APPENDIX J

MULTIDISCIPLINARY ENGINEERING SERVICES REPORT - INTEGRATED GROUP SERVICES

IGS INTEGRATED GROUP SERVICES

505-523 George Street Sydney

Multidisciplinary Engineering Services Report

Job Number: VE - N14_19

September 2014
Rev 1.0

VALUE | INNOVATION | TRUST

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Document Control

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A	19 September 2014	Mays Chalak	MC	Joseph Hanna	JH

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APPENDICES

1. INTRODUCTION

1.1 General

Coombes Property Group and Mirvac have commissioned IGS to carry out a multidisciplinary engineering services report for an indicative mixed-use development at 505-523 George Street, Sydney. This report has been prepared solely for Coombes Property Group and Mirvac. No warranty is provided to third parties who rely on this report for any other purpose.

Coombes Property Group and Mirvac intend to redevelop the site primarily for car parking, retail and residential purposes.

The redevelopment will indicatively consist of the following spaces with the respective areas and apartment numbers:

	RESIDENTIAL			RETAIL			COMMUNITY						TOTAL AREAS			APARTMENT COUNTS				
LEVEL	GBA	GFA	NLA	GBA	GFA	NLA	GBA	GFA	NLA	PLANT	CHILDCARE GBA	CARPARK GBA	GBA	GFA	NLA	Studio	1 Bed	2 Bed	3 Bed	TOTAL
	63,607.1	53,422.7	42,408.1	12,259	10,909	5655	524	502	254	4,277	1,954	26,530	109,151	64,834	48,318	83	227	390	41	741

It is understood that the carpark will be underground and will require carpark ventilation. We have assumed that the effective building height(s) will be approximately 260m in height, and therefore **will** require stair pressurisation, smoke management systems, EWIS, sprinklers, sprinkler/hydrant tanks, and emergency lifts to comply with the BCA.

This report presents the findings of a desk study review with respect to:

- Flood risk assessment; and
- Utility infrastructure (electrical, mains water, natural gas, sewer, telecommunications) assessment.

A 260m tall tower has been considered for the purposes of this multidisciplinary engineering services report.

1.2 The Site

The site is located in the Sydney CBD between George Street, Kent Street, Bathurst Street & Liverpool Street.

The site has an Eastern frontage for George Street and a Western frontage to Kent Street.

An aerial photograph of the site is depicted below in Figure 1.

Figure 1 – Site Photograph (Source: Crone Partners Concept Design)

The site area is approximately 4,308m^2.

1.3 BCA Classification

BCA classification(s) of the development are as follows (based on the 260m high option):

BCA Classification	Class 2 Residential/Apartments Class 5 Commercial Class 6 Retail Class 7a Carpark
Rise in Storeys	6 - Retail/Commercial (Lower Ground to Podium 3) 73 - Residential Amenities (Level 03) Residential Apartments(Levels 4 – 26, 28 – 47, 49 – 74) 3 - 2 x Mid Plant Rooms (Levels 27, 48) & 1 x Roof Plant (Level 75)
Type of Construction	Type A Construction
Effective Height	260m
Gross Building Area (approx)	Commercial / Retail / Other Component - 14,737m^2 Residential Component - 63,607.1m^2 **TOTAL - 78,344.1m^2**

1.4 Mandatory BCA Energy Efficiency Requirements

Mandatory BCA Energy Efficiency requirements are as follows:

- Part J1 – Building Fabric;
- Part J2 – External Glazing;
- Part J3 – Building Sealing;
- Part J5 – Air Conditioning and Ventilation;
- Part J6 – Lighting and Power;
- Part J7 – Hot Water Supply.

Additional Requirements:

- BASIX (residential);
- NaTHERS (residential)
- SEPP65 (residential);
- NABERS (commercial/retail).

2. FLOOD RISK ASSESSMENT

2.1 General

IGS has carried out preliminary flood enquiry of the proposed development site. IGS has determined that this site/area is not subject to flooding due to the site being on a ridge area. Council asset engineer, Peter Ryan, has indicated verbally that the site does not appear to be close to a major water system and should not be affected by flooding, however, this information can only be confirmed with a Section 149.

2.2 Suggested Floor Levels

The suggested level associated with the proposed development would be 200mm above the kerb line.

2.3 Summary & Conclusions

There appears to be no flooding associated with this site. As the site is currently fully developed from boundary to boundary, there should not be an overland flooding issue between George Street and Kent Street.

3. UTILITY ENGINEERING SERVICES

3.1 Utilities Services Review / Analysis

A utilities review has been carried out in consultation with the relevant local authorities to identify the existing utilities at the site.

Dial Before You Dig (DBYD) requests were submitted on the 3 April 2014 to investigate the presence of existing utilities such as natural gas, water, stormwater, sewer and telecommunications.

The following utilities with interests/assets in the vicinity of the site were notified in this process:

Seq. No.	Authority Name	Phone	Status
33404229	AAPT / PowerTel, NSW	1800786306	NOTIFIED
33404236	AARNet Pty Ltd, Nsw	1300275662	NOTIFIED
33404231	Ausgrid	0249510899	NOTIFIED
33404234	Jemena Gas South	1300880906	NOTIFIED
33404228	Nextgen, NCC - NSW	1800336886	NOTIFIED
33404233	Optus and/or Uecomm, Nsw	1800505777	NOTIFIED
33404230	PIPE Networks, Nsw	1800201100	NOTIFIED
33404237	Primus Telecom, Nsw	0399233562	NOTIFIED
33404227	RailCorp Central	0297528682	NOTIFIED
33404225	Roads and Maritime Services	0288370285	NOTIFIED
33404235	Sydney Water	132092	NOTIFIED
33404232	Telstra NSW, Central	1800653935	NOTIFIED

3.2 Capacity Calculation Assumptions

The following assumptions have been made in carrying out this assessment:

- Site area 4,308m^2;
- 26,530m^2 of underground carpark;
- 14,737m^2 of Gross Building Area (GBA) for commercial/retail (with uplift included);
- ~741 apartments;
- Average population of 2.5 persons per apartment;
- Cold Water ~500,000l/day (includes commercial/retail);
- Sanitary / Sewer Discharge ~500,000 L/day (includes commercial/retail);
- Gas 20,000 mj/hr diversified load (includes commercial/retail);
- Fire Hydrant System 20 L/sec; and
- Hot Water 60,000 Litres over peak hour (includes commercial/retail).

