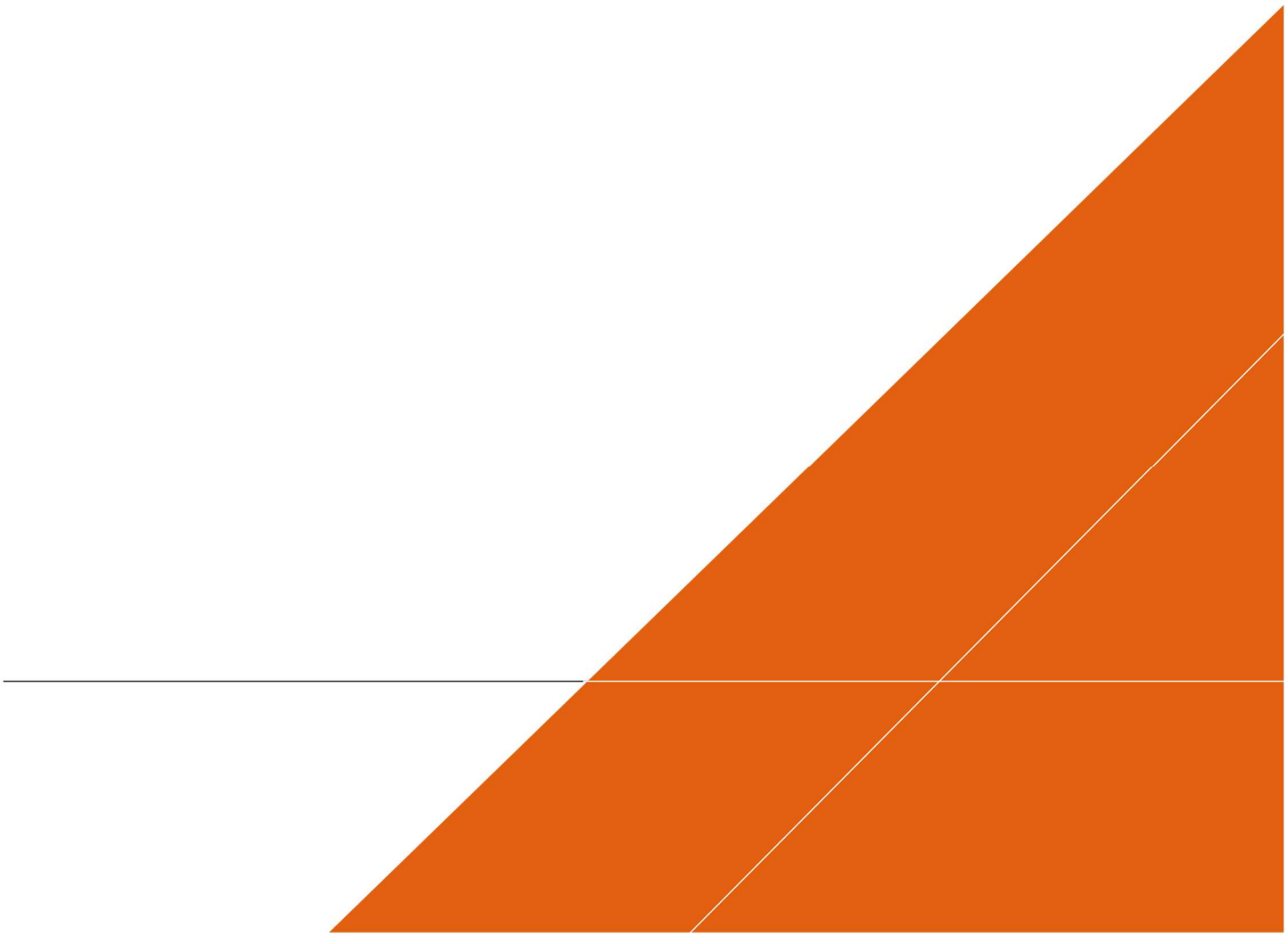
ARCADIS Design & Consultancy for natural and built assets

BONNYRIGG LIVING COMMUNITIES

Review of Services Infrastructure

31 AUGUST 2018



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NSW LAND AND HOUSING CORPORATION

Bonnyrigg Living Communities

Review of Services Infrastructure

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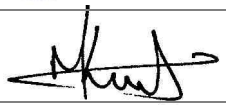
Checker	Michael Kurtz	
Approver	Mai Lam	

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REVISIONS

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A	03/08/2018	Draft Issue to Client	Clement Ding	Mai Lam
B	31/08/2018	Final Issue to Client	Clement Ding	Mai Lam

CONTENTS

APPENDICES

1 SUMMARY

Arcadis has been commissioned by the NSW Land and Housing Corporation to provide civil engineering services for the Bonnyrigg Development comprised of the East Precinct (Stages 8 to 11) and West Precinct (Stages 12 to 18).

The NSW Land and Housing Corporation are investigating an option to increase the residential yield of the Bonnyrigg Local Government Area through these proposed developments. To support these investigations, Arcadis has reviewed available services information and provided an opinion of service modifications or augmentations that are likely to be required in order to service the proposed yield increase of the development.

This report also provides discussion on the service authority processes that are applicable for this project and recommends further investigative works that would assist in obtaining the relevant service authority concurrences / approvals.

Due to the sensitive nature of the proposed yield increase, we have only obtained high level advice regarding service modifications through preliminary correspondence with service authorities. Further investigative works / feasibility applications need to be made with these service authorities and will need to include all other developments connected to their assets and the capacity of their infrastructure to accept / treat any additional loads.

This report should be read in conjunction with the previously prepared report:

- Bonnyrigg Concept Plan – Western Precinct Infrastructure Review, Arcadis Australia Pacific, September 2017 (refer to Appendix B)

1.1 Project Description

The proposed Bonnyrigg Development is divided into the East Precinct (Stage 8 to 11) hatched in blue and the West Precinct (Stage 12 to 18) hatched in yellow as detailed in Figure 1. Both developments are adjacent to the Bonnyrigg town centre and are generally bounded by Edensor Road to the north, Humphries Road to the east, Cabramatta Road / Elizabeth Drive to the south and Bonnyrigg Avenue to the west.

There are two additional load areas that have been taken into consideration. These areas are located south of the proposed West Precinct (Additional Load 1) hatched in red and between the West Precinct and East Precinct (Additional Load 2) hatched in green. Whilst not part of the proposed development area, it has been considered in this report for its impact to existing services. A Concept Masterplan has been provided in Appendix A detailing the proposed East and West Precincts including their associated lot boundaries and site extents.

Figure 1 – Site aerial with development extents (Source: Google Earth Pro, May 2016)

1.2 Yield Increase

The NSW Land and Housing Corporation have requested a review of the potential increase in yield to the proposed Bonnyrigg Development site be investigated to understand the impacts to existing services. Arcadis has considered the potential implications of the proposed / future development of this site to include additional residential units and increased commercial / retail spaces. The development of the East and West Precincts increases the lot yield as per Table 1 below, the impact of which has been assessed in this report.

Table 1 – East and West Precinct Yield Increase

Precinct	Existing Number of Dwellings	Proposed Number of Dwellings
East (Stage 8 to 11)	165	346
West (Stage 12 to 18)	357	1903

2 SERVICES INFRASTRUCTURE

The service infrastructure aspects addressed in this report were obtained by conducting a Dial Before You Dig (DBYD) of the area and included the following:

1. Electrical;
2. Gas;
3. Potable Water;
4. Sewer; and
5. Telecommunications.

A DBYD was conducted for the following area bounded in red (refer to Figure 2 below).

Figure 2 – DBYD Area (Source: Google Earth Pro, May 2016)

The development of the proposed Bonnyrigg precincts will require service infrastructure upgrades to cater for its facilities. Details of these likely future upgrades have been provided in the following sections and authority approval timeframes have also been provided for each service provider. However, it should be noted that these are indicative timeframes only and may be subject to change depending on the extent of works required as well as any changes in authority approval processes that may occur.

