City of Armadale

Armadale Activity Centre

Utilities and Drainage Infrastructure Impact Assessment

253635-C-REP-0002

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Job number 253635

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1 Introduction

1.1 Structure Plan Context

Armadale is designated as a Strategic Metropolitan Centre in State Planning Policy 4.2 ï Activity Centres for Perth and Peel (SPP 4.2). According to SPP 4.2, the main role and function of a Strategic Metropolitan Centre is:

> *"Strategic metropolitan centres are the main regional activity centres. They are multipurpose centres that provide a diversity of uses. These centres provide the full range of economic and community services necessary for the communities in their catchments".*

Placed second-highest in the hierarchy, this type of centre is expected to function at a high level in terms of:

- Strategic Metropolitan Centres are multi-purpose centres that provide a diversity of uses. These centres provide a full range of economic and community services necessary for the communities in their catchments.
- Focus for passenger rail and high frequency bus networks
- Typical types of retail including department stores, discount department stores, supermarkets, full range of speciality stores.
- Office development will typically be major offices and government agencies.

Armadaleôs centre catchment is growing ï expected to reach a population of between 280,000 and 300,000 people by 2036 (from a current population of 120,000 people). This substantial growth, within a relatively short time frame, requires Armadaleôs service offering to expand beyond its current provision. Importantly, Armadale will need to mature beyond its existing retail focus to provide services, jobs, amenity, living and leisure opportunities ï consistent with its Strategic Metropolitan Centre designation.

Increased residential densities are required not just to meet State Policy targets, but to increase the population of Armadaleôs walkable catchment, providing a diversity of housing choice, improving the use of existing infrastructure and enabling development that contributes to the intended amenity and intensity of the centre.

Employment self-sufficiency ï the ratio of local jobs to employed residents ï in the City of Armadale is very low. In 2015/16 there were around 20,109 local jobs and 40,222 employed residents, giving an employment self-sufficiency ratio of 50%. To maintain the current employment self-sufficiency ratio, an additional 15,300 jobs will be required in the City between 2016 and 2036 and an additional 19,000 by 2051. If the ratio were to increase to a more respectable 70% by 2051, an additional 29,400 jobs would be required in the City between 2016 and 2036 and an additional 34,600 by 2051.

This Activity Centre Structure Plan provides a framework for maturation and urban regeneration so that the existing and future population has access to the appropriate services, facilities and amenity. The Structure Plan establishes the vision and sets a strategic planning framework to guide development within its boundary (as shown in Figure 1).

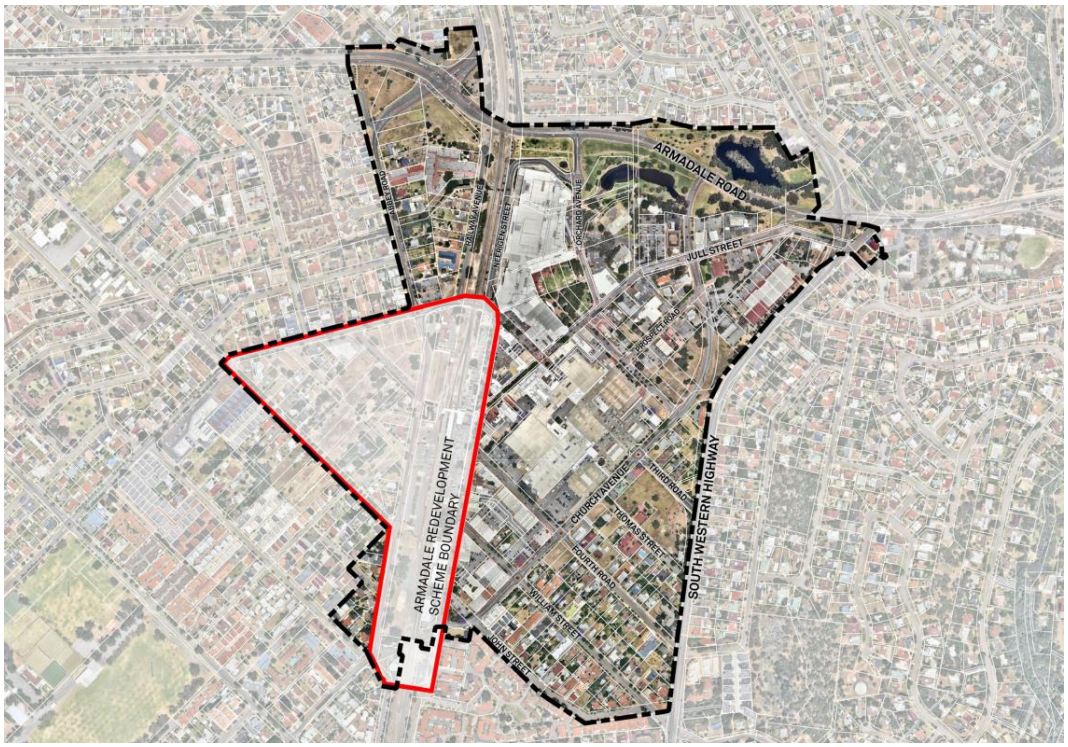


Figure 1 Activity Centre Boundary

Source: Figure 2 Armadale Activity Centre Structure Plan Report, Hassell

This infrastructure impact assessment report has been prepared to support the Structure Plan. It provides a high-level assessment of existing utilities and drainage infrastructure that may be affected by the development. Furthermore, where information is available, it highlights potential supply risks that are anticipated to arise as a result of the future development, and outlines potential utility and drainage network reinforcement that may be required.

Three development concept options were tested through the activity centre design process. Community and stakeholder preferences and values were tested. A number of meetings between the City of Armadale and the Metronet team, Department of Planning, Lands and Heritage, Main Roads WA and Department of Transport have also been held. The Activity Centre Structure Plan proposes the Cityôs preferred approach (as shown in Figure 2) to grade separate road and rail, but has also been prepared to integrate with a range of potential outcomes. It is understood ongoing engagement will occur between the City and Metronet team to progress the outcome of grade-separation as part of the Byford Rail extension project.

PREFERRED PLAN

This preferred plan has formed the basis of the Activity Centre Structure Plan.

- Rail tunnelled between Armadale Road and Church Avenue with the dive structures extending north and south of the centre
- Limited built form over the rail tunnels within the centre core only
- Central focus provided by way of a grand civic plaza integrating with a new station entrance structure
- The civic plaza connects directly with Jull Street Mall
- The preferred plan requires closure to part of Commercial Avenue

1. Armadale underground train station.
2. Train line dive cutting.
3. Public open space / tunnel ventilation.
4. Neerigen Brook reintroduced as a living stream.
5. Jull Street Mall.
6. New civic plaza anchoring Jull Street Mall.
7. Retail and mixed use core focussed around Jull Street and new shared streets - car parking provided in basements, decked structures or on rooftop.
8. Education / mixed use.
9. Performing arts centre / mixed use.
10. Activated buildings address Memorial Park.
11. Commercial office core and mixed use including desirable mid block link.
12. Mixed use development.
13. Landscaped plaza surrounds the heritage listed jarrah tree.
14. Landmark building.
15. Landscaped mid block pedestrian links.
16. Desirable shared streets as a mid block link.
17. New Justice Precinct.
18. High density residential development.
19. Desirable pedestrian link / open space.
20. William Street public transit boulevard.
21. New principal shared path.
22. New development addresses Neerigen Brook.
23. Improved landscaping and pathway systems along Neerigen Brook.
24. Landmark Short stay or mixed use development site.
25. Boulevard planting to Armadale Road.
26. Former Post Office activates Jull Street Mall.
27. District Hall upgrade to facility.
28. Streich Avenue to Commerce Avenue bridge investigation.
29. Mixed use development activating the civic plaza.

Figure 2 Armadale Activity Centre Indicative Development Plan: Preferred Scenario (***Source: Figure 41 Armadale Activity Centre Structure Plan Report, HASSELL***

The Structure Plan is proposing a substantial uplift in both residential and non-residential development within the Activity Centre as shown in Table 1. Whilst detailed information is not available on the form this development will take it is expected to increase demand for all utilities significantly compared to current provision. This report provides background on the existing infrastructure in the Activity Centre and highlights where upgrades may be required to service the proposed Structure Plan.

Table 1 Summary Table of Areas

Item	2017	Future
Total area covered by the Activity Centre Structure Plan	85 Hectares	85 Hectares
Estimated number of dwellings	236	1250-2300
Estimated Population	456	5000-7000

Source: Table 1 Armadale Activity Centre Structure Plan Report, Hassell

For the purpose of assessment the infrastructure impact assessment report considers the preferred scenario only because it is anticipated that this scenario will result in the greatest impact on the siteôs utility and drainage infrastructure network. Critical existing infrastructure has been illustrated on sketch C-SKE-001 located in **Appendix A**. C-SKE-001 identifies locations at which this critical infrastructure may be impacted by the proposed rail lowering, and qualifies each impact as either low, medium or high risk.

It should be noted that this assessment is limited, as some statutory authorities have not provided details on existing infrastructure that may need to be upgraded and/or relocated to accommodate the development. As the structure plan process progresses and further detail is available on the type and scale of land uses to be included within the approved development scenario additional clarity can be sought with service providers on the impacts on the infrastructure network.

It is also likely that infrastructure may be upgraded as part of the Armadale to Byford line rail extension.

1.2 Stakeholder Engagement

In order to complete this utilities and drainage infrastructure impact review, a number of external service providers were contacted. The siteôs existing utility network has been examined through the use of Dial Before You Dig (DBYD) data requested by Arup in March 2017. Records of communication and DBYD plans for assets belonging to Water Corporation, Western Power, ATCO Gas, Optus, Telstra and NBN can be found in **Appendices B-G** respectively.

As part of stakeholder engagement, local utility providers were asked to provide high level comments regarding network upgrades that may be required to service the proposed development. Post-development yield data supplied to service providers is included in **Appendix H** of this report.

As the yield data available at this stage of planning is very conceptual, many of the service authorities were unable to provide detailed comments as to required

network upgrades. The Water Corporation in particular have not provided any commentary. It is recommended that service providers be re-engaged for comments once more detailed post-development yield information is available.

Operator	Name	Contact	Comments
DBYD search for area assets	-	Job No. 11953295	Information indicated on C-SKE-001 located in Appendix A. PDF DBYD plans located in Appendix B-G
Water Corporation	Daniel Lawrence	p. 08 9420 3257 e.Daniel.lawrence@watercorporation.com.au	Has not provided comments regarding potential infrastructure upgrades.
Water Corporation	Russell Nelson	p. 08 9420 3361 e.Russell.Nelson@watercorporation.com.au	Provided comments regarding infrastructure impacted by rail lowering ï See Section 4.1-4.3.
Western Power	Clayton VanderSchaaf	e.clayton.vanderschaaf@westernpower.com.au	Recommends that a Western Power feasibility study be commissioned once specific details of the developments become available.
ATCO Gas	Jamali Gray	p. 08 6163 5148 e.Jamali.Gray@atcogas.com.au	Provided comments regarding infrastructure impacted by rail lowering ï See Section 4.5. Provided comments regarding existing networkôs capacity to service proposed development ï See Section 4.5
Optus	Ray Azzopardi	p. 08 6188 5003 e.Ray.Azzopardi@optus.com.au	Provided comments regarding infrastructure impacted by rail lowering ï See Section 4.6 Provided very high level comments regarding infrastructure upgrade ï See Section 4.6
Telstra	Steve Wells	p. 08 6224 5764 e.Steve.P.Wells@team.telstra.com	Provided comments regarding infrastructure impacted by rail lowering ï See Section 4.6.

Operator	Name	Contact	Comments
			Recommends that a design impact study be completed as early as possible. Unable to provide detailed comments on potential network upgrades at this stage of planning.
Armadale City Council ï Drainage Division	Various Contacts	p. 08 9394 500	Provided comments regarding drainage discharge location and local infiltration within project area ï See section 2.1.3.

1.3 Report Structure

The remainder of this report is structure as follows:

Section 2 examines existing and future water infrastructure.

Section 3 considers existing and future power networks.

Section 4 reviews existing and future gas supplies.

Section 5 identifies the existing and future communication network implications.

Section 6 highlights the potential impact of lowering the rail line to accommodate development above the current rail corridor.

Section 7 summarises the recommendations and where further investigation is required to support the Structure Plan.

This report forms part of a suite of documents to support the Structure Plan process and in particular should be read in conjunction with the transport assessment to understand the implications on the road and rail infrastructure.

2 Water

2.1 Water Supply

The Armadale Activity Centre is located within the Perth Integrated Water Supply Scheme and benefits from having several large distribution mains crossing the area as shown in Figure 3.

The primary line is a 1400mm diameter steel main known as the Wungong Transfer Main, which runs along Wungong Road and Green Avenue parallel to the railway line and then diverts northwest along Abbey Road. Additionally, there is a 760mm diameter steel main, Wungong Trunk Main, which runs along the South Western Highway on the siteôs Eastern border, and a 300mm diameter ductile iron main, MWA BL21, which runs along Forrest Road through the siteôs centre. All three of the identified mains feed the water reticulated area within the study area.

Branching off from the above mentioned main lines, there is a network of 100mm and 150mm cast iron, PVC and steel reticulation size water mains. These pipes run down all the streets within the site and provide property connections. 50mm copper reticulation pipes supplement this network providing property connections, and a section of 205mm cast iron main that runs along Streich Avenue parallel to the railway. For detailed DBYD plans illustrating all assets within the Activity Centre boundary belonging to the Water Corporation see **Appendix B**.

It should be noted that the Water Corporationôs Land Servicing Policy is for developers to fund reticulation size works, and as such it may be appropriate for the City of Armadale to consider including any water upgrades in the Developer Contribution Scheme.

Whilst the Water Corporation has not provided comments on whether the existing potable water network will require an upgrade to service the increased demand from the proposed development it is understood that the 1400mm Wungong Transfer Main will not be available to supply the Activity Centre with potable water.

Based on DBYD plans and Water Corporation comments, critical water supply infrastructure that may be impacted by proposed grade separation of the rail corridor includes:

- The 1400mm Wungong transfer main located parallel to the railway on Wungong Road and Green Avenue. This asset may inhibit development adjacent to the rail, or require diversion/lowering depending on the rail lowering footprint.
- The 100mm steel water main which crosses the rail at Forrest Road.

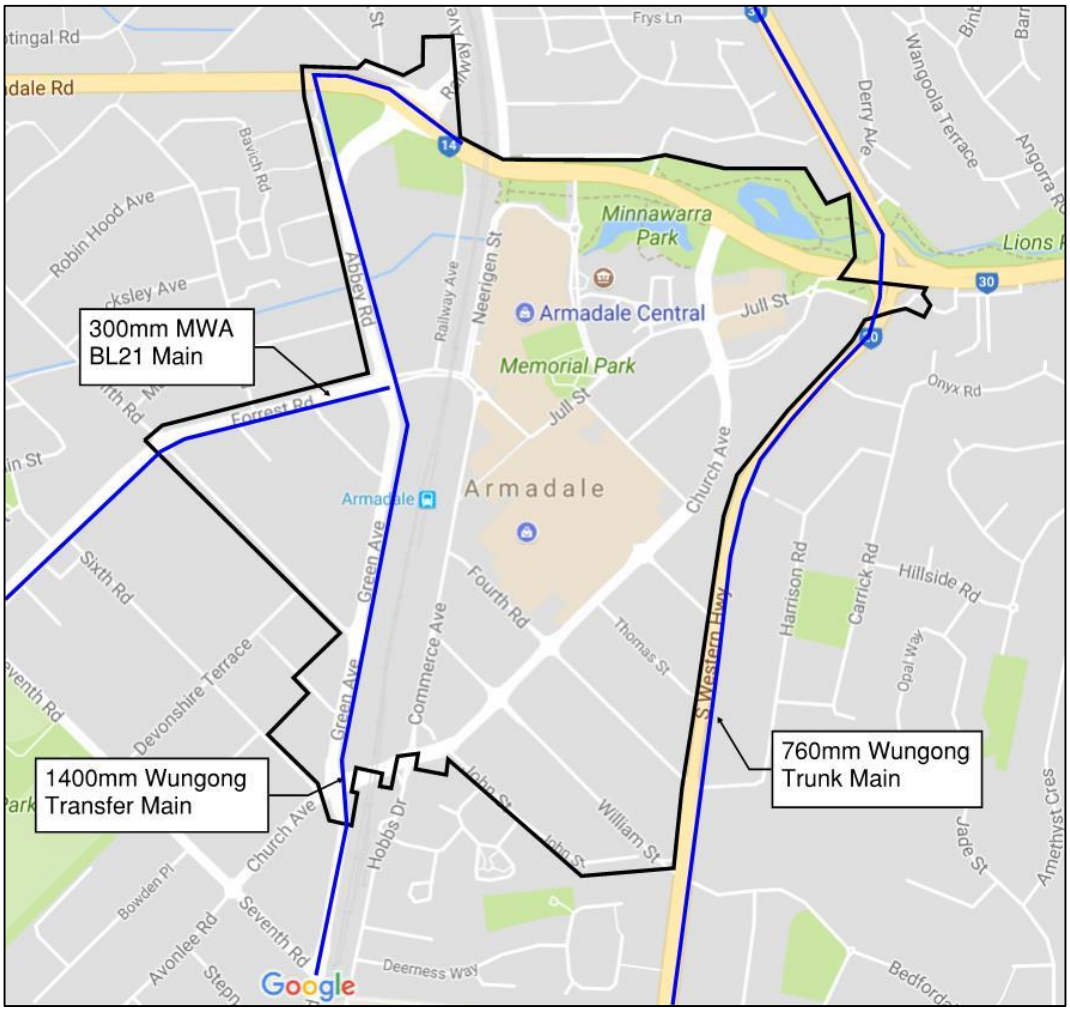


Figure 3 Water Corporation Water Supply - Primary Assets

2.2 Sewer

The Activity Centre is serviced by the Woodman Point wastewater treatment plant located approximately 25km to the west of Armadale City Centre. There are a number of major sewer mains west of the site which convey wastewater towards this treatment plant.

There are no critical pipelines or pressure mains / mains sewers within the structure plan boundary area and the existing Water Corporation sewer network within the Activity Centre is comprised mainly of 150mm diameter PVC and Vitrified Clay (VC) gravity sewer mains. These gravity sewer mains run along the front and rear of existing properties and much of this existing network is located within road reserves.

These sewers discharge into a 230mm VC gravity sewer which spans the site from east to west, running north of Jull Street and Forrest Road. The 203mm VC pipe discharges into a 305mm VC gravity sewer pipe which runs along Forrest Road and exits the site to the west. The 305mm VC pipe acts as the main collector for the site.

There are also a number of 150mm VC gravity sewer pipes located beneath the existing Armadale Shopping City which are not in use.

The detailed DBYD plans illustrating assets and commentary within the Activity Centre boundary belonging to Water Corporation are shown in **Appendix B**.

The Water Corporation has not provided feedback on whether the existing sewer network will require an upgrade to service the Structure Plan proposals. It is expected that an increase in size of sewer reticulation mains will be required due to increased population density, however further investigation on upgrades to reticulation mains is necessary. This may involve installation of flow meters on the existing sewer mains to determine the flows within the system.

Based on DBYD plans and Water Corporation comments, critical sewer infrastructure that may be impacted by changes to the rail corridor include:

- The 230mm diameter VC sewer pipe crossing the rail to the north of Forrest Road
- The 150mm diameter PVC sewer main crossing the rail north of Church Avenue.

2.3 Stormwater Drainage

The drainage network currently servicing the Activity Centre consists of local drainage infrastructure owned by the City of Armadale, and major drainage lines owned by the Water Corporation.

The majority of the areaôs local drainage network discharges into the Neerigen Brook Bypass line operated by the Water Corporation. This line traverses the site from east-west, south of Armadale Road and north of Marian Avenue. The drainage line consists of 1800mm reinforced concrete pipe connecting sections of open channel, and crosses the railway with a number of reinforced concrete culverts.

Figure 4 illustrates the critical stormwater drainage infrastructure within the Activity Centre. The Water Corporation conveys the runoff from this area via a piped and open channel network to a discharge point in the Wungong River. Based on information from the City of Armadale, it is understood, there are currently no infiltration cells, chambers or basins for local infiltration within the Activity Centre boundary.

For detailed DBYD plans illustrating assets within the project area belonging to Water Corporation see **Appendix B**.

The Town Planning Scheme No. 4 for the City of Armadale includes a Drainage Contribution Scheme (reference Schedule 9A2). Figure 5 identifies the cost sharing requirements for drainage works within the contributions area which covers the Activity Centre. As the Structure Plan process progresses, further details of how the Drainage Contribution Scheme will apply to individual developments must be developed in collaboration with the Cityôs Technical Services department.

To minimise the future impact on the drainage network it is recommended that consideration be given, through undertaking appropriate feasibility studies, into sustainable water management systems.

Where appropriate, the City of Armadale should consider introducing mechanisms to make developers introduce sustainable water management systems (soakwells, drainage cells and water harvesting) for all new developments. Sustainable water management systems will also provide other benefits, such as assisting in naturally recharging the areaôs ground water table, as well as providing a form of pollutant filtration for water re-entering the system.

This will in turn reduce the amount of runoff discharging into the Cityôs drainage system, and as such may mitigate any potential need to upgrade existing drainage infrastructure.

Based on DBYD plans and Water Corporation comments, critical drainage infrastructure that may be impacted by this proposed grade separation of the rail line includes:

- Stormwater drainage that crosses the rail adjacent to Church Avenue and near Armadale Train Station.
- The 1800mm reinforced concrete Neerigen Brook main drain located within the rail reserve south of Armadale Road. This asset may inhibit development adjacent to the rail, or require diversion/lowering depending on the rail lowering footprint.
- The existing reinforced concrete culvert structures which facilitate the Neerigen Brook open channel rail crossing south of Armadale Road.

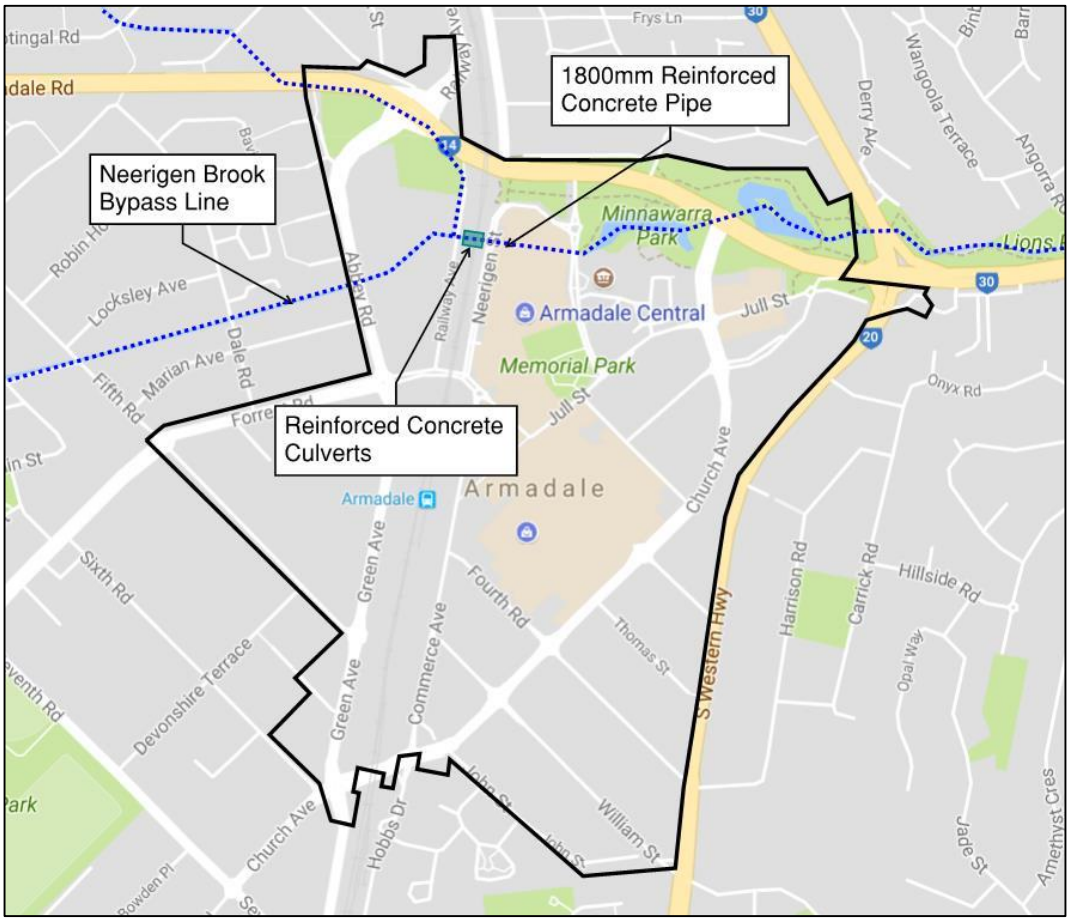


Figure 4 Water Corporation Stormwater Drainage Infrastructure ï Critical Assets

City of Armadale
Town Planning Scheme No.4 162

No.	Description of Land	Infrastructure to which cost sharing arrangements relate	Cost sharing arrangement
2.	Armadale City Centre Drainage Development area (as shown on Scheme Map)	a) The cost of all drainage works necessary for the proper drainage of those parts of the Scheme Area which require drainage and which are shown on the Special Control Area Supplementary Scheme Map pertaining to Drainage Areas; b) The cost of acquisition of any land for drainage services; c) The amount to reimburse the local government for all overhead, supervision and management costs it incurs in the implementation and administration of the Scheme in respect of drainage works; d) All fees, costs and expenses paid to engineering consultants, surveyors and other professional consultants and valuation costs in respect of the drainage works; e) All other costs and expenses which the local government incurs in order to implement and complete the Scheme in respect of the drainage works.	2.1 All landowners within the designated drainage area(s) shall make a proportional contribution to the cost of common infrastructure. 2.2 The Area Basis method of cost apportionment is to be used for all elements of infrastructure for which costs are to be apportioned.

Figure 5 Armadale Drainage Contribution Scheme

3 Power

There is an existing power network owned by Western Power located in the Activity Centre and Figure 6 illustrates the critical high voltage power infrastructure.

These high voltage lines feed overhead and underground low voltage distribution cables which provide local connections to properties. Transformers are located throughout the proposed development area, and are used to facilitate the high voltage to low voltage transition. There is also street lighting located throughout the area.

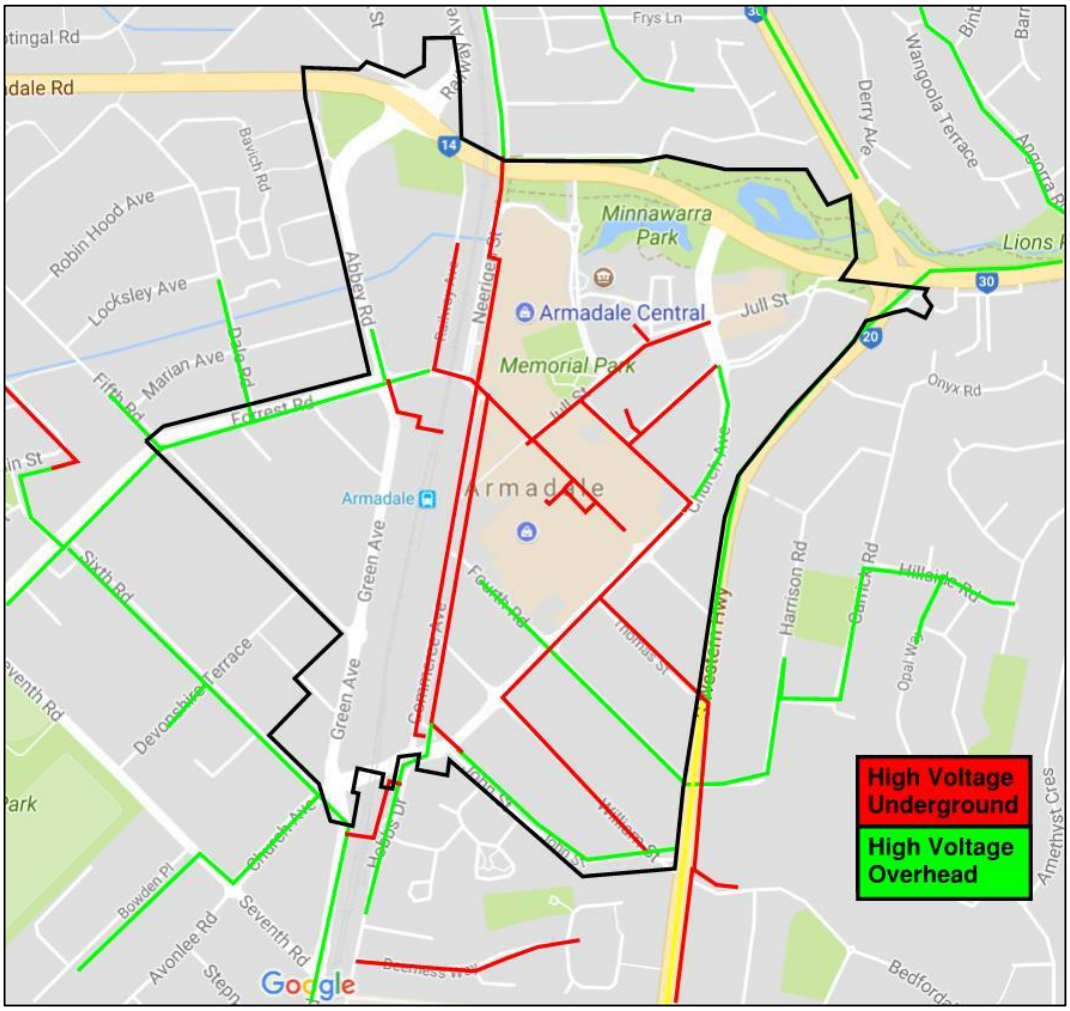


Figure 6 Western Power High Voltage Power Infrastructure

For detailed DBYD plans illustrating assets within the project area belonging to Western Power see **Appendix C**.

Based on the DBYD plans, existing power infrastructure that may be impacted by changes to the rail corridor include:

- 3 phase underground HV cables crossing the rail at Church Avenue, Forrest Road, and Green Avenue
- 3 phase underground HV cables along Neerigen Street that may need lowering or realignment depending on the rail lowering footprint
- 3 phase overhead poles located near to the railway along Forrest Road which may require relocation (2 poles).

Western Power have recommended that a feasibility study be conducted once clarity on the changes to the rail corridor are known. This would provide report style commentary on required network upgrades and the infrastructure potentially impacted by the proposed lowering of the rail line. The process of requesting a Western Power feasibility study can be found here:

https://westernpower.com.au/services/feasibility-study/

It was identified that Western Power would require a design brief, as well as load increases and the timing of these increases in order to perform their study.

It is recommended that further input from specialist consultants be sought as the structure plan process progresses in relation to capacity assessments on existing lines and the program for undergrounding all power cables across the City Centre.

4 Gas

The gas network in the Activity Centre is owned by ATCO Gas Australia.

Figure 7 illustrates the critical gas distribution infrastructure within the site. The network is comprised of 50mm, 80mm, and 100mm diameter medium pressure PVC pipes, running in all streets and connecting to properties. There are also two high pressure mains in the area; a 150mm steel high pressure main running parallel to the railway along Wungong Road, Green Avenue, and Railway Avenue, as well as a 200mm steel high pressure main running along Armadale Road. For detailed DBYD plans illustrating assets within the project area belonging to ATCO Gas see **Appendix D**.

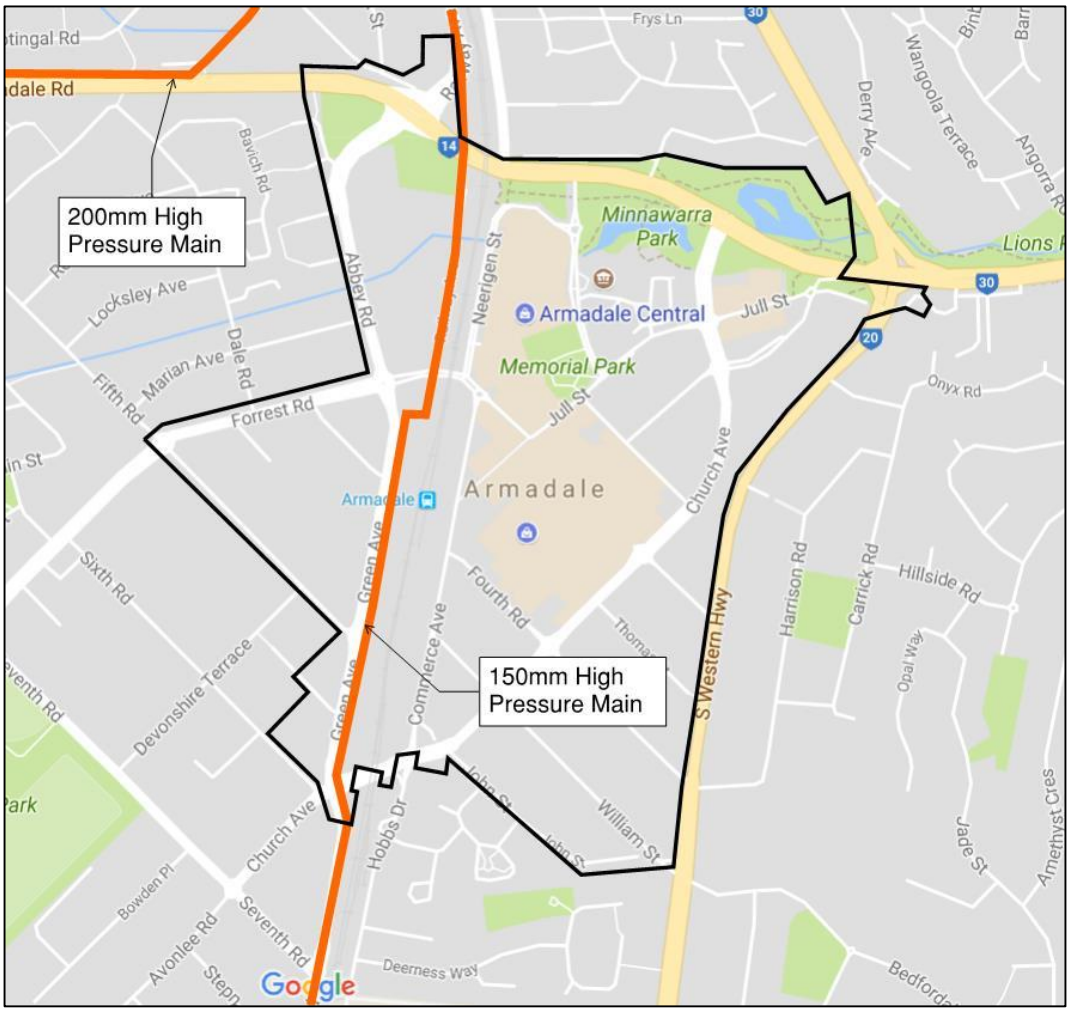


Figure 7 Critical ATCO Gas High Pressure Gas Infrastructure

ATCO Gas indicated that existing gas supply infrastructure will have sufficient capacity to service the proposed development, and at this stage of the Structure Plan process it is not expected that upgrades will be required. This has been based on the following assumptions:

- MP Metro 2027 modelling.
- 3,300 expected domestic connections.

- No gas intensive industry connections.

ATCO Gas has stated that they will require more complete information regarding the number of lots and individual connections for different land uses to assess detailed supply requirenments. It is recommended that ATCO Gas be contacted again for comments once more detailed post-development information is available.

Based on DBYD plans, and confirmed by ATCO Gas commentary, existing gas infrastructure that may be impacted by the proposed grade separation of the rail line includes:

- The 150mm steel main running along Railway Avenue and Wungong Road. This asset may require lowering/realignment depending on the rail lowering footprint
- The medium pressure 150mm PVC pipe which crosses the rail near Sixth Road.

5 Communications

Optus, Telstra, National Broadband Network (NBN), Directional Systems Australia, and Pipe Networks all operate communication infrastructure within the area.

The most significant communication networks in the area are as follows:

- The Telstra network comprising property connections and service ducts on all streets, as well as a number of large copper distribution cables.
- The Optus network comprising underground optic fibre cabling running parallel to the railway along Hobbs Drive, Commerce Avenue and Railway Avenue, as well as to the West along Sixth Road.
- The NBN network comprising property connections and service ducts on all streets ï it is understood that the program for disconnecting the Armadale area from old phone and internet connections is scheduled for February 2019.

Figure 8 illustrates critical Optus fibre optic telecommunications infrastructure within the Activity Centre boundary.