4. ELECTRICAL

4.1 Electrical Maximum Demand

Based on our preliminary electrical maximum demand calculations, the new development will require 5,069.7 Amps/Phase when After Diversity Maximum Demand (ADMD) has been applied.

This equates to approximately 3,645kVA.

The detailed maximum demand calculation is presented below:

Electrical Maximum Demand Calculation
505 - 523 George Street Sydney
~741 Unit Residential Development
14,737m2 of Commercial/Retail NLA
7 Levels of Underground Basement Carparking
12 Lifts
2 Escalators

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Basements	Area (m2)	Quantities	VA/m2	VA	I (A)	Subdivided I (A)
Carpark (Mechanically Ventilated)	26530		20	530600	736.9	
Common Space				0	0.0	
Carpark Lighting	26530		10	265300	368.5	
						1105.4
General	**Area (m2)**	**Quantities**	**VA/m2**	**VA**	**I (A)**	**Subdivided I (A)**
Common Space	10000	1	20	200000	277.8	
Lifts		12			480.0	
Escalators		2			80.0	
						837.8
Apartments	**Area (m2)**	**Quantities**	**VA/Bed**	**VA**	**I (A)**	**Subdivided I (A)**
Studios		83	2000	166000	230.6	
1 bed		227	2500	567500	788.2	
1 bed + study			2750	0	0.0	
2 bed		390	3000	1170000	1625.0	
2 bed + study			3250	0	0.0	
3 bed		41	3500	143500	199.3	
						2843.1
Commercial	**Area (m2)**		**VA/m2**	**VA**	**I (A)**	
Retail/Commercial Space	14737		120	1768440	2456.2	
						2456.2
Total (without ADMD)						7242.4
Total (with ADMD of 70% applied)						5069.7

The redevelopment of the site will necessitate a new onsite substation that is considerate of the future site layout.

To accommodate the new development load a 3 x 1,500kVA Triplex Chamber Substation will be required. There may also be mid level transformers required to reduce voltage drop up the building. These can be accommodated in the mid level plant spaces allocated. This will be resolved in the design development phase of the project.

4.2 Existing Services

There is an existing substation on the site that will need to be decommissioned. The existing substation is an older chamber type substation built within the existing building structures. The approximate location of the existing substation is shown below in Figure 5 on the Ausgrid plans:

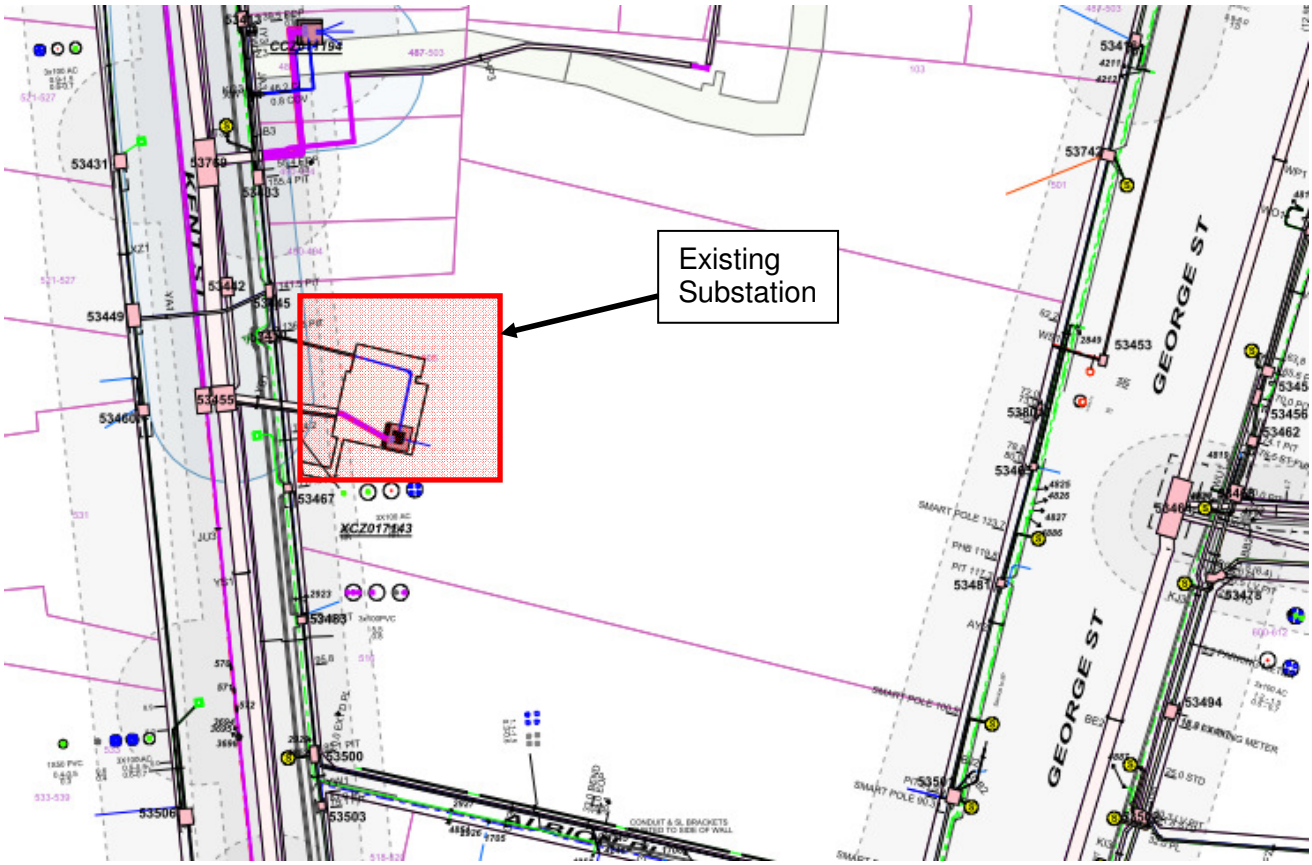

Figure 5 – Substation Location on the Site

The existing substation appears to service other customers. Before decommissioning the substation, further liaison will be required with Ausgrid to ensure alternative arrangements are put in place to service these other customers (if they are still active). The high voltage associated with the substation will also need to be decommissioned and removed as this reticulates within the site. Furthermore the status of existing substation easements will need to be reviewed and negotiations with Ausgrid will be necessary to extinguish these easements and right of way (associated with the high voltage cables servicing the substation). A new easement will then need to be created for the new substation proposed for the development.