2.1 Electrical

2.1.1 Endeavour Energy

Endeavour Energy have existing electrical infrastructure in most of the main roads surrounding the development site as well as within the internal roads of the existing residential development (refer to Appendix B which contains Endeavour Energy DBYD Plans). Furthermore, there are several padmount substations scattered within the site area which should have capacity to service the existing development as well as the yield increase of the proposed development (with the addition of new transformers for each multi dwelling building).

The main electrical infrastructure includes:

- Electrical cables along Smithfield Road, Bonnyrigg Avenue, Elizabeth Drive, Edensor Road, Cabramatta Road and through the centre of the site from Monash Place to Newleaf Parade; and
- Padmount substations along Bonnyrigg Avenue, Tarlington Parade, Cabramatta Road and Humphries Road.

To cater for the electrical demands of each proposed building, a number of additional transformers are likely to be required within the development site for each multi dwelling building. These could be electrical kiosks located outside of the buildings or chamber substations incorporated within. It is also anticipated that additional connections or existing connections upgrades will be required to connect new residential lots with the existing electrical infrastructure.

Preliminary correspondence has been initiated with Endeavour Energy (refer to Appendix C) who have indicated that the proposed Bonnyrigg development is situated within an existing 11kV network area supplied almost entirely by the Bonnyrigg Zone Substation. Based on a load assessment and the capacity of the existing network, Endeavour Energy has determined that no upgrades to the Bonnyrigg Zone Substation will be required as there currently is sufficient capacity to cater for the proposed development. Additionally, no new 11kV feeders are anticipated however, reconfiguration of up to six existing feeders will be required.

Overall, Endeavour Energy do not anticipate that any major works to their existing network will be required to service the proposed stages of the Bonnyrigg development. However, additional assessments will need to be conducted if any future staging works occur to determine if there is additional supply availability from the Bonnyrigg Zone Substation. Ultimately, it should be noted that this will still be subject to further analysis and a formal assessment by Endeavour Energy when applications for each stage of the development are formally submitted.

To progress the development proposal, it is recommended that load demands are calculated and an Application for Connection of Permanent Load and/or Subdivision is submitted to Endeavour Energy. If the application is approved, Endeavour Energy will issue a Supply Offer, after which the developer will need to engage a level 3 Accredited Serviced Provider to submit a formal Method of Supply. It should be noted that there is no guarantee of supply availability or final conditions of supply until an Application for Connection of Permanent Load is submitted to Endeavour Energy. Until then, capacity will not be reserved by Endeavour Energy.

Indicative Authority Approval Timeframes

Table 2 – Authority Approval Timeframes (Endeavour Energy)

Key Milestone	Indicative Timeframe
Endeavour Energy design	2 Weeks
Endeavour Energy design review	6 – 8 Weeks
Review and address comments	1 – 2 Weeks
Endeavour Energy design review	1 – 2 Weeks
Endeavour Energy review and certification of amended drawings	6 – 8 Weeks
Drawings approved for construction	1 Week

2.2 Gas

2.2.1 Jemena

Jemena have existing gas infrastructure in most of the main roads surrounding the site as well as within the internal roads of the existing residential development (refer to Appendix B which contains Jemena DBYD Plans).

The main gas infrastructure includes:

- Ø110mm Polyethylene main along Bonnyrigg Avenue, Newleaf Parade and Elizabeth Drive;
- Ø32mm Nylon main and Ø110mm Polyethylene main along Edensor Road; and
- Ø50mm Nylon main and Ø63mm Polyethylene main along Tarlington Parade.

Preliminary correspondence has been initiated with Jemena (refer to Appendix D) who have identified that Natural Gas is available adjacent to the proposed development. Furthermore, Jemena have indicated that their existing gas network currently has sufficient capacity and can be extended to service the existing development within the area as well as the yield increase of the proposed development depending upon its commercial viability. However, it should be noted that this will still be subject to further analysis and a formal application to Jemena in order to confirm this. Additional connections or existing connections upgrades will also be required to connect new residential lots with the existing gas infrastructure.

To progress the development proposal, it is recommended that a formal application be submitted to Jemena along with preliminary electrical reticulation and lot layout plans, as shared trenching with electrical infrastructure is recommended to minimise coordination and costs. It should be noted that there is no guarantee of supply and that Jemena does not reserve capacity for any individual project until an offer for supply has been made available.

Indicative Authority Approval Timeframes

Table 3 – Authority Approval Timeframes (Jemena)

Key Milestone	Indicative Timeframe
Jemena Gas design	6 Weeks
Jemena Gas design review	2 Weeks
Review and address comments	1 Week
Drawings approved for construction and Jemena to issue formal reticulation offer	2 Weeks
Jemena advise developer contributions	2 Weeks
Construction	12 Weeks
Jemena testing and certification	4 Weeks
Developer to lodge connection	4 Weeks

2.3 Potable Water

2.3.1 Sydney Water

Sydney Water have existing potable water infrastructure in all of the main roads surrounding the development site as well as within the internal roads of the existing residential development (refer to Appendix B which contains Sydney Water DBYD Plans). After assessing the existing potable water network, there is likely to be sufficient capacity to service the existing development in the area as well as the yield increase of the proposed development.

The main potable water infrastructure includes:

- Ø1200mm Steel Cement Lined Internal Bitumen Lined (SCL IBL) trunk main running along Smithfield Road from Elizabeth Drive to Edensor Road;
- Ø750mm SCL IBL trunk main running along Edensor Road from Smithfield Road to Knapton Street;
- Ø450mm Cast Iron Cement Lined (CICL) main running along Edensor Road from Knapton Street to Humphries Road;
- Ø375mm CICL main running along Elizabeth Drive and Cabramatta Road from Smithfield Road to Tarlington Parade;
- Ø450mm Cast Iron Cement Lined (CICL) main running parallel to Monash Place from Elizabeth Drive to Edensor Road; and
- Ø100 Ductile Iron Cement Lined (DICL) main running along Humphries Road from Cabramatta Road to Edensor Road.

The proposed number of dwellings (including relevant additional load areas) that will need to be serviced as part of the existing and proposed development, is estimated to be approximately 3500 dwellings. We have reviewed the increase in yield against an estimate of the capacity of the existing system and have noted that the existing Ø450mm CICL main running parallel to Monash Place from Elizabeth Drive to Edensor Road should be sufficient in conveying these demands. It is however anticipated that additional connections or existing connections upgrades will be required to connect new residential lots with this existing potable water main. Furthermore, given that several of these lots will house apartment buildings, booster pumps will be required to provide potable water to apartments located above ground level.

Preliminary correspondence has been initiated with Sydney Water (refer to Appendix E) who have briefly provided indication that some potable water mains may need to be amplified in certain parts of the development to meet their minimum requirements. To progress the development proposal, the developer should engage a Water Servicing Coordinator and seek a formal Notice of Requirements from Sydney Water. This will advise if their system has sufficient capacity to service the proposed development and provide details for any required augmentations to their system.

Whilst the first few stages of the Bonnyrigg development installed recycled water reticulation pipework, there is no proposal to continue this through the remainder of the site.

Indicative Authority Approval Timeframes

Table 4 – Authority Approval Timeframes (Sydney Water)

Key Milestone	Indicative Timeframe
Sydney Water to issue Notice of Requirements	12 Weeks
Sydney Water design	12 Weeks
Sign and issue Developer Works Deed to Sydney Water	3 Weeks
Sydney Water design review	8 Weeks
Review and address comments	1 – 2 Weeks
Sydney Water design review and certification of amended drawings	8 Weeks
Drawings approved for construction	1 Week

2.4 Sewer

2.4.1 Sydney Water

Sydney Water have existing sewer infrastructure in most of the main roads surrounding the development site as well as within the internal roads of the existing residential development (refer to Appendix B which contains Sydney Water DBYD Plans). After assessing the existing sewer network, there is likely to be sufficient capacity to service the existing development in the area as well as the yield increase of the proposed development.

