If you are not the intended recipient of this e-mail, the use of this information or any disclosure, copying or distribution is prohibited and may be unlawful. If you received this in error, please contact the sender and delete the material from any computer.

From: Nietoski, Les P [REDACTED]

Sent: Wednesday, September 6, 2017 11:04 AM

To: Higginson, Rachel <[REDACTED]>

Cc: [REDACTED]

Subject: RE: Feasibility Study - Hurlstone Precinct

Rachel,

Just a quick response to your questions:

1. Confirmation of all existing assets in the region (preferably in spatially referenced GIS format); **Telstra doesn't provide this. You will need to go through Dial Before You Dig (1100) to get records of our network. Any relocation of Telstra assets will need to be paid for by the developers.**
2. Any information relating to capacity constraints of existing assets; **By the time this area develops, it will be serviced by NBN for basic services. Telstra will still have a requirement to service any school sites and commercial centres.**
3. Advice on whether there is sufficient capacity in the network to cater for the additional load generated by the Hurlstone development; **You need to check with NBN. Telstra involvement will mainly be with Schools sites and commercial areas (e.g. Town Centre).**
4. Any additional network requirements that should be considered to assess the feasibility of the proposed Property NSW development within the DPE Priority Precinct. **During the development phase, besides installing conduit for NBN**

use throughout the area, a separate conduit needs to be installed for Telstra to service the school and commercial sites. Individual development sites (e.g. School) need to be registered on the Telstra Smart Community website so that a proper assessment can occur for each site.

Let me know if you need further details.

Regards

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]

From: Higginson, Rachel [REDACTED] [m](#)]
Sent: Wednesday, 6 September 2017 10:33 AM
To: Nietoski, Les P [REDACTED]
Cc: Abbot, Tom J [REDACTED]
Subject: Feasibility Study - Hurlstone Precinct

Good morning Les,

Mott MacDonald has been requested to prepare a feasibility study in relation to Telstra services for a proposed development located within the Hurlstone Priority Precinct at Glenfield. Please find the relevant information in the attached letter.

Your advice on the provision of Telstra for the site would be greatly appreciated.

If this enquiry is not something you usually deal with, can you please provide details of who I should send this to.

Kind regards,

[REDACTED]
[REDACTED]

[REDACTED] [REDACTED] [REDACTED]
[REDACTED]
[REDACTED]



Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia

[Website](#) | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [YouTube](#)

Mott MacDonald Australia Pty Limited is a subsidiary of Mott MacDonald International Limited. Registered in Australia, ABN 13 134 120 353

The information contained in this e-mail is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. If you are not the intended recipient of this e-mail, the use of this information or any disclosure, copying or distribution is prohibited and may be unlawful. If you received this in error, please contact the sender and delete the material from any computer.

Abbot, Tom J

From: Greg Clifford [REDACTED]
Sent: Monday, October 9, 2017 7:56 AM
To: Abbot, Tom J
Subject: RE: Feasibility Study - Hurlstone Precinct

Follow Up Flag: Follow up
Flag Status: Completed

Hi Tom,

I have received a response from our Planning Department regarding the Hurlstone Development Feasibility Study. **NBN** would be required to provide 2 x 576 fibre cables to service this development which will be fed from Liverpool exchange needing 7kms of hauling. The Backhaul charge has been calculated at \$85,800 to service a development of this size. If you require any further information, please let me know. Thanks Greg

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



[Subscribe to the Construction Industry newsletter](#) to keep up to date with news for property developers and the construction industry.

From: Greg Clifford
Sent: Friday, 22 September 2017 9:34 PM
To: 'Abbot, Tom J'
Subject: RE: Feasibility Study - Hurlstone Precinct [nbn-Confidential:Commercial]

nbn-Confidential: Commercial

Tom,

I'm on leave next week so I will call you on my return which is Tuesday 3rd October. Thanks Greg

Greg Clifford
Account Manager
nbn Build Partnerships | Demand Deployment



[Subscribe to the Construction Industry newsletter](#) to keep up to date with news for property developers and the construction industry.

From: Abbot, Tom J [REDACTED]
Sent: Friday, 22 September 2017 5:26 PM
To: Kristine Lam
Cc: Higginson, Rachel; Andy Every; Singh, Devpaal; Greg Clifford
Subject: RE: Feasibility Study - Hurlstone Precinct [nbn-Confidential:Commercial]

Thanks Kristine,

Greg – please call me early in the week

Kind Regards,

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678 QVB Sydney NSW 1230
Australia

[Website](#) | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [YouTube](#)

Mott MacDonald Australia Pty Limited is a subsidiary of Mott MacDonald International Limited. Registered in Australia, ABN 13 134 120 353

The information contained in this e-mail is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. If you are not the intended recipient of this e-mail, the use of this information or any disclosure, copying or distribution is prohibited and may be unlawful. If you received this in error, please contact the sender and delete the material from any computer.