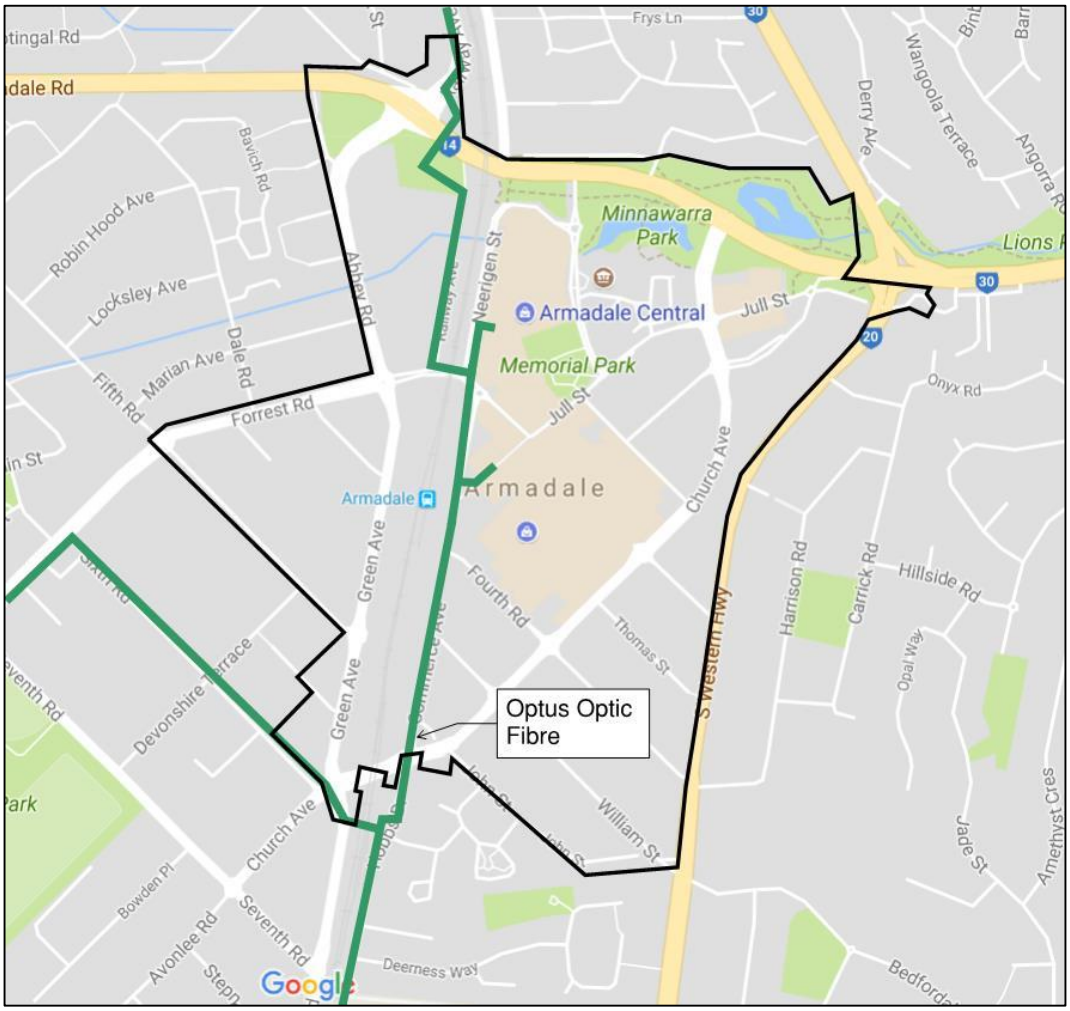


Figure 8 Critical Optus Optic Fibre

Copies of correspondence with the three service providers and detailed DBYD plans illustrating assets within the Activity Centre are provided within **Appendix E to Appendix G**.

5.1.1 Optus

Optus indicated that they do not have any plans to upgrade existing infrastructure within the project area. Additionally, Optus have stated that they do not provide service to residential customers except through the NBN, and any commercial customers will only be serviced on an ós needed basis.

Based on DBYD plans, and confirmed by Optus, existing Optus communications infrastructure that may be impacted by the proposed grade separation of the rail line includes:

- Optus optic fibre cables crossing the rail at Forrest Road and south of Church Avenue
- Optus optic fibre cable running along Commerce Avenue and Hobbs Drive that may require lowering/realignment depending on the rail lowering footprint.

Optus have also stated that, at rail crossings they are reliant upon Telstra leased ducts, and as such, any potential Optus relocation/lowering at rail crossings will be dependent on Telstraôs re-design in response to the lowering.

5.1.2 Telstra

The Telstra planning group have not provided feedback on whether their existing communication network will require an upgrade in order to service the proposed development. The Telstra Network Construction and Services group however were able to provide commentary on assets potentially impacted by the proposed rail lowering.

It is recommended that liaison with Telstra is reinstated once more detailed post-development yield information is available.

It should be noted that, in light of the NBN currently being legislated to service all developments greater than one hundred units, it may be inappropriate for Telstra to comment on how infrastructure would be provided to the Activity Centre.

Based on DBYD plans and confirmed by Telstra commentary, existing communications infrastructure that may be impacted by proposed grade separation of the rail line includes:

- Six 100mm PVC conduits crossing the rail at the intersection of Sixth Road and Coombe Avenue. These conduits contain Telstra, NBN, and Optus fibre optic cables, as well as large copper cables. After crossing the rail, the 100mm conduits run along Commerce Avenue and may require lowering/realignment depending on the rail lowering footprint.
- Up to four manholes crossing the rail at the intersection of Forrest Road and Third Road.

- Sixteen 100mm PVC conduits crossing the rail at the intersection of Forrest Road and Third Road. These conduits contain Telstra and Optus optic fibre cables, as well as up to ten very large copper mains cables. After crossing the rail the 100mm conduits run along Railway Avenue and may require lowering/realignment depending on the rail lowering footprint.

Telstra has commented that the abovementioned relocation works have the potential to become óvery large and time consumingô, and recommend that a design impact study be completed as early as possible.

6 Rail Lowering Impact Summary

Infrastructure that may be impacted by the proposed grade separation of the rail line has been summarised below. Critical and high-risk infrastructure that may be impacted by the proposed rail lowering is also summarised on C-SKE-001 located in **Appendix A**.

Water Corporation			
Asset	Asset Class	Location	Impact
1400mm Wungong transfer main	Potable Water	Parallel to the railway on Wungong Road and Green Avenue	Inhibit development on that side of the rail or require lowering/realignment depending on the rail lowering footprint
100mm steel water main	Potable Water	Forrest Road	Crosses the rail
230mm diameter VC sewer pipe	Sewer	North of Forrest Road	Crosses the rail
150mm diameter PVC-U sewer main	Sewer	North of Church Avenue	Crosses the rail
1800mm reinforced concrete Neerigen Brook main drain	Drainage	South of Armadale Road	Within the rail reserve and may inhibit development on that side of the rail or require lowering/realignment depending on the rail lowering footprint
Open channel reinforced concrete culverts ï Facilitate Neerigen Brook open channel rail crossing	Drainage	South of Armadale Road	Crosses the rail
ATCO Gas			
Asset	Asset Class	Location	Impact
High pressure 150mm steel main	Gas	Running along Railway Avenue and Wungong Road	May require lowering/realignment depending on the rail lowering footprint
Medium pressure 150mm PVC pipe	Gas	Near Sixth Road	Crosses the rail

Western Power			
Asset	Asset Class	Location	Impact
3 phase underground HV cables	Power	Church Avenue, Forrest Road, and Green Avenue	Crosses the rail
3 phase underground HV cables	Power	Running along Neerigen Street	May need lowering/realignment depending on the rail lowering footprint
3 phase overhead poles and cables	Power	Near to the railway along Forrest Road	May require relocation depending on the rail lowering footprint (2 poles)
Telstra & NBN			
Asset	Asset Class	Location	Impact
6x 100mm PVC conduits containing: 1x 120 Optic Fibre Cable 2x 60 Optic Fibre Cable Multiple Large Copper Cables 1x NBN Fibre Cable	Communications	Intersection of Sixth Road and Coombe Avenue	Crosses Rail
6x 100mm PVC conduits containing: 1x 120 Optic Fibre Cable 2x 60 Optic Fibre Cable Multiple Large Copper Cables 1x NBN Fibre Cable	Communications	Running Along Commerce Avenue	May require lowering/realignment depending on rail lowering footprint
4x Manholes	Communications	Forrest Road and Third Road Intersection	Within Rail Reserve
16x 100mm PVC conduits containing: 3x 312 Optic Fibre Cable 3x 120 Optic Fibre Cable 1x 90 Optic Fibre Cable 1x 10 Optic Fibre Cable 10x Very Large Copper Mains Cables	Communications	Forrest Road and Third Road Intersection	Crosses Rail
16x 100mm PVC conduits containing: 3x 312 Optic Fibre Cable 3x 120 Optic Fibre Cable 1x 90 Optic Fibre Cable 1x 10 Optic Fibre Cable 10x Very Large Copper Mains Cables	Communications	Running Along Railway Avenue	May require lowering/realignment depending on rail lowering footprint

Optus			
Asset	Asset Class	Location	Impact
Optus optic fibre cables 500m of 144 fibre cable and 500m of 36 fibre cable Crosses in Telstra leased duct	Communications	Forrest Road	Crosses the rail
Optus optic fibre cables 1km of 144 fibre cable Crosses in Telstra leased duct	Communications	South of Church Avenue	Crosses the rail
Optus optic fibre cables 1.7km of 144 fibre cable	Communications	Running along Commerce avenue and Hobbs Drive	May need lowering/realignment depending on the rail lowering footprint
Road Infrastructure (covered in more detail in the transport assessment)			
Asset	Asset Class	Location	Impact
Armadale Road Forrest Road / Third Road Church Avenue	Main Roads WA asset	Armadale Railway Line intersection	Road network crossing rail line

7 Next Steps

At this stage of planning only conceptual post-development yield data is available. As such, it is not possible to reasonably define whether the project areaôs existing infrastructure will require upgrades in order to service the proposed development.

It is recommended that formal feasibility and design impact studies be commissioned once more detailed post-development yield and service connection information is available. These studies will provide detailed commentary on required network upgrades as well as associated costs. Feasibility and design impact studies will be completed by appropriate service providers, and will likely incur a fee.

It is also recommended that a detailed design impact study be completed in order to assess the risks associated with the proposed grade separation of the rail corridor. This report has provided a high-level overview on utility infrastructure that may be impacted, however more thorough analysis will need to be conducted once the project enters more detailed planning stages.

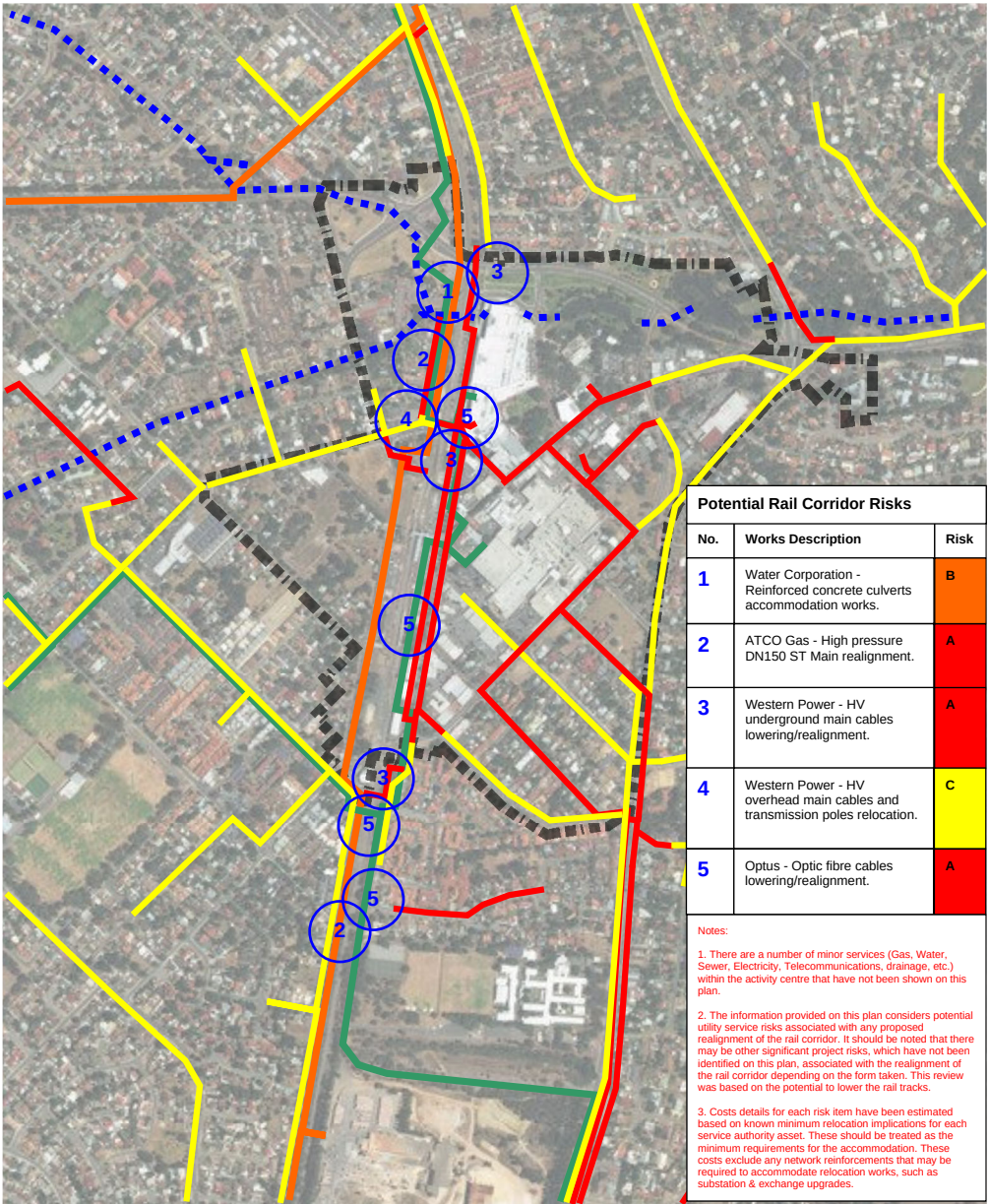
The Metronet Grade Separation project will be required to undertake design impact and risk analysis studies and there may be other significant project risks, which have not been identified by this report, associated with the grade separation of the rail corridor.

At a concept level, this study concludes that infrastructure redesign as a consequence of the proposed Armadale Activity Centre Structure Plan, may result in significant time and cost risk.

Appendix A

Critical Service Network and
Rail Lowering Impact Mark-up

A1



Potential Rail Corridor Risks

No.	Works Description	Risk
1	Water Corporation - Reinforced concrete culverts accommodation works.	B
2	ATCO Gas - High pressure DN150 ST Main realignment.	A
3	Western Power - HV underground main cables lowering/realignment.	A
4	Western Power - HV overhead main cables and transmission poles relocation.	C
5	Optus - Optic fibre cables lowering/realignment.	A

Notes:

1. There are a number of minor services (Gas, Water, Sewer, Electricity, Telecommunications, drainage, etc.) within the activity centre that have not been shown on this plan.

2. The information provided on this plan considers potential utility service risks associated with any proposed realignment of the rail corridor. It should be noted that there may be other significant project risks, which have not been identified on this plan, associated with the realignment of the rail corridor depending on the form taken. This review was based on the potential to lower the rail tracks.

3. Costs details for each risk item have been estimated based on known minimum relocation implications for each service authority asset. These should be treated as the minimum requirements for the accommodation. These costs exclude any network reinforcements that may be required to accommodate relocation works, such as substation & exchange upgrades.

Structure Plan Area

0 0.25 0.5 km

- Western Power HV - Overhead
- Western Power HV - Underground
- ATCO High Pressure Gas Main
- Optus Fibre Optic Cables
- Water Corporation Surface Water 'Open Channel'

Risk Category	Cost ($M)
A	>2
B	1-2
C	<1

ARUP

Date:	26/06/2017 Rev: A
Scale:	Indicated on Figure
Job Title:	Armadale Activity Centre
Job No:	253635
Dwg Title:	Service Network and Rail Lowering Impact Mark-up
Dwg No:	C-SKE-001

Appendix B

Water Corporation - DBYD and Record of Contact

B1

From: Brandon Rademeyer
Sent: Wednesday, 8 November 2017 11:31 AM
To: 'daniel.lawrence@watercorporation.com.au'
Subject: Armadale Activity Centre Structural Plan - Utility Assessment
Attachments: FW: Armadale Structure Plan/Water Corporation Asset Enquiry; Armadale Site Boundary.pdf; CoA_001.pdf

Hi Daniel,

Thank you for your time on the phone today. I have attached a site boundary to this email to lend further clarity to our conversation.

As discussed we do not have detailed yield/demand information for the site, however we do have the expected increase in floor space for different land uses ï This is summarised in the table below.

Land Use	Current (m^2)	Expected Full Build Out (m^2)	Expected 25 Year Build Out (m^2)	Percentage of Full Build-Out at 25 Years
Residential	20,060	453,462	226,731	50%
Retail	54,000	138,861	97,203	70%
Office	16,000	270,225	135,113	50%
Education	0	31,751	31,751	100%
Civic	0	28,466	28,466	100%
Grand Total	**90,060**	**1,030,409**	**573,086**	**55.6%**

As can be seen, the percentage of full build out over a 25 year horizon varies between land uses.

We would welcome any high level comments as to:

1) Whether the current **potable water** network within the study area will need an upgrade in order to service the increased demand of the new development ?

2) Whether the current **sewage** network within the study area will need an upgrade in order to service the increased demand of the new development ?

3) Whether the current **drainage** network within the study area will need an upgrade in order to service the increased demand of the new development ?

4) As discussed part of the project scope is also concerned with relocating the rail underground within the project area. We have received feedback from Russell Nelson regarding this and the email correspondence is attached for your reference. Potentially impacted assets are summarised below and if you have any additional high level comments please can you let me know?

Asset	Asset Class	Location	Impact

1400mm Wungong transfer main	Potable Water	Parallel to the railway on Wungong Road and Green Avenue	Inhibit development on that side of the rail or require diversion/lowering depending on the rail lowering footprint
100mm victuliac water main	Potable Water	Forrest Road	Crosses the rail
230mm diameter VC sewer pipe	Sewer	North of Forrest Road	Crosses the rail
150mm diameter PVC-U sewer main	Sewer	North of Church Avenue	Crosses the rail
1800mm reinforced concrete main drain	Drainage	South of Armadale Road	Within the rail reserve and may inhibit development on that side of the rail or require diversion/lowering depending on the rail lowering footprint
Open channel reinforced concrete culverts - Neerigen brook drain	Drainage	South of Armadale Road	Crossing the rail

Our current and unconfirmed recommendations in relation to the network are detailed below, I would be grateful if you could flag anything that is incorrect or in need of updating ?

Potable Water

The Armadale area is currently well serviced in terms of water supply due to the presence of the large 1400mm and 760mm mains in Wungong Road and South Western Highway respectively.

Due to the increase in population and land use density within the proposed developments there will likely be a requirement to increase the size of the mains in the existing water reticulation network (mains less than 300mm) in the area.

Sewer

The study area is serviced by the Woodman Point wastewater treatment plant and there are large sewer mains within the area.

It is expected that increase in size of sewer reticulation mains will be required due to the increase in population density. Further investigation on upgrades to reticulation mains is required and this may involve the installation of flow meters on the existing sewer mains to determine the existing flows in the system.

Many thanks for your assistance. Please let me know if you require any further clarification on the above.

Best regards,

Brandon Rademeyer
Graduate Engineer | Transport & Resources
Perth Foresight + Innovation Representative

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www.arup.com

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From: Russell Nelson <Russell.Nelson@watercorporation.com.au>
Sent: Wednesday, 16 August 2017 11:37 AM
To: Tim Sholer
Subject: FW: Armadale Structure Plan/Water Corporation Asset Enquiry

Tim,

John Davies has forwarded your request through to my group.

We look after any possible relocation or protection of assets.

In relation to the question, it is possible to relocate most of the water reticulation assets should the train line be lowered, there is one dn150 sewer crossing at the southern end that may be limited to how much diversion is possible due to maintaining the required clearances to PTA rail levels.

There is the large dn1400 Wungong transfer main located in Wungong Rd that may inhibit development that side of the rail line.

The Neerigen brook drain at the northern end will also be a potential constraint to the lowering as the top of the tunnel structure will need to be under the invert of the drain.

If the tunnel is kept to within the bounds of the current rail corridor the lateral clearances to existing mains will be adequate.

Reticulation sewers can potentially be located under buildings but this will need to be assessed on a case by case basis, reticulation water mains cannot be located in or under buildings and should be maintained within road reserves.

Following is link to the guidelines for working near our assets this covers many of the other questions you have raised. Each pipe is unique in terms of what may be required as is the type of proposals that we may see so it is not possible to provide a catch all comment at this stage.

https://www.watercorporation.com.au/-/media/files/builders-and-developers/working-near-assets/technical-guidelines-working-near-our-assets.pdf

Happy to catch up to discuss further if required.

Regards

Russell Nelson
Team Leader Headworks Delivery
Development Services

E: Russell.Nelson@watercorporation.com.au

T: (08) 9420 3361

A: 629 Newcastle Street,
Leederville, WA 6007

P: PO Box 100, Leederville, WA
6902

Keep in touch **W:**
watercorporation.com.au

Please consider the environment before printing this email.

From: Tim Sholer [mailto:Tim.Sholer@arup.com]
Sent: Thursday, 10 August 2017 4:45 PM
To: John Davies
Cc: Emma Forde
Subject: Armadale Structure Plan/Water Corporation Asset Enquiry

Hi John,

Thanks for your time earlier. As discussed, we are working with City of Armadale to regenerate the town centre. One of the aims for the redevelop is to provide better transport connectivity (east-west) and one option being considered is to lower the Perth-Armadale railway line and Armadale Station underground (i.e. tunnel a section of the line). This will allow better road traffic flow and potential to redevelop the land over the tunnelled section of rail line. The extent of the potential regeneration area is attached for information.

We would welcome any preliminary comments that Water Corporation may have for any existing assets that cross the Perth-Armadale railway line within the area clouded attached. If you could provide any preliminary comments or observations for the viability of the following;

1. diverting the existing assets to avoid conflicts with the rail tunnel;
2. prescribed proximity distances that the railway tunnel should be from the asset;
3. the viability of building over Water Corporation's assets within the area that the rail line is sunk below ground (i.e build offices/houses/shops etc);
4. any restrictions or proximity requirements to bet met if the development over the rail tunnel requires pilling works; and
5. any requirements to provide tunnels/access/venting to any of the existing Water Corporation assets with the above proposals in mind.

Kind Regards

Tim Sholer
Senior Civil Engineer | Transport & Resources (Civil Infrastructure)
MSc CEng MICE

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ARMADALE RD
ALBANY HWY
SOUTH WESTERN HWY
RAILWAY AV
STREICH AV
COMMERCE AV
CHURCH AV
WUNGONG RD
HOBBS DR
FORREST RD
SEVENTH RD
FIFTH RD
SIXTH RD
THIRD RD
FOURTH RD
JULL ST
ORCHARD AV
NEERIGEN ST
FRYS LANE
SHERBOURNE WAY
NETLEY PL
NEWTON CT
OWTRAM RD
FOUNTAINS CT
GLASTONBURY RD
BLYTHE PL
WESTMINSTER ST
FORDE PL
BRIAN ST
FRIAR RD
TUCK ST
CLARENCE
GLADSTONE ST
MCCORMACK ST
LITTLE JOHN RD
MCKEOWN ST
RUPERT
PEEL CT
LOWANNA WAY
ROBE
AGNEW PL
REDROSS
TOMAH RD
DOORIGO RD
WINDARRA WAY
IRONCAP PL
IVES PL
SCOTIA PL
WYLOO PL
KOOTINGAL
BURRAN CT
TAIT
TARRAWAN
COONONG PL
CUDAL PL
OLBAH PL
GRIBBLE AV
EDGEROI
ALLAWAH CT
SEXTY
COHUNA DR
HAYNES CT
TERRIGAL WAY
DALE AV
SHERIFF PL
SHERWOOD
BAVICH
CASTLE PL
ROBIN CT
RICHARD PL
FOREST CT
ABBEY
ROBIN HOOD
LOCKSLEY
MARIAN
PINE TREE CL
DEVEREUX
BENJAMIN
TREBY
ANKHAM
BROOKDALE DR
NATTAI CT
DAWSON ST
GREALIS ST
JAMES
BONNER LANE
TOWNSEND ST
EGAN ST
WERNDLEY
MCCARTHY
OSCAR ST
ANGELO ST
GERALD ST
TOWNLEY ST
RIGDEN
NEILSON
GRAFHAM
MORNINGTON
PELHAM
OFFORD
PIGOTT
SELBY
KAROONDA
BARELLAN CT
BOWDEN
AVONLEE
ANTON
SHANKS CT
MARDI CT
COWRA CT
LEWIS CT
CAMBELL
MORRELL
BRIGGS PL
DURI
TIJUANA
WEDGETAIL CT
BANDICOOT PL
EMU
PRICE CT
PROUT RD
POLLITT CL
BELL CT
MILL PL
DEVONSHIRE
CORALIE
STEPNEY
SELKIRK
CORNISH ST
TUDOR
GREEN
TCE
WILLIAM
JOHN
THOMAS ST
COOMBE AV
DEERNESS WAY
RICE PL
LENSHAM PL
TREDALE AV
BURNDALE RD
MARSH RD
HARRISON
CARRICK
AITKIN RD
PROSPECT RD
WHITEHEAD
SAW
HILLSIDE RD
JASPER PL
GARNET ST
EMERALD
OPAL WAY
JADE
AMETHYST CR
PETALITE PL
CRYSTAL CT
ONYX RD
SAPPHIRE CT
RUBY CT
BEDFORDALE HILL RD
TALUS DR
GOLD PL
COLYER RISE
SUMMIT VIEW
BILLING
TRITON CR
TOPAZ CT
COOLIBAH
MIRRIA WAY
ANGORRA RD
BINBURRA WAY
BARRANDUNA DR
BILKURRA WAY
KALOOMBA WAY
WANGOOLA
WYONG PL
MOLONG ST
CARRADINE
OPHELIA AV
ARMADALE THOMSONS LAKE MAIN
ARMADALE LHL TANK
LOT 100 ALBANY HWY ARMADALE JOB1
SEE FILE JT1 2006 02567 VO1
SEE FILE JT1 2006 05733 VO1
SEE FILE JT1 2006 07797 VO1
SEE FILE 2001 00740
SEE FILE 31284 TMP
REFER JT1 2005 11154 VO1
SEE JT1 2006 12478 VO1 FOR LPS PLANNING
SECTION 70A FOR A NON-STANDARD CONNECTION. REFER PROJECT OFFICER X2097
REFER FILE D34767
SEE H/F (FOLIO 31)
DRAIN
ENLARGEMENT

Screen bg34/22.02 ARMADALE Date Printed: 07/03/17 13:14:28 Coordinate System: MGA94 Zone 50 Height Datum: AHD

Plan legend information

This legend is provided to Dial Before You Dig users to assist with interpreting Water Corporation plans.
WARNING - Plans may not show all pipes or associated equipment at a site, or their accurate location. Pothole by hand to verify asset location before using powered machinery.

Water Plan Symbols - Blue

PIPELINES

Critical pipeline (thick line)

Extra caution required. Pipe may not be labelled. Risk assessment may be required if working near this pipe. Refer to your Dial Before You Dig information or **131375**.

CANNING TRUNK MAIN

ELLENBROOK DISTRIBUTION MAIN

100P-12

GWELUP BORE MAIN

DEAD MAIN

MAIN NOT IN USE

PROPOSED MAIN

Pipes are not always labelled on plans as shown here – assume a pipe is significant and pothole to prove location and depth.

Common pipe material abbreviations

AC	Asbestos Cement
ACL	Asbestos Cement Concrete Lined
BI	Black Iron
CI	Cast Iron
CU	Copper
DI	Ductile iron
GRP	Glass reinforced plastic
GS	Galvanised steel
GWI	Galvanised wrought iron
HDPE	High density polyethylene; pipe class may also be shown
MDPE	Medium density polyethylene; pipe class may be shown
P	PVC - class will be shown following pipe material (e.g.100P-12)
RC	Reinforced concrete
S	Steel - plate thickness and joint type may be shown after pipe type
SI	Spun iron
SUTT	Sutton
TUNN	Tunnel
VC	Vitrified clay
VIC	Victualic; steel pipe using special coupling

OTHER PIPELINE REFERENCES

MWA12345 or PWD12345 or CK43

42665 -145

(3.0)

Planset numbers (Water Corporation internal use.)

Field book reference (Water Corporation internal use.)

Some pipes may be on a non-standard alignment. i.e. An alignment other than 2.1m for reticulation mains and 4.5m for distribution mains.

Shaded background indicates a Water Corporation internal reference to more detailed information.

CONCRETE ENCASEMENT AND SLEEVES

CONC ENC

100S SL

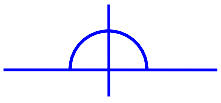
ENC	Encasement	DI	Ductile Iron
SL	Sleeve	GWI	Galvanised Wrought Iron
AC	Asbestos Cement	RC	Reinforced Concrete
CI	Cast Iron	S	Steel (e.g. 100S as shown)

CHANGE INDICATOR ARROW

150P 150AC

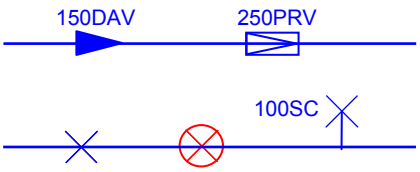
Indicates a change in pipe type or size.
Example: 150mm diameter PVC to 150mm diameter asbestos cement.

PIPE OVERPASS

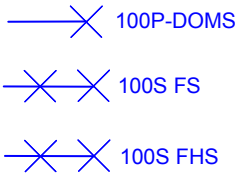


The overpass symbol indicates the shallower of the two pipes.

Water Plan Symbols - Blue

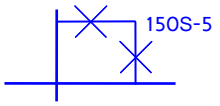


VALVE
Different symbols indicate different valve types. Many different valves types are in use. Valves may be labelled (e.g. 250PRV, 100BV, R)
From the left: DAV-Double air valve, PRV-Pressure Reducing Valve, SC-Scour valve
Valves may be shallower than the main or offset from it. e.g. A scour valve (SC) may have a pipe coming away from main pipeline on the opposite side to that indicated on the plan.



DOMS domestic service
FS Fire service
FHS Fire hydrant service

A hydrant may be visible external to the building. Even if not visible a substantial fire service may still be present.



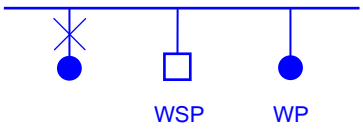
PIPE BYPASS
Bypass will not be on the same alignment as the main pipeline.

DEADPLATE

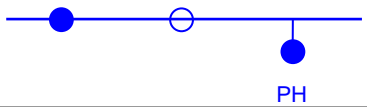
CATHODIC PROTECTION FITTINGS
Cathodic protection (CP) systems protect pipelines from corrosion by application of an electric current. Buried CP equipment may be located some distance from the pipeline being protected connected together by buried electric cable. All fittings may not be visible.
A buried anode – various sizes and configurations
TP test point - may be visible on a post or in-ground
TR transformer rectifier

ACCESS TEE OR MANHOLE OR SERVICE ACCESS PIT
Below ground. May not be any visible signs at ground level or may be located in a pit.
WARNING: Opening any manhole or pit is dangerous and is prohibited.

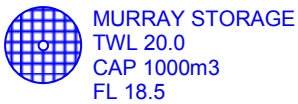
FLOWMETER
Various types of flow meters located in a pit. May be labelled with identifier. (e.g. 50 MFM, 50MM)



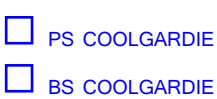
STANDPIPE
WATER SAMPLING POINT (WSP)
WATER SUPPLY POINT (WP)
May be located adjacent to mains. Usually some visible location.



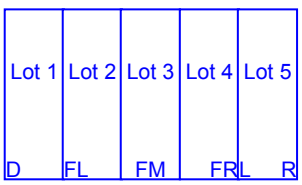
HYDRANT
HYDRANT TEE
PILLAR HYDRANT



TANKS AND RESERVOIRS
May have data shown:
TWL Top Water Level
CAP Capacity (cubic metres)
FL Floor level



WATER PUMP STATION
Water booster station
Name and number may be displayed.



PRE-LAID SERVICES
Code indicates which side of a lot the water service is located:
D Deferred
FL Fully Prelaid Left
FM Fully Prelaid Front Middle
FR Fully Prelaid Right
L Left
R Right

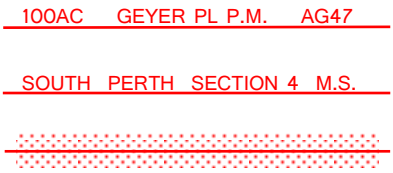
Code indicates on which side of a lot the water service is located:

May be no visible indication at site.

Sewer Plan Symbols - Red

CRITICAL PIPELINE (THICK LINE)

Extra caution required. Pipe may not be labelled. Risk assessment may be required if working near this pipe. Refer to Dial Before You Dig information or **131375**.



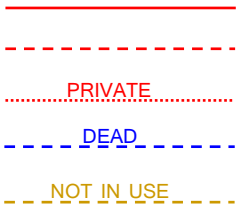
PRESSURE MAINS AND MAIN SEWERS

Sewerage gravitates to pump stations and then is pumped in a pressure main to a main sewer or wastewater treatment plant.

Size & material – name of pressure main – planset number

P.M. Pressure Main
M.S. Main Sewer

Shaded background indicates an internal Water Corporation reference to more detailed information.



PIPE

Actual pipe in use

Proposed or unavailable for release

Private pressure main

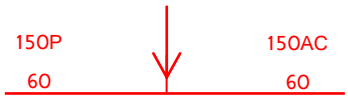
Dead

Not in use (may be used in future)

Pipe material

AC	asbestos cement
AC P	asbestos cement lined with UPVC pipe
BK	brick conduit
CI	cast iron
CI P	cast iron lined with UPVC pipe
DI	ductile iron
GRP	glass reinforced plastic centrifugally cast (HOBAS)
GRP/FW	glass reinforced plastic filament wound
HDPE	high density polyethylene or PE100 plain walled
HDPE/PW	high density polyethylene or PE100 profile walled
MDPE	medium density polyethylene or PE80 plain walled
P	unplasticised polyvinyl chloride (UPVC)
P/FRP	PVC lined with fibre reinforced plastic- enviroliner
P/PW	UPVC profile walled
PF	pitch fibre
RA	resin aggregate
RC	reinforced concrete
RC/FRP	reinforced concrete lined with fibre reinf plastic enviroliner
RC/S	reinforced concrete segments
RC/S_GRP	RC segments lined with glass reinf. plastic pipe or liner
RCPL	RC pipe lined with keyed plasticised PVC sheeting
RC_CIPL	reinforced concrete with cured in place liner
RC_FPVC	reinf. concrete lined with shapes formed from rigid UPVC sheeting
RC_G	reinf. concrete with sprayed on cement or gunite lining
RC_GRP	reinforced concrete lined with glass reinforced plastic pipe
RC_HDPE	reinf. concrete lined with high density polyethylene pipe
RC_P	reinforced concrete lined with UPVC pipe
RC_P/SW	reinforced concrete lined with spirally wound UPVC pipe
RC_RC	reinf. concrete lined with another reinforced concrete pipe
RC_RCPL	RC pipe lined with another RC pipe lined with keyed plasticised PVC sheeting
S	mild steel cement lined
SU	steel usually unlined and not coated
S_SL	steel with a fusion bonded polyethylene internal lining
VC	vitrified clay
VC/FRP	vitrified clay lined with fibre reinforced plastic- enviroliner
VC_HDPE	vitrified clay lined with high density polyethylene pipe
VC_P	vitrified clay lined with UPVC pipe
VC_P/SW	vitrified clay lined with spirally wound UPVC pipe

Pipe types of steel (S) and glass reinforced plastic (GRP) display an outside diameter with the nominal pipe size and type.



CHANGE INDICATOR ARROW

Only used on pressure mains. Indicates a change in pipe size, grade, joint or bedding.

VALVE

Many different valve types are in use. Valve may be in a pit or have a visible valve cover. There may be no surface indication. May be labelled (e.g. SAV, RV, SV)
Valves may be shallower than the main or offset from it. e.g. A scour valve (SC) may have a pipe coming away from main pipeline on the opposite side to that indicated on the plan.

PIPE OVERPASS

When two pipes cross, the shallower of the two pipes has an overpass symbol attached.

WASTEWATER ACCESS CHAMBERS (MANHOLES)

--	Manhole (shown not labelled)
--	Tee or maintenance shaft (shown not labelled)
MS	maintenance shaft (labelled)

HAZARDOUS MANHOLE

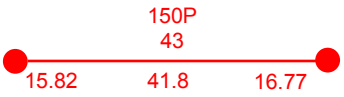
Indicates a potential health hazard from risk of exposure to toxic waste.
NOTE: Opening any manhole is dangerous and is prohibited.

Sewer Plan Symbols - Red

MANHOLE INFORMATION BOX
Square - nontrafficable (Do not drive vehicles or place loads.)
Round - trafficable
Lid level (reduced level)
Access chamber no.
Alignment
Offset

A - along, the distance along a boundary from an intersection of boundaries. This will be a first distance only. (e.g. 7.0 ASE: 7m along boundary SE direction)

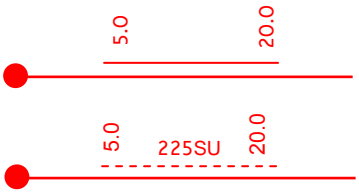
F - from, the distance at right angles from a boundary. This will be the second distance, but may be the first as well. (e.g. 2m from boundary SW direction.)



GRAVITY PIPE

size / material grade

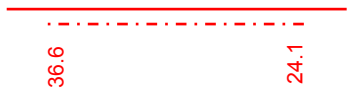
downstream invert level of manhole	*Length between centres of manholes*	*upstream invert level of manhole*



CONCRETE ENCASEMENT OR SLEEVE

Upstream distances indicated from sewer manhole.

Sleeve: Sleeve size and material type shown. (e.g. 225SU)

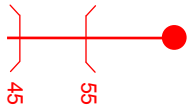


UNDERPINNING
Underpinning supports nearby foundations which have potential to be affected by excavation.

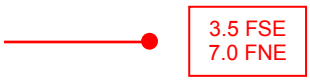
PUMP STATION
Wastewater pressure main will be in the vicinity.

CATHODIC PROTECTION
Cathodic protection (CP) systems protect pipelines from corrosion by application of an electric current. Buried CP equipment may be located some distance from the pipeline being protected connected together by buried electric cable. All CP fittings may not be visible.

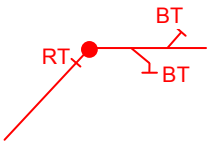
A	buried anode – various sizes and configurations
TP	test point - may be visible on a post or in-ground
TR	transformer rectifier



TUNNEL
As indicated with square brackets facing towards the tunnel with both distances from downstream manhole displayed.

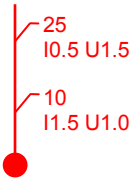


INSPECTION OPENING
Screw capped end of a gravity pipe running from a sewer manhole.
Placed at the end (usually upstream) of pipes. Information box displays tie distances and directions. (See manholes)



TRAP
A trap is used to minimise gas build up and odour in house connection lines.