The main sewer infrastructure includes:

- Ø400mm Vitrified Clay (VC) main running along Newleaf Parade and crossing Bayswater Street;
- Ø225mm VC main adjacent to Bunker Parade and crossing Humphries Road; and
- Ø300mm VC main adjacent to Wall Place and crossing Tarlington Parade, that also collects a Ø225mm VC main running parallel to Merinda Place and crossing Elizabeth Drive.

We have reviewed the site layout (refer to Appendix A) as well as the required demands and it is anticipated that the sewer mains listed above will need to be utilised in order to service the existing and proposed development. All of these sewer mains connect to either a Ø750mm concrete main to the north of the development site or a Ø600mm VC main to the east of the development site, both of which ultimately drain to the Fairfield Sewerage Treatment Plant. The calculated demands of the site have been detailed in the following sections.

2.4.1.1 Sewer Catchments

To assess the potential impacts of the proposed East and West Precinct developments on the existing sewer infrastructure, the site area has been divided into separate sewer catchments to calculate the EP that will be conveyed to each of the relevant sewer mains (as detailed in Section 2.4.1). The additional load areas have also been taken into consideration and included in the final EP demands.

- Additional Load 1 will have 1600 EP, which is the maximum allowable EP associated with a Ø225mm sewer main. This conservative estimate has been adopted given that it connects to the Ø300mm main as detailed in Section 2.4.1 and hence will contribute to its load.
- Additional Load 2 is an existing development and 60% of the site area has been assumed as housing residential property with an average lot size of 450m^2 and 3.0 EP per lot.

Refer to Appendix G for a detailed sewer catchment plan which includes the location of the relevant sewer mains and proposed connection locations. Furthermore, a summary of these sewer catchments and the anticipated sewer mains they will drain to (refer to Appendix H and Appendix I for lot information and detailed sewer EP calculations respectively) are detailed below in Tables 5 to 7.

Ø400mm VC Main

Table 5 – Ø400mm VC Main Anticipated EP Load

Sewer Catchment	Colour	EP
A1	Blue	3393
A2 (Additional Load 2)	Purple	1198
C1	Green	53
	Total	4644

Ø225mm VC Main

Table 6 – Ø225mm VC Main Anticipated EP Load

Sewer Catchment	Colour	EP
D1 (Additional Load 2)	Red	54
D2 (Additional Load 2)	Red	72
E1	Orange	788
	Total	914

Ø300mm VC Main

Table 7 – Ø300mm VC Main Anticipated EP Load

Sewer Catchment	Colour	EP
B1	Yellow	1277
F1 (Additional Load 1)	Grey	1600
	Total	2877

2.4.1.2 Estimated Sewer Upgrades

We have reviewed the increase in demand against an estimate of the capacity of the existing Sydney Water sewer network and the estimated sewer upgrades have been detailed below in Tables 8 to 10.

Ø400mm VC Main

Table 8 – Ø400mm VC Main Estimated Upgrade

Maximum Allowable EP*	Total EP**	Upgrade Requirement
8100	4644	Total EP does not exceed maximum allowable EP. Therefore, sewer main will have sufficient capacity and can be retained in place (this is to be further confirmed with Sydney Water).

Ø225mm VC Main

Table 9 – Ø225mm VC Main Estimated Upgrade

Maximum Allowable EP*	Total EP**	Upgrade Requirement
1600	914	Total EP does not exceed maximum allowable EP. Therefore, sewer main will have sufficient capacity and can be retained in place (this is to be further confirmed with Sydney Water).

Ø300mm VC Main

Table 10 – Ø300mm VC Main Estimated Upgrade

Maximum Allowable EP*	Total EP**	Upgrade Requirement
3200	2877	Total EP does not exceed maximum allowable EP. Therefore, sewer main will have sufficient capacity and can be retained in place (this is to be further confirmed with Sydney Water).

* In accordance with WSA 02 – 2002-2.2, Appendix SW 4

** Estimated for feasibility purposes, to be confirmed

2.4.1.3 Summary

We have reviewed the increase in EP of the proposed development and additional load areas against an estimate of the capacity of the existing Sydney Water sewer network and have noted that the existing sewer mains listed in Section 2.4.1 should be sufficient in conveying these demands. It is however anticipated that additional connections or existing connections upgrades will be required to connect new residential lots with these existing sewer mains. Additional considerations when modifying the existing sewer network to service the proposed development are that structures built over or adjacent to sewer pipes will require those pipes to be concrete encased as maintenance free assets in accordance with Sydney Water requirements. Whilst we have reviewed and provided advice on the capacity of the sewer connections within the development site to convey flows to the sewer mains listed in Section 2.4.1, it is only Sydney Water that can assess and confirm the overall system capacity.

Preliminary correspondence has been initiated with Sydney Water (refer to Appendix E) who have briefly provided indication that some sewer mains may need to be amplified in certain parts of the development to meet their minimum requirements. To progress the development proposal, the developer should engage a Water Servicing Coordinator and seek a formal Notice of Requirements from Sydney Water. Which will advise if their system has sufficient capacity to service the proposed development and provide details for any required augmentations to their system.

Indicative Authority Approval Timeframes

Table 11 – Authority Approval Timeframes (Sydney Water)

Key Milestone	Indicative Timeframe
Sydney Water to issue Notice of Requirements	12 Weeks
Sydney Water design	12 Weeks
Sign and issue Developer Works Deed to Sydney Water	3 Weeks
Sydney Water design review	8 Weeks
Review and address comments	1 – 2 Weeks
Sydney Water design review and certification of amended drawings	8 Weeks
Drawings approved for construction	1 Week

2.5 Telecommunications

2.5.1 NBN Co Limited

NBN Co Limited have existing telecommunications infrastructure in most of the main roads surrounding the development site as well as within some portions of the internal roads of the existing residential development (refer to Appendix B which contains NBN Co Limited DBYD Plans). Reviewing the DBYD plans it is evident that the NBN network within the development site has not yet been fully constructed. It is therefore anticipated that once construction of the network has been completed, there is likely to be sufficient capacity to service the existing development in the area as well as the yield increase of the proposed development.

The existing telecommunications infrastructure that has been constructed includes:

- Telecommunication cables along Elizabeth Drive, Bonnyrigg Avenue, Tarlington Parade, Edensor Road and portions of the internal roads located at the north-eastern part of the development site i.e. Reeves Crescent and Bunker Parade.

To cater for the proposed demand of each building, the NBN Co Limited network will need to be fully constructed and it is anticipated that additional connections or existing connections upgrades will be required to connect new residential lots with the existing telecommunications infrastructure.

Preliminary correspondence has been initiated with NBN Co Limited (refer to Appendix F) who have provided indication that NBN Co and Landcom (acting on behalf of the NSW Land and Housing Corporation), had previously entered into an agreement regarding the installation of fibre infrastructure for the Bonnyrigg development and that NBN Co Limited will agree to procure the installation of this fibre infrastructure at the development.

However, it has been noted that given this development is now under new ownership with the NSW Land and Housing Corporation and that there have been significant changes to the development masterplan and associated number of lots, a new development application will need to be submitted to NBN Co Limited before they can assess whether the new proposed development can be serviced. Furthermore, to progress the development proposal, it is recommended that load demands are calculated and submitted to NBN Co Limited during the formal application phase.

It has been noted that NBN Co Limited will construct its network within the existing Telstra conduits. Once the proposed development has been completed, Lead-in Conduits (LIC) will then be constructed to connect all lots to the NBN Network.