From: Kristine Lam [REDACTED]
Sent: Friday, September 22, 2017 4:24 PM
To: [REDACTED]
[REDACTED]
[REDACTED]
Subject: RE: Feasibility Study - Hurlstone Precinct [nbn-Confidential:Commercial]

nbn-Confidential: Commercial

Hi Devpaal,

Greg Clifford will be in contact to discuss the outcome of this feasibility assessment with you.

Regards

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



Notice to recipient: This e-mail is intended only to be read or used by the addressee. It is confidential and may contain information that is subject to legal professional privilege or protected by copyright. If you are not the addressee indicated in this message (or responsible for delivery of the message to that person), you may not copy or deliver this message to anyone, and you should destroy this message and kindly notify the sender by reply e-mail. Copyright, confidentiality and legal professional privilege are not waived or lost by reason of mistaken delivery to you. Emails to/from nbn co limited ABN 86 136 533 741 may undergo email filtering and virus scanning, including by third party contractors, however, nbn co limited does not guarantee that any email or any attachment is secure, error-free or free of viruses or other unwanted or unexpected inclusions. Any views expressed in this message are those of the individual sender, except where the sender specifically states them to be the views of nbn co limited.

PLEASE CONSIDER OUR ENVIRONMENT BEFORE PRINTING

From: [REDACTED]
Sent: Friday, 22 September 2017 3:50 PM
To: Kristine Lam
Cc: Abbot, Tom J; Higginson, Rachel
Subject: RE: Feasibility Study - Hurlstone Precinct [nbn-Confidential:Commercial]

Dear Kristine,

Can I please follow up on the status of this NBN feasibility assessment? I note the application number as below is

[REDACTED].

Thank you.

Kind regards,

From: [REDACTED]
Sent: Wednesday, September 6, 2017 11:00 AM
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Feasibility Study - Hurlstone Precinct [nbn-Confidential:Commercial]

nbn-Confidential: Commercial

Hi Rachel,

Thank you for your email.

A Feasibility Assessment Request has been created in our system for this development – application reference is **AYCA-4QL9RS**.

Once our planning team has completed the feasibility assessment, we will contact you to discuss the outcome.

Regards

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]



Notice to recipient: This e-mail is intended only to be read or used by the addressee. It is confidential and may contain information that is subject to legal professional privilege or protected by copyright. If you are not the addressee indicated in this message (or responsible for delivery of the message to that person), you may not copy or deliver this message to anyone, and you should destroy this message and kindly notify the sender by reply e-mail. Copyright, confidentiality and legal professional privilege are not waived or lost by reason of mistaken delivery to you. Emails to/from nbn co limited ABN 86 136 533 741 may undergo email filtering and virus scanning, including by third party contractors, however, nbn co limited does not guarantee that any email or any attachment is secure, error-free or free of viruses or other unwanted or unexpected inclusions. Any views expressed in this message are those of the individual sender, except where the sender specifically states them to be the views of nbn co limited.

PLEASE CONSIDER OUR ENVIRONMENT BEFORE PRINTING

From: [REDACTED]
Sent: Wednesday, 6 September 2017 10:28 AM
To: Kristine Lam
Cc: Abbot, Tom J
Subject: Feasibility Study - Hurlstone Precinct

Good morning Kristine,

Mott MacDonald has been requested to prepare a feasibility study in relation to NBN services for a proposed development located within the Hurlstone Priority Precinct at Glenfield. Please find the relevant information in the attached letter.

Your advice on the provision of NBN for the site would be greatly appreciated.

Kind regards,

[REDACTED]
[REDACTED]
[REDACTED] [REDACTED] [REDACTED]
[REDACTED]
[REDACTED]