BT	boundary trap on connection
BTR	boundary trap required on connection
RT	running trap on a pipe
RF	rubber flap on a manhole
RV	property, backflow device, shown as reflux valve on connection



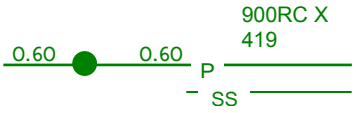
PROPERTY CONNECTION

I	In-distance towards the property at right angles from the pipe. Only shown when 0.5 or more.
U	Up-distance the connection is brought up to bring it to within 1.5 of the surface

Drainage Plan Symbols - Green

GENERIC PIPE LINE

Extra caution required Pipe may not be labelled. Risk assessment may be required if working near this pipe. Refer to Dial Before You Dig information or **131375**.



STORMWATER PIPE

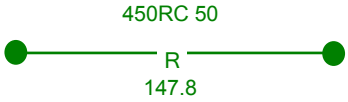
P Branch or main drain
SS Subsoil drain

Information displayed: type, upstream and downstream invert levels, length, nominal pipe size. Other info may also be displayed.

OPEN CHANNEL

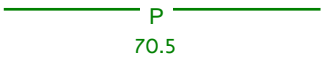
OA	Landscaped
OE	Normal Open Earth
OF	Open channel with flood levee
OH	Half Pipe
OL	Lined Channel
OS	Swale-Shallow Depression
OW	Natural Water Course

Drainage structures even if dry must be kept clear of any obstruction such as sand stockpiles.



RISING MAIN

Letter 'R' displayed on pipe between pump station and access chamber. (e.g. 450mm diam reinforced concrete)

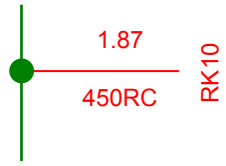


Material abbreviations

A	Asbestos	HCAL	Hel-Cor Aluminium
AC	Asbestos cement	HCMS	Hel-Cor Galvanised Mild Steel
BK	Brick	MS	Mass Concrete
CI	Cast Iron	MSCL	Mild Steel Cement Lined
CM	Concrete Monier	MF	Geofabrics-Megaflo
CTL	Concrete tunnel	P	Polyvinyl Chloride
CV	Concrete Voussoirs	POLY	Polyethylene
DI	Ductile Iron	RC	Reinforced Conc (e.g. 900RC)
ECC	Enclosed Conc Channel	RCBC	Reinforced Conc Box Culvert
ECCB	Enclosed Conc Channel	S	Steel
Bridge		VC	Vitrified Clay
FRC	Fibre Reinforced Concrete	W	Wood
GB	Glazed Brick		
GRP	Glass Reinforced Plastic		

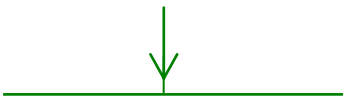
SHADED BACKGROUND

Shaded background around a pipe indicates an internal reference to more detailed information.



CONNECTION

Local authority or private connection (orange). Pipe size, type and invert level shown. Identifier may be shown.



CHANGE INDICATOR

Indicates a change in pipe size, grade, joint or bedding

VALVES

Different valve types indicated. May be also be labelled (e.g. 100SAV, 100SC, 100BV)

Valves may be shallower than the main or offset from it. Valve may be in a pit or have a cover which is visible or there may not be any surface indication.

PIPE OVERPASS

The overpass symbol indicates the shallower of the two pipes.

Drainage Plan Symbols - Green

ACCESS CHAMBER OR MANHOLE
An access point to drainage pipes.

Square non-trafficable
Round trafficable

Access chamber no — *e.g. A021*

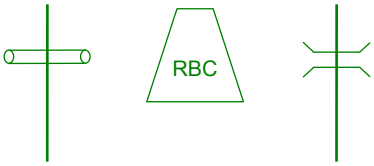
Type
- WI well liner
- PS pipe segment
- BK brick (See example)
- RC reinforced concrete
- MC mass concrete

Lid level (reduced level) — e.g. 30.69

Alignment — F - From, the distance at right angles from a boundary. This will be the second distance, but may be the first as well. (e.g. 3.3 FSW: 3.3 m from boundary in SW direction)

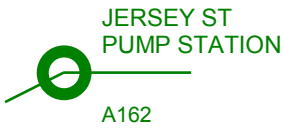
Offset — A - Along, the distance along a boundary from an intersection of boundaries. This will be a first distance only. (e.g. 19.0 ASE: 3.3 m along boundary in SE direction)

DRAIN CROSSING



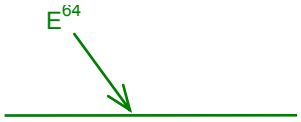
A drain crossing which is a pipe or series of pipes.
- BPC bank access culvert
- OBC occupational box culvert
- OPC occupational culvert
- RBC road box culvert
- RPC road culvert
- SYP syphon

PUMP STATION



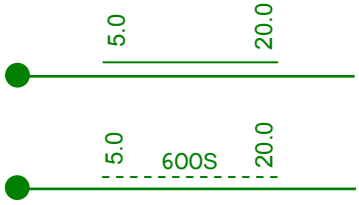
Pump station name, number and planset number.

DRAIN FITTINGS



Represented by a letter and identification number.
- E extraction point
- F continuously logged flow station
- G groundwater monitoring site
- I industrial waste discharge
- M maximum height indicator
- Q water quality-sampling site
- R continuously logged rain gauge

CONCRETE ENCASEMENT OR SLEEVE



Concrete encasement or sleeve provides increased protection. Upstream distances are indicated from the manhole.

Sleeve size and material type shown. e.g. 600S = 600mm diam steel

CATHODIC PROTECTION

Buried CP equipment may be located some distance from the pipeline being protected interconnected by buried cable. All CP fittings may not be visible.
- A buried anode – various sizes and configurations
- TP test point (may be visible on a post or in-ground)
- TR transformer rectifier

Appendix C

Western Power - DBYD

C1

Explanation of Map Symbols

ROAD AND RAIL INFORMATION

Freeway — KWINANA FWY

Primary Road — FORREST RD

Secondary Road — NICHOLSON RD

Minor Arterial Road — Sealed WALNUT RD; Unsealed APPLE ST

Minor Road, (with Terminating Road Dot) — MANUS PL; GUNJIN RD

Tracks — OXLEY TRK

Laneway, Mall, Arcade (restricted vehicular access) — His Majestys L; Plaza Arcade

Proposed Road — LANDER ST

Route Markers

- 94 National Highway: A road providing a direct link between capital cities
- 14 State Route: An urban or inter regional route
- 1 National Route: A road of National significance
- 205 State Tourist Route: A scenic or historic drive

Road Bridges, Footbridges

Traffic Lights - Audible/tactile pedestrian facility (not necessarily all crossings at intersection)
No audible/tactile pedestrian facility (may have other pedestrian facility)

Traffic Direction Arrow, Underpass, Entrance / Exit Arrow, Roundabout, House Numbers — 53; 62

Railway Line, Crossing, Bridge Station with distance from Perth — Maylands 4 km

Shared Path

Bicycle Path, Walk Trail, Horse Trail

Dampier to Bunbury Natural Gas Pipeline (DBNGP) Corridor (Approx position)

Note: additional pipelines exist outside the DBNGP corridor shown in this publication. For the location of pipelines & services **ALWAYS** contact **Dial Before You Dig** on **1100**.

BOUNDARIES

Locality Boundary with Name and Postcode — BELDON 6027

Local Government Boundary — City of Swan

Emergency Services Levy Boundary — Category 2 ESL Boundary

Channel Boundary and Markers

Water Skiing Area, PWC (Jetski) Area — PWC (JetSki) Area

National Park, Marine Park

DEC Restricted Access (forest quarantine) — DISEASE RISK AREA

Landmark Feature — quarry; wastewater treatment

WATER FEATURES

Watercourse — Perennial; Non-Perennial

Lakes

Swamp

LAND AND VEGETATION INFORMATION

Bushland

Forest Estate

Industrial / Commercial Area

Orchard or Vineyard

Park / Reserve / Recreation with Prepared Grass Area

Pine Plantation

Residential Area

Shopping Centre

SYMBOLS

- Access for the Disabled
- Car Park
- CHC Child Health Centre
- FS Fire Station
- Hospital
- Patrolled Beach
- Picnic Area
- Pol Police Station
- Post Office / Agency
- Post Box (CBD Enlargements)
- K Pre-Primary Centre (Off-Site)
- Public Toilets
- Sports Centre
- SES State Emergency Service
- Telephone (Public)
- Telephone (Emergency)

Fuel:

- Petrol / Autogas
- Petrol (no autogas)
- Marine

Places of Worship:

- Church
- Mosque
- Synagogue

TO FIND A STREET

The *Index to Street Names* section (page 329) contains an alphabetical list of the road names located on the maps and enlargements within this publication.

The STREET NAME appears in heavy type and the abbreviated ROAD TYPE, for example St, Rd, Cl, appears immediately below. An abbreviated road type may be omitted from the map if there is insufficient room to show it clearly. A complete list of road types and their abbreviations is provided on pages 518-519.

To the right of the abbreviation is the LOCALITY. Following this is the MAP NUMBER and alphanumeric MAP REFERENCE.

BOYD			
Cl	Sth Guildford 346	A	1
Cr	Hamilton Hill 460	D	1
Ct	Padbury 250	D	10
Pl	Canning Vale 434	C	9
St	Palmyra 431	B	1
BOYDELL			
Rd	Kenwick 435	D	2

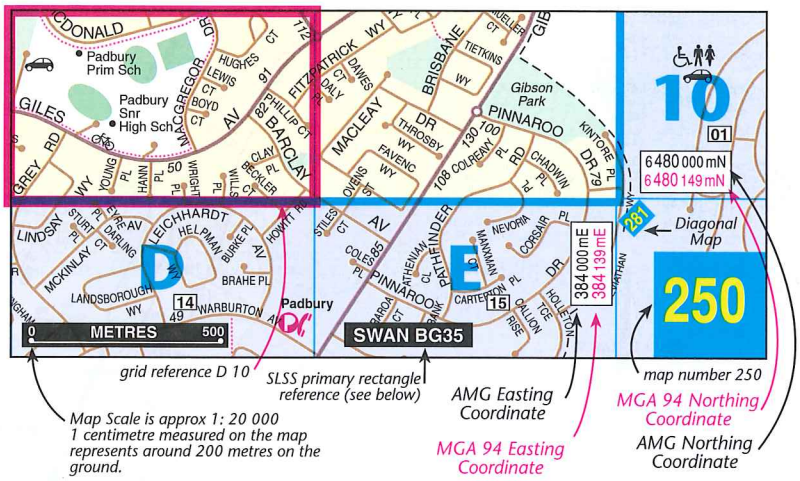
EXAMPLE

To locate Boyd Court in the locality of Padbury:

Step 1: Look up the street name and suburb in the Index to Street Names section (page 329).

Step 2: Take note of the map number and grid reference.

Step 3: Turn to Map 250. Look up from the letter D and across from number 10. Boyd Court will be found in the rectangle formed by this map reference.



THE STREET DIRECTORY AS AN INDEX TO THE STATE LARGE SCALE SERIES

The map referencing system used in this publication conforms to the 1:1000 sheet lines of the State Large Scale Mapping Series (SLSS). The small black numbers located within boxes in the map overlap region refer to the east and north map references within this system. The 1:1000 map sheet of any grid square can be identified by quoting the Primary Rectangle reference, located in the bottom overlap and then the east (bottom overlap) and north (side overlap) map references (eg. Swan BG35 14.01)

Note: The maps of Rottnest Island conform to the 1:2000 sheet lines of the State Large Scale Mapping Series.

MAP COORDINATES - AUSTRALIAN MAP GRID (AMG) and MAP GRID of AUSTRALIA (MGA94)

The black coordinates located at the corners of each map refer to the Australian Map Grid (AGD84).

The pink coordinates located at the corners of each map refer to the Map Grid of Australia, Geocentric Datum of Australia (GDA94). The coordinates on the Regional Centres maps refer to the Map Grid of Australia (MGA94). For more information about GDA94 please refer to: http://www.landgate.wa.gov.au/corporate.nsf/web/Geodetic+Data

STREETSMART®

Unless otherwise indicated, Grid North is towards the top of the page.

westernpower

Arup Pty Ltd

3/03/2017

Legend

- Recloser
- Distribution Transformer
- Distribution Transformer
- Auto Transformer
- Isolating Tranformer
- Regulating Transformer
- Power Transformer
- Sectionaliser
- Circuit Breaker
- Load Break Switch
- Drop Out Fuse
- Fuse Switch
- Fuse Disconnector
- Disconnector OH
- Pole Top Switch
- Disconnector
- Disconnector UG
- Non Load Break Connector
- Circuit Breaker Disconnector
- Metal Pole
- Aus Pole
- Concrete Pole
- Lamp Standard Pole
- Wood Pole
- Unknown Pole type
- HV Three Phase
- HV Three Phase - Underground
- HV Single Phase
- HV Singe Phase - Underground
- LV - Overhead
- LV - Underground
- Street Light - Overhead
- Street Light - Underground
- Customer Service Line

N

0 50 100 200

Meters

Latitude and Longitude based on Geocentric Datum of Australia 1994

PRODUCED BY
ENHANCED INFORMATION SERVICES TEAM,
WESTERN POWER
363 WELLINGTON STREET PERTH WA 6000

Appendix D

ATCO Gas - DBYD and Record of Contact

D1

From: Gray, Jamali <Jamali.Gray@atcogas.com.au>
Sent: Tuesday, 21 November 2017 1:46 PM
To: Brandon Rademeyer
Subject: RE: ES20171149 RE: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Brandon,

In regards to checking the capacity of the existing MP network at Armadale for future connection. By using the following assumptions:

- MP Metro 2027 model.
- Expected total domestic connection is 3300 customers.

Results:
The existing network has the capacity to supply the expected domestic customers.

If you require additional information feel free to contact me.

Regards,
Jamali Gray
Project Coordinator
ATCO Gas AUSTRALIA | Connecting WA to natural gas
www.atcogas.com.au
81 Prinsep Road, Jandakot, Western Australia, 6164
Ph: 6163 5148 Mobile: 0477740106

From: Brandon Rademeyer [mailto:Brandon.Rademeyer@arup.com]
Sent: Thursday, 16 November 2017 11:02 AM
To: Gray, Jamali
Subject: RE: ES20171149 RE: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Jamali,

I have received a response from the structural plan team, and at this stage of design they are unable to provide an estimate of how many new lots or individual connections will be required by the development.

Are you able to provide very high level comments on whether the current gas network will need an upgrade based only on increased floor space quantities for different land use areas ?

Thanks again for your help,

Brandon Rademeyer
Engineer | Transport & Resources

Perth Foresight + Innovation Representative

Arup
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PO Box 5750, St Georges Tce WA 6831
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www.arup.com

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From: Brandon Rademeyer
Sent: Monday, 13 November 2017 9:13 AM
To: 'Gray, Jamali'
Subject: RE: ES20171149 RE: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Jamali,

Thank you very much for your reply and apologies for my slow response.

Thank you also for your confirmation of my original assumptions.

In terms of providing you with a rough estimate of how many new lots or individual connections will be created, I will need to check this with the structural plan team and get back to you.

I will contact you as soon as I have an estimate of the numbers.

Thank you again for your help.

Best regards,

Brandon Rademeyer
Graduate Engineer | Transport & Resources
Perth Foresight + Innovation Representative

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t: +61 8 9327 8300 d: +61 8 9327 8332
www.arup.com

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From: Gray, Jamali [mailto:Jamali.Gray@atcogas.com.au]
Sent: Friday, 10 November 2017 11:51 AM
To: Brandon Rademeyer
Subject: ES20171149 RE: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Brandon,

Your initial assumptions on the impacted gas network caused by the underground rail are correct:

- Estimated timeframe for these lowering/diversion works would be 24-36 months with a cost in the order of >2m dollars.

In regards to the existing gas network being able to support the increase in customers:

- Do you have a rough estimate of how many new lots or individual connections will be created by the development?

This information will help model the additional loads on our network and design any additional capacity required.

Regards,

Jamali Gray
Project Coordinator
ATCO Gas AUSTRALIA | Connecting WA to natural gas
www.atcogas.com.au
81 Prinsep Road, Jandakot, Western Australia, 6164
Ph: 6163 5148 Mobile: 0477740106

From: Brandon Rademeyer [mailto:Brandon.Rademeyer@arup.com]
Sent: Wednesday, 8 November 2017 10:01 AM
To: Kholosy, Amr
Subject: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Amr,

Thank you for your time on the phone today. I have attached a site boundary to this email to lend further clarity to our conversation.

As discussed we do not have detailed yield/demand information for the site, however we do have the expected increase in floor space for different land uses – This is summarised in the table below.

Land Use	Current (m^2)	Expected Full Build Out (m^2)	Expected 25 Year Build Out (m^2)	Percentage of Full Build-Out at 25 Years
Residential	20,060	453,462	226,731	50%
Retail	54,000	138,861	97,203	70%
Office	16,000	270,225	135,113	50%
Education	0	31,751	31,751	100%
Civic	0	28,466	28,466	100%

Grand Total	**90,060**	**1,030,409**	**573,086**	**55.6%**

As can be seen, the percentage of full build out over a 25 year horizon varies between land uses.

We would welcome any high level comments as to:

1) Whether the current **gas** network within the study area will need an upgrade in order to service the increased demand of the new development ?

2) As discussed part of the project scope is also concerned with relocating the rail underground within the project area. Potentially impacted assets are summarised below, and if you have any additional high level comments please can you let me know?

Asset	**Asset Class**	**Location**	**Impact**
High pressure 150mm steel main	Gas	Running along Railway Avenue and Wungong Road	May require lowering/realignment depending on the rail lowering footprint
Medium pressure 150mm PVC pipe	Gas	Near Sixth Road	Crosses the rail

3) Our current recommendations in relation to the gas network are detailed below and I would be grateful if you could flag anything that is incorrect or in need of updating ?

Gas Network:
Existing gas infrastructure that may be impacted by this project's scope includes, the 150mm steel main running along Railway Avenue and Wungong Road which may require lowering/realignment depending on the rail lowering footprint, as well as a medium pressure 150mm PVC pipe which crosses the rail near Sixth Road. It is estimated that the timeframe for these lowering/diversion works would be 24-36 months with a cost in the order of >2m dollars.

Many thanks for your assistance. Please let me know if you require any further clarification on the above.

Best regards,

Brandon Rademeyer
Graduate Engineer | Transport & Resources
Perth Foresight + Innovation Representative

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Level 14 Exchange Tower 2 The Esplanade Perth WA Australia 6000
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Armadale
Large Scale

ATCO Gas AUSTRALIA

Date: 3/03/2017	Scale: 1:3,000	Plot Size A1
Draftsperson: dsaw	Datum: GDA94	

WARNING BEWARE: The location of pipes and services are approximate only,and show an indicative posistion at time of construction. No guarantee can be given to the accuracy or completeness of information due to the age of some pipes and records. Refer to "Occupational Safety & Health" Regulation and Utility Providers "Code of Practice" for further useful information.

Appendix E

Optus - DBYD and Record of Contact

E1

From: Ray Azzopardi <Ray.Azzopardi@optus.com.au>
Sent: Tuesday, 21 November 2017 3:17 PM
To: Brandon Rademeyer
Cc: Cam Brennan; Mark Roberts
Subject: FW: Armadale Activity Centre Structural Plan - Utility Assessment
Attachments: Armadale Site Boundary.pdf; CoA_001.pdf

Hi Brandon,

I have had a quick at the area in question and can offer the following (in red):

1) Whether the current **Optus** network within the study area will need an upgrade in order to service the increased demand of the new development ?
   a. Optus currently does not have any plans for an upgrade of the current infrastructure within the specified area. Optus does not service residential customers except through the NBN. Any commercial customers will be built on an "as needed" basis.

2) As discussed part of the project scope is also concerned with relocating the rail underground within the project area. Potentially impacted assets are summarised below, if you have any additional high level comments please can you let me know?

Asset	Asset Class	Location	Impact	
Optus optic fibre cables	Telecommunications	Forrest Road	Crossing the rail	500m of 144 fibre cable and 500m of 36 fibre cable Crosses in Telstra leased duct. Will require relocation with Telstra. Final design will be dependent upon Telstra's final design as Optus will re-lease duct in the new Telstra crossing.
Optus optic fibre cables	Telecommunications	South of Church Avenue	Crossing the rail	1km of 144 fibre cable Crosses in Telstra leased duct. Will require relocation with Telstra. Final design will be dependent upon Telstra's final design as Optus will re-lease duct in the new Telstra crossing.
Optus optic fibre cables	Telecommunications	Running along Commerce avenue and Hobbs Drive	May require lowering/realignment depending on the rail lowering footprint.	1.7km of 144 fibre cable. Relocation or lowering/protection will be dependent upon rail lowering footprint.

Apart from the above, I cannot offer too much more information. The information you have provided regarding the existing Optus infrastructure appears to be correct. As stated in the table, Optus is reliant upon Telstra leased duct for the rail crossings.

Regards,

Ray Azzopardi
Team Leader | Networks
08 6188 5003
Lot 4, Altone Rd, Lockridge WA 6054 Australia
Ray.Azzopardi@optus.com.au

OPTUS

Follow us

From: Brandon Rademeyer [mailto:Brandon.Rademeyer@arup.com]
Sent: Wednesday, 8 November 2017 9:58 AM
To: Ray Azzopardi <Ray.Azzopardi@optus.com.au>; Ray.Azzapardi@optus.com.au
Subject: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Ray,

Thank you for your time on the phone today. I have attached a site boundary to this email to lend further clarity to our conversation.

As discussed we do not have detailed yield/demand information for the site, however we do have the expected increase in floor space for different land uses – This is summarised in the table below.

Land Use	Current (m^2)	Expected Full Build Out (m^2)	Expected 25 Year Build Out (m^2)	Percentage of Full Build-Out at 25 Years
Residential	20,060	453,462	226,731	50%
Retail	54,000	138,861	97,203	70%
Office	16,000	270,225	135,113	50%
Education	0	31,751	31,751	100%
Civic	0	28,466	28,466	100%
Grand Total	**90,060**	**1,030,409**	**573,086**	**55.6%**

As can be seen, the percentage of full build out over a 25 year horizon varies between land uses.

We would welcome any high level comments as to:

1) Whether the current **Optus** network within the study area will need an upgrade in order to service the increased demand of the new development ?

2) As discussed part of the project scope is also concerned with relocating the rail underground within the project area. Potentially impacted assets are summarised below, if you have any additional high level comments please can you let me know?

Asset	**Asset Class**	**Location**	**Impact**
Optus optic fibre cables	Telecommunications	Forrest Road	Crossing the rail
Optus optic fibre cables	Telecommunications	South of Church Avenue	Crossing the rail
Optus optic fibre cables	Telecommunications	Running along Commerce avenue and Hobbs Drive	May require lowering/realignment depending on the rail lowering footprint.

3) Our current recommendations in relation to the optus network are detailed below and I would be grateful if you could flag anything that is incorrect or in need of updating ?

Optus Network:

Existing communications infrastructure that may be impacted by the scope of this project includes, Optus optic fibre cables crossing the rail at Forrest Road and south of Church Avenue, as well as Optus optic fibre cable running along Commerce avenue and Hobbs Drive that may require lowering/realignment depending on the rail lowering footprint. It is estimated that the timeframe for these lowering/diversion works would be 24-36 months with a cost in the order of >2m dollars.

Many thanks for your assistance. Please let me know if you require any further clarification on the above.

Best regards,

Brandon Rademeyer
Graduate Engineer | Transport & Resources
Perth Foresight + Innovation Representative

Arup
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PO Box 5750, St Georges Tce WA 6831
t: +61 8 9327 8300 d: +61 8 9327 8332
www.arup.com

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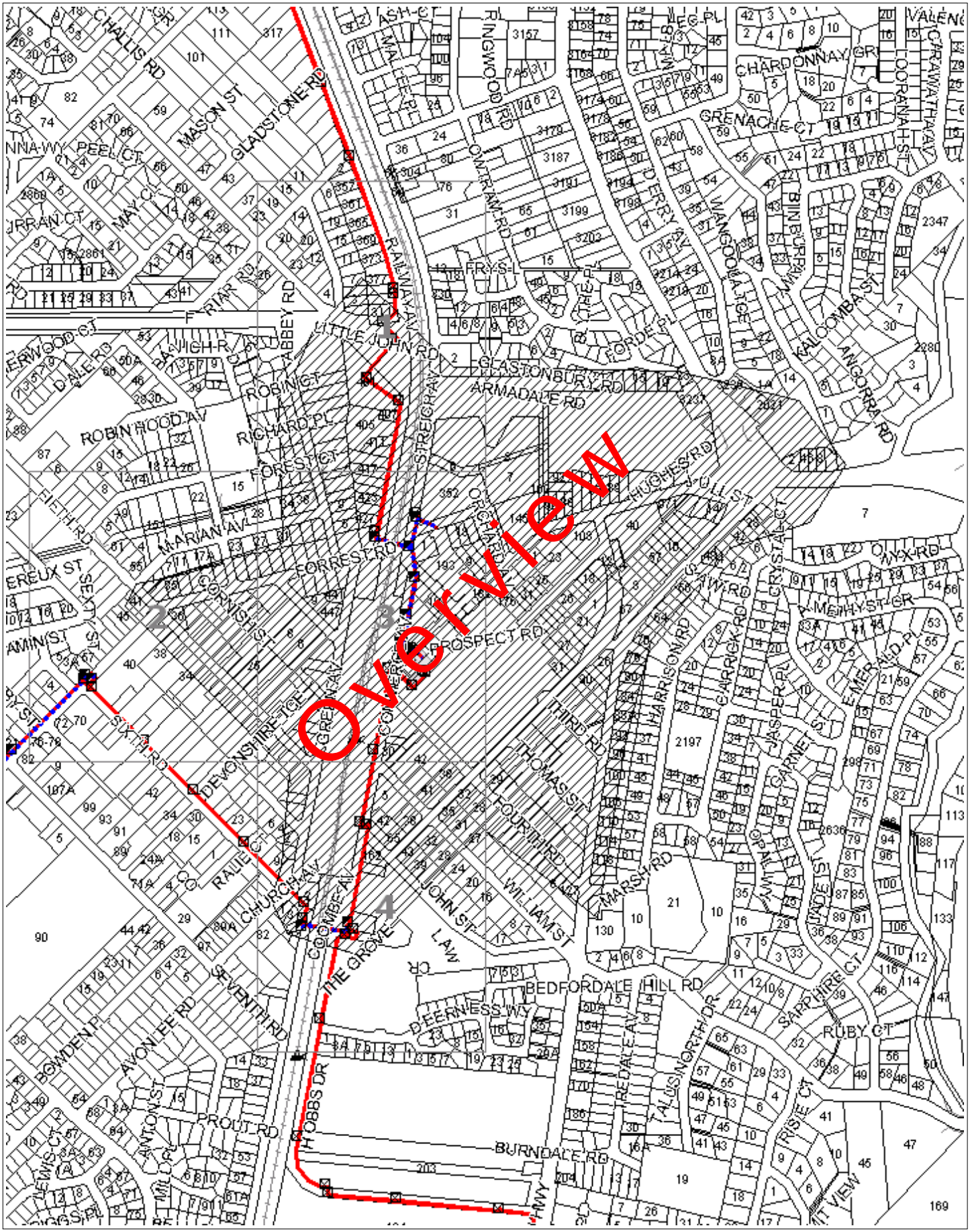

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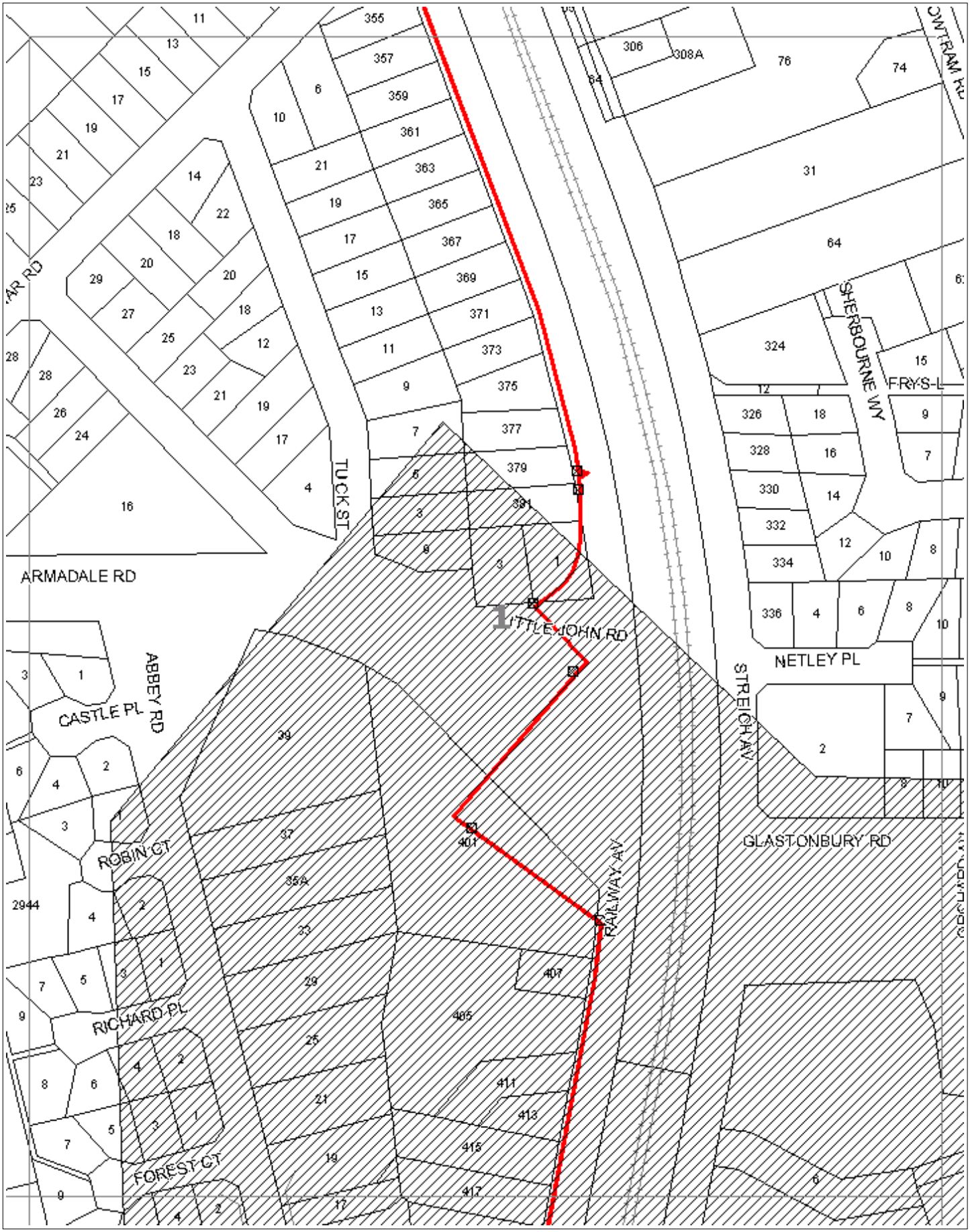
Date Generated: 01/03/2017

For all Optus DBYD plan enquiries –
Email: Fibre.Locations@optus.net.au
For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208



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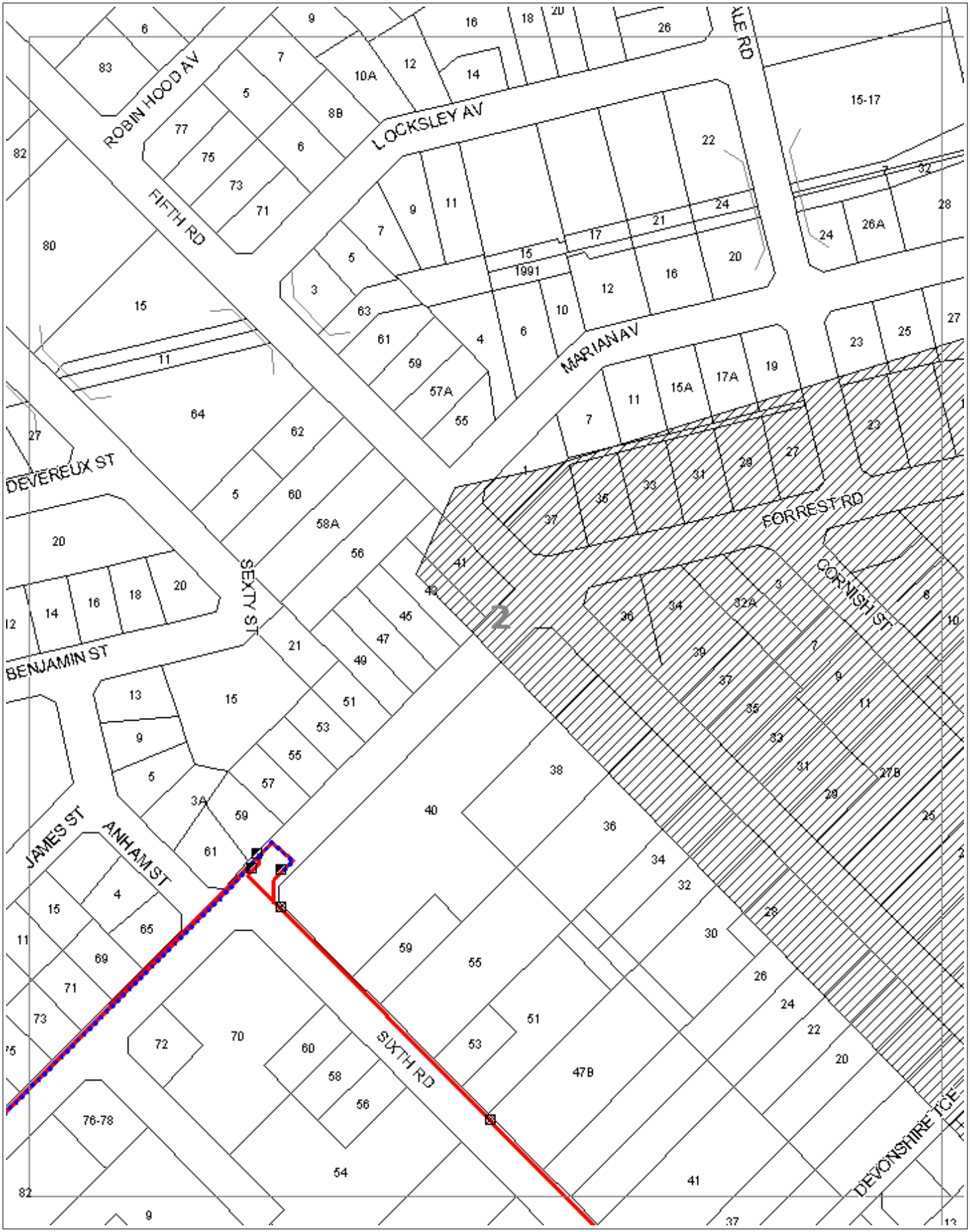

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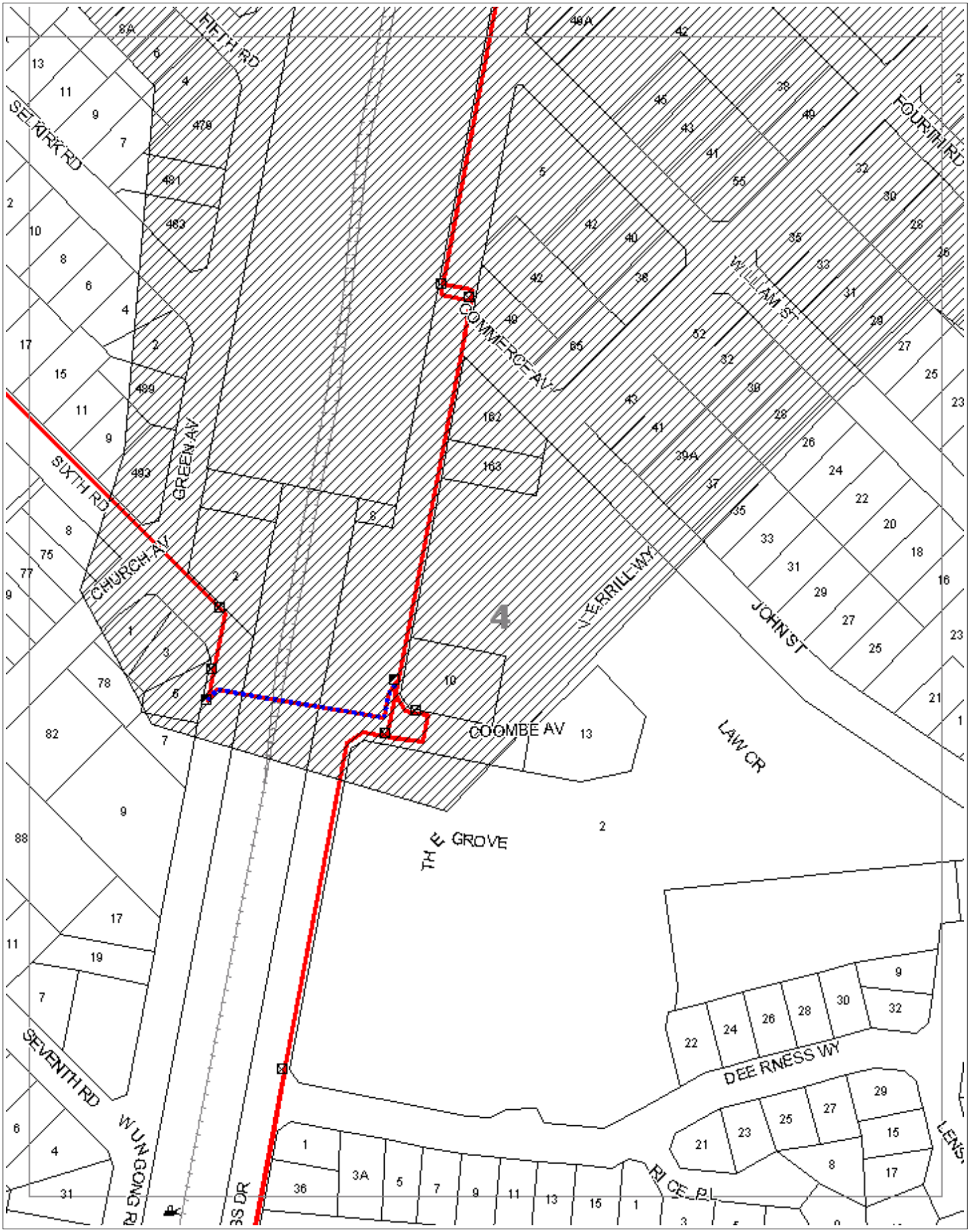

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For urgent onsite assistance contact 1800 505 777
Optus Limited ACN 052 833 208

Appendix F

Telstra - Record of Contact

F1

From: Wells, Steve <Steve.P.Wells@team.telstra.com>
Sent: Friday, 10 November 2017 1:39 PM
To: Brandon Rademeyer
Subject: RE: Armadale Activity Centre Structural Plan - Utility Assessment
Attachments: Armadale South of Forrest.pdf; Armadale Forrest Clash.pdf; Armadale North of Forrest.pdf; Armadale North of Armadale Road.pdf

Hi Brandon,
I have passed on your email to the area planning group in Telstra to respond to the increased demand and NBN issues mentioned below.