Indicative Authority Approval Timeframes

Table 12 – Authority Approval Timeframes (NBN Co Limited – Single Dwelling Units)

Key Milestone (Single Dwelling Unit)	Indicative Timeframe
NBN to review and approve application	4 Weeks
NBN design	40 Weeks
NBN design review and approval	4 Weeks
Pit & pipe audit for certification (provided no remediation)	4 Weeks
Installation of Network	14 Weeks

Table 13 – Authority Approval Timeframes (NBN Co Limited – Multi Dwelling Units)

Key Milestone (Multi Dwelling Unit)	Indicative Timeframe
NBN to review and approve application	4 Weeks
NBN design	30 Weeks
NBN design review and approval	4 Weeks
Pathway audit for certification (provided no remediation)	4 Weeks
Installation of Network	8 Weeks

APPENDIX A – CONCEPT MASTERPLAN REVISION P

+ concept master plan_stages 8-11 & 12-18

lot plan

Key

Precincts & lots
east/west precinct boundary
superlot boundary
common open space

1:5000@A3

lot plan

AJ+C
Allen Jack+Cottier

18.08.27_REV_P

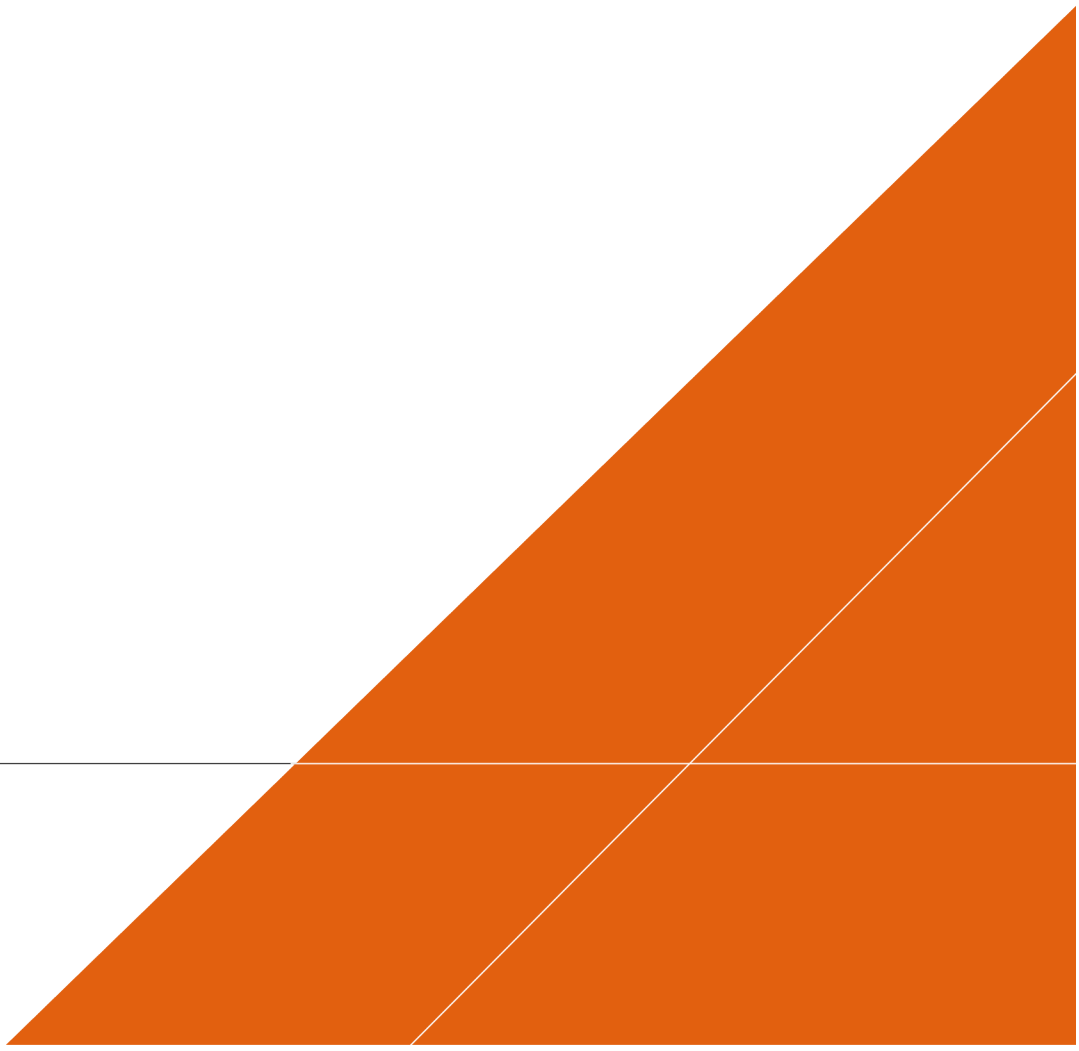
APPENDIX B – BONNYRIGG CONCEPT PLAN – WESTERN PRECINCT INFRASTRUCTURE REVIEW

ARCADIS Design & Consultancy for natural and built assets

BONNYRIGG CONCEPT PLAN

Western Precinct

Infrastructure Review



Incorporating Hyder

NSW LAND AND HOUSING CORPORATION
BONNYRIGG CONCEPT PLAN

Infrastructure Review

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Checker	Mai Lam	
Approver	Simon Kinsey	
Report No	LaHCR 2017/358 - 10009142	
Date	18/09/2017	
Revision	01	

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/09/17	Issue to client	MN	SK

CONTENTS

APPENDICES

1 PROJECT OVERVIEW

Arcadis have been commissioned by NSW Land and Housing Corporation (LAHC) to undertake an infrastructure and layout review of the revised concept masterplan of the Bonnyrigg Newleaf development. The concept plan will see an increase of 500 dwellings over the 2,500 currently approved, raising the total yield to 3,000 dwellings.

The total Newleaf Development site area is approximately 81 hectares although the scope is to review the sites western precinct, located west of Tarlington Parade and Tarlington drainage reserve. This area consists of the approved masterplan stages 12 to 18 as shown in Figure 1, Figure 2 and Figure 3 below.

The purpose of this report is to summarise the results of the review for the proposed development site. The review considered the following site elements;

- Earthworks,
- Roads / Layout,
- Stormwater Drainage,
- Potable water,
- Waste water,
- Electricity,
- Telecommunications, and
- Gas.

The review assessed the impacts on capital costs, constructability, authority approvals and impacts on surrounding areas due to the revised layout from the approved layout.

This report has been prepared based on the following sources:

- *Newleaf Overall Masterplan – Rev P(2)* by DKO Architecture, received on 24/08/17,
- *170710 Concept Master Plan_Rev C(2)* by Allen Jack and Cottier, received on 24/08/17,
- DBYD enquiry, lodged on 01/09/17,
- LiDAR data from NSW Land and Property Information (LPI), 2012,
- Google Maps and Google Street View.

2 SITE DESCRIPTION

The western precinct is approximately 30 hectares consisting of a mix of existing private and social houses with typical lot sizes in the 500m2 and 600m2 ranges and a series of local roads. The development is designed to create new social and private housing by redesigning, renewing and reinvigorating an existing public housing estate.

Figure 1 Existing site plan

The existing site grades are generally between 3% and 5% apart from hill in south western corner where grades are up to 7%. There is a crest running north south with approximately 4 hectares of the site falling west towards Elizabeth Drive and Bonnyrigg Avenue (western catchment), the remainder of the site falls towards Tarlington Drainage Reserve (central catchment).