4.3 Ausgrid Infrastructure in the Vicinity of the Site

There are high voltage feeders reticulating on Kent Street for the development to connect in to. These are shown below in Figure 6 which is an extract from the Ausgrid planning maps for the area:

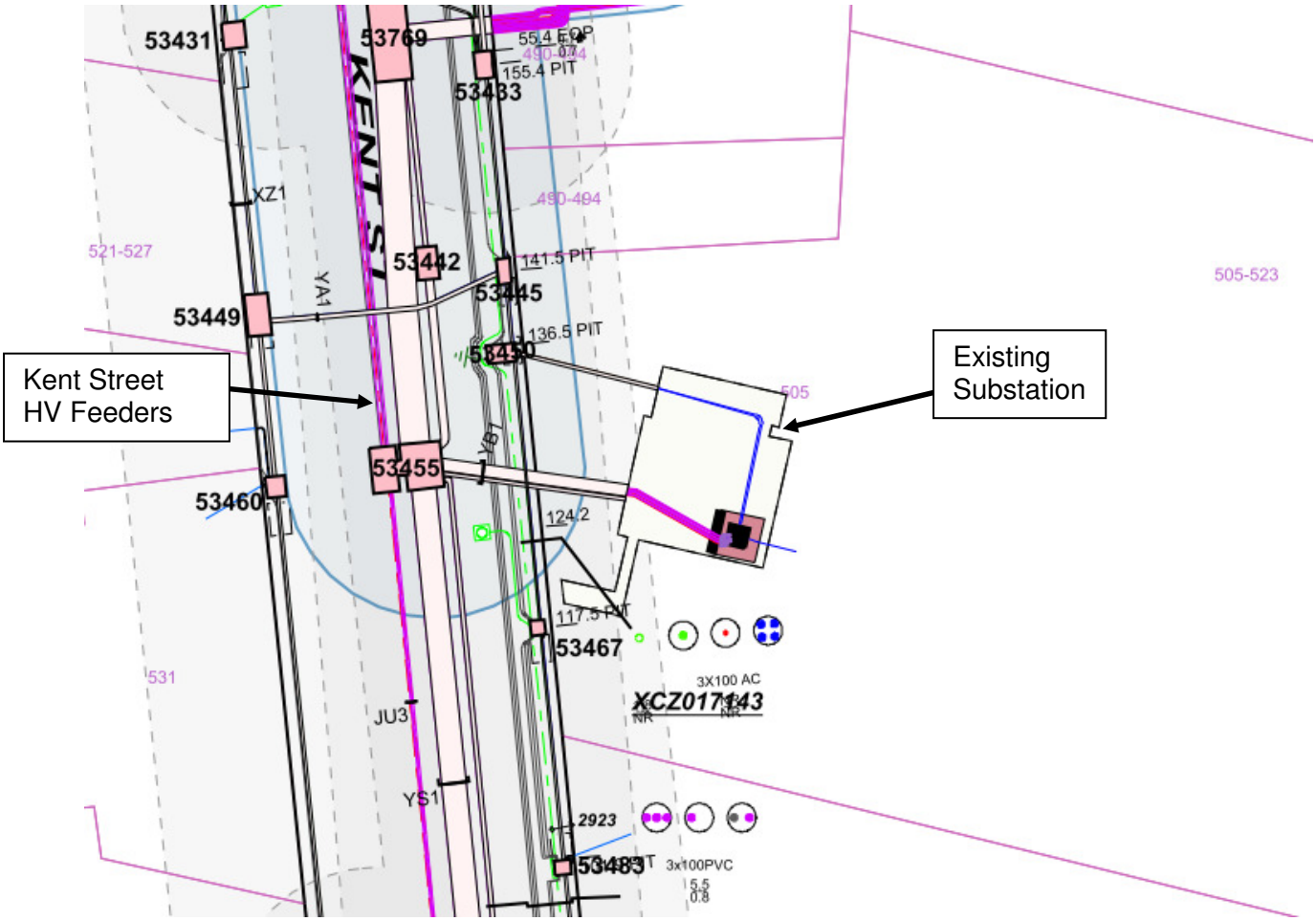

Figure 6 – Kent Street HV Feeders

4.4 New Substation Options for the Development

4.4.1 Option 1 – Triplex Basement Chamber Substation

Quantity Required

If a basement chamber substation is considered, then only one (1) would be required of 3 x 1,500kVA capacity.

Spatial Requirements

Approximately 200m^2 will be required for a new basement chamber substation.

4.4.2 Option 2 – Triplex Surface Chamber Substation

Quantity Required

If a surface chamber substation is considered, then only one (1) would be required of 3 x 1,500kVA capacity.

Spatial Requirements

Approximately 150m^2 will be required for a new surface chamber substation.

4.5 Summary & Conclusions

The following items will need to be further considered with respect to the electrical services associated with the site:

- **Decommissioning of the existing substation;**
- **Decommissioning of right of way for high voltage feeders servicing the existing substation;**
- **Extinguishing the easement associated with the existing substation;**
- **Confirmation of any other customers being serviced from the existing substation and making arrangements for these customers to be alternatively serviced in the future; and**
- **Establishment of new 3 x 1,500kVA triplex substation (surface or basement type) for the proposed development that works in with the new building/development layout.**

5. NATURAL GAS

5.1 Gas Maximum Demand

The gas maximum demand has been estimated at:

- Gas 20,000 mj/hr diversified load (includes commercial/retail).

This is based on the Heating Ventilation and Air Conditioning (HVAC) System being either a reverse cycle, split, air cooled, type system or centralised water cooled chiller based system. It has been assumed that hot water and cooking appliances in the residential and food retail portions of the development will predominantly be gas.

5.2 Existing Services

There are no major existing gas services within the site that will need to be decommissioned and/or diverted.

Any minor supplies servicing the existing buildings can be readily decommissioned during demolition.