Re the possible tunnel relocation requirements.

South of Forrest intersection.
Network crosses rail at intersection of Six Rd and Combe, 6 x P100 containing 1 x 120 and 2 x 60 Optic Fibre cables, multiple large copper cables and an NBN fibre.

Network is then on the east side of Commerce Av heading north.

Biggest issue is around the Forrest/Third intersection.
Up to 4 x Manholes, 16 x P100 conduits containing 3 x 312 O/F, 3 x 120 O/F, 1 x 90 and 1 x 10 O/F cables, plus up to 10 very large copper mains cables and 1 Optus fibre.

Network is then west side of Railway Av but crosses again before Clarence.
Crossing consists of 4 x P100 conduits containing 1 x 312 O/F, 1 x 120 O/F, 1 x 60 O/F and 4 smaller O/F cables plus 6 large copper mains cables.

Relocation has the potential to become a very large and time consuming project.
As mentioned on the phone my recommendation is to go for a design impact study as early as possible.

Regards

Steve Wells Project Specialist
Network Construction and Services | Networks | Telstra Operations
P 08 6224 5746 | M 0400 043 536 | E Steve.P.Wells@team.telstra.com | W www.telstra.com

---

From: Brandon Rademeyer [mailto:Brandon.Rademeyer@arup.com]
Sent: Wednesday, 8 November 2017 9:30 AM
To: Wells, Steve <Steve.P.Wells@team.telstra.com>
Subject: Armadale Activity Centre Structural Plan - Utility Assessment

Hi Steve,

Thank you for your time on the phone today. I have attached a site boundary and the DBYD .dwf file I received to this email – I hope this lends sufficient clarity to the site location.

As discussed we do not have detailed yield/demand information for the site, however we do have the expected increase in floor space for different land uses – This is summarised in the table below.

Land Use	Current (m^2)	Expected Full Build Out (m^2)	Expected 25 Year Build Out (m^2)	Percentage of Full Build-Out at 25 Years
Residential	20,060	453,462	226,731	50%
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Civic	0	28,466	28,466	100%
Grand Total	**90,060**	**1,030,409**	**573,086**	**55.6%**

As can be seen, the percentage of full build out over a 25 year horizon varies between land uses.

We would welcome any high level comments as to:

1. Whether the current **Telstra** network within the study area will need an upgrade in order to service the increased demand of the new development ?

2. As discussed part of the project scope is also concerned with relocating the rail underground within the project area. Is any Telstra infrastructure proximate to the rail likely to be impacted by the lowering ?

3. In light of the NBN being currently legislated to service all developments greater than one hundred units, is it still appropriate for Telstra to comment on how infrastructure would be provided to the area ?

Many thanks for your assistance. Please let me know if you require any further clarification on the above.

Best regards,

Brandon Rademeyer
Graduate Engineer | Transport & Resources
Perth Foresight + Innovation Representative

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t: +61 8 9327 8300 d: +61 8 9327 8332
www.arup.com

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DUTY OF CARE

TELSTRA CORPORATON ACN 051 775 556

IMPORTANT:

When working in the vicinity of telecommunications plant you have a "Duty of Care" that must be observed. Please read and understand all the information and disclaimers provided below.

Telstra network is complex and requires expert knowledge to interpret information, to identify and locate components, to pothole underground assets for validation and to safely work around assets without causing damage. If you are not an expert and/or qualified in these areas then you should not be attempting these activities. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

The 4 essential steps that must be undertaken to prevent damage to Telstra assets are listed below. Construction activities must not commence without first undertaking these 4 steps. If your project is dependent on the position of the underground network then it is recommended you validate the position of the network prior to finalising your design.

(The following pages contain more detail on each step below and the contact details to seek further advice. AS5488-2013 is the Australian Standard for the Classification of Subsurface Utility Information.)

1 Dial Before You Dig -Telstra Plans :

The essential first step in preventing damage -

You must have current Telstra plans via the DBYD process. Telstra advises that the accuracy of the information provided by Telstra conforms to Quality Level D as defined in AS5488-2013. This means the information is indicative only, not a precise location. **The actual location may differ substantially from that shown on the plans** - refer to steps 2 & 3 to determine actual location prior to commencing construction.

2 Telstra Accredited Plant Locator :

The essential second step in preventing damage -

To be able to trace and identify individual subsurface cables and ducts requires access to Telstra pits and manholes. Only a Telstra Accredited Plant Locator (TAPL) is authorised to access Telstra network for locating purposes. A TAPL can interpret plans, validate visible assets and access pits and manholes to undertake electronic detection of underground assets prior to further validation. All Telstra assets must be located, validated and protected prior to commencing construction. If you are not authorised to do so by Telstra, you should not be accessing Telstra network or locating Telstra network.

3 Validation :

The essential third step in preventing damage -

All Telstra assets must be positively identified (i.e. validated), by physically sighting them. For underground assets this can be done by potholing by hand or using non-destructive vacuum extraction methods (Refer to 'validation' as defined in AS5488-2013 QL-A). **Underground assets located by electronic detection alone (step 2), are not deemed to be 'validated' and should not be used for construction purposes.** Some TAPL's can assist with non-destructive potholing for validation purposes. **If you cannot validate the Telstra network you should not proceed with construction**. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

4 Protection :

The essential fourth step in preventing damage -

Telstra assets must be protected to avoid damage from construction activities. Minimum working distances around Telstra network must be maintained. These distances are provided in this document. Telstra can also provide advice and assistance in regards to protection – refer to the following pages.

STEP 1 – Dial Before You Dig -Telstra Plans:

The actual location of Telstra assets may differ substantially from that shown on the plans. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for the accuracy shown on the plans. Steps 2 and 3 must also be undertaken to determine actual location of network.

- Telstra DBYD plans are not suitable for displaying Telstra network within a Telstra exchange site. For advice on Telstra network within a Telstra exchange site contact Telstra Plan Services.
- Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose.
- Telstra plans or other details are provided only for the use of the applicant, its servants, agents or Telstra Accredited Plant Locators. The applicant may not give the plans or details to any parties other than these, and may not generate profit from commercialising the plans or details.
- Please contact Telstra Plan Services immediately should you locate Telstra assets not indicated on these plans.
- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
- Please ensure Telstra plans and information provided remains on-site at all times throughout the inspection, location and construction phase of any works.
- Telstra plans are valid for 60 days after issue and should be replaced if required after the 60 days.

- **Emergency situations - receiving Telstra plans** Telstra's automated mapping system (TAMS) will provide a fast response for emergency situations (faster than an operator can provide manually via a phone call - see below for fast response requirements). Automated responses are normally available 24/7.

  To receive a fast automated response from Telstra your request must **-**

  - Be a web request lodged at DBYD (**www.1100.com.au**). The request will be then forwarded to Telstra.
  - Contain your current email address so you can receive the automated email response.
  - Be for the purposes of 'mechanical excavation' or other ground breaking DBYD activity. (Requests with activity types such as conveyancing, planning & design or other non-digging activities may not be responded to until the next business day).
  - Be for an area less than 350 metres in size to obtain a PDF map (over 350 metres will default to DWF due to size) this does not include congested CBD areas where only DWF may be supplied.
  - Be for an area less than 2500 metres in size to obtain a DWF map (CBD's less)

- **Data Extraction Fees.** In some instances a data extraction fee may be applicable for the supply of Telstra information. Typically a data extraction fee may apply to large projects or requests to be supplied in non-standard formats. For further details contact Telstra Plan Services.

- **Electronic plans - PDF and DWF maps** If you have received Telstra maps via email you will have received the maps as either a PDF file (for smaller areas) or DWF file (for larger area requests). All requests over approximately *350m or in congested CBD areas can only be supplied in DWF format. There are size limits on what can be provided. (* actual size depends on geographic location of requested area). If you are unable to launch any one of the softcopy files for viewing and printing, you may need to download and install one or more of the free viewing and printing products such as Adobe Acrobat Reader (for PDF files) or Autodesk Design Review (for DWF files) available from the internet

  - **Pdf files -** PDF is the default softcopy format for all requests for areas up to approx *350m in length. (*depends on geographic location of request). The PDF file is nominally formatted to A3 portrait sheet however it can be printed on any size sheet that your printer supports, e.g. either as the full sheet or selected areas to suit needs and legibility. (to print a selected area zoom up and print 'current view') If there are multiple layers of Telstra network you may receive up to 2 sheets in the single PDF file attachment supplied. There are three types or layers of network normally recorded - local network, mains cables or a combined layer of local and mains (usually displayed for rural or semi-rural areas). If mains cable network is present in addition to local cables (i.e. as separate layer in a particular area), the mains will be shown on a separate sheet. The mains cable information should be read in conjunction with the local cable information.

  - **DWF files** – DWF is the default softcopy format for all requests for areas that are over 350m in length. Maximum length for a DWF automated response is approx 2500m - depending on geographic

location of request (manually-processed plans may provide larger coverage). The DWF files differ from PDF in that DWF are vector files made up of layers that can be turned on or off and are not formatted to a specific sheet size. This makes them ideal for larger areas and for transmitting electronically.

- ***How to view Telstra DWF files –***
  Telstra DWF files come with all layers turned on. You may need to turn individual layers on or off for viewing and printing clarity. Individual layer names are CC (main cable/conduit), DA (distribution area network) and sometimes a combined layer - CAC. Layer details can be viewed by either picking off the side menu or by selecting 'window' then 'layers' off the top menu bar. Use 'layers' to turn individual layers off or on (double click or right click on layer icon).
- ***How to print Telstra DWF files –***
  DWF files can be printed on any size sheet – either their entirety or by selected areas of interest. Some DWF coverage areas are large and are not suited to printing legibly on a single A4 sheet - you may need several prints if you only have an A4 printer. Alternatively, an A3, A1 or larger printer could be used. To print, zoom in or out and then, by changing the 'print range' settings, you can print what is displayed on your screen to suit your paper size. If you only have a small printer, e.g. A4, you may need to zoom until the text is legible for printing (which is why you may need several prints). To print what is displayed on your screen the 'view' setting should be changed from 'full page' to 'current view'. The 'current sheet' setting should also be selected. You may need to print layers separately for clarity and legibility. (Details above on how to turn layers on or off)
- ***How to change the background colour from white to black (when viewing) Telstra DWF files –***
  If using Autodesk Design Review the background colour can be changed by selecting 'Tools' then 'options' then 'sheet'. Tick the box 'override published paper colours' and select the colour required using the tab provided.

STEP 2 - Telstra Accredited Plant Locator (TAPL):

Utilising a TAPL is an essential part of the process to identify network and to trace subsurface network prior to validating. A TAPL can provide plan interpretation, identification and electronic detection. This will assist in determining the position of subsurface assets prior to potholing (validating). Some TAPL's can also assist in validating underground detected network. Electronic detection is only an indication of the existence of underground network and can be subject to interference from other services and local conditions. Electronic detection should not be used solely to determine location for construction purposes. The electronic (indicative) subsurface measurements must be proven by physically sighting the asset (see step 3 - Validation).

- All TAPL's locating Telstra network must be able to produce a current photo ID card issued by Telstra. A list of TAPL's is provided with the Telstra Dial Before You Dig plans.
- Telstra does not permit external parties (non-Telstra) to access or conduct work on our network. Only Telstra staff, Telstra contractors or locators whom are correctly accredited are authorised to work on or access our manholes, pits, ducts, cables etc. This is for safety as well as for legal reasons.

  It is a criminal offence under the *Criminal Code Act 1995* (Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

- Optic fibre cable locations must be performed by a locator with Telstra optic fibre cable location accreditation. The locators with optic fibre cable location accreditation are indicated by a 'yes' in the column headed 'Fibre' in the lists of locators that are published with the Telstra DBYD plans. Telstra Accredited Plant Locators that are DBYD Certified Locators are also fibre accredited. Inspection of photo ID cards will confirm whether locators are just copper accredited or copper + fibre accredited.
- The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the Telstra Accredited Plant Locator engaged. Telstra is not a party to any contract entered into between you and a Telstra Accredited Plant Locator.
- Payment for the site assistance will be your responsibility and payment details should be agreed before the engagement is confirmed.

- Telstra does not accept any liability or responsibility for the performance of or advice given by a Telstra Accredited Plant Locator. Accreditation is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.
- Neither the Telstra Accredited Plant Locator nor any of its employees are an employee or agent for Telstra. Telstra is not liable for any damage or loss caused by the Telstra Accredited Plant Locator or its employees.

- **Electronically derived subsurface measurements (e.g. depths/alignments by locating devices)**

  All locator provided measurements for Telstra assets must have the AS5488-2013 quality level specified - (e.g. QL-A, B, C or D). These quality levels define the accuracy of subsurface information and are critical for determining how the information is later used – for example if suitable for excavation purposes.

  1) ***An example of a subsurface measurement with no quality level specified – (i.e. not to be used)***

     Telstra cover - **0.9m**

     *The measurement above has no AS5488-2013 quality level specified and **should not** be provided by a locator or used for design or construction. This is because it is not known whether the measurement is actual or derived (where 'actual' means validated and 'derived' means assumed and not validated, e.g. electronic or other). Typically damages occur by constructors incorrectly using unvalidated measurements as actual measurements.*

  2) ***An example of a subsurface measurement with quality level B specified –***

     Telstra cover - **0.9m** (QL-B)

     Where (QL-B) complies with AS5488-2013 QL-B (for example an electronic location that complies with QL-B)

     (Note QL-B means it has not been validated and should not be used for construction purposes around Telstra network, however it would assist further investigation to determine the actual location)

  3) ***An example of a subsurface measurement with the quality level A specified –***

     Telstra cover - **0.6m** (QL-A)

     Where (QL-A) complies with AS5488-2013 QL-A (and is deemed suitable for excavation purposes). *In this example the asset has been electronically located first, (QL-B) and then physically exposed (QL-A).*

     Note -Telstra will seek compensation for damages caused to it its property and losses caused to Telstra and its customers if unvalidated subsurface measurements are used for construction and subsequently result in damage to Telstra assets. Only measurements conforming to AS5488-2013 (QL-A) are deemed by Telstra to be validated measurements.

- **Rural landowners** Where Telstra-owned cable crosses agricultural land, Telstra may provide on-site assistance with cable location. **You must contact Telstra Plan Services to determine eligibility and to request the service**.

  Please note the following –

  - If eligible, the location assistance must be approved and organised by Telstra. Telstra will not pay for a location that has not been approved and facilitated by Telstra (Telstra is not responsible for payment assistance when a customer engages a locator directly).
  - The exact location, including depth of cables**,** must be validated by potholing, which may not be covered by this service.
  - This service is nominally only available to assist private rural land owners.
  - This service nominally covers one hour on-site only. Any time required in addition to Telstra-funded time can be purchased directly from the assigned Telstra Accredited Plant Locator.
  - This service does not apply to previously located network at the same location (i.e. it is a once off).
  - This service does not apply to other carriers' cables (marked as 'OC' on Telstra plans).

STEP 3 – *Validation:

After utilising a Telstra Accredited Plant Locator and prior to commencing construction, any electronically detected underground network must be positively identified (validated) by physically sighting it. This can be done by careful hand digging or using non-destructive water jet methods to expose the network.

*Validation as defined in AS5488-2013 (QL-A).

Manual potholing needs to be undertaken with extreme care and by employing techniques least likely to damage cables. For example, align shovel blades and trowels parallel to the cable rather than digging across the cable. Some Telstra Accredited Plant Locators are able to provide or assist with non-destructive potholing methods to enable validation of underground cables and ducts.

If you cannot validate the underground network then you should not proceed with construction. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Important note: *The construction of Telstra's network dates back over many years. Some of Telstra's pits and ducts were manufactured from asbestos-containing cement. You must take care in conducting any works in the vicinity of Telstra's pits and ducts. You must refrain from in any way disturbing or damaging Telstra's network infrastructure when conducting your works. We recommend that before you conduct any works in the vicinity of Telstra infrastructure that you ensure your processes and procedures eliminate any possibility of disturbing, damaging or interfering in any way with Telstra's infrastructure. Your processes and procedures should incorporate appropriate measures having regard to the nature of this risk. For further information -*

http://ucm.in.telstra.com.au/about/media/emergencies-incidents/asbestos/index.htm?ssSourceSiteId=consumer-advice

STEP 4 – Protection:

You must maintain the following minimum clearance distances between construction activity and the validated position of Telstra plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual validated location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of **actual validated location** of Telstra ducts.* *300mm compact clearance cover before compactor can be used across Telstra ducts.*
Boring Equipment (in-line, horizontal and vertical)	*Not within 2.0m of **actual validated location**.* *Constructor to hand dig or use non-destructive water jet method (pothole) and expose plant.*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Telstra ducts (or plant) with less than 600mm cover.* *Constructor to check actual depth via hand digging.*
Mechanical Excavators, Farm ploughing and Tree Removal	*Not within 1.0m of **actual validated location.*** *Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.*

- For blasting or controlled fire burning please contact Telstra Plan Services for advice.
- If conducting roadworks all existing Telstra pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.
- After the completion of any ground work in footways (or under roads), all Telstra conduits must have a depth of cover which is compliant with the current specifications of the road owner e.g. the local council or road

authority. Depth specification will vary across different authorities in different states. For clarification please contact Telstra Network Integrity.

- For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact Telstra Plan Services.

- If Telstra plant is situated wholly or partly where you plan to work (i.e. in conflict), then Telstra's Network Integrity Group must be contacted to discuss possible engineering solutions.
  Please phone **1800 810 443** or email NetworkIntegrity@team.telstra.com

- You are not permitted to relocate or alter or repair any Telstra assets or network under any circumstances.

  It is a criminal offence under the *Criminal Code Act 1995* (Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

  Only Telstra and its contractors may access and conduct works on Telstra's network (including its plant and assets). This requirement is to ensure that Telstra can protect the integrity of its network, avoid disruption to services and ensure that the relocation meets Telstra's requirements.

- If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer, constructor or person for whom the work is performed. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works.
  Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com
  Further information -
  https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

  ### Damage to Telstra's network must be reported immediately -
  https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment

- You will be held responsible for all plant damage that occurs or any impacts to Telstra's network as a result of your construction activities. This includes interfering with plant, conducting unauthorised modification works and interfering with Telstra's assets in a way that prevents Telstra from accessing or using its assets in the future.

- Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

FURTHER INFORMATION:

NATURAL DISASTERS

Natural Disasters include (amongst other things) earthquakes, cyclones, floods and tsunamis.
In the case of such events, urgent requests for plans or information relating to the location of Telstra network can be made directly to Telstra Network Integrity Team Managers as follows:

NSW – John McInerney 0419 485 795

QLD – Glenn Swift 0419 660 147

VIC/TAS - David Povazan 0417 300 947

SA/NT - Mick Weaver 0419 828 703

WA - Angus Beresford-Peirse 0419 123 589

TELSTRA PLAN SERVICES **-** for all Telstra Dial Before You Dig related enquiries

Email - **Telstra.Plans@team.telstra.com**

Phone - 1800 653 935 (general enquiries, business hours only)

*Telstra DBYD plan information -	Shalin	07 3455 2997
	Anthony	07 3455 2365
Advice on preventing damage -	Glen	07 3455 1011
	Lachlan	07 3455 3132
Accredited plant locator enquiries -	Mike	0477 377 036
	Taylor	0477 365 666
Road closures -	Megan	07 3455 0834
	Lachlan	07 3455 3132
Telstra easements -	Glen	07 3455 1011

***Please note** - to make a Telstra plan enquiry the plans must be current (within 60 days of issue). If your plans have expired you will need to submit a new request via DBYD prior to contacting Telstra Plan Services.*

Information for new developments (developers, builders, home owners)
Telstra Smart Communities - https://www.telstra.com.au/smart-community

Asset relocations
Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com

https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

Telstra offers free Cable Awareness Presentations, if you believe you or your company would benefit from this offer please contact Network Integrity on 1800 810 443 or NetworkIntegrity@team.telstra.com

PRIVACY NOTE

Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps your information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy

DUTY OF CARE

TELSTRA CORPORATON ACN 051 775 556

IMPORTANT:

When working in the vicinity of telecommunications plant you have a "Duty of Care" that must be observed. Please read and understand all the information and disclaimers provided below.

Telstra network is complex and requires expert knowledge to interpret information, to identify and locate components, to pothole underground assets for validation and to safely work around assets without causing damage. If you are not an expert and/or qualified in these areas then you should not be attempting these activities. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

The 4 essential steps that must be undertaken to prevent damage to Telstra assets are listed below. Construction activities must not commence without first undertaking these 4 steps. If your project is dependent on the position of the underground network then it is recommended you validate the position of the network prior to finalising your design.

(The following pages contain more detail on each step below and the contact details to seek further advice. AS5488-2013 is the Australian Standard for the Classification of Subsurface Utility Information.)

1 Dial Before You Dig -Telstra Plans :

The essential first step in preventing damage -

You must have current Telstra plans via the DBYD process. Telstra advises that the accuracy of the information provided by Telstra conforms to Quality Level D as defined in AS5488-2013. This means the information is indicative only, not a precise location. **The actual location may differ substantially from that shown on the plans** - refer to steps 2 & 3 to determine actual location prior to commencing construction.

2 Telstra Accredited Plant Locator :

The essential second step in preventing damage -

To be able to trace and identify individual subsurface cables and ducts requires access to Telstra pits and manholes. Only a Telstra Accredited Plant Locator (TAPL) is authorised to access Telstra network for locating purposes. A TAPL can interpret plans, validate visible assets and access pits and manholes to undertake electronic detection of underground assets prior to further validation. All Telstra assets must be located, validated and protected prior to commencing construction. If you are not authorised to do so by Telstra, you should not be accessing Telstra network or locating Telstra network.

3 Validation :

The essential third step in preventing damage -

All Telstra assets must be positively identified (i.e. validated), by physically sighting them. For underground assets this can be done by potholing by hand or using non-destructive vacuum extraction methods (Refer to 'validation' as defined in AS5488-2013 QL-A). **Underground assets located by electronic detection alone (step 2), are not deemed to be 'validated' and should not be used for construction purposes.** Some TAPL's can assist with non-destructive potholing for validation purposes. **If you cannot validate the Telstra network you should not proceed with construction**. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

4 Protection :

The essential fourth step in preventing damage -

Telstra assets must be protected to avoid damage from construction activities. Minimum working distances around Telstra network must be maintained. These distances are provided in this document. Telstra can also provide advice and assistance in regards to protection – refer to the following pages.

STEP 1 – Dial Before You Dig -Telstra Plans:

The actual location of Telstra assets may differ substantially from that shown on the plans. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for the accuracy shown on the plans. Steps 2 and 3 must also be undertaken to determine actual location of network.

- Telstra DBYD plans are not suitable for displaying Telstra network within a Telstra exchange site. For advice on Telstra network within a Telstra exchange site contact Telstra Plan Services.
- Telstra owns and retains the copyright in all plans and details provided in conjunction with the applicant's request. The applicant is authorised to use the plans and details only for the purpose indicated in the applicant's request. The applicant must not use the plans or details for any other purpose.
- Telstra plans or other details are provided only for the use of the applicant, its servants, agents or Telstra Accredited Plant Locators. The applicant may not give the plans or details to any parties other than these, and may not generate profit from commercialising the plans or details.
- Please contact Telstra Plan Services immediately should you locate Telstra assets not indicated on these plans.
- Telstra, its servants or agents shall not be liable for any loss or damage caused or occasioned by the use of plans and or details so supplied to the applicant, its servants and agents, and the applicant agrees to indemnify Telstra against any claim or demand for any such loss or damage.
- Please ensure Telstra plans and information provided remains on-site at all times throughout the inspection, location and construction phase of any works.
- Telstra plans are valid for 60 days after issue and should be replaced if required after the 60 days.

- **Emergency situations - receiving Telstra plans** Telstra's automated mapping system (TAMS) will provide a fast response for emergency situations (faster than an operator can provide manually via a phone call - see below for fast response requirements). Automated responses are normally available 24/7.

  To receive a fast automated response from Telstra your request must **-**

  - Be a web request lodged at DBYD (**www.1100.com.au**). The request will be then forwarded to Telstra.
  - Contain your current email address so you can receive the automated email response.
  - Be for the purposes of 'mechanical excavation' or other ground breaking DBYD activity. (Requests with activity types such as conveyancing, planning & design or other non-digging activities may not be responded to until the next business day).
  - Be for an area less than 350 metres in size to obtain a PDF map (over 350 metres will default to DWF due to size) this does not include congested CBD areas where only DWF may be supplied.
  - Be for an area less than 2500 metres in size to obtain a DWF map (CBD's less)

- **Data Extraction Fees.** In some instances a data extraction fee may be applicable for the supply of Telstra information. Typically a data extraction fee may apply to large projects or requests to be supplied in non-standard formats. For further details contact Telstra Plan Services.

- **Electronic plans - PDF and DWF maps** If you have received Telstra maps via email you will have received the maps as either a PDF file (for smaller areas) or DWF file (for larger area requests). All requests over approximately *350m or in congested CBD areas can only be supplied in DWF format. There are size limits on what can be provided. (* actual size depends on geographic location of requested area). If you are unable to launch any one of the softcopy files for viewing and printing, you may need to download and install one or more of the free viewing and printing products such as Adobe Acrobat Reader (for PDF files) or Autodesk Design Review (for DWF files) available from the internet

  - **Pdf files -** PDF is the default softcopy format for all requests for areas up to approx *350m in length. (*depends on geographic location of request). The PDF file is nominally formatted to A3 portrait sheet however it can be printed on any size sheet that your printer supports, e.g. either as the full sheet or selected areas to suit needs and legibility. (to print a selected area zoom up and print 'current view') If there are multiple layers of Telstra network you may receive up to 2 sheets in the single PDF file attachment supplied. There are three types or layers of network normally recorded - local network, mains cables or a combined layer of local and mains (usually displayed for rural or semi-rural areas). If mains cable network is present in addition to local cables (i.e. as separate layer in a particular area), the mains will be shown on a separate sheet. The mains cable information should be read in conjunction with the local cable information.

  - **DWF files** – DWF is the default softcopy format for all requests for areas that are over 350m in length. Maximum length for a DWF automated response is approx 2500m - depending on geographic

location of request (manually-processed plans may provide larger coverage). The DWF files differ from PDF in that DWF are vector files made up of layers that can be turned on or off and are not formatted to a specific sheet size. This makes them ideal for larger areas and for transmitting electronically.

- ***How to view Telstra DWF files –***
  Telstra DWF files come with all layers turned on. You may need to turn individual layers on or off for viewing and printing clarity. Individual layer names are CC (main cable/conduit), DA (distribution area network) and sometimes a combined layer - CAC. Layer details can be viewed by either picking off the side menu or by selecting 'window' then 'layers' off the top menu bar. Use 'layers' to turn individual layers off or on (double click or right click on layer icon).
- ***How to print Telstra DWF files –***
  DWF files can be printed on any size sheet – either their entirety or by selected areas of interest. Some DWF coverage areas are large and are not suited to printing legibly on a single A4 sheet - you may need several prints if you only have an A4 printer. Alternatively, an A3, A1 or larger printer could be used. To print, zoom in or out and then, by changing the 'print range' settings, you can print what is displayed on your screen to suit your paper size. If you only have a small printer, e.g. A4, you may need to zoom until the text is legible for printing (which is why you may need several prints). To print what is displayed on your screen the 'view' setting should be changed from 'full page' to 'current view'. The 'current sheet' setting should also be selected. You may need to print layers separately for clarity and legibility. (Details above on how to turn layers on or off)
- ***How to change the background colour from white to black (when viewing) Telstra DWF files –***
  If using Autodesk Design Review the background colour can be changed by selecting 'Tools' then 'options' then 'sheet'. Tick the box 'override published paper colours' and select the colour required using the tab provided.

STEP 2 - Telstra Accredited Plant Locator (TAPL):

Utilising a TAPL is an essential part of the process to identify network and to trace subsurface network prior to validating. A TAPL can provide plan interpretation, identification and electronic detection. This will assist in determining the position of subsurface assets prior to potholing (validating). Some TAPL's can also assist in validating underground detected network. Electronic detection is only an indication of the existence of underground network and can be subject to interference from other services and local conditions. Electronic detection should not be used solely to determine location for construction purposes. The electronic (indicative) subsurface measurements must be proven by physically sighting the asset (see step 3 - Validation).

- All TAPL's locating Telstra network must be able to produce a current photo ID card issued by Telstra. A list of TAPL's is provided with the Telstra Dial Before You Dig plans.
- Telstra does not permit external parties (non-Telstra) to access or conduct work on our network. Only Telstra staff, Telstra contractors or locators whom are correctly accredited are authorised to work on or access our manholes, pits, ducts, cables etc. This is for safety as well as for legal reasons.

  It is a criminal offence under the *Criminal Code Act 1995* (Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

- Optic fibre cable locations must be performed by a locator with Telstra optic fibre cable location accreditation. The locators with optic fibre cable location accreditation are indicated by a 'yes' in the column headed 'Fibre' in the lists of locators that are published with the Telstra DBYD plans. Telstra Accredited Plant Locators that are DBYD Certified Locators are also fibre accredited. Inspection of photo ID cards will confirm whether locators are just copper accredited or copper + fibre accredited.
- The details of any contract, agreement or retainer for site assistance to locate telecommunications plant shall be for you to decide and agree with the Telstra Accredited Plant Locator engaged. Telstra is not a party to any contract entered into between you and a Telstra Accredited Plant Locator.
- Payment for the site assistance will be your responsibility and payment details should be agreed before the engagement is confirmed.

- Telstra does not accept any liability or responsibility for the performance of or advice given by a Telstra Accredited Plant Locator. Accreditation is an initiative taken by Telstra towards the establishment and maintenance of competency standards. However, performance and the advice given will always depend on the nature of the individual engagement.
- Neither the Telstra Accredited Plant Locator nor any of its employees are an employee or agent for Telstra. Telstra is not liable for any damage or loss caused by the Telstra Accredited Plant Locator or its employees.

- **Electronically derived subsurface measurements (e.g. depths/alignments by locating devices)**

  All locator provided measurements for Telstra assets must have the AS5488-2013 quality level specified - (e.g. QL-A, B, C or D). These quality levels define the accuracy of subsurface information and are critical for determining how the information is later used – for example if suitable for excavation purposes.

  1) ***An example of a subsurface measurement with no quality level specified – (i.e. not to be used)***

     Telstra cover - **0.9m**

     *The measurement above has no AS5488-2013 quality level specified and **should not** be provided by a locator or used for design or construction. This is because it is not known whether the measurement is actual or derived (where 'actual' means validated and 'derived' means assumed and not validated, e.g. electronic or other). Typically damages occur by constructors incorrectly using unvalidated measurements as actual measurements.*

  2) ***An example of a subsurface measurement with quality level B specified –***

     Telstra cover - **0.9m** (QL-B)

     Where (QL-B) complies with AS5488-2013 QL-B (for example an electronic location that complies with QL-B)

     (Note QL-B means it has not been validated and should not be used for construction purposes around Telstra network, however it would assist further investigation to determine the actual location)

  3) ***An example of a subsurface measurement with the quality level A specified –***

     Telstra cover - **0.6m** (QL-A)

     Where (QL-A) complies with AS5488-2013 QL-A (and is deemed suitable for excavation purposes). *In this example the asset has been electronically located first, (QL-B) and then physically exposed (QL-A).*

     Note -Telstra will seek compensation for damages caused to it its property and losses caused to Telstra and its customers if unvalidated subsurface measurements are used for construction and subsequently result in damage to Telstra assets. Only measurements conforming to AS5488-2013 (QL-A) are deemed by Telstra to be validated measurements.

- **Rural landowners** Where Telstra-owned cable crosses agricultural land, Telstra may provide on-site assistance with cable location. **You must contact Telstra Plan Services to determine eligibility and to request the service**.

  Please note the following –

  - If eligible, the location assistance must be approved and organised by Telstra. Telstra will not pay for a location that has not been approved and facilitated by Telstra (Telstra is not responsible for payment assistance when a customer engages a locator directly).
  - The exact location, including depth of cables**,** must be validated by potholing, which may not be covered by this service.
  - This service is nominally only available to assist private rural land owners.
  - This service nominally covers one hour on-site only. Any time required in addition to Telstra-funded time can be purchased directly from the assigned Telstra Accredited Plant Locator.
  - This service does not apply to previously located network at the same location (i.e. it is a once off).
  - This service does not apply to other carriers' cables (marked as 'OC' on Telstra plans).

STEP 3 – *Validation:

After utilising a Telstra Accredited Plant Locator and prior to commencing construction, any electronically detected underground network must be positively identified (validated) by physically sighting it. This can be done by careful hand digging or using non-destructive water jet methods to expose the network.

*Validation as defined in AS5488-2013 (QL-A).

Manual potholing needs to be undertaken with extreme care and by employing techniques least likely to damage cables. For example, align shovel blades and trowels parallel to the cable rather than digging across the cable. Some Telstra Accredited Plant Locators are able to provide or assist with non-destructive potholing methods to enable validation of underground cables and ducts.

If you cannot validate the underground network then you should not proceed with construction. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.

Important note: *The construction of Telstra's network dates back over many years. Some of Telstra's pits and ducts were manufactured from asbestos-containing cement. You must take care in conducting any works in the vicinity of Telstra's pits and ducts. You must refrain from in any way disturbing or damaging Telstra's network infrastructure when conducting your works. We recommend that before you conduct any works in the vicinity of Telstra infrastructure that you ensure your processes and procedures eliminate any possibility of disturbing, damaging or interfering in any way with Telstra's infrastructure. Your processes and procedures should incorporate appropriate measures having regard to the nature of this risk. For further information -*

http://ucm.in.telstra.com.au/about/media/emergencies-incidents/asbestos/index.htm?ssSourceSiteId=consumer-advice

STEP 4 – Protection:

You must maintain the following minimum clearance distances between construction activity and the validated position of Telstra plant.

Jackhammers/Pneumatic Breakers	*Not within 1.0m of **actual validated location.***
Vibrating Plate or Wacker Packer Compactor	*Not within 0.5m of **actual validated location** of Telstra ducts.* *300mm compact clearance cover before compactor can be used across Telstra ducts.*
Boring Equipment (in-line, horizontal and vertical)	*Not within 2.0m of **actual validated location**.* *Constructor to hand dig or use non-destructive water jet method (pothole) and expose plant.*
Heavy Vehicle Traffic (over 3 tonnes)	*Not to be driven across Telstra ducts (or plant) with less than 600mm cover.* *Constructor to check actual depth via hand digging.*
Mechanical Excavators, Farm ploughing and Tree Removal	*Not within 1.0m of **actual validated location.*** *Constructor to hand dig or use non-destructive water jet method (pot-hole) and expose plant.*

- For blasting or controlled fire burning please contact Telstra Plan Services for advice.
- If conducting roadworks all existing Telstra pits and manholes should be a minimum of 1.2m in from the back of kerb after the completion of your work.
- After the completion of any ground work in footways (or under roads), all Telstra conduits must have a depth of cover which is compliant with the current specifications of the road owner e.g. the local council or road

authority. Depth specification will vary across different authorities in different states. For clarification please contact Telstra Network Integrity.

- For clearance distances relating to Telstra pillars, cabinets and RIMs/RCMs please contact Telstra Plan Services.

- If Telstra plant is situated wholly or partly where you plan to work (i.e. in conflict), then Telstra's Network Integrity Group must be contacted to discuss possible engineering solutions.
  Please phone **1800 810 443** or email NetworkIntegrity@team.telstra.com

- You are not permitted to relocate or alter or repair any Telstra assets or network under any circumstances.

  It is a criminal offence under the *Criminal Code Act 1995* (Cth) to tamper or interfere with communication facilities owned by a carrier. Heavy penalties may apply for breach of this prohibition, and any damages suffered, or costs incurred by Telstra as a result of any such unauthorised works may be claimed against you.

  Only Telstra and its contractors may access and conduct works on Telstra's network (including its plant and assets). This requirement is to ensure that Telstra can protect the integrity of its network, avoid disruption to services and ensure that the relocation meets Telstra's requirements.

- If Telstra relocation or protection works are part of the agreed solution, then payment to Telstra for the cost of this work shall be the responsibility of the principal developer, constructor or person for whom the work is performed. The principal developer or constructor will be required to provide Telstra with the details of their proposed work showing how Telstra's plant is to be accommodated and these details must be approved by the Regional Network Integrity Manager prior to the commencement of site works.
  Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com
  Further information -
  https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

  ### Damage to Telstra's network must be reported immediately -
  https://service.telstra.com.au/customer/general/forms/report-damage-to-telstra-equipment

- You will be held responsible for all plant damage that occurs or any impacts to Telstra's network as a result of your construction activities. This includes interfering with plant, conducting unauthorised modification works and interfering with Telstra's assets in a way that prevents Telstra from accessing or using its assets in the future.