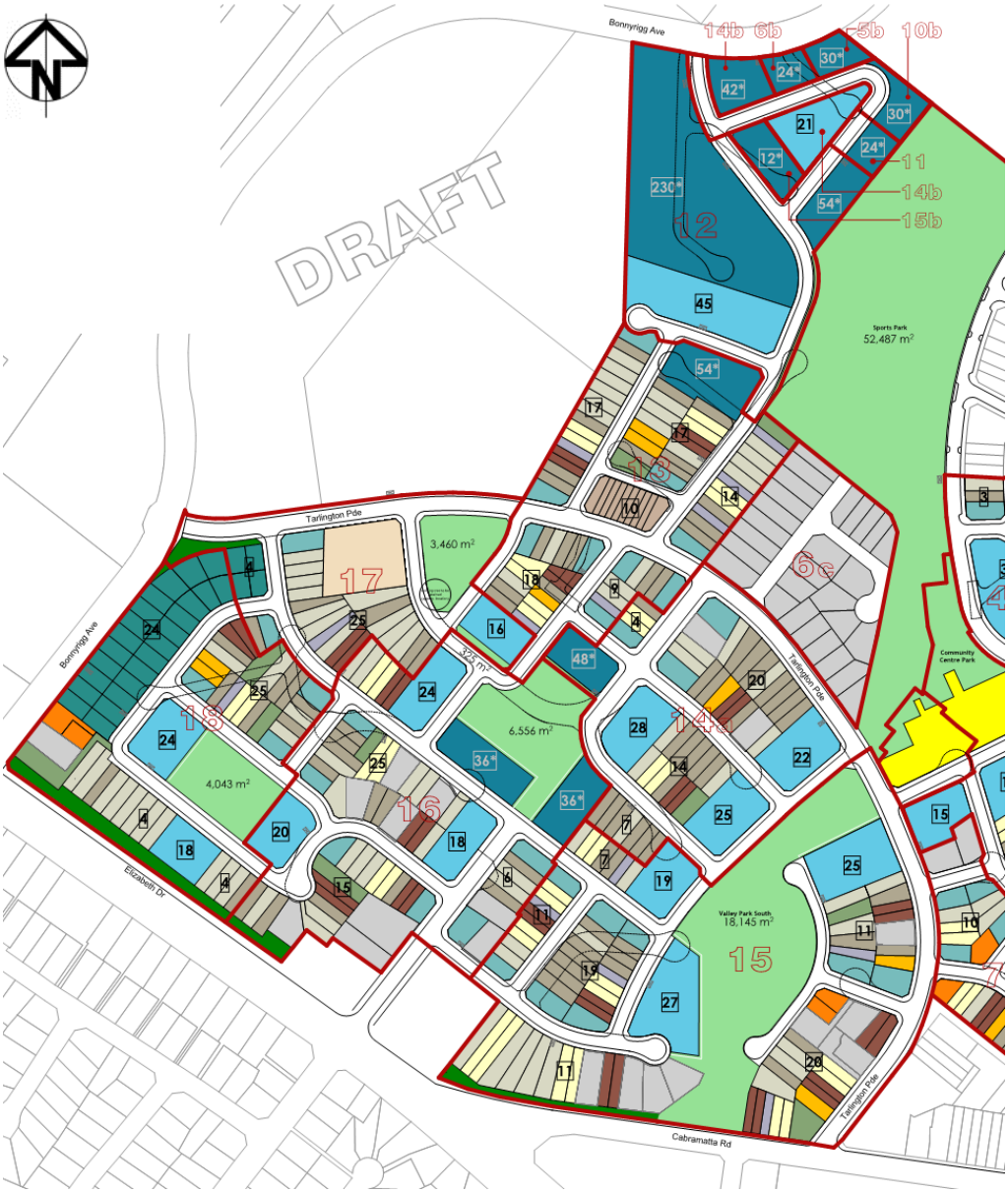


Figure 2 Approved Masterplan (Western Precinct)

Figure 3 Revised Concept masterplan (Western Precinct)

3 INFRASTRUCTURE REVIEW

3.1 Earthworks

The layout proposes to utilise some of the existing road alignments and will generally match existing levels around the outer boundaries, as such Arcadis don't anticipate that the proposed levels will vary significantly from the existing and would expect an earthworks balance could be achieved. This does not include below ground basement car parking for the unit blocks, this will lead to an increase in excavated material.

Earthworks shortfall or surplus could be gained or lost in the open space areas. Further 3-dimensional modelling will be completed in the next stage of design to confirm this assumption.

The above statement is applicable to both the approved and revised layouts, and therefore Arcadis don't see any negative impact from the revised layout.

3.2 Roads / Layout

There is a reduction in the combined road and lane lengths / areas in the revised layout by approximately 25%, although this is excluding internal roads and car parks for the unit blocks. This reduction in roads will slightly reduce the roadworks costs for the subdivision civil works package.

There is a staggered intersection proposed on Monash Place (refer Figure 4), the distance between opposing side streets is approximately 11m. this is not good practice and will unlikely be approved by council without physical restrictions such as restricting movements to left in and left out only of the two side streets. There is still a risk that council will not accept this. The minimum recommended spacing between the side roads should be 40m. the approved layout has 32m between side roads.

Figure 4 Staggered intersection

The approved layout has been designed around the existing private lots which are to remain, the revised layout has not in some areas (refer Figure 5). Negotiations with the lot owners and purchase of these lots will be required to proceed with the revised layout, there is a risk that not all owners are willing to sell.

Figure 5 Existing lots clash with revised layout

The road minimum horizontal radii should be no less than 20m at sharp bends (between 75 and 90 degree change in angle) and 50m for all other areas.

The revised layout has not included boundary splays at intersections. Suitable splays to council's guidelines will be required. The addition of splays may impact on the lot areas and layouts.

b) Splay corners will generally need to be 6m x 6m in the following suburbs: Wetherill Park, Bossley Park, Prairiewood, Wakeley, Greenfield Park, Edensor Park, St. Johns Park, Abbotsbury, Bonnyrigg and Bonnyrigg Heights.

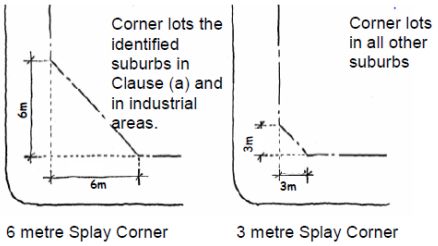


Figure 6 Fairfield Council splay requirements

It should be noted that all roads will require full depth pavement reconstruction due to the existing pavements nearing the end of their design life and increased traffic loading from the proposed development. This is the case for both layouts, as there are less roads in the revised layout there may be a small reduction in costs for the roadworks, although this will be offset by increased costs of the unit block internal roads and car parks.

Monash Place is currently a no through road servicing 6 dwellings directly and a total of 63 dwellings and substation, when connecting streets are counted. Both the approved and revised layouts will provide a link access from Monash Place to Tarlington Parade and other proposed local streets. It has been assumed that for the approved plan, no upgrades to the intersection of Monash Place and Elizabeth Drive are required. The increase in proposed dwellings from the approved to revised layout in the area may trigger an upgrade to the intersection that may not have been required previously. This will need to be checked by a traffic consultant.

Figure 7 Elizabeth Drive Monash Place intersection (left in left out configuration)

The western portion of the site does not have regional stormwater detention or water treatment downstream, and therefore detention and treatment will need to be provided within the site. The revised layout has an open space area adjacent to Bonnyrigg Avenue, and it is assumed this space will be allocated for a detention and water treatment basin. This basin is not located at the lowest point the site, the low point is approximately 1.6m lower than the basin location (see Figure 8 below). The basin would be best located closer to the low point to ensure the full western catchment can drain to the detention basin. At this low point, there is an existing drainage structure which is assumed to connect to the Bonnyrigg Avenue drainage system. The revised layout has allowed approximately 1,000m^2 of area allocated for the basin, although preliminary calculations indicated an area of approximately 1,600m^2 is required, refer to section 3.3 Stormwater below for further details of the basin.