5.3 Jemena Infrastructure in the Vicinity of the Site

Response from Jemena shows there is a 100mm, 210kPa gas main off Kent Street. This capacity is adequate for the proposed new development. This is shown below in Figure 7.

The identified gas mains can adequately service the site.

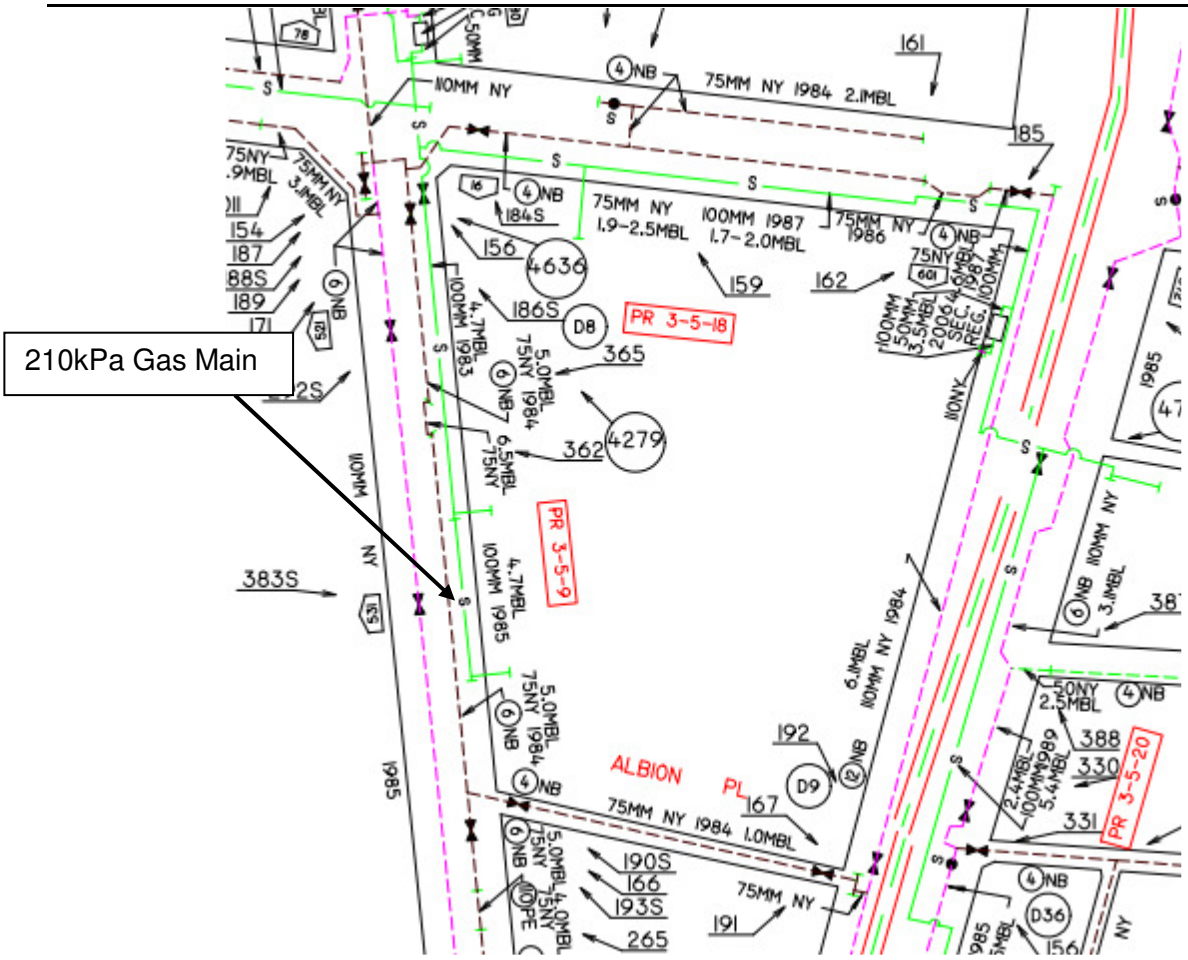

Figure 7 – Jemena Natural Gas Infrastructure (Kent Street)

5.4 Summary and Conclusions

Jemena have extensive infrastructure in the vicinity of the site and can easily cater for the proposed new development.

6. TELECOMMUNICATIONS

6.1 Telecommunications Maximum Demand

Based on current estimate of apartments and commercial/retail area proposed for the development, broadband fibre optic cabling will be required to the site main distribution frame (MDF/BD).

6.2 Existing Services

There are no major existing telecommunications services within the site that will need to be decommissioned and/or diverted.

Any minor supplies servicing the existing buildings can be readily decommissioned during demolition.

6.3 Telecommunications Infrastructure in the Vicinity of the Site

Response from the respective Telco's shows multiple conduits located along Kent and George Streets.

High bandwidth services are available off Kent and George Streets.

The telecommunications services identified in the vicinity of the site are expected to have the carrying capacity to suit the needs of the proposed development.

NBN is not readily available in the CBD. With a development which includes this number of dwellings, it would be highly likely that NBN will be interested in entering into further negotiations.

Below are some examples (Figures 8 – 12) of the extent of Telco infrastructure in the vicinity of the site:

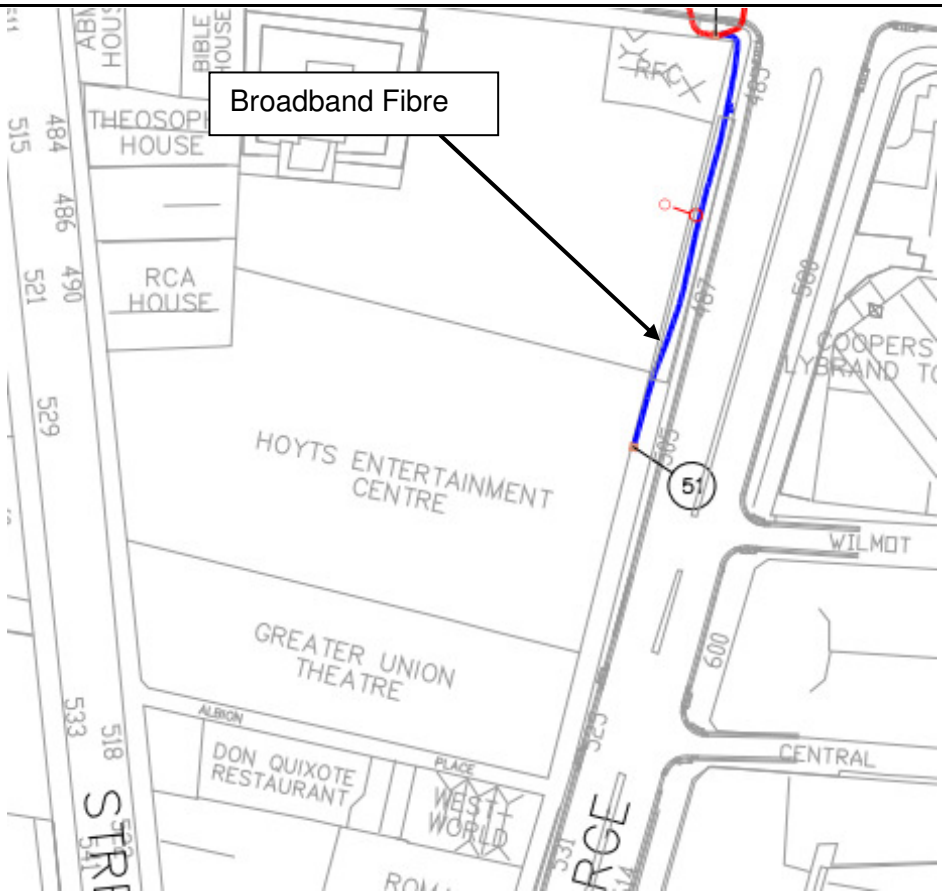

Figure 8 – Telco Infrastructure (George Street)

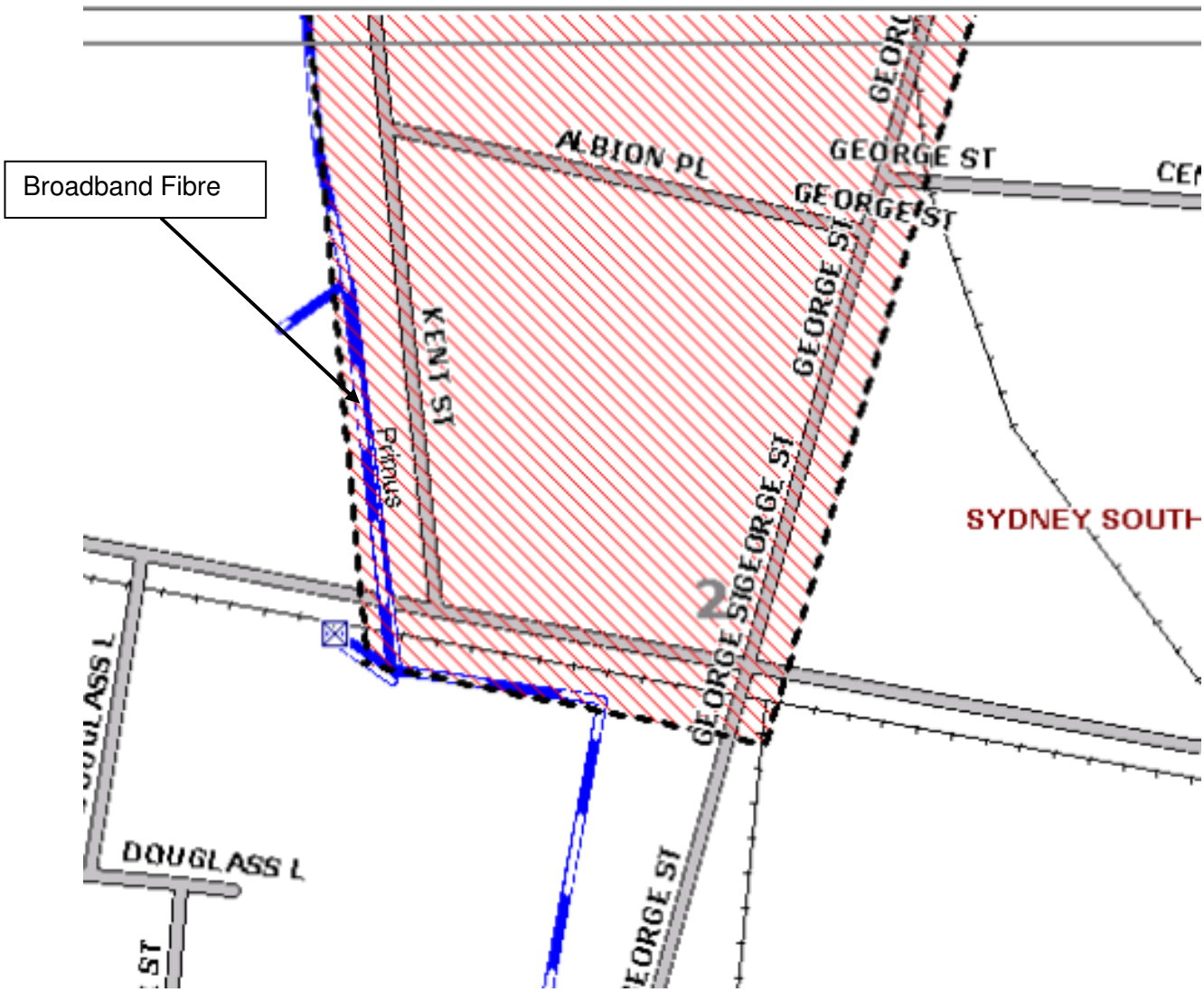

Figure 9 – Telco Infrastructure (Kent Street)