- Telstra reserves all rights to recover compensation for loss or damage to its cable network or other property including consequential losses.

FURTHER INFORMATION:

NATURAL DISASTERS

Natural Disasters include (amongst other things) earthquakes, cyclones, floods and tsunamis.
In the case of such events, urgent requests for plans or information relating to the location of Telstra network can be made directly to Telstra Network Integrity Team Managers as follows:

NSW – John McInerney 0419 485 795

QLD – Glenn Swift 0419 660 147

VIC/TAS - David Povazan 0417 300 947

SA/NT - Mick Weaver 0419 828 703

WA - Angus Beresford-Peirse 0419 123 589

TELSTRA PLAN SERVICES **-** for all Telstra Dial Before You Dig related enquiries

Email - **Telstra.Plans@team.telstra.com**

Phone - 1800 653 935 (general enquiries, business hours only)

*Telstra DBYD plan information -	Shalin	07 3455 2997
	Anthony	07 3455 2365
Advice on preventing damage -	Glen	07 3455 1011
	Lachlan	07 3455 3132
Accredited plant locator enquiries -	Mike	0477 377 036
	Taylor	0477 365 666
Road closures -	Megan	07 3455 0834
	Lachlan	07 3455 3132
Telstra easements -	Glen	07 3455 1011

***Please note** - to make a Telstra plan enquiry the plans must be current (within 60 days of issue). If your plans have expired you will need to submit a new request via DBYD prior to contacting Telstra Plan Services.*

Information for new developments (developers, builders, home owners)
Telstra Smart Communities - https://www.telstra.com.au/smart-community

Asset relocations
Please phone 1800 810 443 or email NetworkIntegrity@team.telstra.com

https://www.telstra.com.au/consumer-advice/digging-construction/relocating-network-assets

Telstra offers free Cable Awareness Presentations, if you believe you or your company would benefit from this offer please contact Network Integrity on 1800 810 443 or NetworkIntegrity@team.telstra.com

PRIVACY NOTE

Your information has been provided to Telstra by DBYD to enable Telstra to respond to your DBYD request. Telstra keeps your information in accordance with its privacy statement entitled "Protecting Your Privacy" which can be obtained from Telstra either by calling 1800 039 059 or visiting our website at www.telstra.com.au/privacy

LEGEND

IT'S HOW WE CONNECT

For more info contact a Telstra Accredited Locater or Telstra Plan Services 1800 653 935

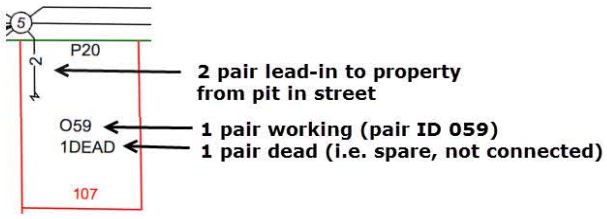
Exchange
(major cable present)

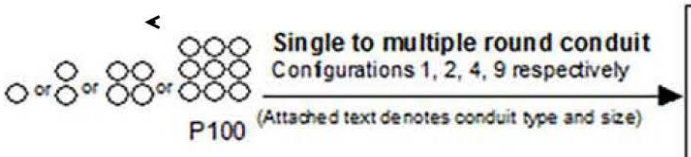
Footway access chamber
(can vary from 1-lid to 12-lid)

or **Pillar/cabinet**
(above the ground / free standing)

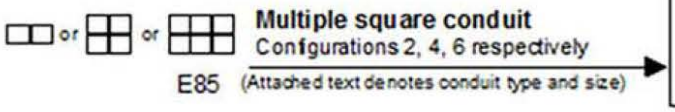
Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V electricity.

OC **other carrier**





Single to multiple round conduit
Configurations 1, 2, 4, 9 respectively
(Attached text denotes conduit type and size)



Multiple square conduit
Configurations 2, 4, 6 respectively
(Attached text denotes conduit type and size)

Some examples of conduit type and size:
A - Asbestos cement, P - PVC / plastic, C - Concrete, GI - Galvanised iron, E - Earthenware.
Conduit sizes *nominally* range from 20mm to 100mm.

P50	50mm PVC conduit
P100	100mm PVC conduit
A100	100mm asbestos cement conduit
E 85	85mm square earthenware conduit

Cable jointing pit
(number indicating pit type)

Elevated cable joint
(above ground joint on buried cable)

Telstra Plant in shared utility trench

Aerial Cable
(above ground)

Aerial Cable
(attached to joint use pole e.g. power)

Direct buried cable

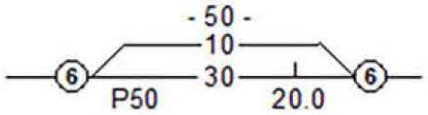
M **Marker post installed**

TR **Buried transponder**

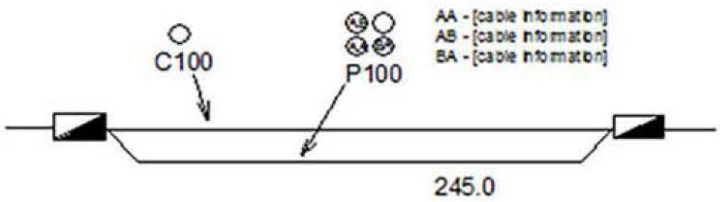
MT **Marker, transponder**

SMOF **Optical fibre cable direct buried**

Some examples of how to read Telstra plans:

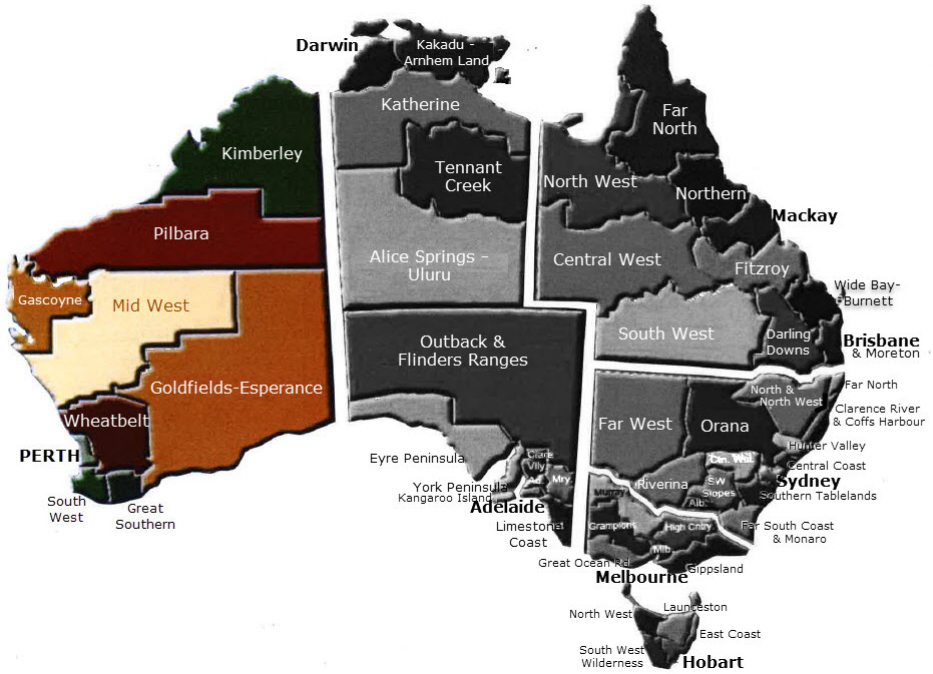


One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



Two separate conduit runs between two footway access chambers (manholes) 245m apart. A nest of four 100mm PVC conduits (P100) containing assorted cables in three ducts (one being empty) and one empty 100mm concrete duct (C100) along the same route.

WARNING: Telstra plans and location information conform to Quality Level 'D' of the Australian Standard AS 5488 - Classification of Subsurface Utility Information. As such, Telstra supplied location information is indicative only. Spatial accuracy is not applicable to Quality Level D. Refer to AS 5488 for further details. Telstra does not warrant or hold out that its plans are accurate and accepts no responsibility for any inaccuracy shown on the plans. FURTHER ON SITE INVESTIGATION IS REQUIRED TO VALIDATE THE EXACT LOCATION OF TELSTRA PLANT PRIOR TO COMMENCING CONSTRUCTION WORK. A plant location service is an essential part of the process to validate the exact location of Telstra assets and to ensure the asset is protected during construction works. The exact position of Telstra assets can only be validated by physically exposing it. Telstra will seek compensation for damages caused to its property and losses caused to Telstra and its customers.



TELSTRA ACCREDITED PLANT LOCATORS – WESTERN AUSTRALIA.

Region WAUS

Telstra plans are intended to be indicative only. A plant location service (Telstra accredited) is required to identify the exact location of the plant and ensure that the asset is protected during construction work. It is your responsibility as part of your "Duty of Care" to engage an Accredited Plant Locator.

***Optic fibre cable locations** must be performed by a locator with Telstra optic fibre location accreditation.

Locators with Telstra optic fibre cable location accreditation are indicated by either a 'yes' in the 'Fibre' column or the DBYD Certified Locator Symbol.

DIAL BEFORE YOU DIG CERTIFIED LOCATOR

Please contact a Telstra accredited locator from the pages following (fees apply).

Telstra Accredited Plant Locators – Western Australia

Western Australia.

Company Name & service areas	*Fibre	Contact	
A 1Stop Locating Shop **t/as Cable Locates & Consulting** All of WA		08 9524 6600 0409 115 517 admin@cablelocates.com.au	Phone Mobile Fax Email Web
Abaxa All of WA		08 9256 0100 admin@abaxa.com.au www.abaxa.com.au	Phone Mobile Fax Email Web
Advance Scanning Services All of WA	YES	1300 738 118 0417 011 384 admin@advancescannning.com.au	Phone Mobile Fax Email Web
All Assets 2 Locate (AA2L) WA Kimberly's, Northern SA, Central Australia, Northern Territory	YES	1300 2562283 0428 600 703 plans@kellercom.com.au www.13002LOCATE.com.au	Phone Mobile Fax Email Web
Australian Damage Prevention Specialists Pty Ltd t/as Utility Locations Perth, Bunbury, Busselton, Margaret River-Augusta and surrounding areas	YES	0455 365 282 david.berukoff@gmail.com.au	Phone Mobile Fax Email Web
Award Contracting All areas Metro and Country WA		08 9242 2113 0411 878 895 info@awardcontracting.com.au www.awardcontracting.com.au	Phone Mobile Fax Email Web
B & D Goldfields Pty Ltd t/as MJB Underground Utilities Country WA, Kalgoorlie, Goldfields Wheatbelt and Esperance regions		08 9091 8606 08 9022 7504 admin@mjbuu.com.au	Phone Mobile Fax Email
Big Rock Electrical Dunsborough, Busselton, Bunbury, Margaret River, Augusta and surrounding districts		 0407 475 698 08 9751 5559 bigrockelect@gmail.com www.bigrockelectrical.com.au	Phone Mobile Fax Email Web
BJ Davies Plumbing Kimberley & Pilbara areas	YES	08 9192 3128 0417 330 016 davies333@bigpond.com	Phone Mobile Fax Email Web
Bunbury Telecom Service South West WA		08 9726 0088 0407 997 505 admin@btswa.com.au	Phone Mobile Fax Email Web
Cabling WA Pty Ltd Bibra Lake	YES	08 9412 0500 08 9412 0555 admin@cablingwa.com.au	Phone Mobile Fax Email Web
Courtsea Pty Ltd Top of WA All of NT & North Queensland		08 8983 1404 0407 269 337 08 8983 1404 courtsea@bigpond.com	Phone Mobile Fax Email Web
Diamond Communications Perth, Gascoyne, Mid-West, Wheat belt, South West & Great Southern regions		08 6350 9135 0427 219 762 ken.mariu@diacom.com.au www.diacom.com.au	Phone Mobile Fax Email Web

Telstra Accredited Plant Locators – Western Australia

Find Wise Location Services Joondalup / Yanchep and surrounding areas	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 9561 1865 0407 992 758 08 9561 1866 shane@findwise.com.au	Phone Mobile Fax Email Web
Gas It Pipe Contracting Bunbury and South West WA	YES	08 9726 0166 0438 933 195 gasit@gateway.net.au	Phone Mobile Fax Email Web
Geographe Underground Services Busselton and surrounding areas	YES	08 9752 3166 0439 976 751 admin@geographeunderground.com.au www.geographeunderground.com.au	Phone Mobile Email Web
iFind Pipes 'N' Cables Pty Ltd top of WA and Kimberley region all of NT and Northern Qld.	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	0419 612 476 08 8941 2615 info@ifindnt.com www.ifindnt.com	Phone Mobile Fax Email Web
J & S Castlehow Electrical Services Albany and surrounding areas	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 9841 4888 0428 210 903 08 9841 5252 dave.kelly@castlehow.com.au	Phone Mobile Fax Email Web
Jim McKenzie Pty Ltd All areas	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	0417 173 944 bigjim@wn.com.au	Phone Mobile Fax Email Web
Katanning Area Telephones Great Southern WA	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 9821 1197 0419 930 646 johnmburns@dodo.com.au	Phone Mobile Fax Email Web
LivePower Construction and Plant All of WA	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 6401 6234 0448 220 338 08 6401 6242 bookings@livepower.com.au www.livepower.com.au	Phone Mobile Fax Email Web
Minitdol Pty Ltd t/as Danisam Covering NT & the top of WA	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 8941 6434 0417 089 865 08 8941 6435 danisam@westnet.com.au	Phone Mobile Fax Email Web
Mossy's Mini Excavation Perth Metro & Eastern regions from Wangara office And the Mid-Western region from the Geraldton office.	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	08 9408 0625 0408 840 024 mossykv@westnet.com.au www.miniexcavation.com	Phone Mobile Fax Email Web
Northern Comms Pty Ltd. All of NT, and northern end of WA	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	0407 904 319 steve@northerncomms.net.au www.northerncomms.net.au	Phone Mobile Fax Email Web
Platinum Locating Services	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	0451 746 060 info@ppeh.com.au www.ppeh.com.au	Phone Mobile Fax Email Web
Pulse Locating	DIAL BEFORE YOU DIG CERTIFIED LOCATOR	0420 988 552 enquiries@pulselocating.com.au www.pulselocating.com.au	Phone Mobile Fax Email Web
Somerset Hill (WA) Pty Ltd Denmark & 500klm radius of Denmark	YES	08 9840 9036 0428 409 036 08 9840 9536 rogerbevseeney@bigpond.com	Phone Mobile Fax Email Web

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Spotters Asset Locations Pty Ltd Perth Metro and Country		0459 130 677 jeremy@spottersassetlocations.com.au	Phone Mobile Fax Email
SUBTERA Perth Metro and all of WA		1300 046 636 0404 046 636 dale@subtera.com.au	Phone Mobile Fax Email Web
Subterranean Service Locations WA Geraldton and all of WA.		0420 862 426 derek@sslwa.com.au	Phone Mobile Fax Email Web
TerraVac Vacuum Excavation		0427 531 119 0433 374 802 terravac@terravac.com.au www.terravac.com.au	Phone Mobile Fax Email Web
Total Scan & Survey Perth Metro, greater South West & greater Northern areas and surrounds		0417 575 548 jon@tssurvey.com.au	Phone Mobile Fax Email Web
Underground Services Australia Greater Perth region, the North West and surrounding districts of WA		08 9272 0100 08 9272 0199 skills@usa.com.au	Phone Mobile Fax Email Web
United Scanning Services Pty Ltd All of WA		08 9294 1832 0433 724 921 08 9294 1832 matthew@unitedscanning.com.au	Phone Mobile Fax Email Web
Utility Locating Solutions Perth & surrounding areas		08 9385 5000 0477 660 077 scott@ulswa.com.au	Phone Mobile Fax Email Web
Utility Mapping (Aust) Pty Ltd Perth and all of WA		1300 MAPPING 0417 413 353 perth@utilitymapping.com.au www.utilitymapping.com.au	Phone Mobile Fax Email Web
WBHO Infrastructure Pty Ltd		08 9923 7000 0427 350 851 Jeff.clarke@wbho.com.au	Phone Mobile Fax Email Web
Western Service Locators Perth and all of WA		0487 339 001 info@westernservicelocators.com.au www.westernservicelocators.com.au	Mobile Email Web
Westscan Pty Ltd All of WA		0412 619 391 08 9593 6656 james.horton@westscan.com.au www.westscan.com.au	Phone Mobile Fax Email Web
WKC Spatial All of WA	YES	08 9374 7777 subsurface@wkc.com.au www.wkc.com.au	Phone Mobile Fax Email Web

DWF Map Files (all sizes over A3)

If you have received a **DWF map file** it is because either (a) you have requested a large area or (b) requested a heavily congested area such as a central business district..
The information on the plans cannot be shown legibly on an A3 PDF which is why a vector friendly DWF has been sent.
Plans over A3 in size cannot be supplied in PDF format due to system constraints - i.e. even if you specifically request it. You either need to utilise DWF viewing/printing software (see below for details) **or**
re-request a smaller area through DBYD which will result in a PDF (e.g. max length for a A3 PDF is approx 400m for all areas except CBD's)

Autodesk A360 (https://360.autodesk.com/viewer) Free online DWF viewer - Browser update may be required.
Best viewed in Google Chrome Web Browser (http://www.google.com/chrome/) and Mozilla Firefox (*https://www.mozilla.org/en-US/**firefox**/new/*)

or

Autodesk Design Review (http://usa.autodesk.com/design-review/) for DWF files. (Windows)

Mobile Apps:

Autodesk A360 (https://360.autodesk.com/viewer) Internet Browser window.
Etoolbox: **Android** http://play.google.com/store/apps/details?id=com.etoolbox.viewer&hl=en
Turbo Viewer iPhone http://itunes.apple.com/au/app/turboviewer/id440584381?mt=8

Appendix G

NBN - DBYD

G1

□o:	Mr Brandon Rademeyer
P□one:	0499424900
Fa□:	Not Supplied
□ma□:	Brandon.Rademeyer@arup.com

D□a□before □ou □□□ Job □:	11953295	
Sequence □	59315607	
Issue Date:	03/01/2017	
□ocat□on:	Armadale,Armadale,WA-6112	

Location of Underground Telecommunications Facilities

We thank you for your enquiry. In relation to your enquiry at the above address:

- **nbn□s** records indicate that there □□□ underground fibre optic/telecommunications facility/facilities (owned or controlled by **nbn**) in the vicinity of the location identified above ("Location").
- **nbn** indicative plan/s are attached with this notice ("Indicative Plans").
- The Indicative Plans show general depth and alignment information only and are not an exact scale or accurate depiction of the location, depth and alignment of the fibre optic/ telecommunications facilities shown on the Indicative Plans.
- In particular, the fact that the Indicative Plans show that a facility is installed in a straight line, or at uniform depth along its length cannot be relied upon as evidence that the facility is, in fact, installed in a straight line or at uniform depth.
- You should read the Indicative Plans in conjunction with this notice and in particular, the notes below.
- The information contained in the Indicative Plans is valid for 28 days from the date of issue set out above. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your expense to locate **nbn** telecommunications facilities during any activities you carry out on site).

We thank you for your enquiry and appreciate your continued use of the Dial Before You Dig Service. If you are planning to excavate or require further information, please contact **nbn** on 1800 626 762. For any enquiries related to moving assets or Planning and Design activities, please email **nbn** at RelocationWorks@nbnco.com.au.

Notes:

1. You are now aware that there are items of telecommunications and/or power facilities in the vicinity of the above property that could be damaged as a result of activities carried out (or proposed to be carried out) by you in the vicinity of the Location.
2. You should have regard to section 474.6 and 474.7 of the *Criminal Code Act 1995* (Cth) which deals with the consequences of interfering or tampering with a telecommunications facility. Only persons authorised by **nbn** can interact with **nbn**'s network facilities.
3. Any information provided is valid only for **2** days from the date of issue set out above.

Indicative Plans

1	9	17	25	33
2	10	18	26	34
3	11	19	27	35
4	12	20	28	36
5	13	21	29	37
6	14	22	30	38
7	15	23	31	39
8	16	24	32	40

LEGEND

Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

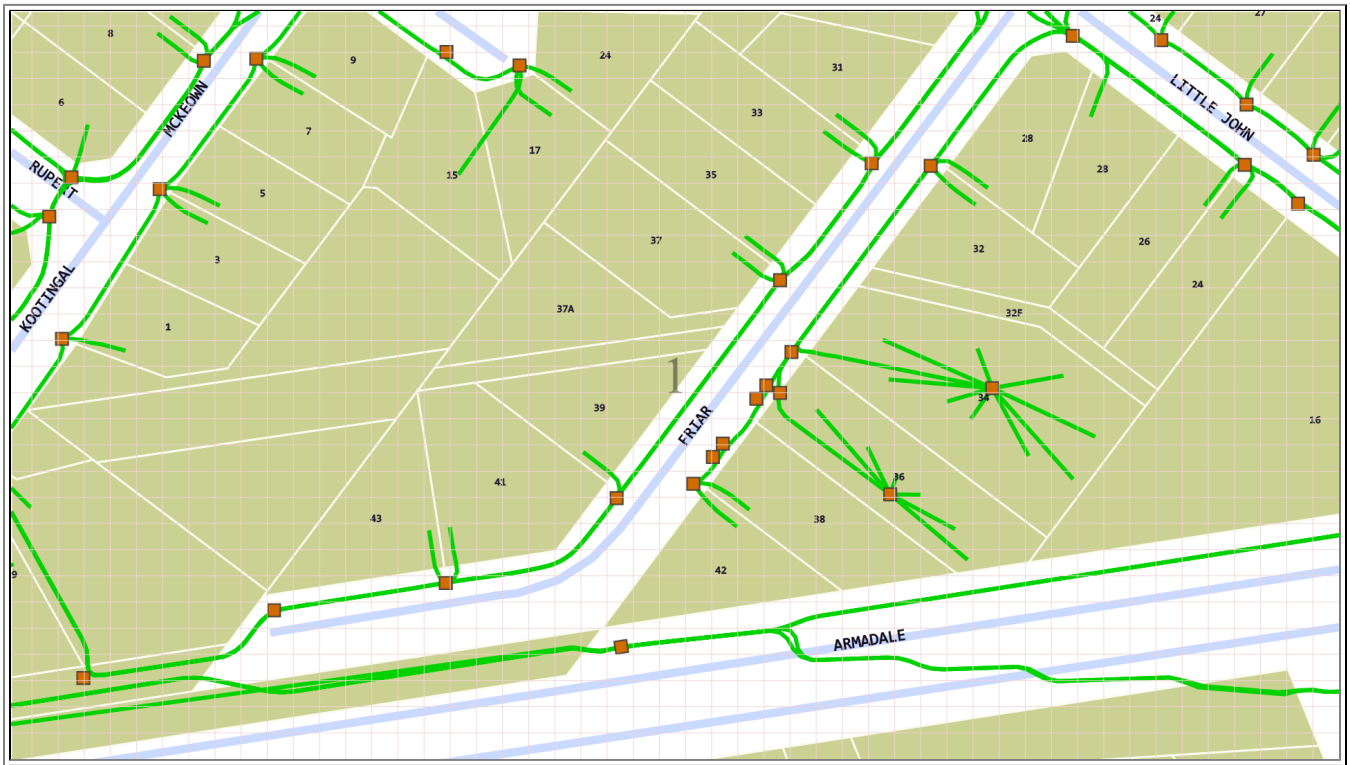
Pit/Manhole

Scale

0 20 40 60 Meters

1:2000
1 cm equals 20 m

Email info@nbn.com.au Web nbn.com.au



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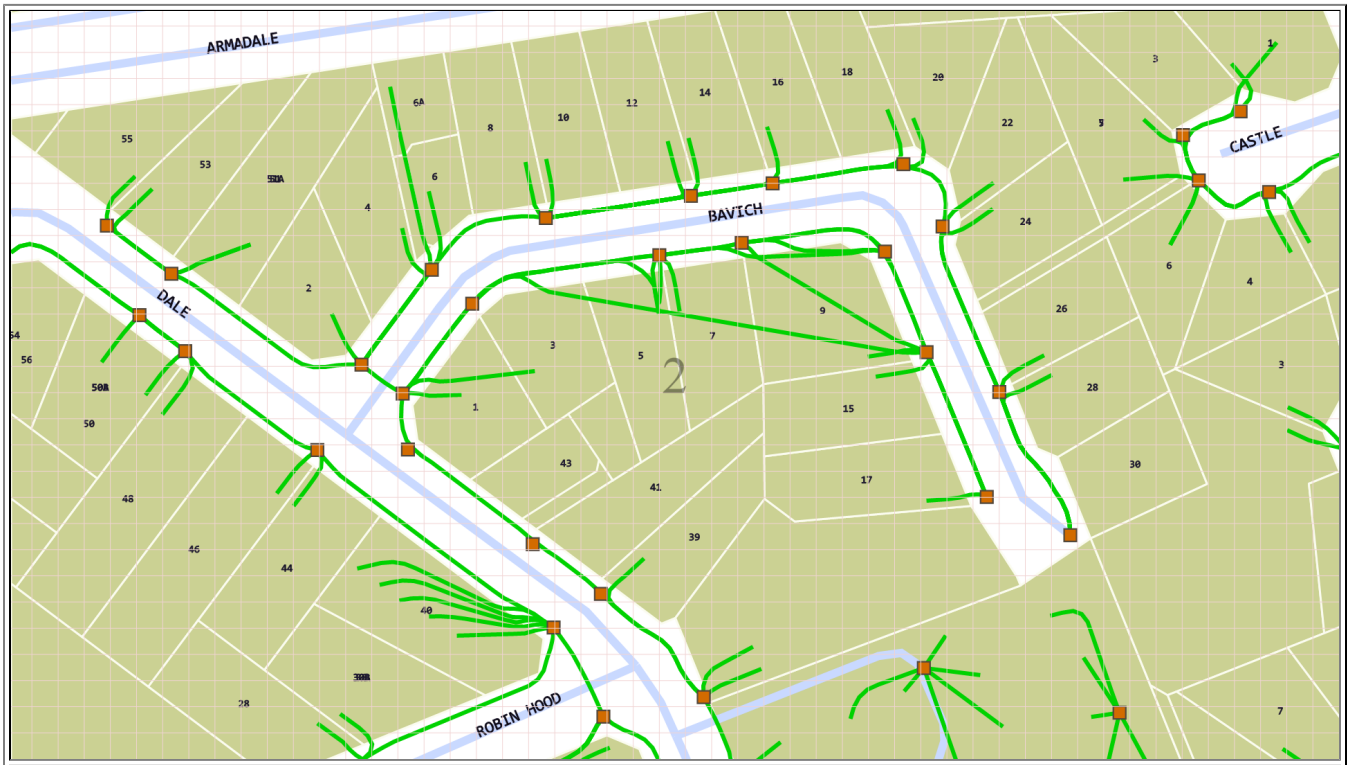

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LEGEND

Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

Pit/Manhole

Scale

0 20 40 60 Meters

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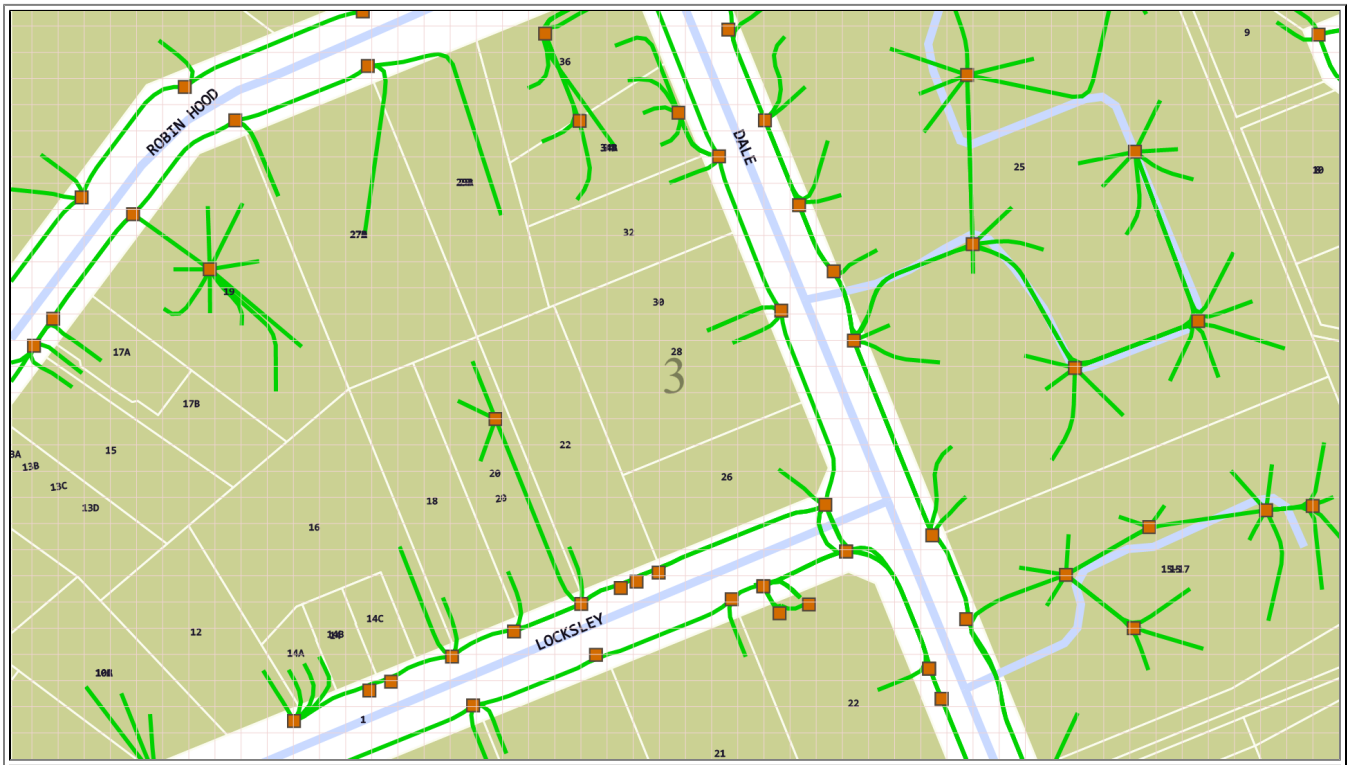
Email info@nbn.com.au Web nbn.com.au



Email info@nbn.com.au Web nbn.com.au

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Assets

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DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

Pit/Manhole

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0 20 40 60 Meters

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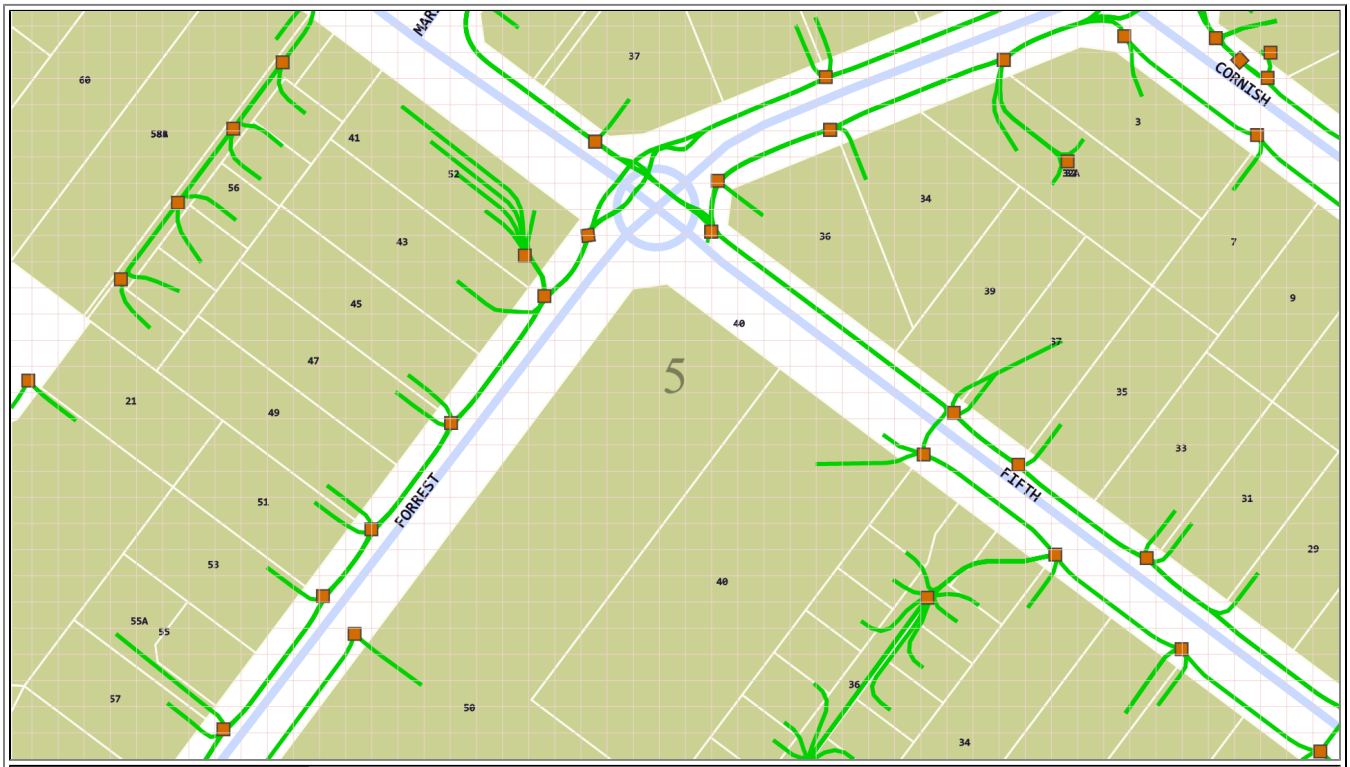

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Assets

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DESIGNED/CONSTRUCTED:
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Pit/Manhole

Scale

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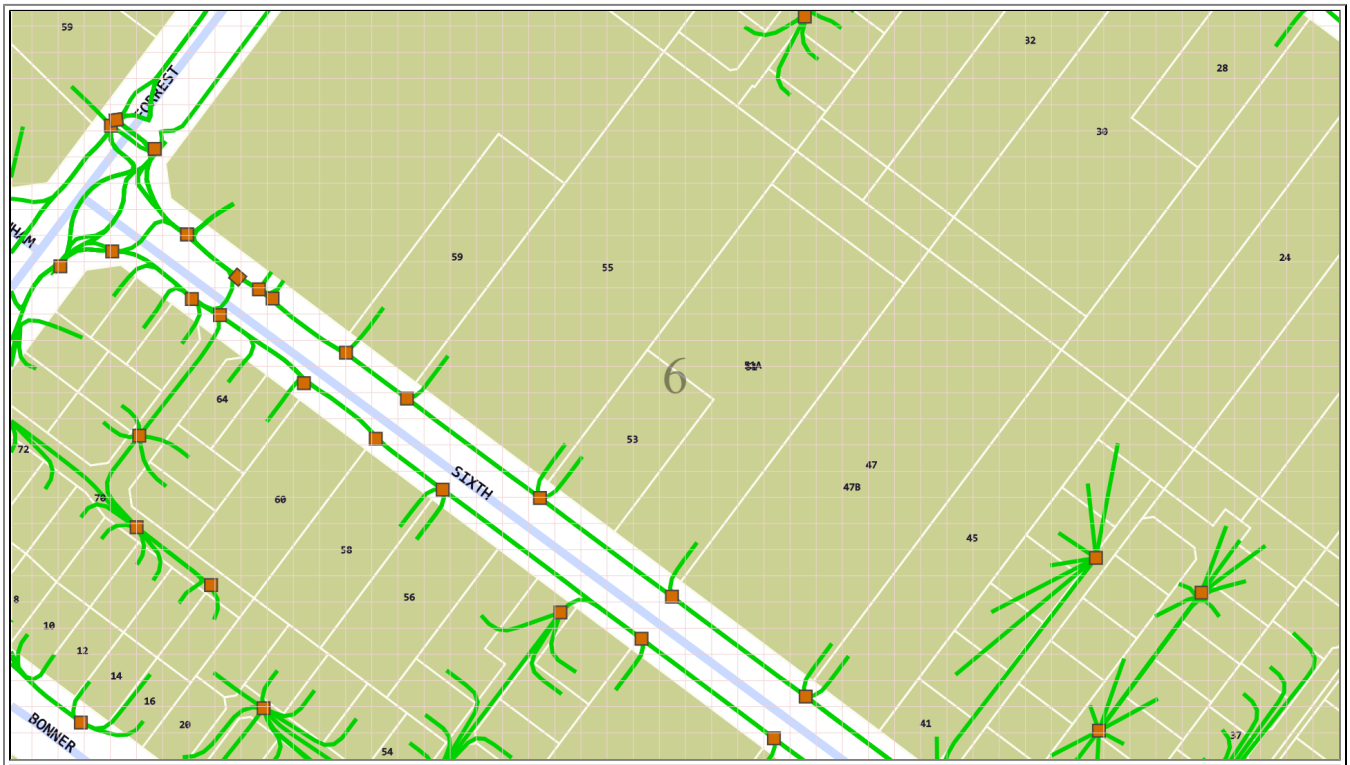