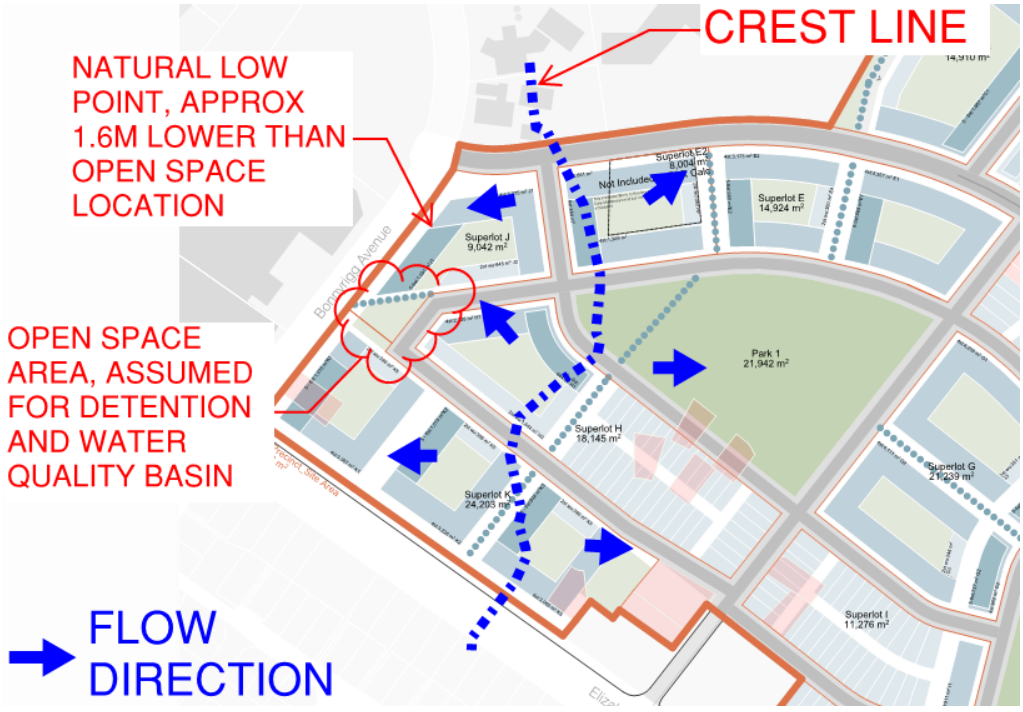


Figure 8 Open space location relative to site low point

If the revised layout does not allow the basin to be located at the low point, the current location may be retained, and the proposed unit block in superlot J (located at the low

point) would require a detention tank located within its site if it can't drain back to the basin. Further design will be required to determine the detention and layout requirements at this location.

3.3 Stormwater Drainage

An assessment of the revised layout was completed to ascertain if there are any adverse impacts on the surrounding areas. The site is split into two catchments, the central catchment which drains to Tarlington drainage reserve and the western catchment draining towards Elizabeth Drive and Bonnyrigg Avenue. The Tarlington drainage reserve contains stormwater detention storage and water treatment devices downstream of the site, which were sized to suit the approved masterplan. The review assessed changes in site usage and impervious areas to determine if any additional requirements for detention and water quality are required.

The following observations were made between the approved and revised layouts;

Central Catchment

- The total site area remains unchanged and it is assumed the central catchment area (approximately 26 hectares) will be the same for both the approved and revised layouts,
- The park / open space areas have increased from approximately 3 hectares to 5 hectares,
- The area of roads has reduced by approximately 25%,
- The area of low / medium density lots is approximately 1/3rd, and the area of the lots is typically smaller and will have a higher impervious area percentage for the revised layout,
- The area of unit blocks has approximately doubled.

Preliminary calculations indicate the impervious area for the revised layout is slightly lower than the approved layout. As the total catchment area remains the same and the impervious area slightly less, the downstream stormwater detention basin and water quality measures will be sufficient for the revised layout.

Western Catchment

- The total site area remains unchanged and it is assumed the western catchment area (approximately 4 hectares) will be the same for both the approved and revised layouts,
- The impervious area percentage will increase by approximately 5% to 10% due to this area changing from low and medium density lots to unit blocks,
- There is a reduction of park / open space by approximately 4,000m^2.

The above changes will lead to a small increase in stormwater detention and biofiltration area required, although it's not expected to be significant.

The detention volume required will be approximately 1,200m^3, assuming the basin will be 1.3m deep with a maximum water level depth during the 100 year ARI storm event of 1.0m, the basin is assumed to have 1(V):4(H) batter slopes. With this configuration, the total area required for the basin will be approximately 1,600m^2, and will likely require fencing around the basin. The volume and area will need to be confirmed through more detailed modelling at the next stage of design. It should be noted that council's preference is to limit detention basin maximum water level depths to 0.5m and to have 1(V):6(H) batter slopes, with these parameters there is no requirement to

fence the basin. Using councils preferred basin design criteria the total basin area required would be approximately 3,200m^2.

The area of biofiltration required will be approximately 400m^2, using a rate of 1% of upstream site area, this area will be confirmed at the next stage of design using a MUSIC model. Water treatment will likely be through a Gross Pollutant Trap (GPT) at the outlet and raingarden located within the detention basin.

3.4 Potable Water

The site is currently serviced by the following existing mains;

- DN450 CICL potable watermain through the site along Monash Place and Bradfield Crescent,
- DN375 CICL watermain along Elizabeth Drive,
- DN750 SCL main along Edensor Road,
- DN100 DICL along Tarlington Parade.

Refer to Appendix B for DBYD information.

The approved lot yield is estimated to increase the demand from 2,500 dwellings to 3,000 dwellings or an Equivalent Population of 1,500 (EP). The increase in lot yield of 500 lots will have minor impact on the water network as the site is adequately serviced from the trunk water main along Edensor Road and Smithfield Road.

The existing watermain along Tarlington Parade will require upgrading from DN100 to DN250 to increase the network supply due to the additional dwellings.

It is recommended a feasibility application is submitted to Sydney Water. Following this Sydney Water would advise if their system has sufficient capacity to service the proposed development and provide details for any required augmentations to their system.

3.5 Waste Water

Currently, Sydney Water services the development with trunk mains in the following locations:

- Ø400mm Vitrified Clay (VC) trunk main running through Tarlington Reserve
- Ø225mm VC main running through Humphries Road
- Ø150mm VC running along the southern edge of Tarlington Parade

Refer to Appendix B for DBYD information.

Arcadis has assessed the existing capacity of the sewer network based on the approved master plan layout (refer Figure 9), this is assumed to the base case.

Figure 9 Existing Case - Approved Masterplanned Layout

The assessment identified the sewer main running adjacent to Tarlington Reserve as the trunk main which most of the development connects into. The site was split into catchments and the discharge locations of each catchment into the trunk main were located. The catchments were subsequently divided based on their use. The way the land is used, dictates the equivalent population (EP) as shown in Table 1 below.

Table 1 Land Use/Equivalent Population Breakdown

Land Use	Equivalent Population (EP)
House/Lot	3/lot
Apartment	2.65H/unit
Open Space	20/Hectare

Three key assumptions in the analysis of the sewer network capacity are as follows:

1. All pipes run at a 1% grade.
2. The section of DN225 sewer servicing the existing area south of Cabramatta Road is at capacity and therefore the available capacity within the existing DN400 will be available for the Bonnyrigg development.