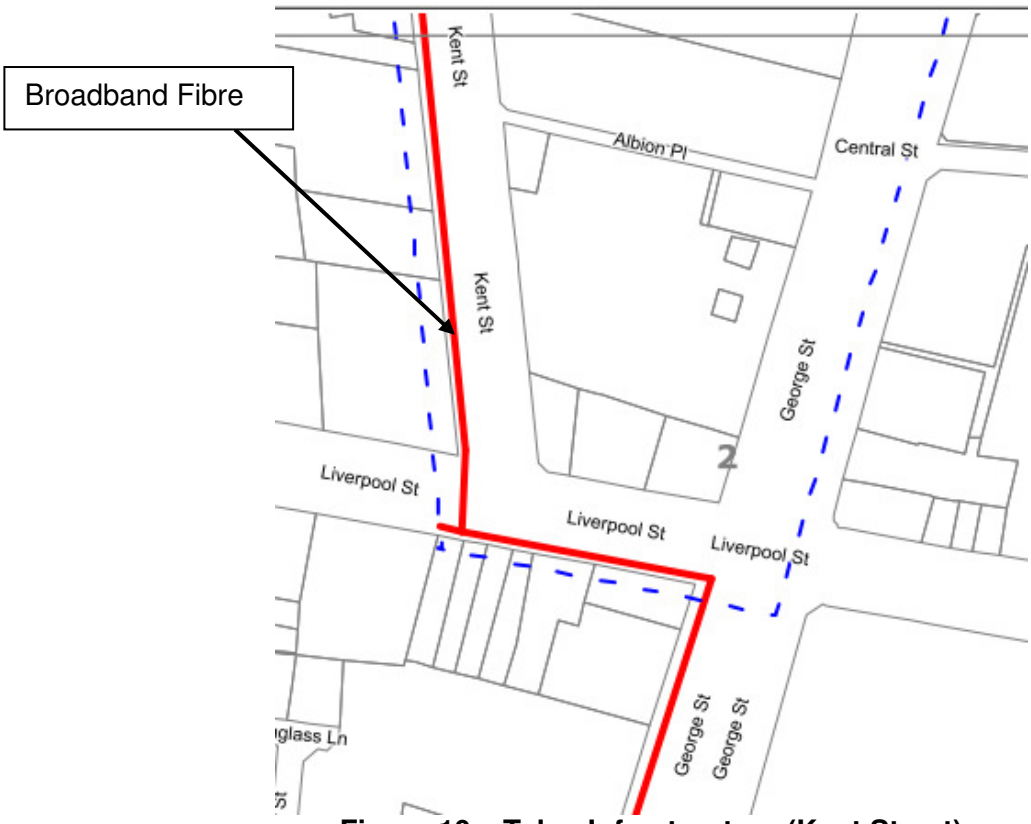

Figure 10 – Telco Infrastructure (Kent Street)

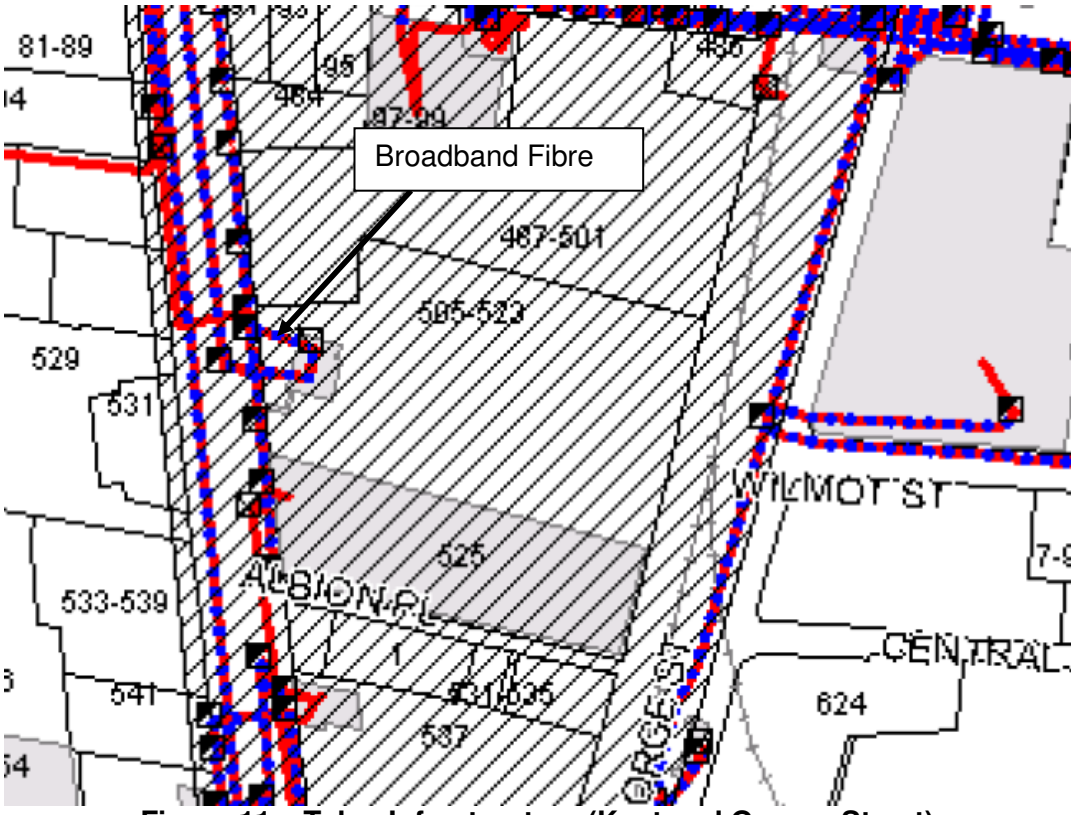

Figure 11 – Telco Infrastructure (Kent and George Street)