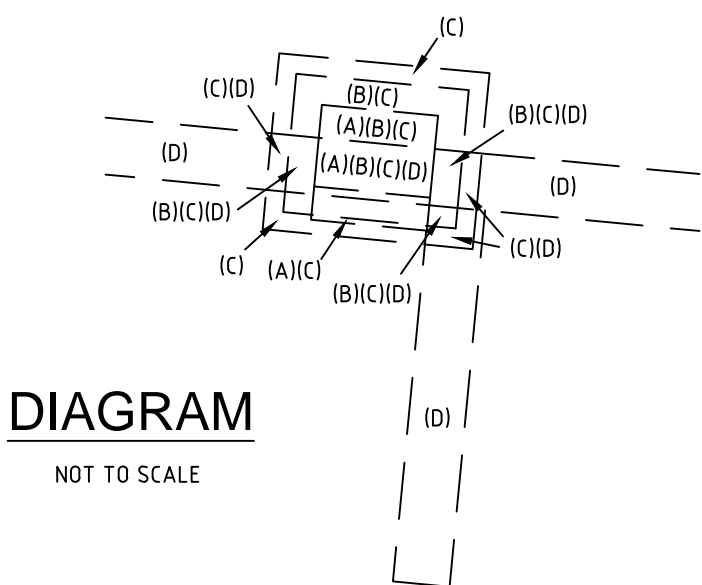
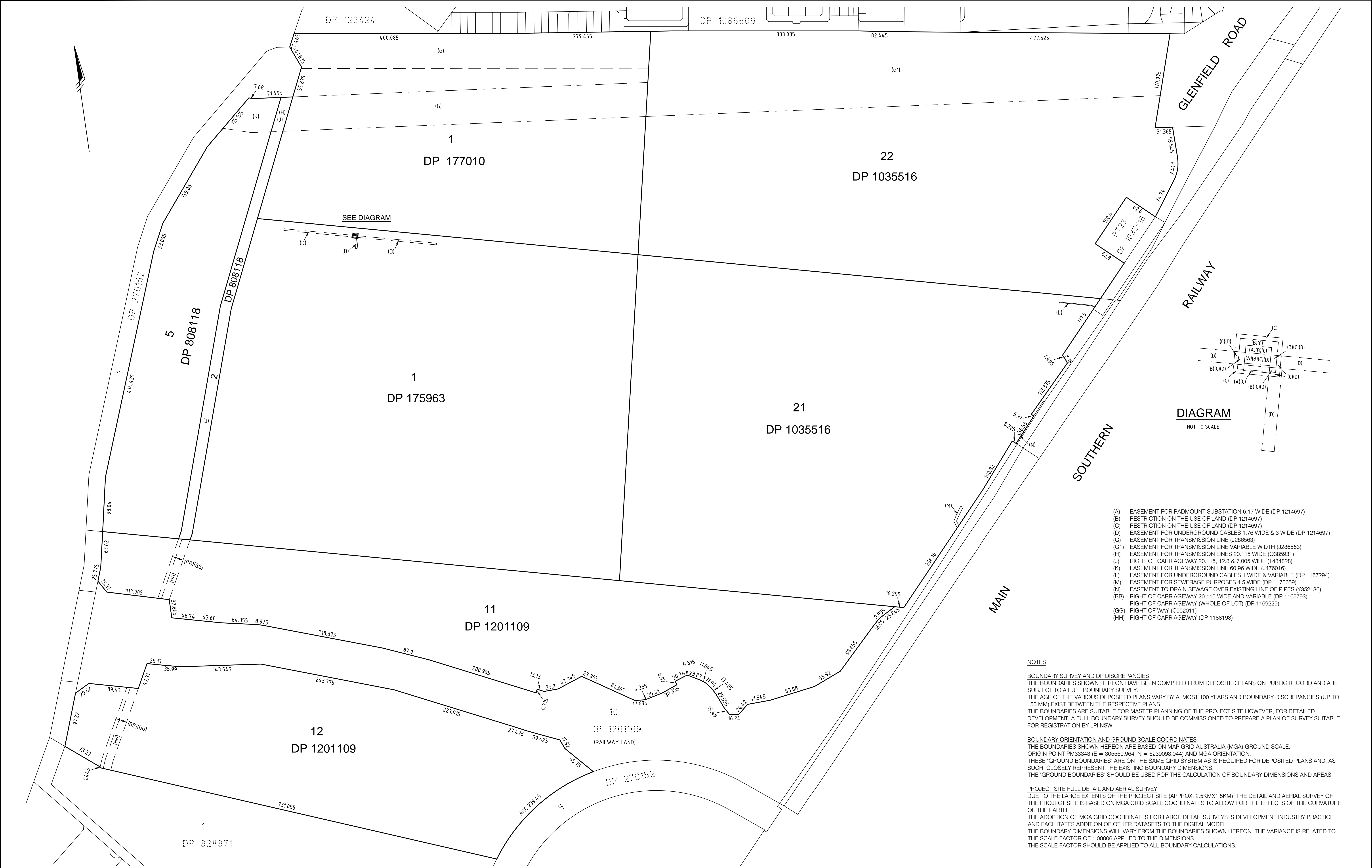


Mott MacDonald
383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB Sydney, NSW 1230
Australia

[Website](#) | [Twitter](#) | [LinkedIn](#) | [Facebook](#) | [YouTube](#)

D. RPS Survey

RPS's survey dated 30.08.2016 is attached.