3.5.1 Sewer Catchments

In undertaking this investigation, the Bonnyrigg Development and its surrounding areas has been split into six catchments. The six catchments are summarised below and in Figure 10;

- Catchment A is the area within Stage 1 - 3 of the Bonnyrigg Development (Blue)
- Catchment B is the area to the north west which includes Stage 6C, Stage 10-15a of the Bonnyrigg Development (Orange)

- Catchment C is the area within Stage 4A to 6A of the Bonnyrigg Development (Red)
- Catchment D is the area with Stage 14A to 16 (Green)
- Catchment E Is the area west of Tarlington Parade (Magenta)
- Catchment F is the existing area south of Cabramatta North Road

3.5.2 Sewer Assessment of Approved Masterplan

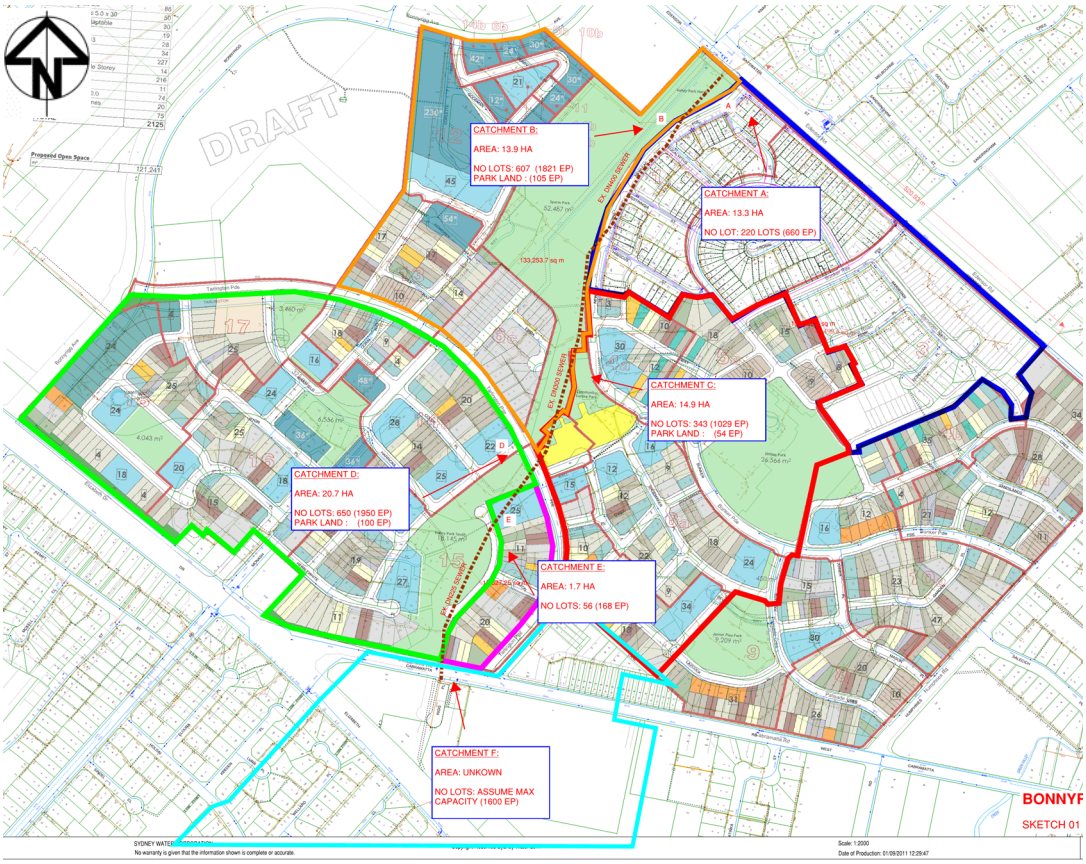


Figure 10 Sewer catchment plan for approved layout

Refer to
Table 2 for the flows contributing to the DN400 sewer carrier.

Table 2 Contributing and cumulative EP for the development

CATCHMENT	No LOT	CONTRIBUTING EP	CUMMULATIVE EP
Catchment A	220	660	7811
Catchment B	607	2245	6832
Catchment C	343	1083	4906
Catchment D	650	2050	3823
Catchment E	56	168	1773
Catchment F	535	1605	NA

Typical capacity of pipe diameters is shown below;

- 150mm diameter pipe caters for up to 600EP.
- 225mm diameter pipe caters for up to 1,600EP.
- 300mm diameter pipe caters for up to 3,200EP.
- 400mm diameter pipe caters for up to 10,000EP.

The existing DN400 sewer through the Bonnyrigg Development has the capacity to take up to 10,000EP, the number of EP generated base on the approved masterplan, including the existing surrounding areas indicated above, utilise 7,811EP, which leaves a spare capacity of 2,200 EP, which is an equivalent to 730 single dwellings or 830 apartments. Therefore, the existing sewer network has the capacity for the proposed yield increase of 500 lots.

It is recommended a feasibility application is submitted to Sydney Water. Following this Sydney Water would advise if their downstream system (such as treatment plant or pumping station) has sufficient capacity to service the proposed development and provide details for any required augmentations to their system.

3.6 Electricity

Endeavour Energy have existing electrical infrastructure in all the roads adjacent to and within the site. The Bonnyrigg Zone Substation is located at 475 Elizabeth Drive.

There is overhead high voltage (HV) lines along Monash Place that continue north south through the existing open space and Bradfield Crescent, the HV line then travels underground to the north. The revised layout changes from open space below the overhead HV line to a road, although it is not expected to impact the development as it is assumed the HV line will be placed underground for both layout options.

Refer to Appendix B for DBYD information.

Within the timeframe requested for the review it was not possible to get information from Endeavour Energy in regards to existing network capacity and what, if any augmentations would be required for the development. It is also not possible at this stage to determine if the additional 500 dwellings from the revised layout would require an increase in conduits and pits from that of the approved masterplan.

It can be assumed that the additional dwellings will increase demand and will require additional sub stations to supply power. A 500kVA substation would typically supply 60 houses or 85 units, the number of houses has reduced by approximately 230 and the total number of units has increase by approximately 730, this would lead to an increase of sub stations by at least 5, although this may increase as Endeavour Energy may ask for a dedicated substation at each unit block where there are more than 25 units. The average cost of a substation is approximately $60,000.

As there is a reduction in road length for the revised layout, there may be a reduction in conduits / cabling length and pits required, although the size may increase due to the increased demand.

It is recommended that a technical enquiry be submitted to Endeavour Energy who will be able to provide more detailed information on the network supply.

3.7 Telecommunications

3.7.1 Telstra

Telstra lines are in all streets within the development. There is the Edensor Park Telstra Exchange located at 57 Bonnyrigg Avenue.

As there is a reduction in road length for the revised layout, there may be a reduction in conduits / cabling length and pits required.

A Telstra Smart Communities application should be made to Telstra. Telstra would then determine if they are able to service the proposed development. Due to the changes to servicing provisions for telecommunications, if Telstra are not able to provide upgraded services for the site then the National Broadband Network would be responsible for providing telecommunications services to the site.

3.7.2 NBN

There is NBN in the following locations within and around the development;

- Northern side of Elizabeth Drive,
- North western side of Bonnyrigg Avenue.
- Southern side of Edensor Road,
- Majority of roads within the recently constructed stages 1 – 3 of the Bonnyrigg development,

Once a response has been received from the Telstra Smart Communities application, the NBN would be in a position to determine if they become a 'supplier of last resort' for the site.

It is assumed that the increase in dwellings will not impact the development.

3.8 Gas

Jemena have existing gas infrastructure in the roads adjacent to the site, including;

- Ø110mm Polyethylene main on the south-eastern side of Bonnyrigg Avenue,
- Ø110mm Polyethylene main on the northern side of Elizabeth Drive,
- Ø63mm Polyethylene main on the northern side of Tarlington Parade between Bonnyrigg Avenue and Barraclough Way,
- Ø50mm Polyethylene main on the northern side of Tarlington Parade between Barraclough Way and Wall Place,
- Ø40mm to Ø63mm Polyethylene mains within some of the local streets.

Refer to Appendix B for DBYD information.

Within the timeframe requested for the review it was not possible to get information from Jemena in regards to existing network capacity and what, if any augmentations would be required for the development. It is also not possible at this stage to determine if the additional 500 dwellings from the revised layout would require an increase in gas main sizes from that of the approved masterplan.