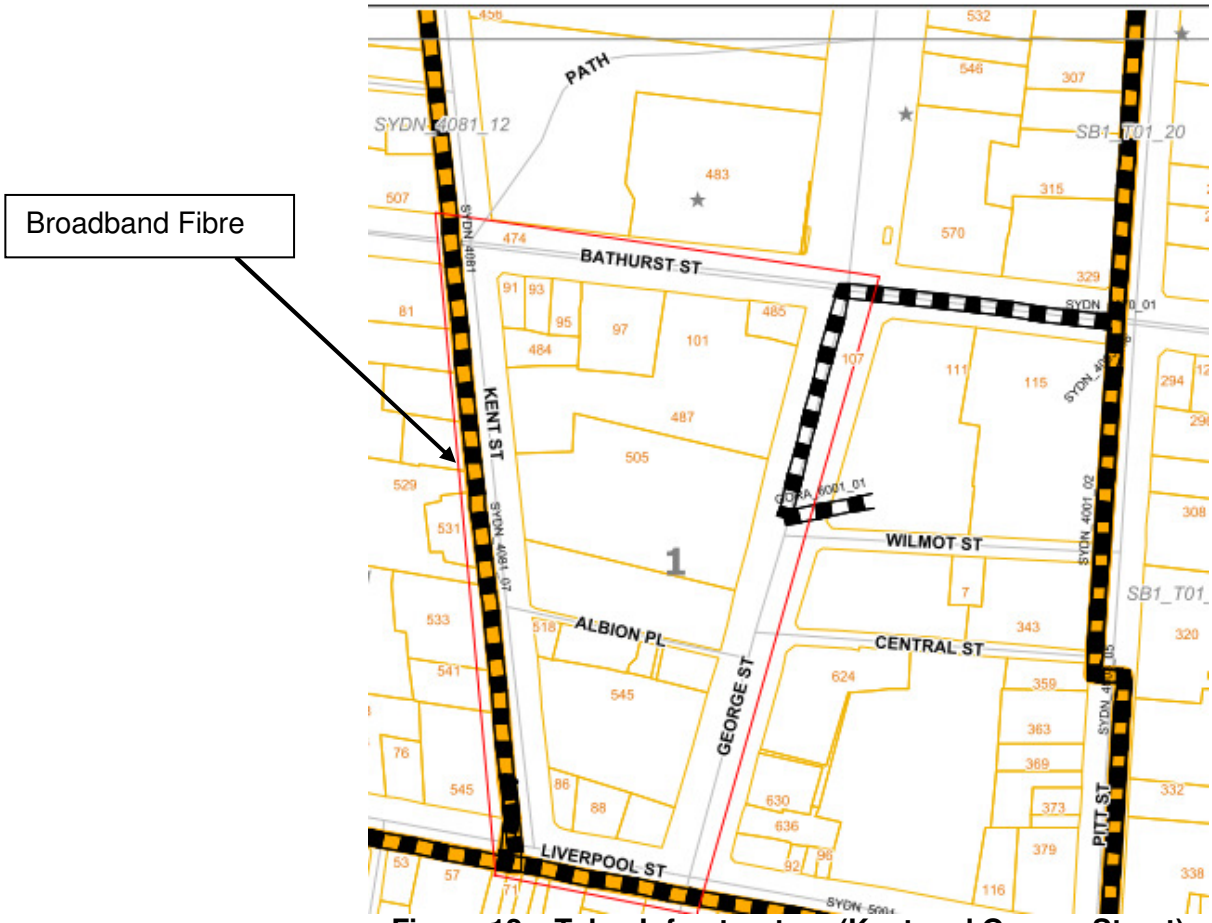

Figure 12 – Telco Infrastructure (Kent and George Street)

6.4 Summary and Conclusions

NBN and the major Telco's all have infrastructure in the vicinity of the site and can easily cater for the proposed new development.

7. STORMWATER

7.1 Stormwater Requirements

The responsibility for the control of stormwater runoff in the vicinity of the site is with the City of Sydney Council.

All future stormwater works at the site must comply with Council's Development Control Plans and Sydney Water's requirements as the application will be referred to Sydney Water Corporation for comments.

The site is located within Sydney Water's catchment consequently the site's peak flow discharges are required to be regulated to meet Sydney Water's Permissible Site Discharge (PSD) rates. This shall be achieved by providing an (OSD) system located in the lowest portion of the site. The entire site shall pass through the OSD system prior to it discharging to Sydney Water's receiving stormwater main in George Street. Based on the site area, the estimated Onsite Detention System (OSD) required will be in the order of 150m^3.

Sydney Water has also a Water Quality policy with specific pollutants loading reduction targets to be met.

The maintenance obligations and costs will need to be integrated into the development of the property.

7.2 Existing Services

There are no major existing stormwater services within the site that will need to be decommissioned and/or diverted.

Review of service drawings obtained from the Council show there are pipe network drains in the vicinity of the site.

Any minor stormwater services within the site servicing the respective buildings can be readily decommissioned during demolition.

7.3 Stormwater Infrastructure in the Vicinity of the Site

The existing stormwater in the vicinity of the site should be adequate to accommodate any proposed development, however with this extent of development onsite detention and Water Sensitive Urban Design (WSUD) will be necessary.

The following image is an extract from Council's mapping system which shows the council infrastructure in Green and Sydney Water's in Blue.

Two possible connection points are available in George Street.

7.4 Summary and Conclusions

There is adequate stormwater infrastructure in the vicinity of the site and can easily cater for the proposed new development.

8. MAINS WATER

8.1 Water Maximum Demand

Water maximum demand has been estimated as follows:

- Cold Water ~500,000l/day (includes commercial/retail);
- Fire Hydrant System 20 L/sec; and
- Hot Water 60,000 Litres over peak hour (includes commercial/retail).

8.2 Existing Services

There are no major water services within the site that will need to be decommissioned and/or diverted.

Any minor water services within the site servicing the respective buildings can be readily decommissioned during demolition.

8.3 Mains Water Infrastructure in the Vicinity of the Site

Sydney Water is the responsible authority for the provision of potable water to the site.

There is a 250mm diameter water main running along Kent Street and a 300mm diameter water main running along George Street that are both suitable for the new development to connect into.

It is likely that the 250mm and 300mm water mains will be sufficient to cater for cold water and fire services requirements of the proposed new development. This will be confirmed by the Section 73 that will be lodged with Sydney Water after a Development Application (DA) is obtained.

Further to this, and with reference to the Pressure/Flow Enquiry obtained from Sydney Water (refer to Appendix of this document for further details) the mains water will need to be internally "boosted" to achieve the AS2419 fire services (hydrants/sprinkler) flow and pressure requirements.

Figure 13 below indicates the Sydney Water mains water and sewer services infrastructure in the vicinity of the site.