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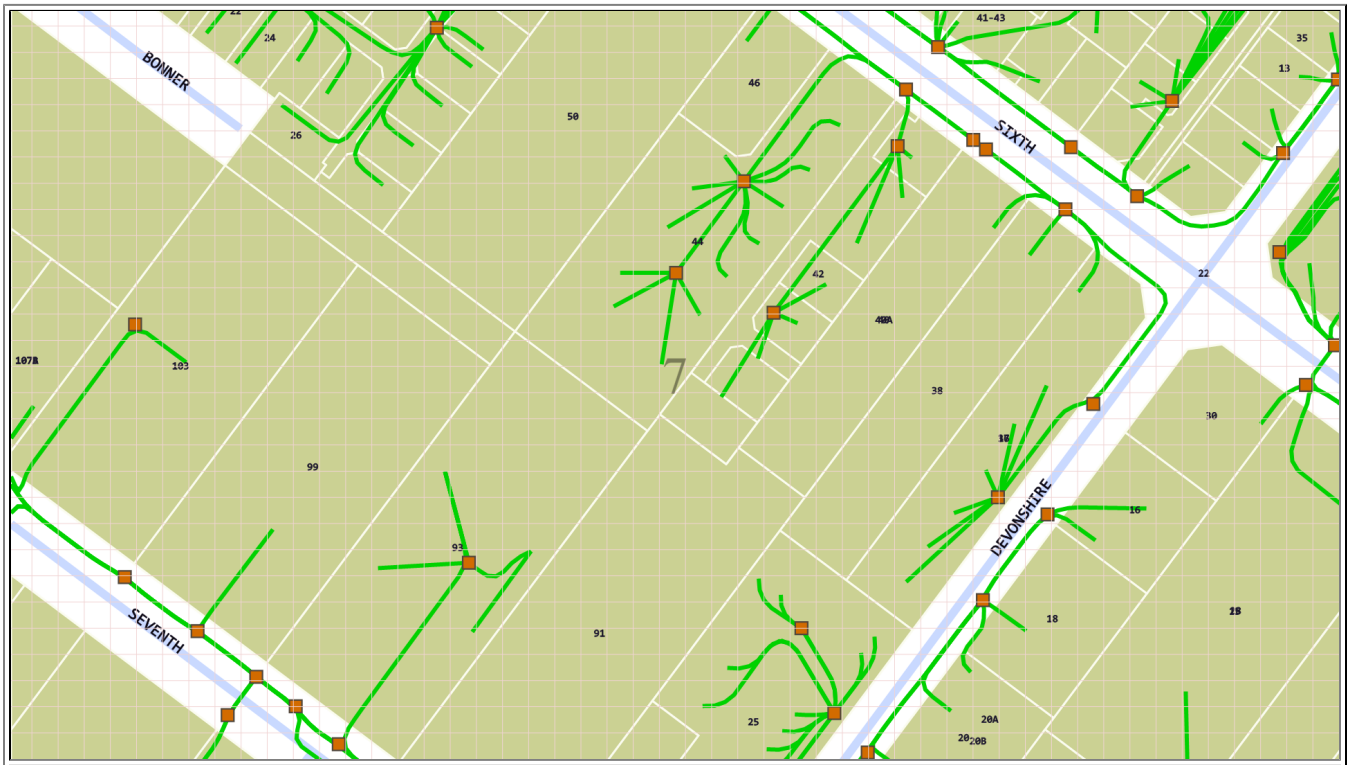

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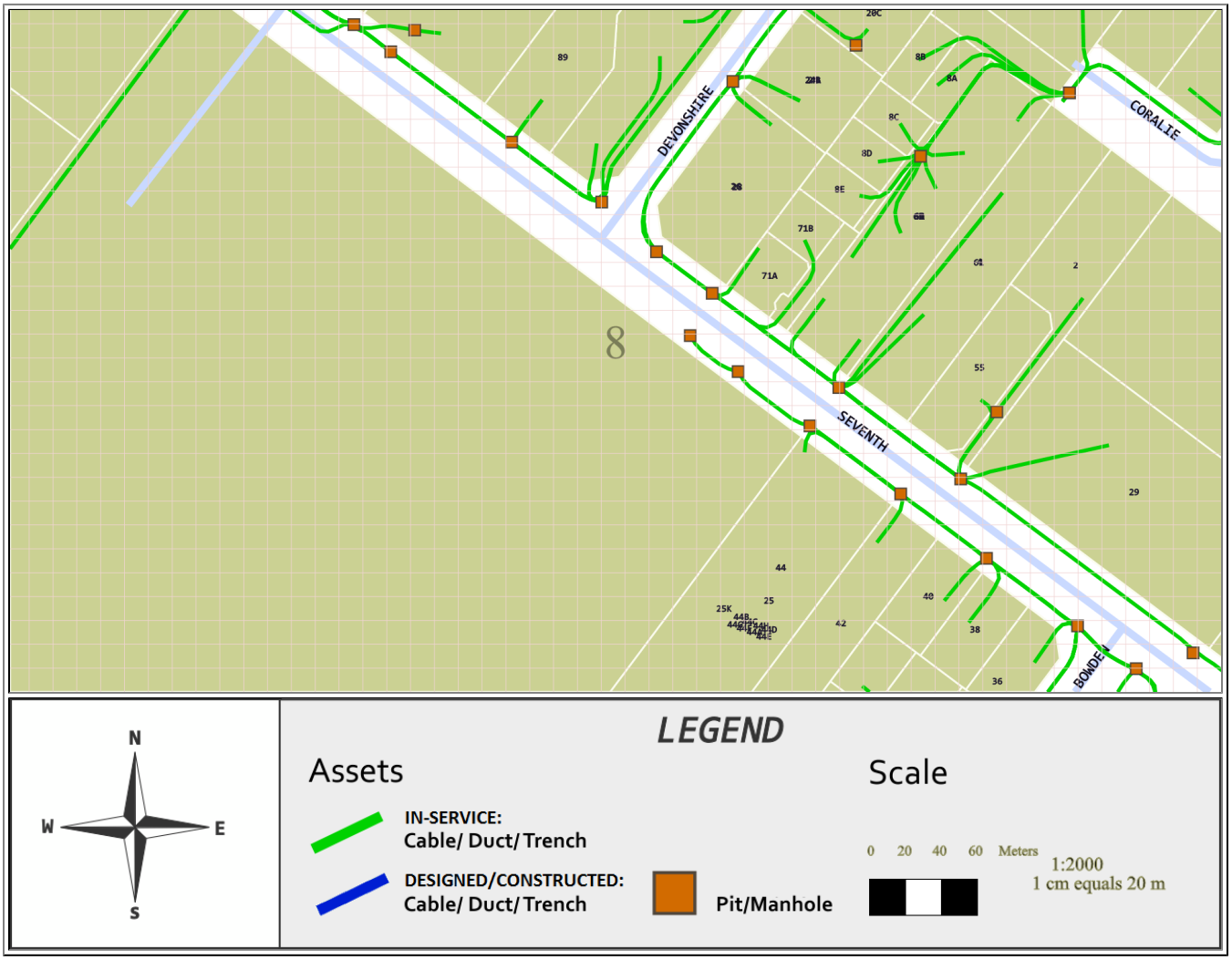

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Assets

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Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

Pit/Manhole

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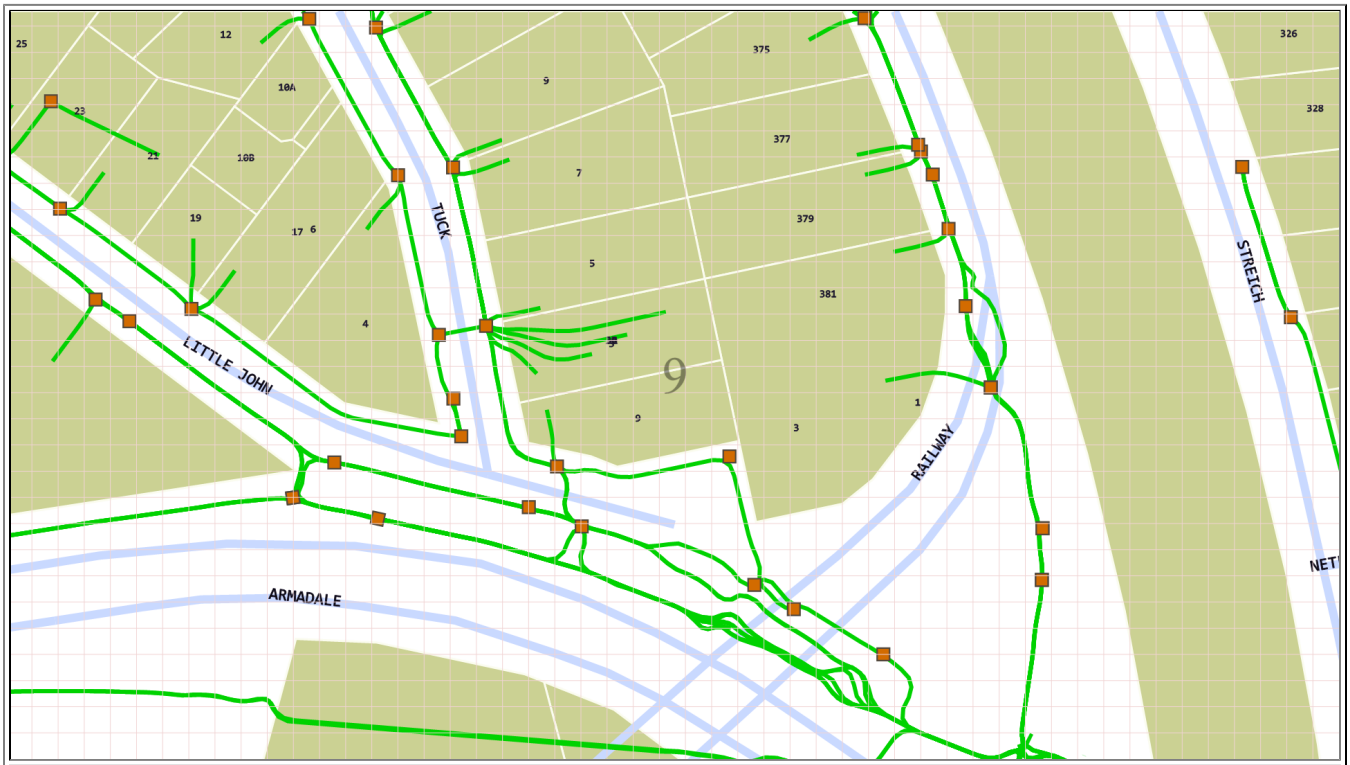

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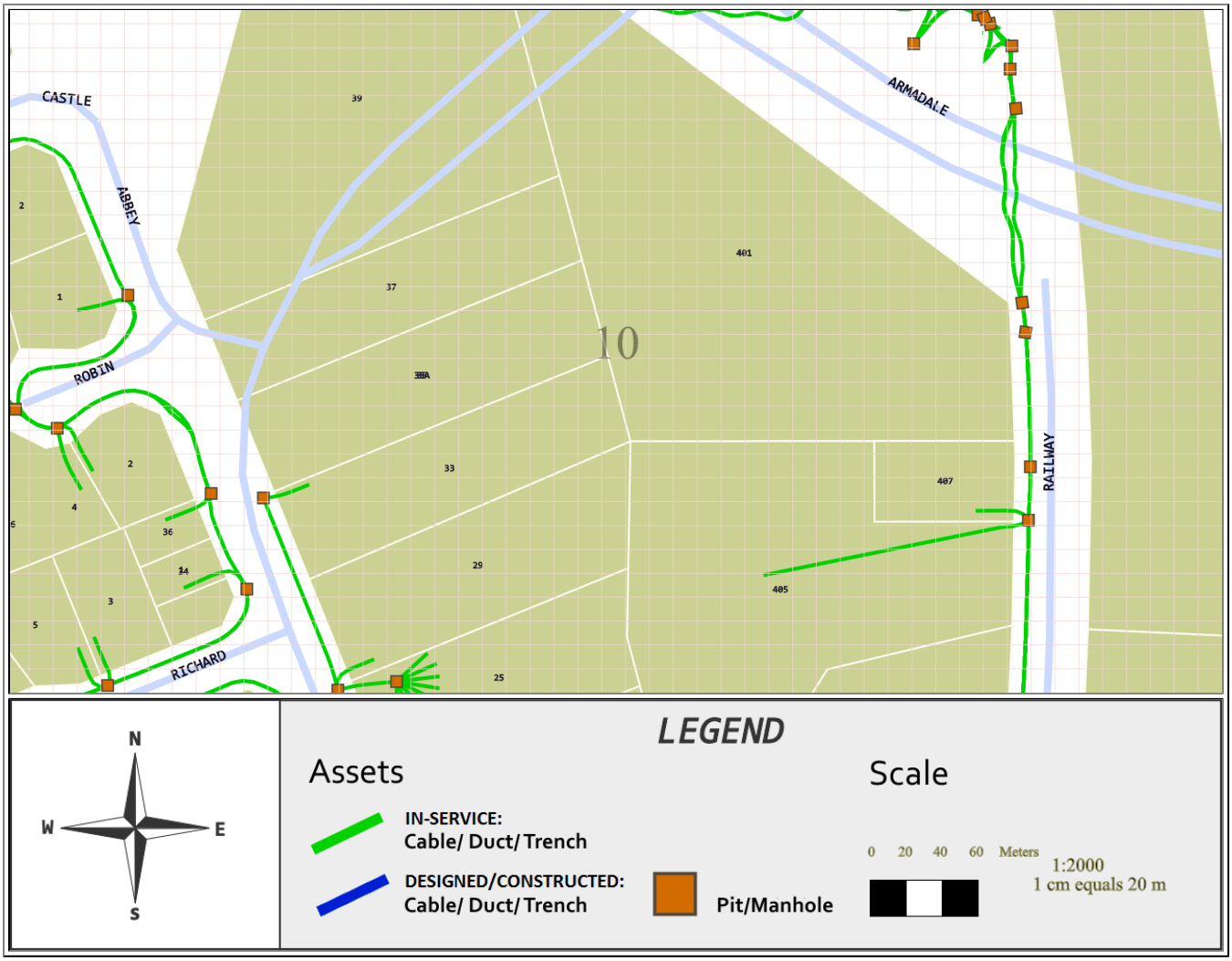

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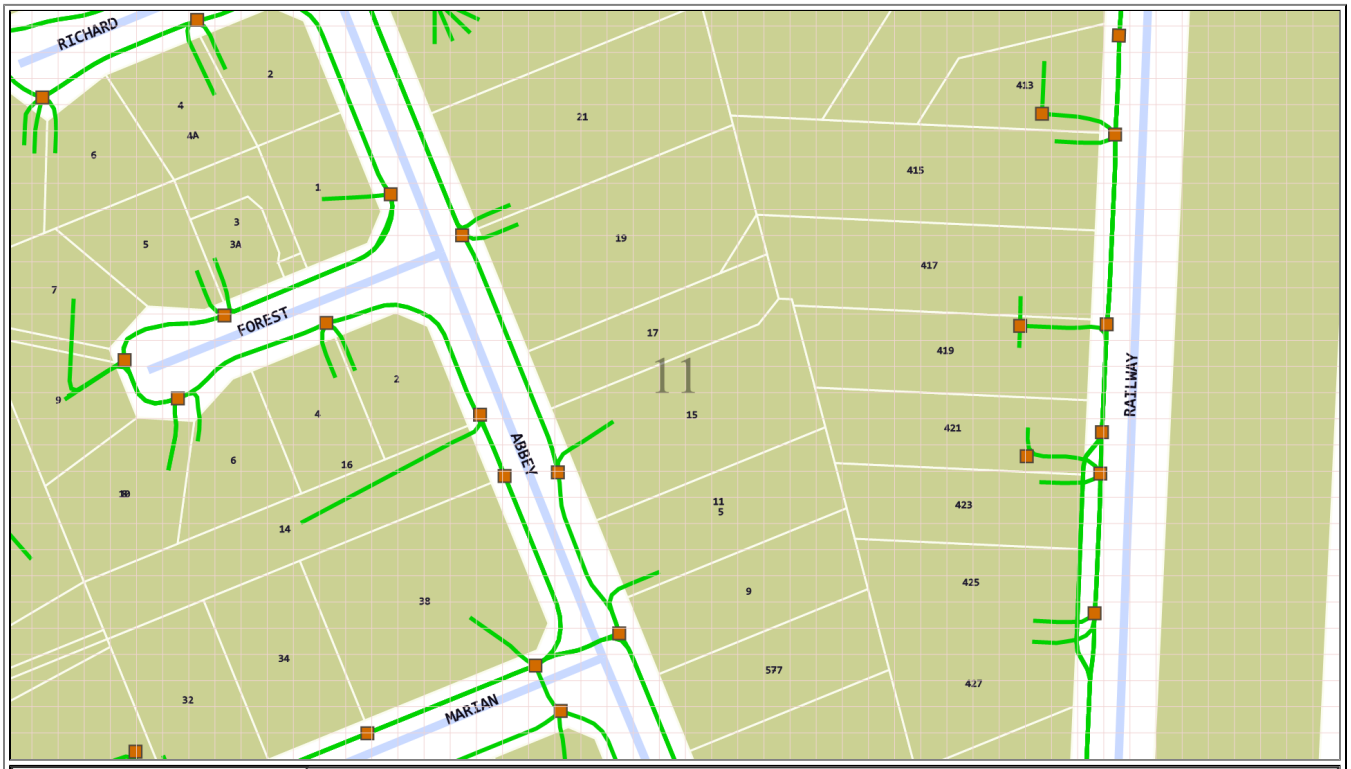

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Assets

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Pit/Manhole

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Level 11, 100 Arthur Street, North Sydney NSW 2060

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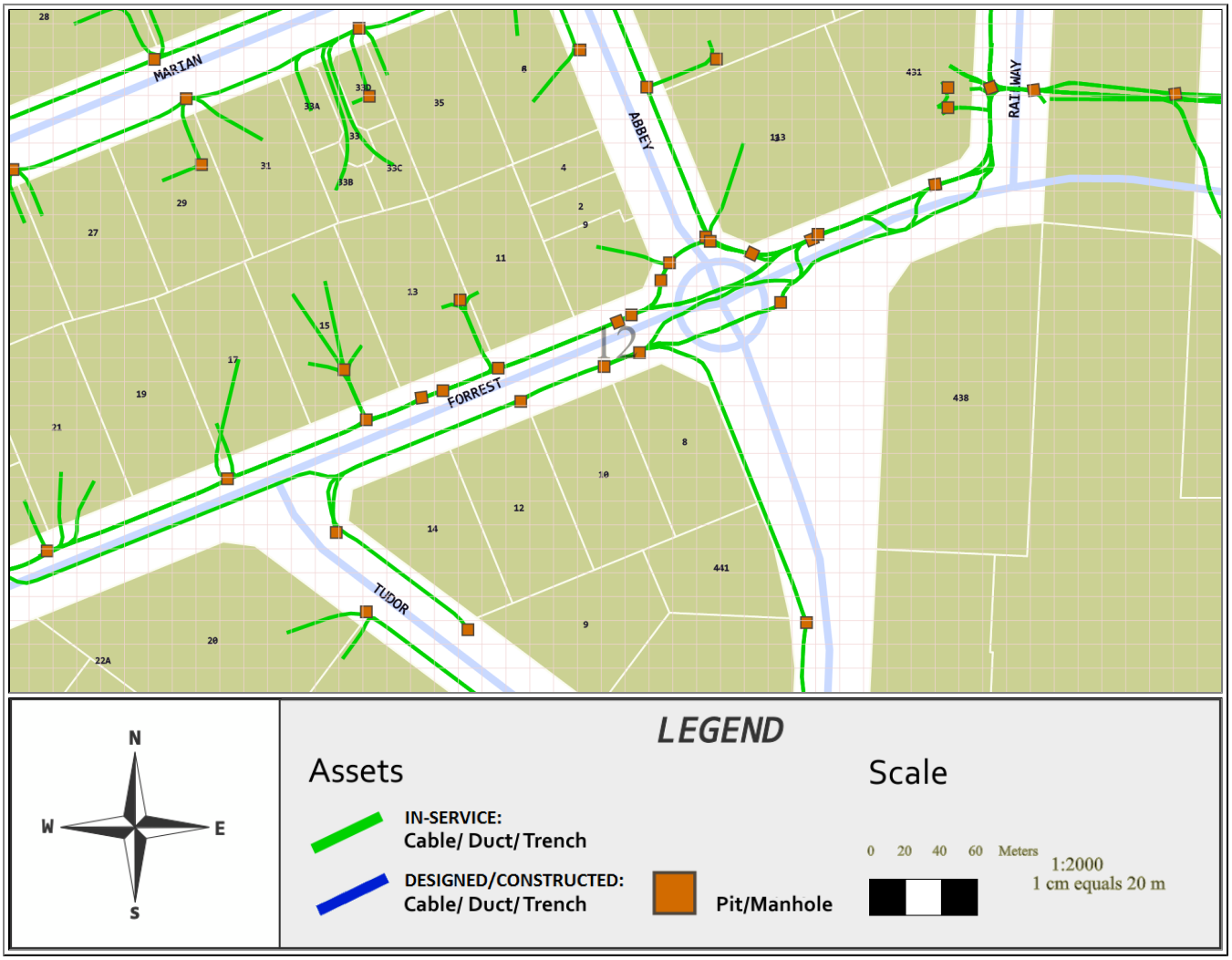

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Pit/Manhole

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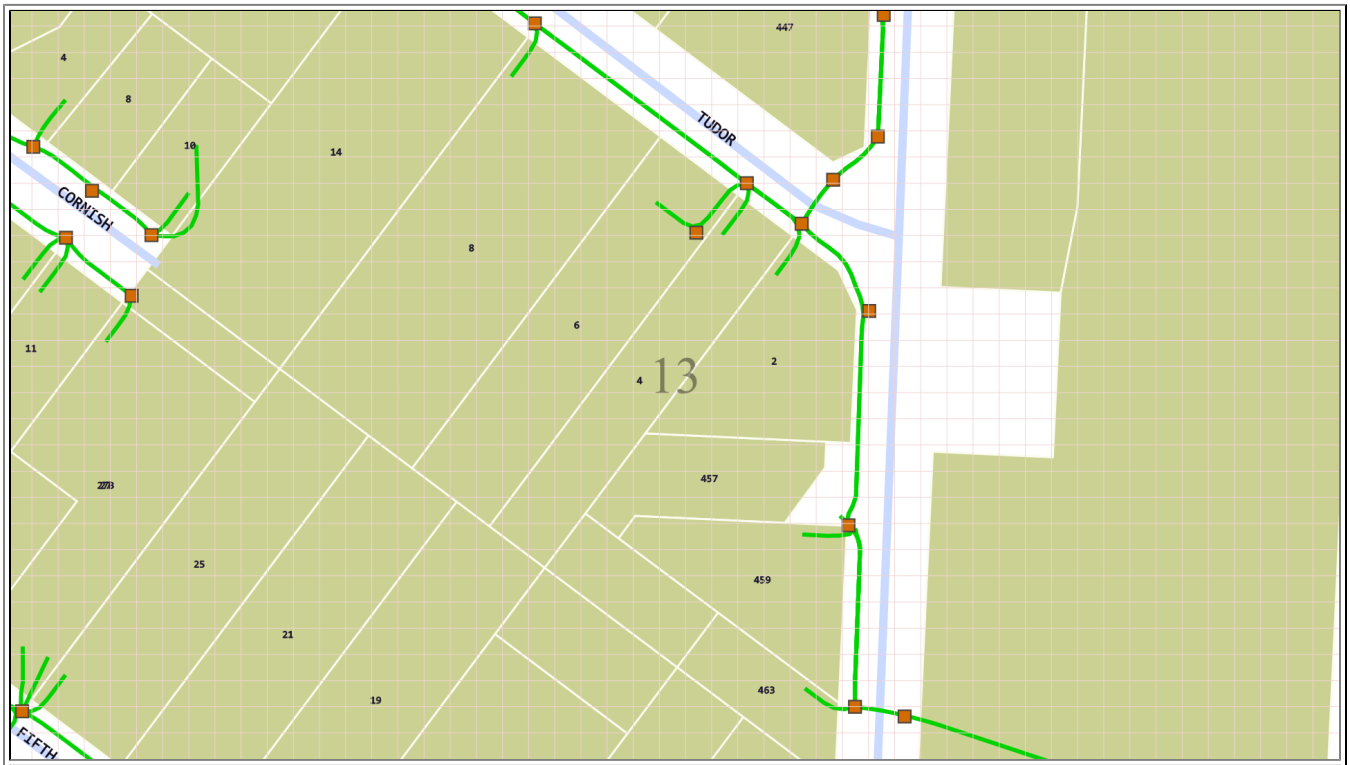

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Pit/Manhole

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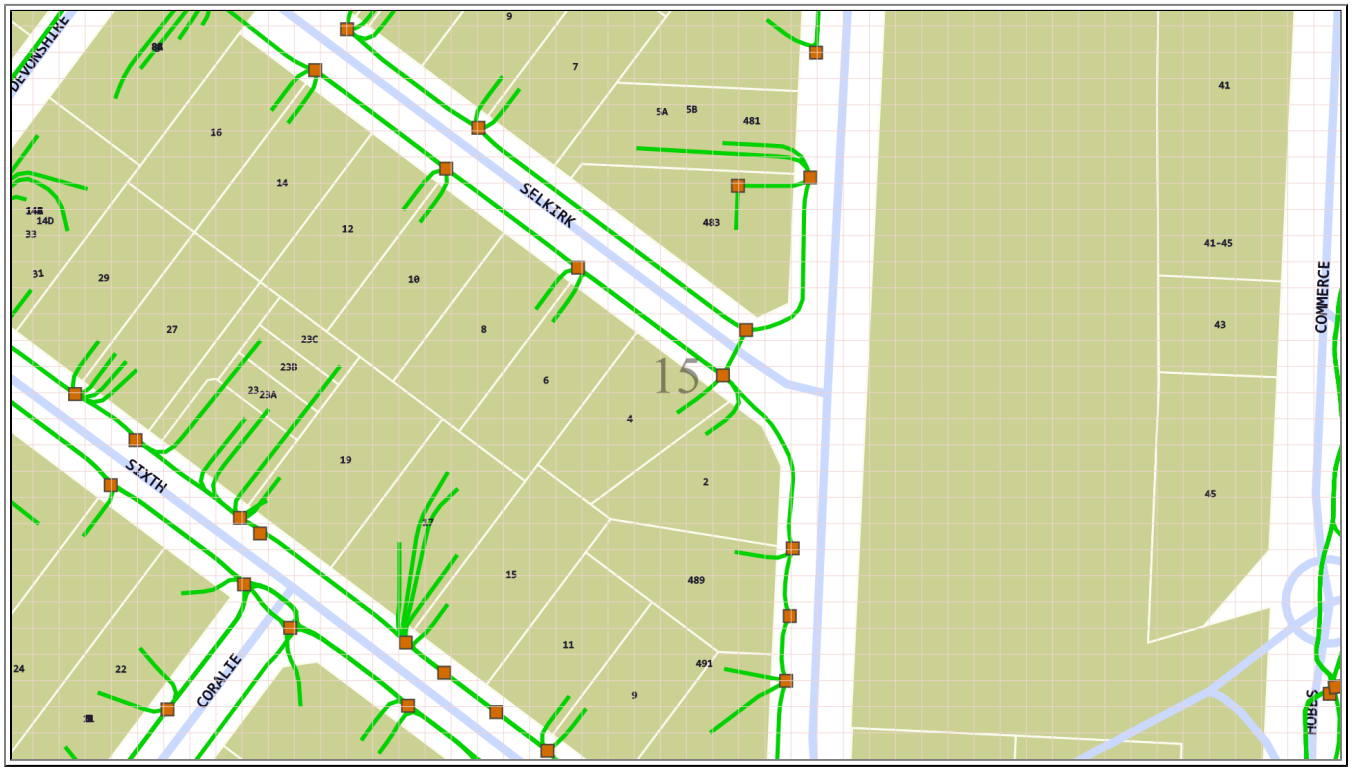


□eferra□Con□t□ons

The following are conditions on which **nbn** provides you with the Indicative Plans. By receiving, accepting or relying upon the plans (including the Indicative Plans), you are agreeing to these conditions. These conditions are in addition to (and not in replacement of) any duties and obligations you have under applicable law.

1. **nbn** does not accept any responsibility for any inaccuracies of its plans including the Indicative Plans. You are expected to make your own inquiries and perform your own investigations (including engaging appropriately qualified plant locators at your cost to locate **nbn** telecommunications facilities during any activities you carry out on site).
2. You should not assume that **nbn** cables and assets follow straight lines or are installed at uniformed depths along their lengths, even if they are indicated on plans provided to you. Careful onsite investigations are essential to locate the exact position of cables.
3. In carrying out any works in the vicinity of **nbn** facilities, you must maintain the following minimum clearances:
    - 300mm when laying assets inline, horizontally or vertically
    - 500mm when operating vibrating equipment, for example: jackhammers or vibrating plates;and
    - 1000mm when operating mechanical excavators.
    - Adherence to clearances as directed by other asset owner's instructions
4. You are aware that there are inherent risks and dangers associated with carrying out work in the vicinity of underground facilities (such as **nbn** fibre optic,copper and coaxial

cables,and power cable feed to **nbn** assets).Damage to underground electric cables may result in:

- Injury from electric shock or severe burns, with the possibility of death.
- Interruption of the electricity supply to wide areas of the city.
- Damage to your excavating plant.
- Responsibility for the cost of repairs.

5. You must take all reasonable precautions to avoid damaging **nbn** facilities. These precautions may include ,but not limited to, the following:
    - All excavation sites should be examined for underground cables by careful hand excavation. Cable cover slabs if present must not be disturbed. Hand excavation needs to be undertaken with extreme care to minimise the likelihood of damage to the cable, for example, the blades of hand equipment should be aligned parallel to the line of the cable rather than digging across the cable.
    - If any undisclosed underground cables are located, notify **nbn** immediately.
    - All personnel must be properly briefed, particularly those associated with the use of earth-moving equipment, trenching, boring and pneumatic equipment.
    - The safety of the public and other workers must be ensured.
    - All excavations must be undertaken in accordance with all relevant legislation and regulations.
6. You will be responsible for all damage to **nbn** facilities that are connected whether directly, or indirectly with work you carry out (or work that is carried out for you or on your behalf) at the Location. This will include,without limitation, all losses expenses incurred by **nbn** as a result of any such damage.
7. You must immediately report any damage to **nbn** network that you are/become aware of. Notification may be by telephone - 1800 626 762.
8. Except to the extent that liability may not be capable of lawful exclusion, **nbn** and its servants and agents and the related bodies corporate of **nbn** and their servants and agents shall be under no liability whatsoever to any person for any loss or damage (including indirect or consequential loss or damage) however caused (including, without limitation, breach of contract negligence and/or breach of statute) which may be suffered or incurred from or in connection with this information sheet or any Plans attached hereto. Except as expressly provided to the contrary in this information sheet or the attached Indicative Plans, all terms, conditions, warranties, undertakings or representations (whether expressed or implied) are excluded to the fullest extent permitted by law.

All works undertaken shall be in accordance with all relevant legislations, acts and regulations applicable to the particular state or territory of the Location. The following table lists all relevant documents that shall be considered and adhered to.

State/Territory	Documents
National	Work Health and Safety Act 2011
	Work Health and Safety Regulations 2011
	Safe Work Australia - Working in the Vicinity of Overhead and Underground Electric Lines (Draft)

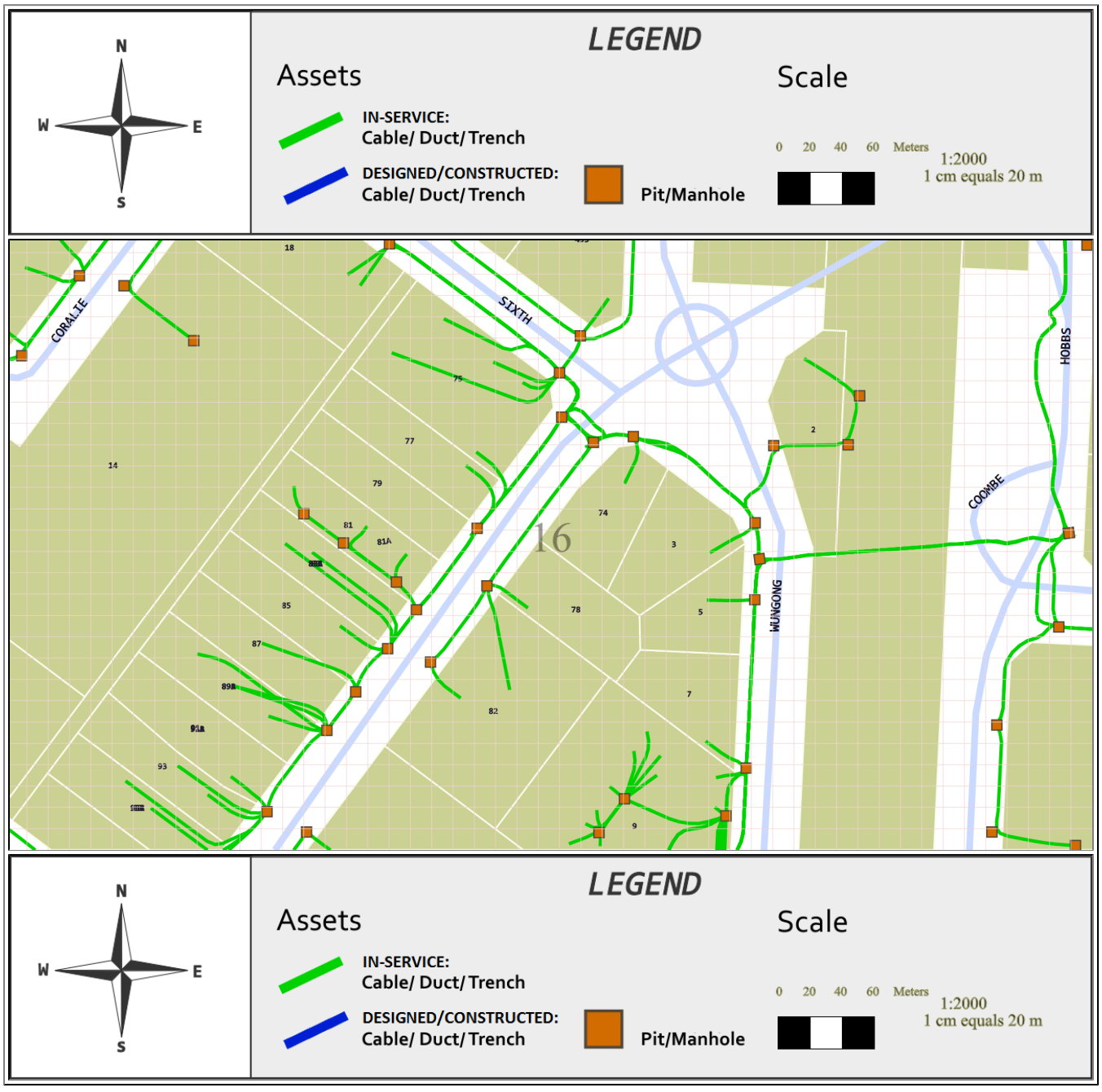
	Occupational Health and Safety Act 1991
NS□	Electricity Supply Act 1995
	Work Cover NSW - Work Near Underground Assets Guide
	Work Cover NSW - Excavation Work: Code of Practice
□IC	Electricity Safety Act 1998
	Electricity Safety (Network Asset) Regulations 1999
□□D	Electrical Safety Act 2002
	Code of Practice for Working Near Exposed Live Parts
S□	Electricity Act 1996
□□S	Tasmanian Electricity Supply Industry Act 1995
□ □	Electricity Act 1945
	Electricity Regulations 1947
N□	Electricity Reform Act 2005
	Electricity Reform (Safety and Technical) Regulations 2005
□C□	Electricity Act 1971