- (A) EASEMENT FOR PADMOUNT SUBSTATION 6.17 WIDE (DP 1214697)
(B) RESTRICTION ON THE USE OF LAND (DP 1214697)
(C) RESTRICTION ON THE USE OF LAND (DP 1214697)
(D) EASEMENT FOR UNDERGROUND CABLES 1.76 WIDE & 3 WIDE (DP 1214697)
(G) EASEMENT FOR TRANSMISSION LINE (J286563)
(G1) EASEMENT FOR TRANSMISSION LINE VARIABLE WIDTH (J286563)
(H) EASEMENT FOR TRANSMISSION LINES 20.115 WIDE (O385931)
(J) RIGHT OF CARRIAGEWAY 20.115, 12.8 & 7.005 WIDE (T484828)
(K) EASEMENT FOR TRANSMISSION LINE 60.96 WIDE (J476016)
(L) EASEMENT FOR UNDERGROUND CABLES 1 WIDE & VARIABLE (DP 1167294)
(M) EASEMENT FOR SEWERAGE PURPOSES 4.5 WIDE (DP 1175699)
(N) EASEMENT TO DRAIN SEWAGE OVER EXISTING LINE OF PIPES (Y352136)
(BB) RIGHT OF CARRIAGEWAY 20.115 WIDE AND VARIABLE (DP 1165793)
(GG) RIGHT OF CARRIAGEWAY (WHOLE OF LOT) (DP 1169229)
(HH) RIGHT OF WAY (C552011)
(HH) RIGHT OF CARRIAGEWAY (DP 1188193)

NOTES

BOUNDARY SURVEY AND DP DISCREPANCIES
THE BOUNDARIES SHOWN HEREON HAVE BEEN COMPILED FROM DEPOSITED PLANS ON PUBLIC RECORD AND ARE SUBJECT TO A FULL BOUNDARY SURVEY.
THE AGE OF THE VARIOUS DEPOSITED PLANS VARY BY ALMOST 100 YEARS AND BOUNDARY DISCREPANCIES (UP TO 150 MM) EXIST BETWEEN THE RESPECTIVE PLANS.
THE BOUNDARIES ARE SUITABLE FOR MASTER PLANNING OF THE PROJECT SITE HOWEVER, FOR DETAILED DEVELOPMENT, A FULL BOUNDARY SURVEY SHOULD BE COMMISSIONED TO PREPARE A PLAN OF SURVEY SUITABLE FOR REGISTRATION BY LPI NSW.

BOUNDARY ORIENTATION AND GROUND SCALE COORDINATES
THE BOUNDARIES SHOWN HEREON ARE BASED ON MAP GRID AUSTRALIA (MGA) GROUND SCALE.
ORIGIN POINT PM33343 (E = 305560.964, N = 6239098.044) AND MGA ORIENTATION.
THESE 'GROUND BOUNDARIES' ARE ON THE SAME GRID SYSTEM AS IS REQUIRED FOR DEPOSITED PLANS AND, AS SUCH, CLOSELY REPRESENT THE EXISTING BOUNDARY DIMENSIONS.
THE 'GROUND BOUNDARIES' SHOULD BE USED FOR THE CALCULATION OF BOUNDARY DIMENSIONS AND AREAS.

PROJECT SITE FULL DETAIL AND AERIAL SURVEY
DUE TO THE LARGE EXTENTS OF THE PROJECT SITE (APPROX. 2.5KMx1.5KM), THE DETAIL AND AERIAL SURVEY OF THE PROJECT SITE IS BASED ON MGA GRID SCALE COORDINATES TO ALLOW FOR THE EFFECTS OF THE CURVATURE OF THE EARTH.
THE ADOPTION OF MGA GRID COORDINATES FOR LARGE DETAIL SURVEYS IS DEVELOPMENT INDUSTRY PRACTICE AND FACILITATES ADDITION OF OTHER DATASETS TO THE DIGITAL MODEL.
THE BOUNDARY DIMENSIONS WILL VARY FROM THE BOUNDARIES SHOWN HEREON. THE VARIANCE IS RELATED TO THE SCALE FACTOR OF 1.00006 APPLIED TO THE DIMENSIONS.
THE SCALE FACTOR SHOULD BE APPLIED TO ALL BOUNDARY CALCULATIONS.