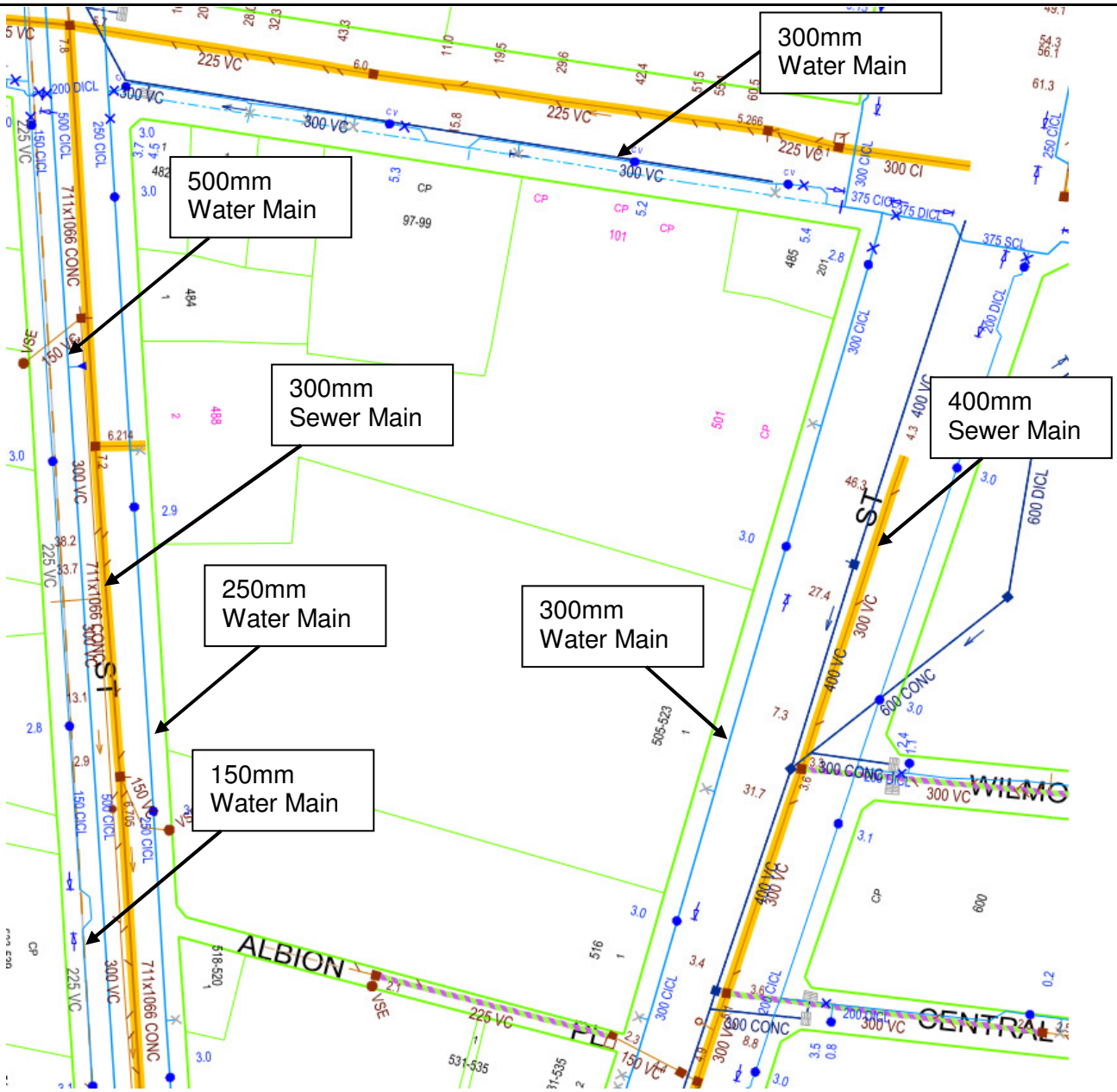

Figure 13 – Sydney Water Sewer/Water Diagram

8.4 Summary and Conclusions

There is adequate mains water infrastructure in the vicinity of the site and can easily cater for the proposed new development.

The mains water will need to be internally boosted based on the Sydney Water Pressure/Flow Enquiry.

9. SEWER

9.1 Sewer Maximum Demand

Sewer maximum demand has been estimated as follows:

- Sanitary / Sewer Discharge ~500,000 L/day (includes commercial/retail);

9.2 Existing Services

There are no major sewer services reticulating within the site that will need to be decommissioned.

Any minor sewer services reticulating within the site can be readily decommissioned during demolition.

9.3 Sewer Infrastructure in the Vicinity of the Site

Sydney Water is also the responsible authority for the provision of sewer services to and through the site. Information provided by Sydney Water shows 300mm gravity sewer services reticulating down Kent Street and 400mm gravity sewer services reticulating down George Street. These are shown above in Figure 13.

Either of these sewer mains will be sufficient to cater for drainage services requirements of the proposed new development.

This will be confirmed by the Section 73 that will be lodged with Sydney Water after a Development Application (DA) is obtained.

9.4 Summary & Conclusions

There is adequate sewer infrastructure in the vicinity of the site and can easily cater for the proposed new development.

APPENDICES

Appendix A

Pressure & Flow Enquiry

Statement of Available Pressure and Flow

Sydney WATER

WMS No: **334811**
Contact No: 88493531
Fax No: 88493071

Date: 16/04/2014

Pressure & Flow Application Number: 8734246
Your Pressure Inquiry Dated: Tue April 8 2014
Property Address: 505-523 George St Sydney 2000

The expected maximum and minimum pressures available in the water main given below relate to modelled existing demand conditions, either with or without extra flows for emergency fire fighting, and are not to be construed as availability for normal domestic supply for any proposed development.

ASSUMED CONNECTION DETAILS

Street Name: George	Side of Street: West
Distance & Direction from Nearest Cross Street	80 metres South from Bathurst
Approximate Ground Level (AHD):	24 metres
Nominal Size of Water Main (DN):	300 mm

EXPECTED WATER MAIN PRESSURES AT CONNECTION POINT

Normal Supply Conditions	
Maximum Pressure	61 metre head
Minimum Pressure	39 metre head

WITH PROPERTY FIRE PREVENTION SYSTEM DEMANDS	Flow l/s	Pressure head m
Fire Hose Reel Installations (Two hose reels simultaneously)	0.66	39
Fire Hydrant / Sprinkler Installations (Pressure expected to be maintained for 95% of the time)	10	42
	15	42
	20	42
	25	42
	30	42
	40	42
	50	42
	60	41
Fire Installations based on peak demand (Pressure expected to be maintained with flows combined with peak demand in the water main)	10	39
	15	39
	20	39
	25	39
	30	39
	40	39
	50	39
	60	38
Maximum Permissible Flow	80	38

(Please refer to reverse side for Notes)

for: **Robert Wickham**
Principal Planner
Urban Growth - Asset Services

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