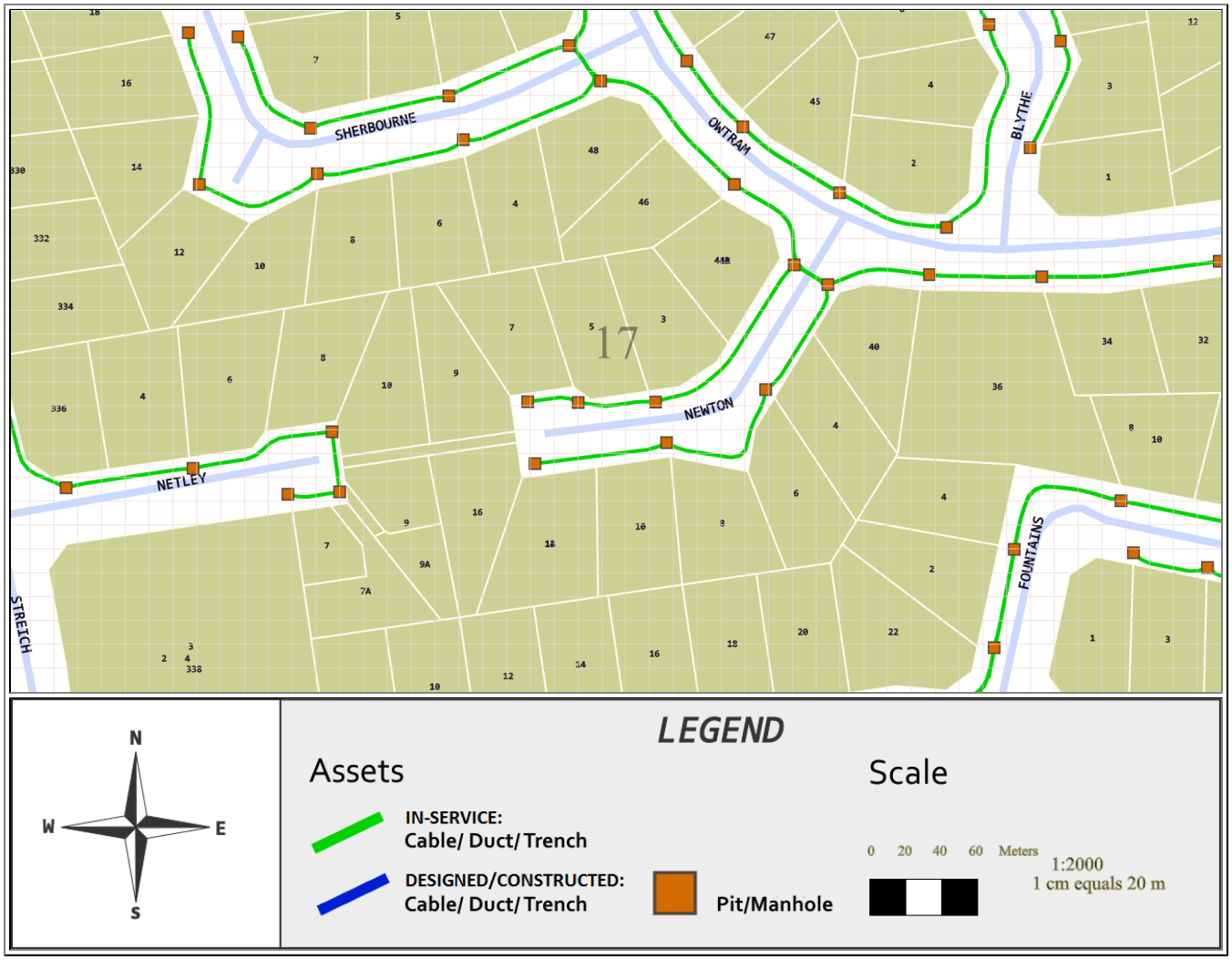
Thank You,

Net□or□ □□erat□ons Centre - □ssurance

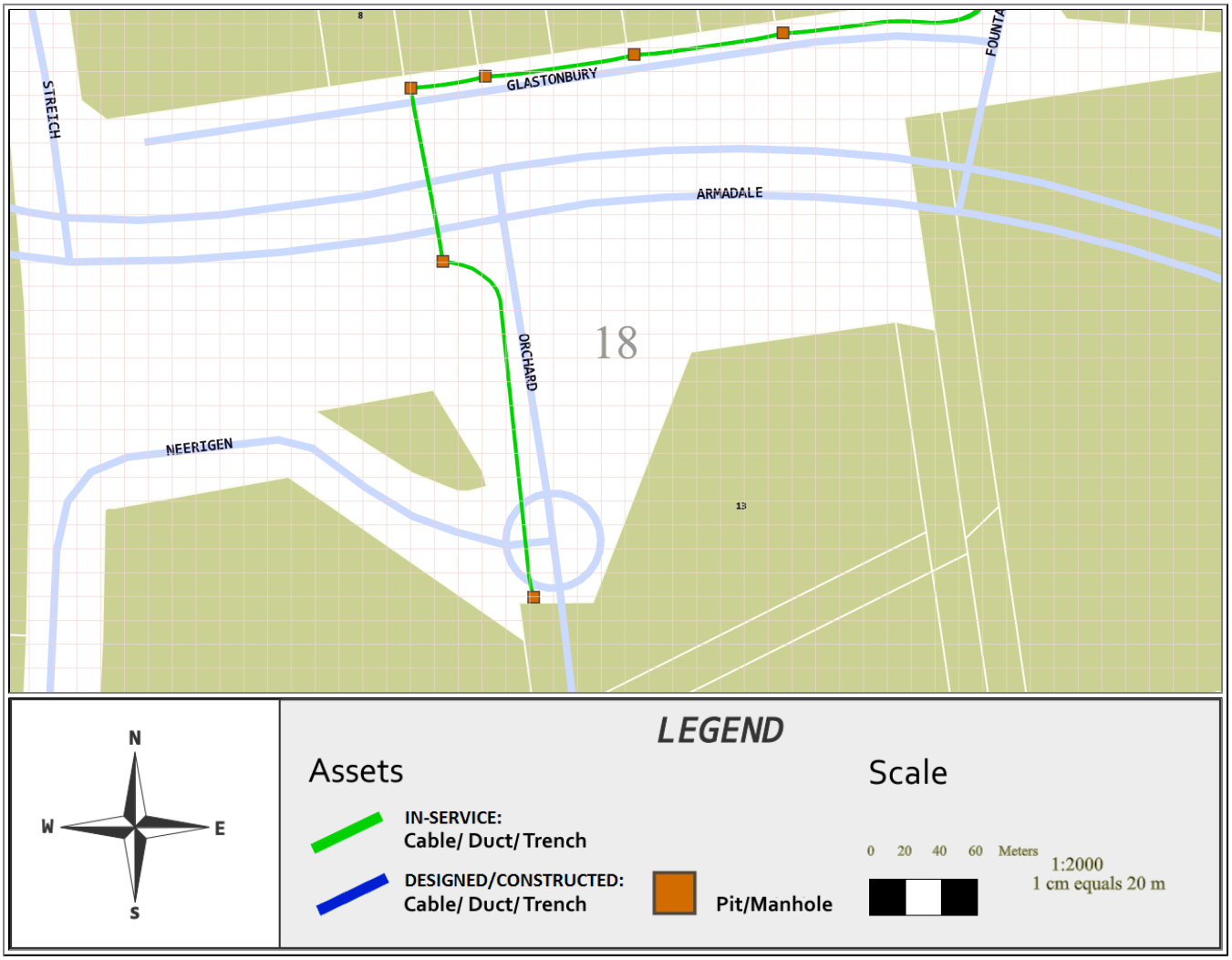
Date: 03/01/2017

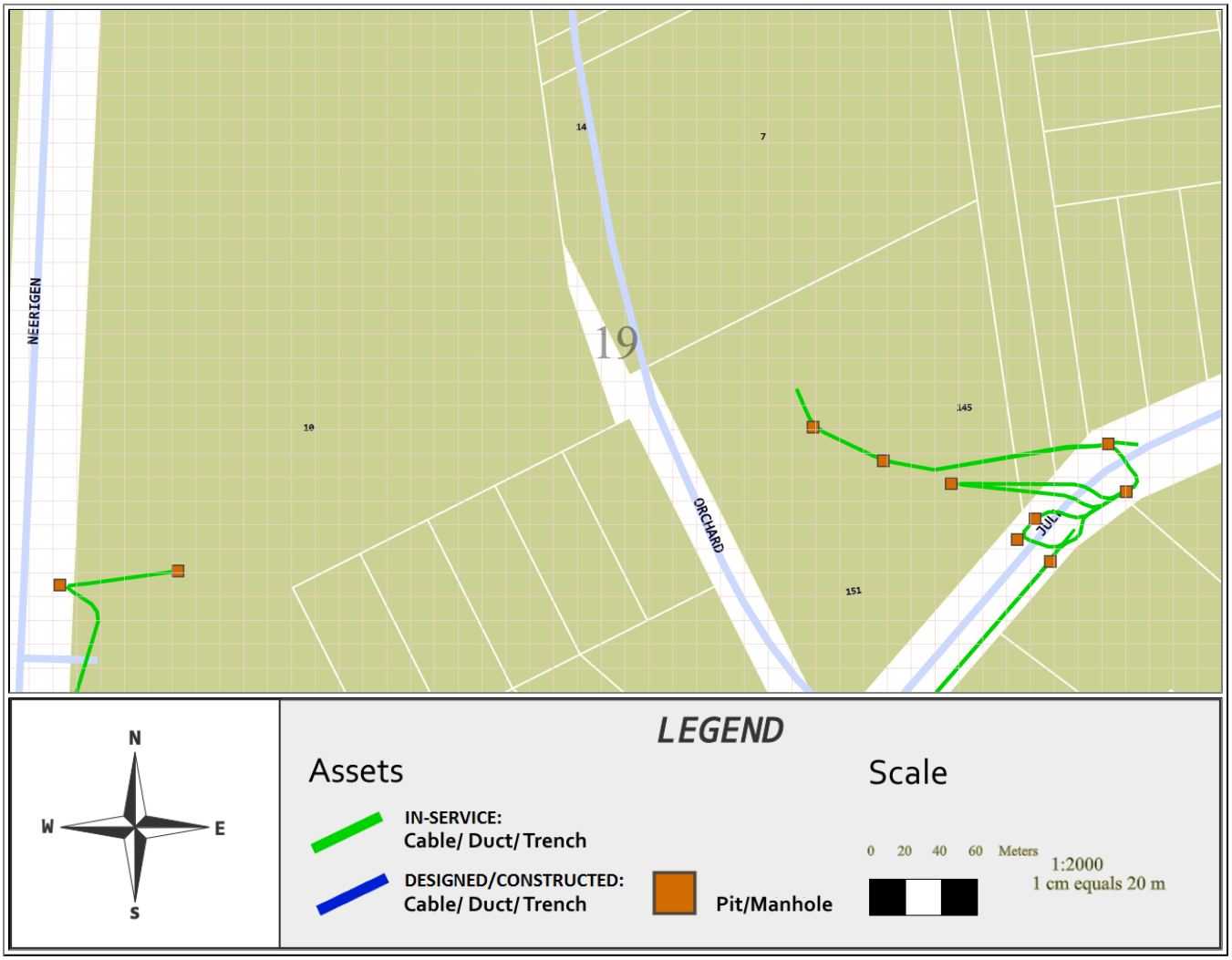
Cont- PDF for Job Number: 11953295 , Sequence Number: 59315607 , Issue Date: 03/01/ 2017

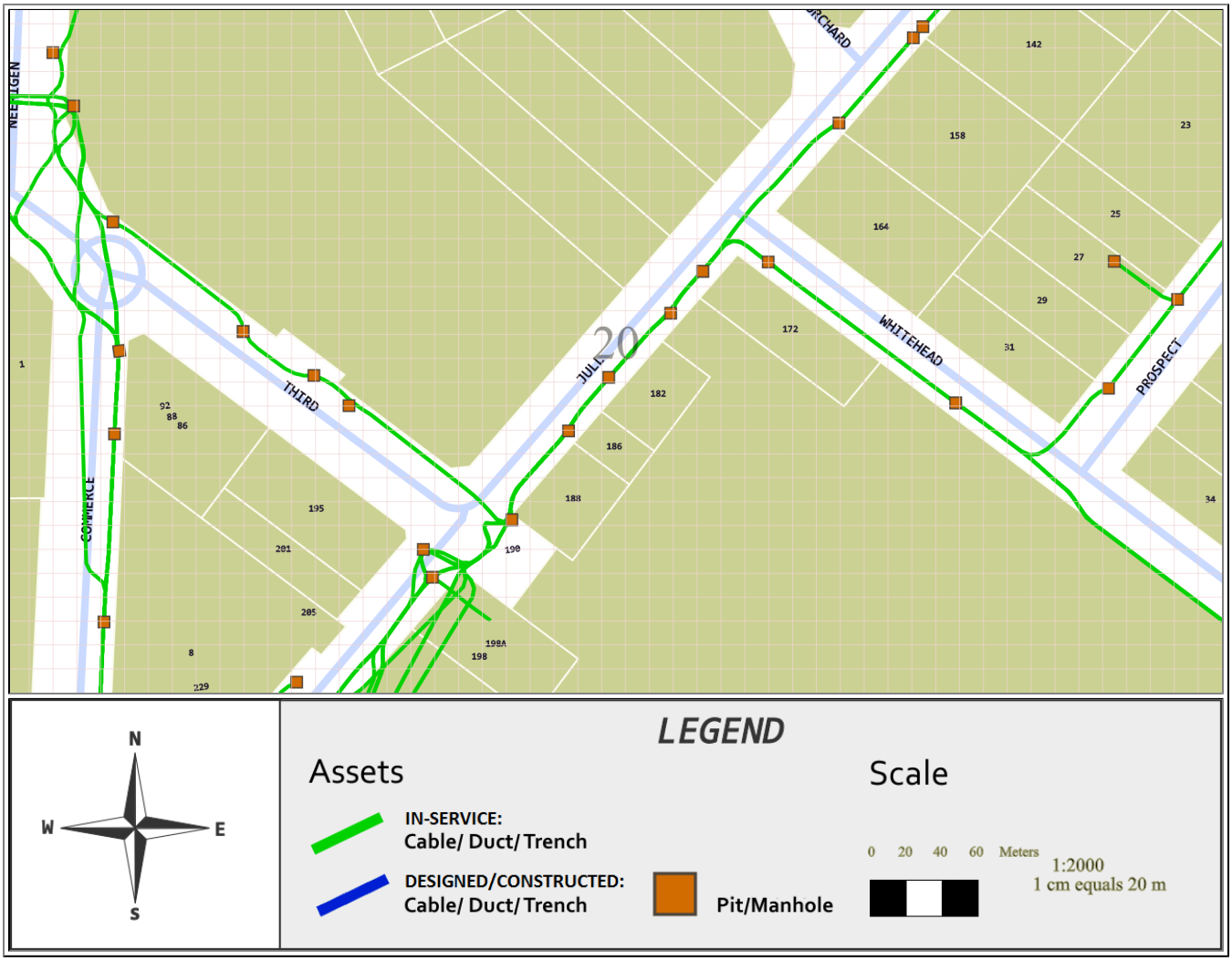




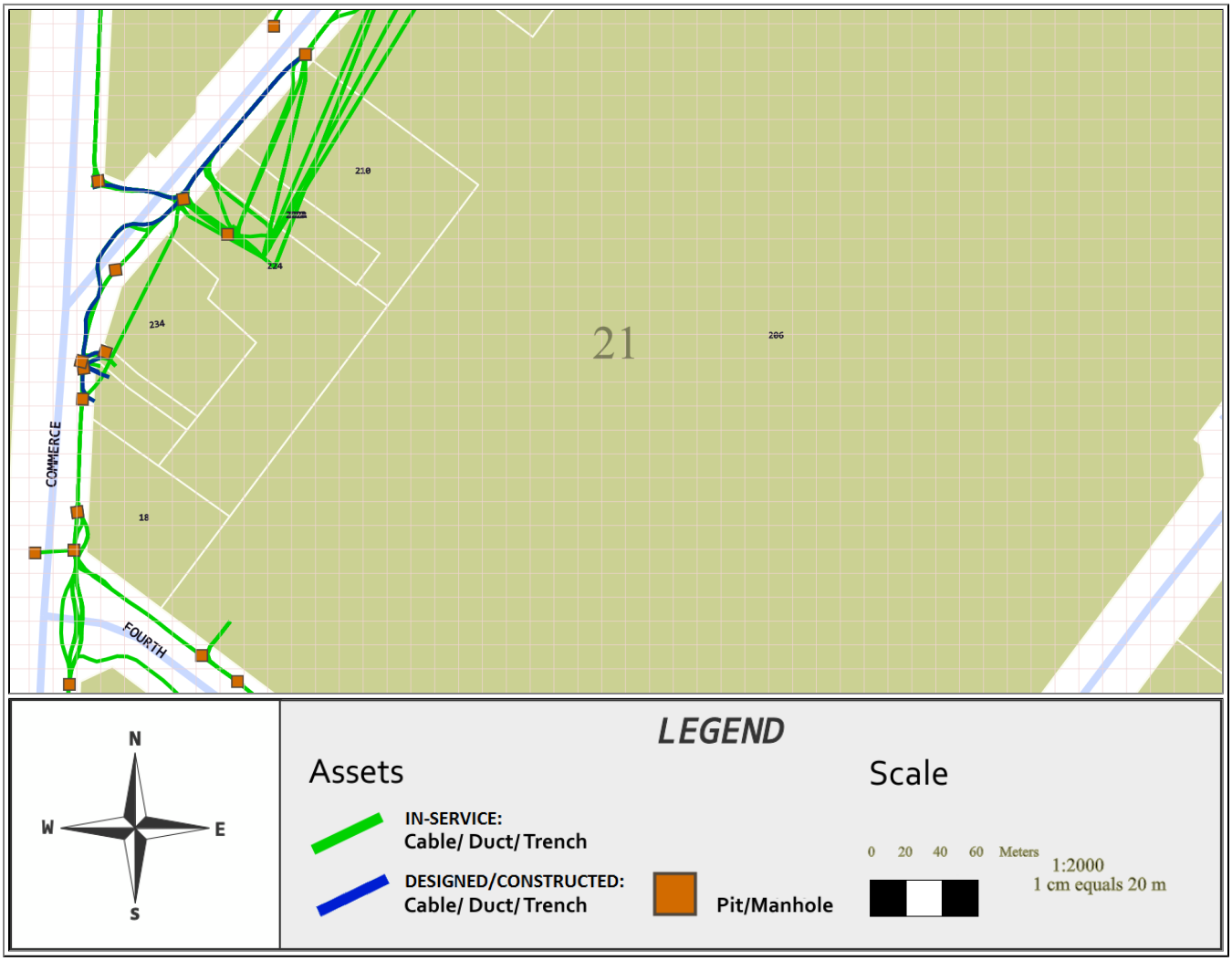
Email info@nbn.com.au Web nbn.com.au







Email info@nbn.com.au Web nbn.com.au



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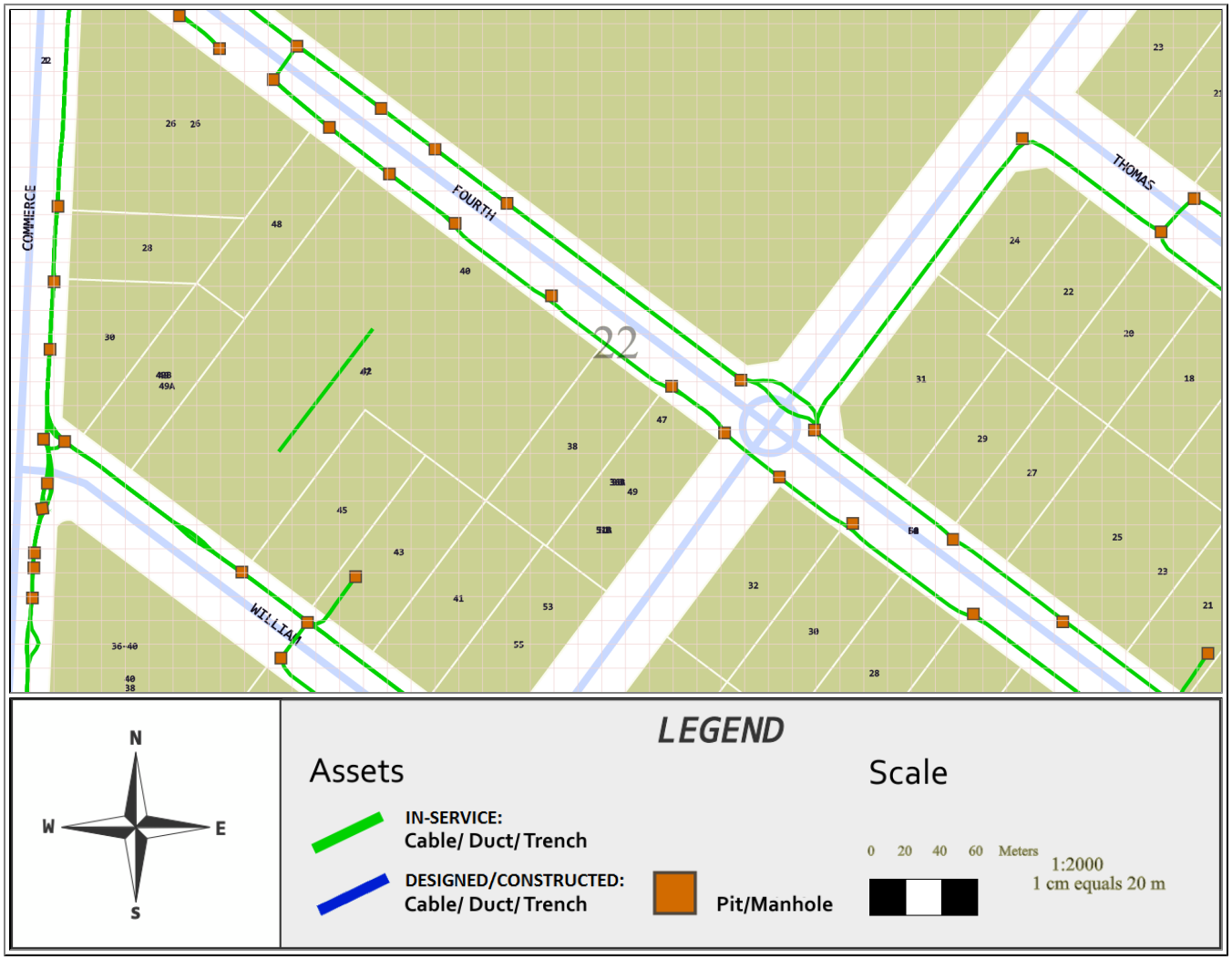
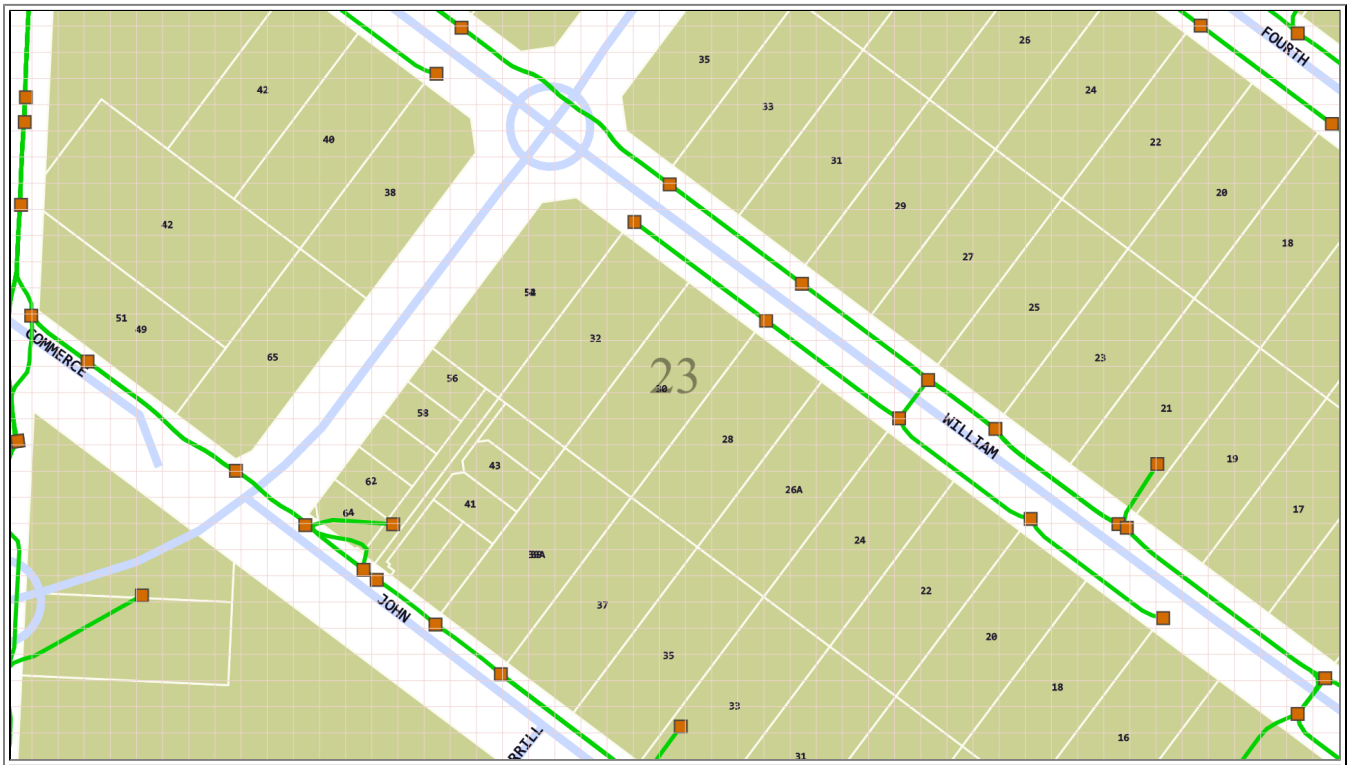


Email info@nbn.com.au Web nbn.com.au



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LEGEND

Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

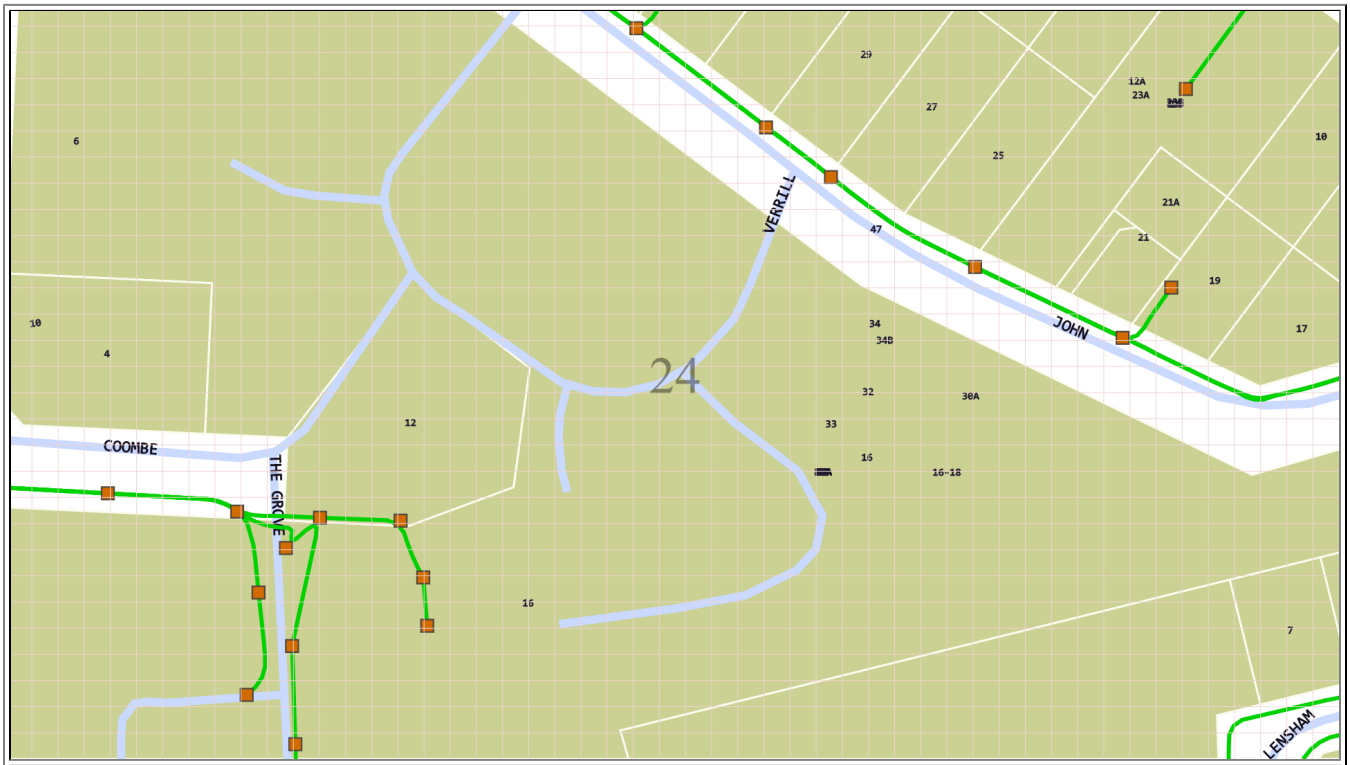
Pit/Manhole

Scale

0 20 40 60 Meters

1:2000
1 cm equals 20 m

Email info@nbn.com.au Web nbn.com.au



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Assets

IN-SERVICE:
Cable/ Duct/ Trench

DESIGNED/CONSTRUCTED:
Cable/ Duct/ Trench

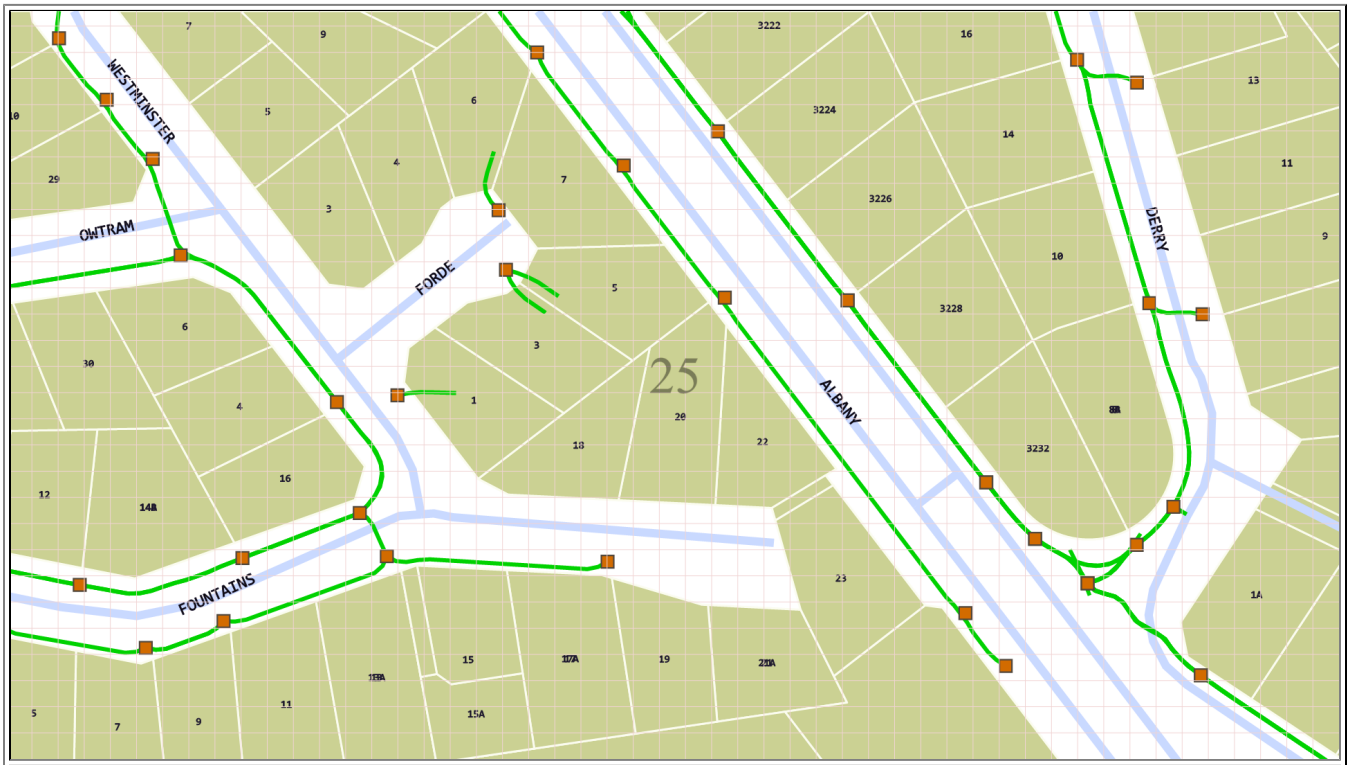
Pit/Manhole

Scale

0 20 40 60 Meters

1:2000
1 cm equals 20 m

Email info@nbn.com.au Web nbn.com.au



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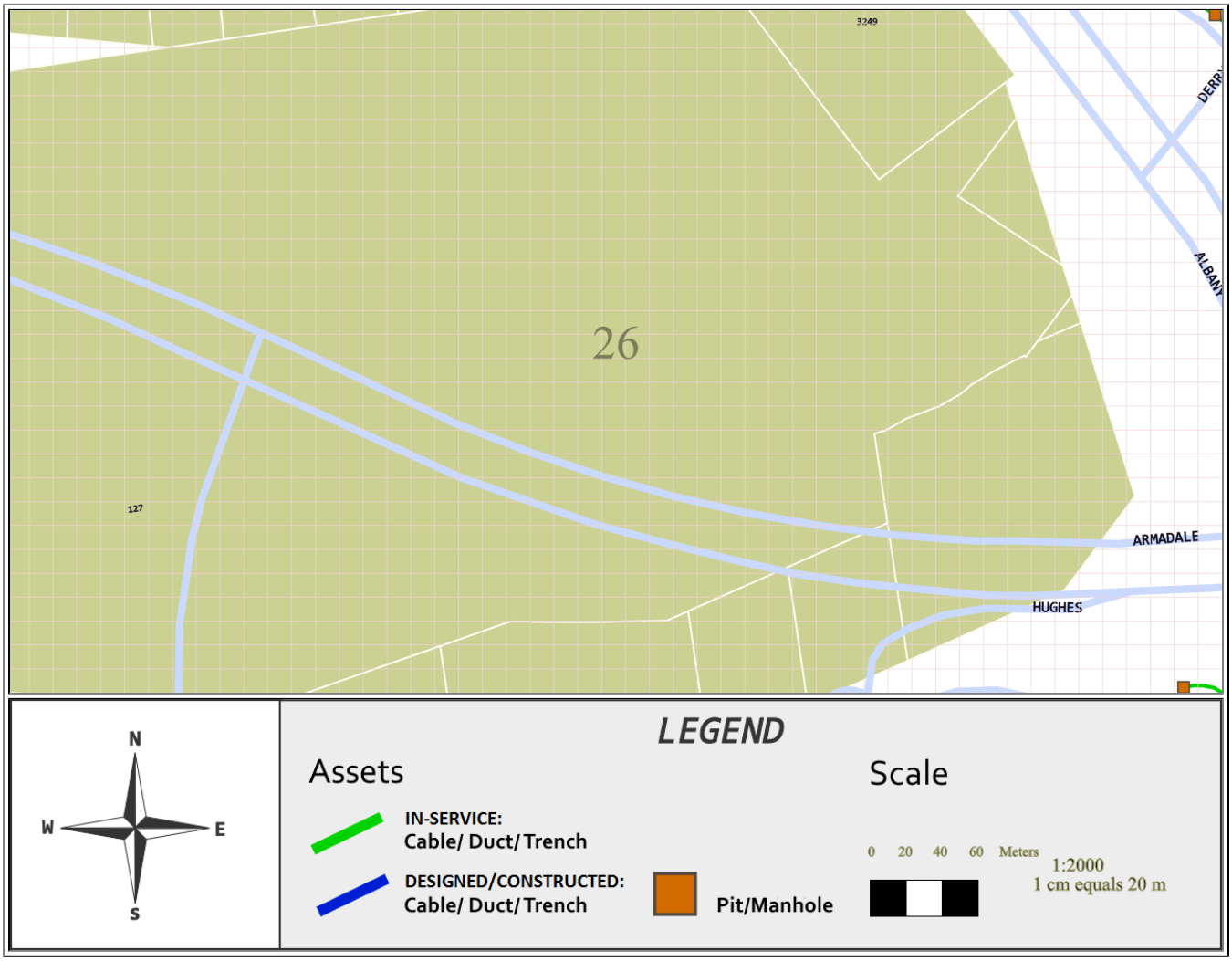

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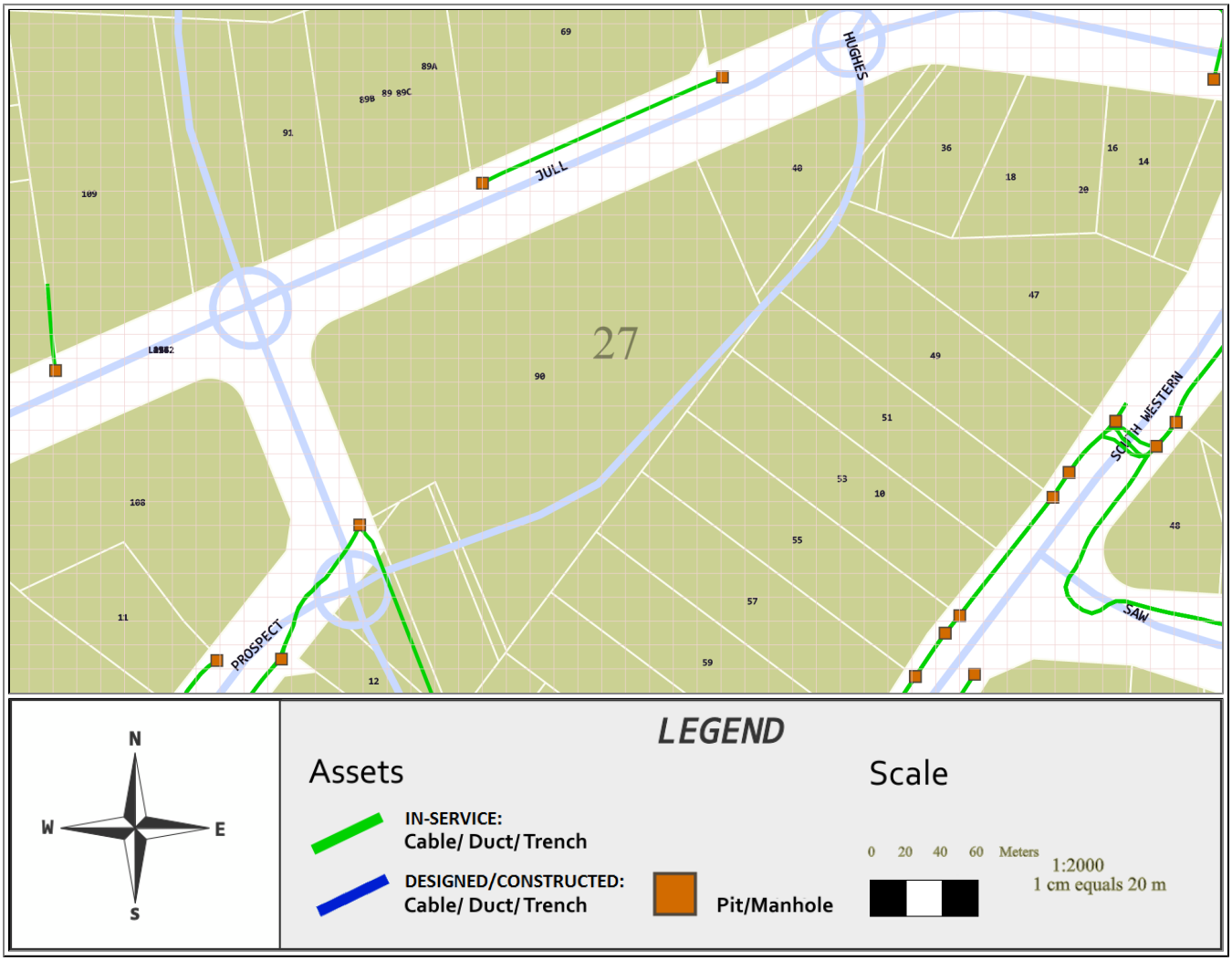

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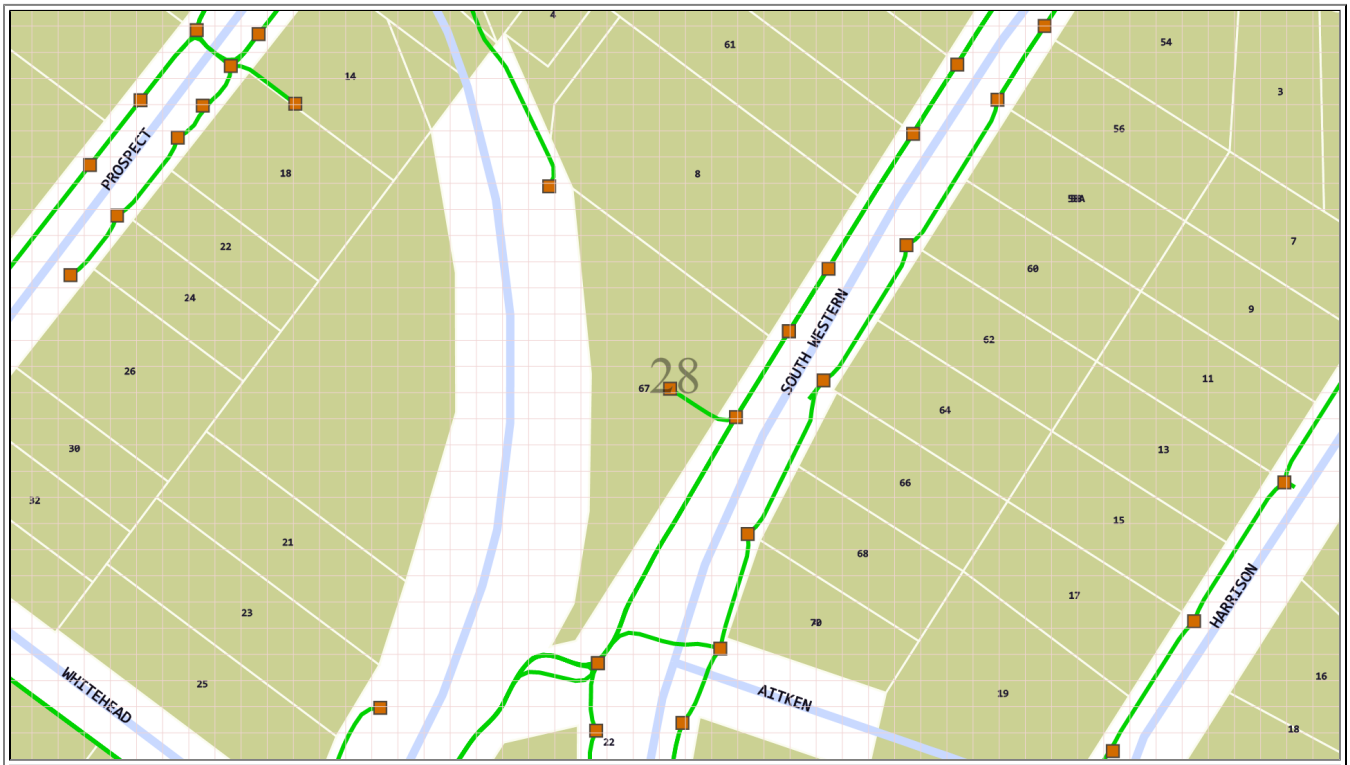

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LEGEND

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DESIGNED/CONSTRUCTED:
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Pit/Manhole

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Level 11, 100 Arthur Street, North Sydney NSW 2060

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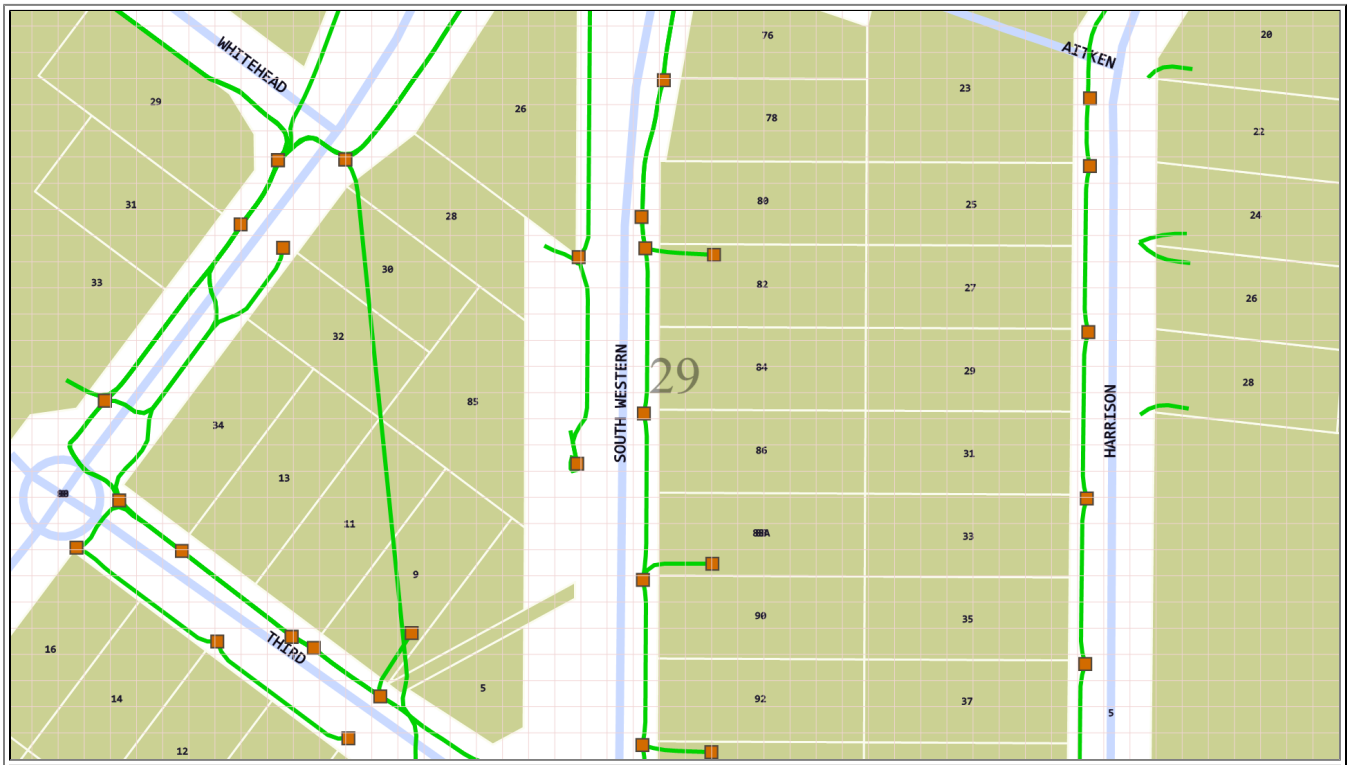

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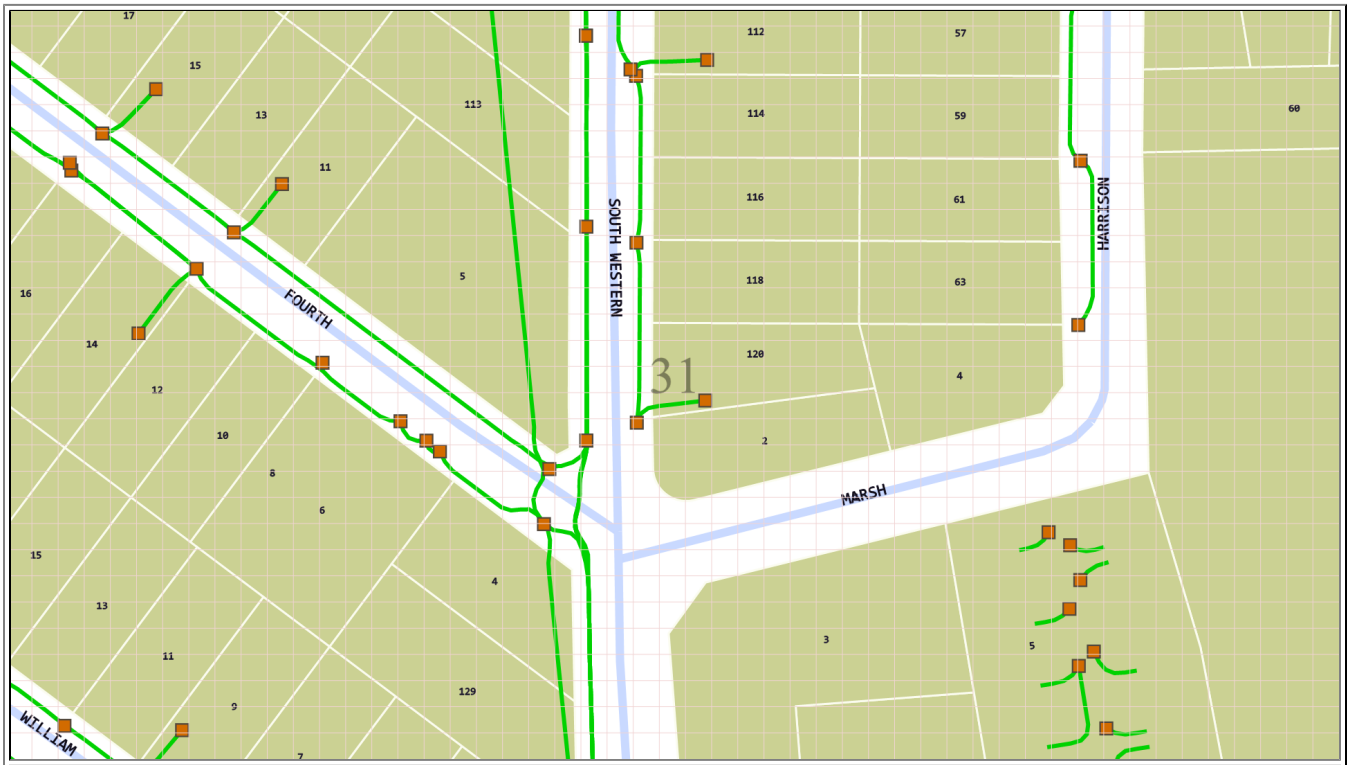

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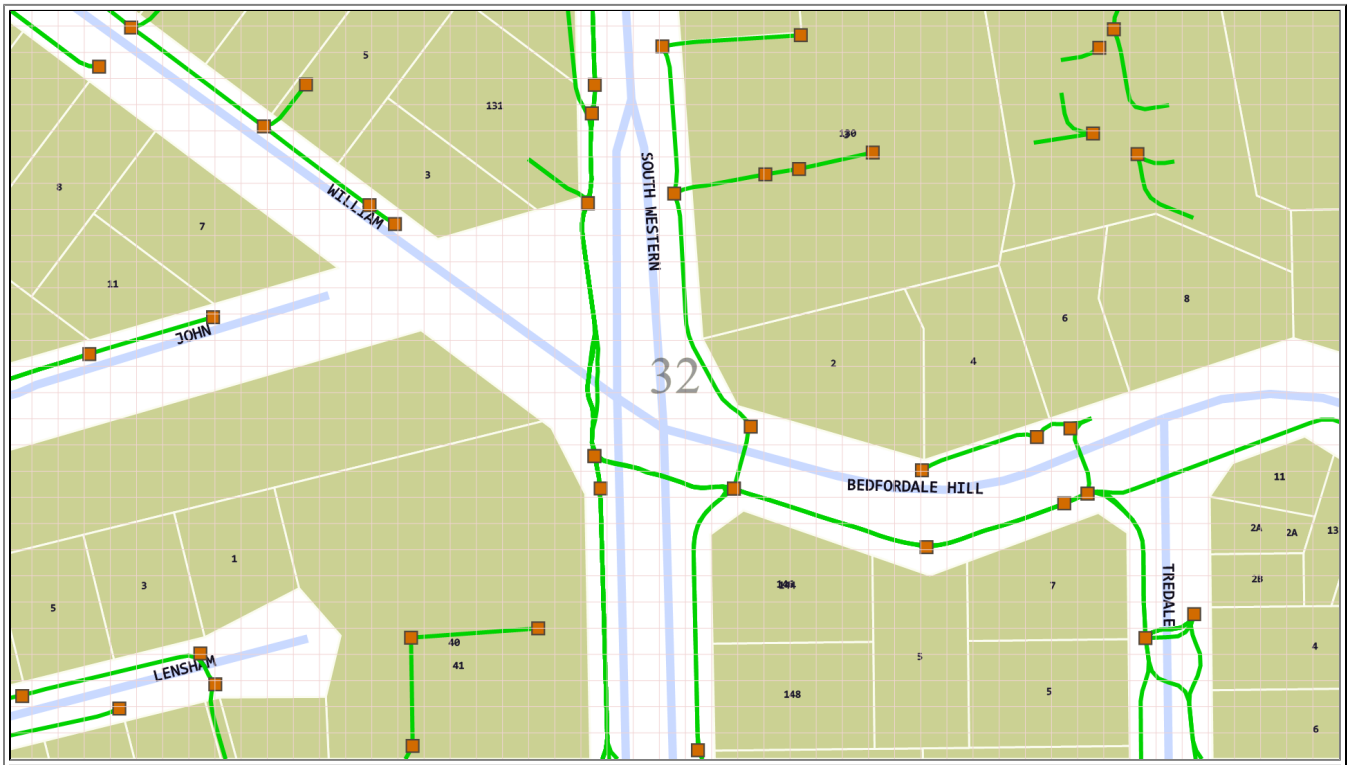

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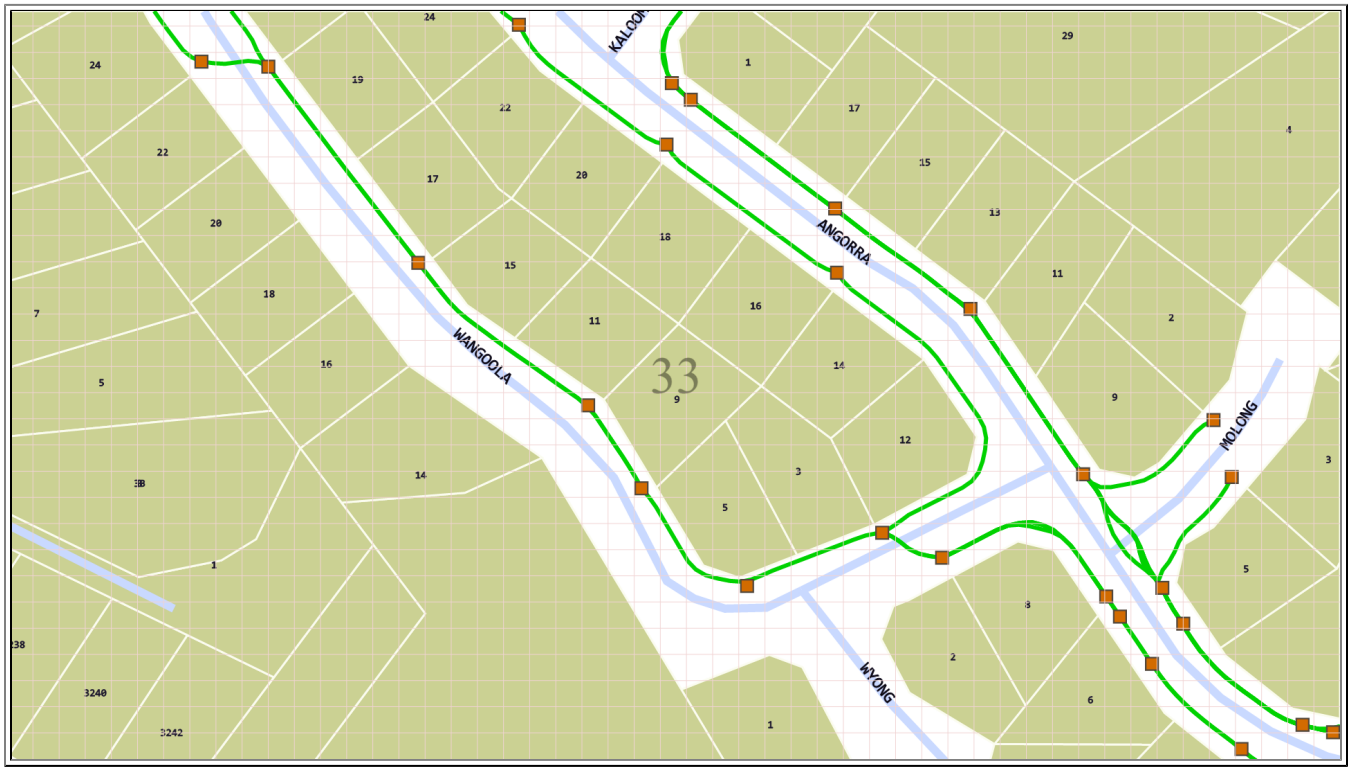

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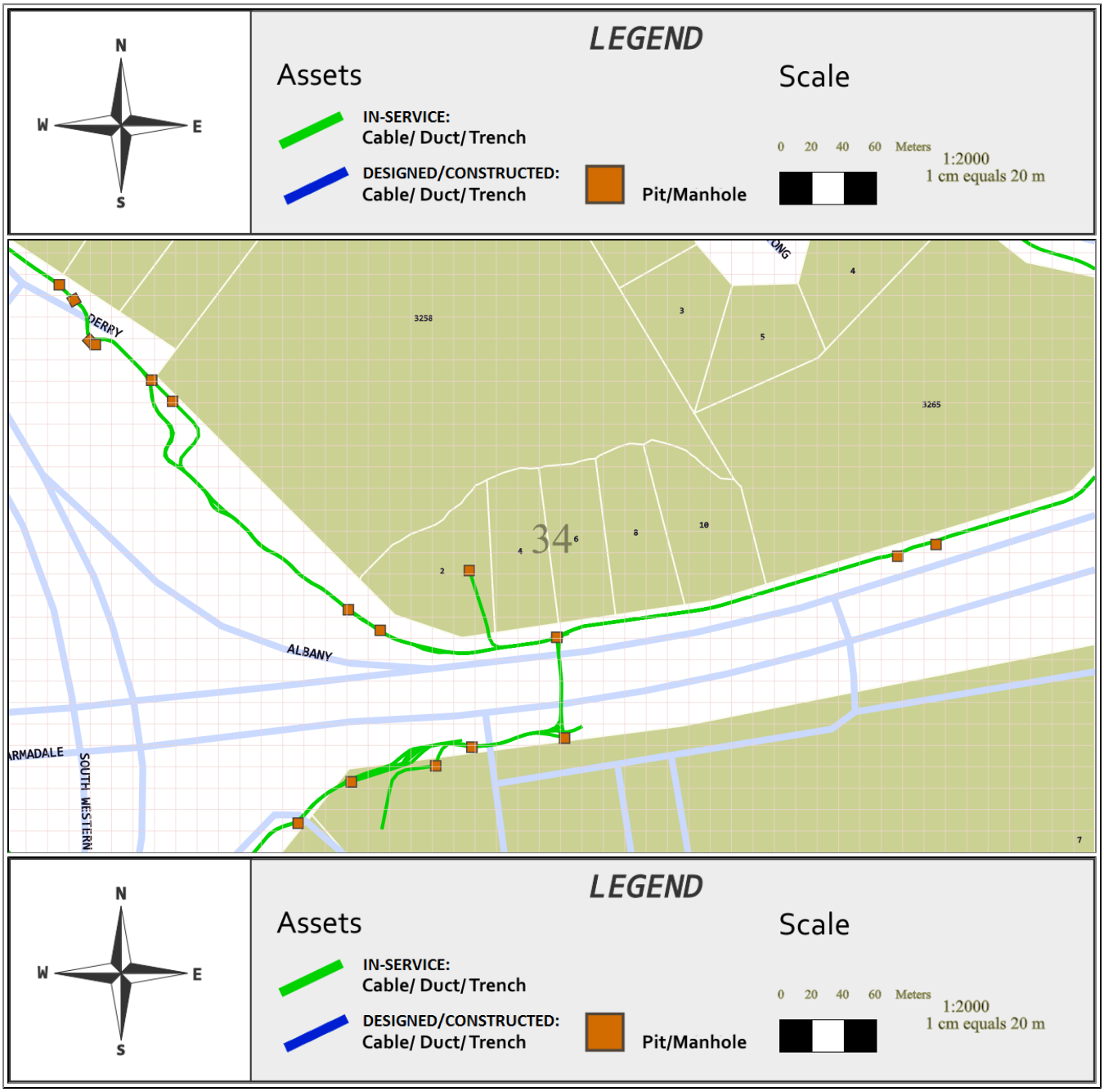

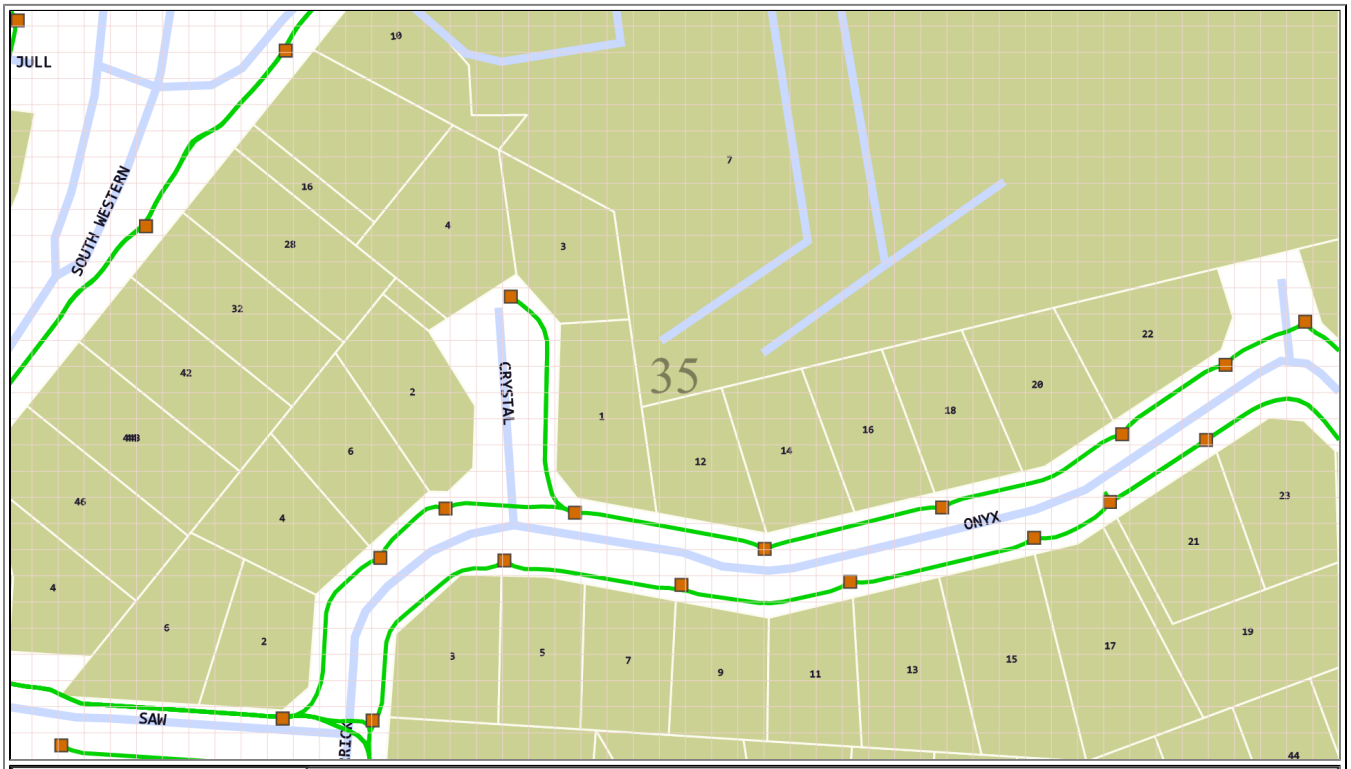

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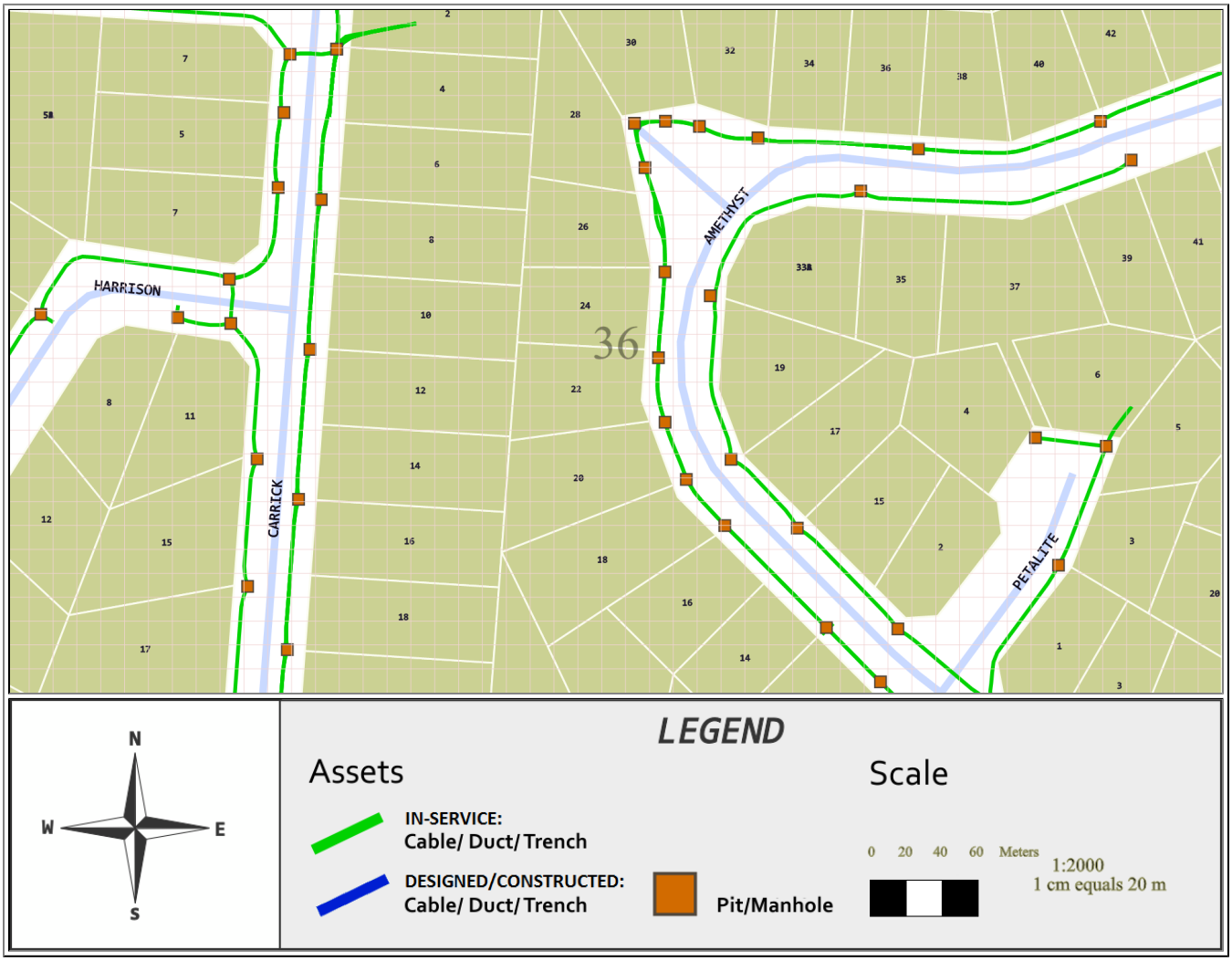

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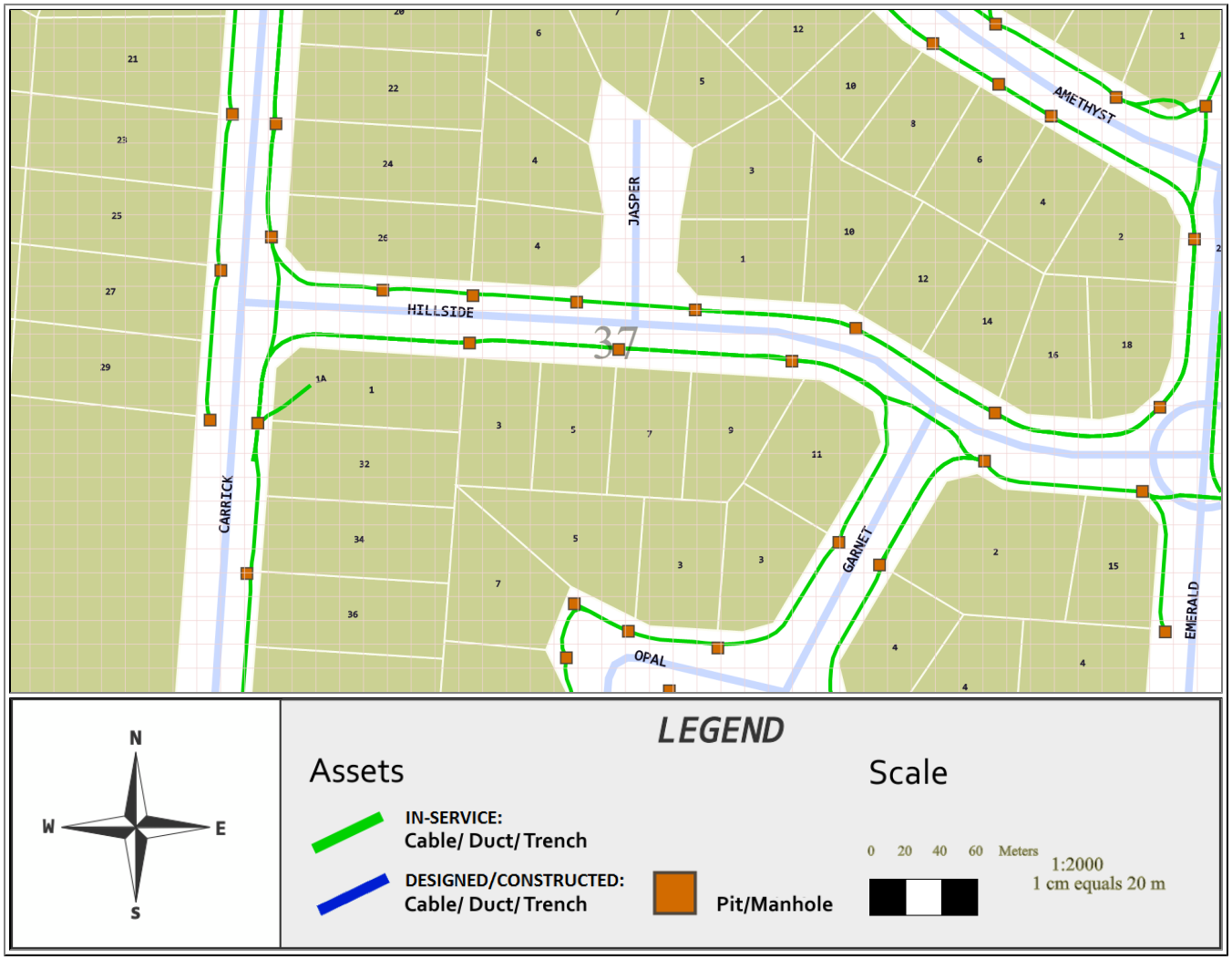

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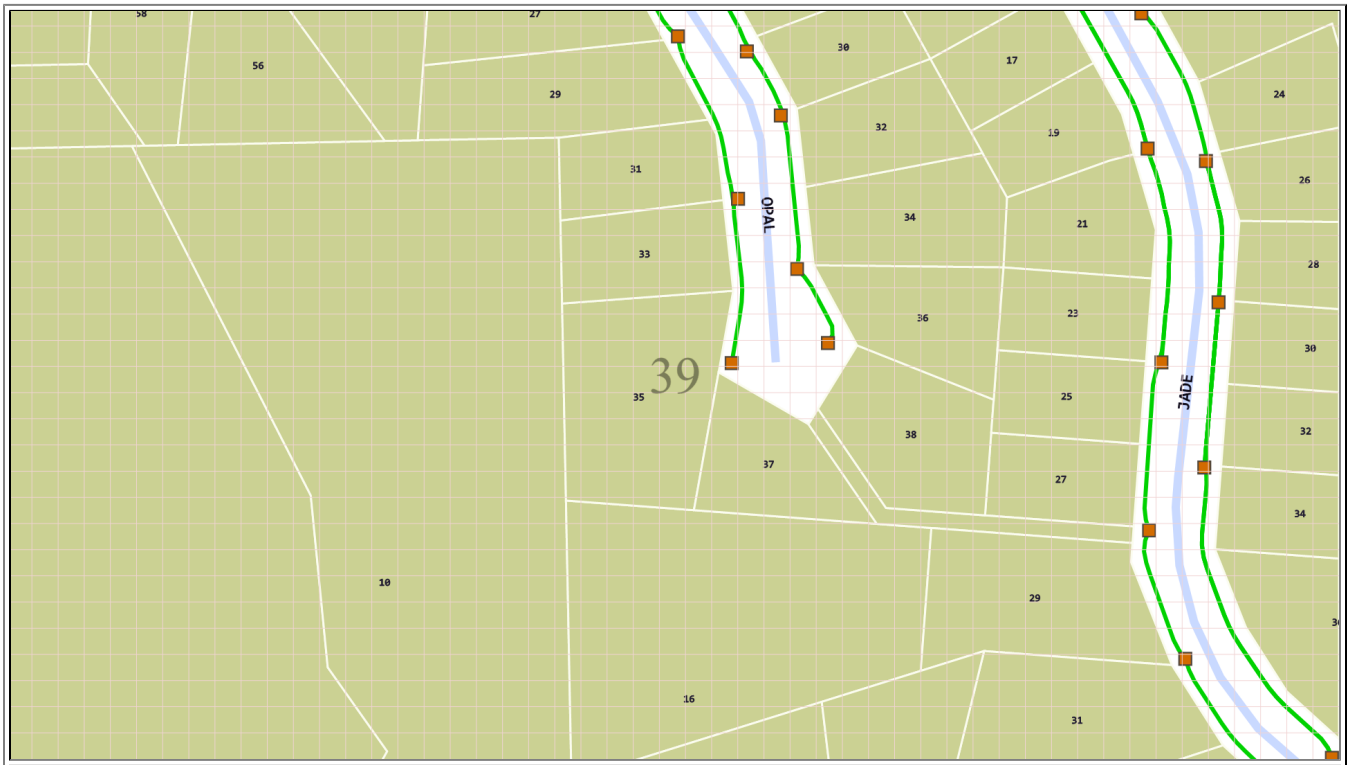

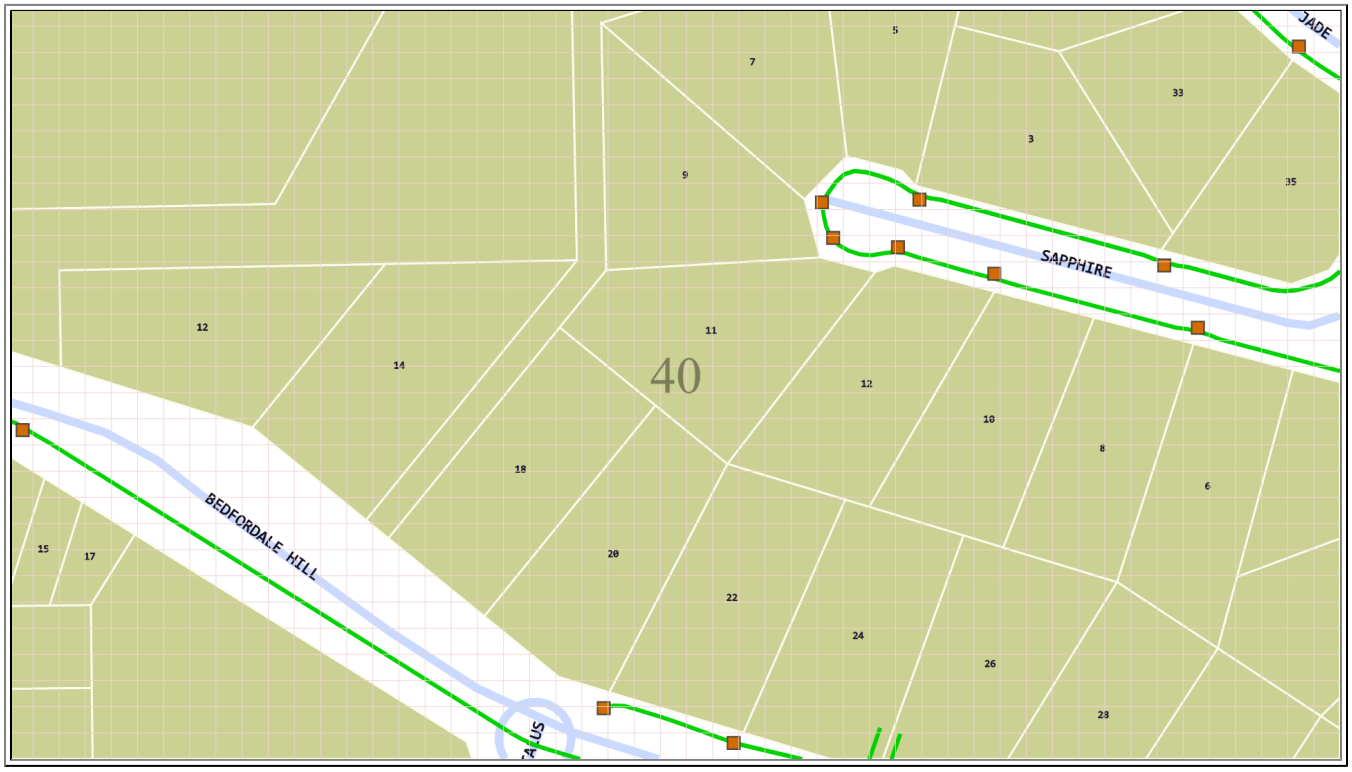

Appendix G

NBN - DBYD

G1

Appendix H

Available Post-Development Yield Information

H1 Available Post-Development Yield Information

Land Use	Current (m2)	Expected Full Build Out (m2)	Expected 25 Year Build Out (m2)	Percentage of Full Build-Out at 25 Years
Residential	20,060	453,462	226,731	50%
Retail	54,000	138,861	97,203	70%
Office	16,000	270,225	135,113	50%
Education	0	31,751	31,751	100%
Civic	0	28,466	28,466	100%
Grand Total	**90,060**	**1,030,409**	**573,086**	**55.6%**