As there is a reduction in road length for the revised layout, there may be a reduction gas main length required, although the size may increase due to the increased demand.

To progress the development, we recommend making an application to Jemena. Connection to the Jemena network is subject to a commercial agreement between the developer and Jemena.

4 CONCLUSION / RECOMMENDATIONS

From the review, there doesn't appear to be any significant adverse impacts from the revised concept masterplan layout.

Arcadis recommend the following items be undertaken prior to Development Application designs,

- Traffic assessment to assess the impacts of the additional dwellings,
- Enquiry applications made to the key utility providers,
- Concept masterplan design including 3-dimensional road and earthworks grading, schematic stormwater, water and sewer layouts and stormwater detention and water quality requirements. This will assist refining the layout, earthworks and utility strategies.

APPENDIX A MASTERPLANS

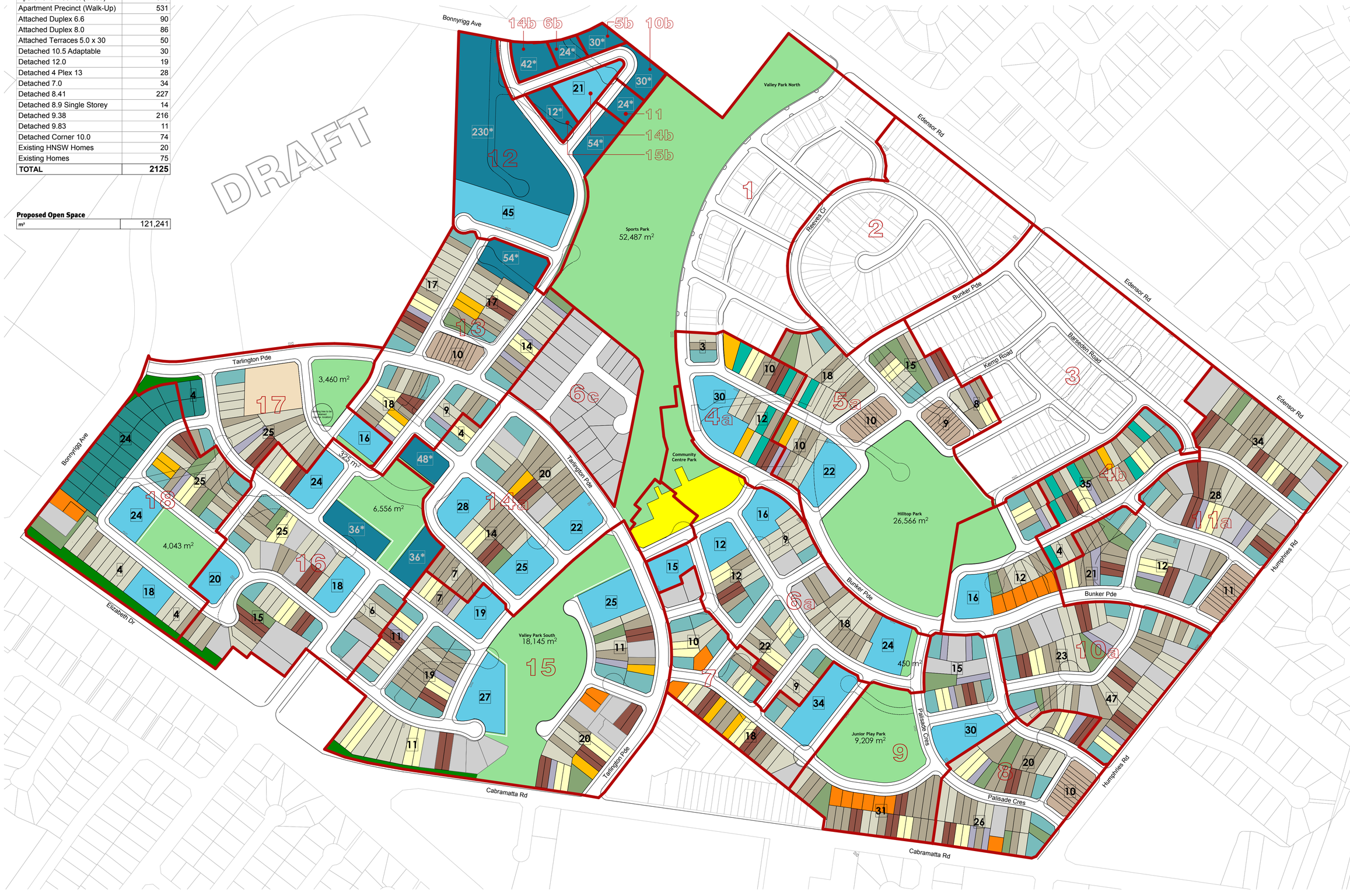
Approved Masterplan

MASTERPLAN Total Yield by Lot Types - Stages 4-18

Lot Types	Quantity
Apartment Precinct (Lifted)	620
Apartment Precinct (Walk-Up)	531
Attached Duplex 6.6	90
Attached Duplex 8.0	86
Attached Terraces 5.0 x 30	50
Detached 10.5 Adaptable	30
Detached 12.0	19
Detached 4 Plex 13	28
Detached 7.0	34
Detached 8.41	227
Detached 8.9 Single Storey	14
Detached 9.38	216
Detached 9.83	11
Detached Corner 10.0	74
Existing HNSW Homes	20
Existing Homes	75
TOTAL	**2125**

Proposed Open Space

m²	121,241



Legend - Lot Types

- Apartment Precinct Lifted
- Apartment Precinct Walk Ups
- Terraces - Standard 5x30 / Terraces - Corner 8.5x30
- Duplex - vertical 6.6 x 2 (13.2 x 25-27)
- Attached Row House (Single Storey)
- Duplex 8 x 2 (16 x 25-27)
- Detached 4 Plex 13 x 4 (Total 26 x 50)
- Detached 7.0 x 25-27
- Detached 8.41 x 27
- Detached 8.9 x 27 (Single Storey)
- Detached 9.38 x 27
- Detached 9.83 x 27
- Detached 10.5 x 27 (Adaptable)
- Detached 12x18
- Detached Corner 10 wide

Legend - Other Zones

- Existing HNSW Lots
- Existing Privately Owned
- Community & NCO
- Open Space

Legend - Notation

- Existing Roads
- Footpath around Apartments
- Stage Boundaries
- 4 Stage Numbering
- 40 Zone / Apartment Yield
- Electrical Substation
- 54* Lifted Apartments Yield

Becton Property Group
Level 14
55 Clarence Street
Sydney NSW 2000

Telephone: +61 2 8234 1800
Facsimilie: +61 2 8324 1880

Revision	Date	Issue
Masterplan Concept Presentation	**12.07.10**	**A**
Revised Masterplan Concept Presentation	**08.09.10**	**B**
Revised Yield Plan	**26.10.10**	**C**
Stage 5/10 boundary change & re-allocation of homes in Stage 5	**28.10.10**	**D**
Updated Stage 3 mix	**17.01.11**	**E**
Updated Masterplan mix and Road layouts	**2.02.11**	**F**
Introduced Public Open Space Areas & Calculations	**15.02.11**	**G**
Introduced 10.5m adaptable lots, updated apartment figures	**08.04.11**	**H**

Revision	Date	Issue
Revised Yield Mix	**03.05.11**	**I**
Revised Yield Mix	**04.07.11**	**J**
New Lots - revised Yield Mix	**10.08.11**	**K**
New Lots - revised Yield Mix	**06.09.11**	**L**
New Road layouts - revised Yield Mix	**14.09.11**	**M**
Revised Layout to Stages 13,14,15,16,17 & 18	**27.09.11**	**N**
Amended Staging Boundaries & Open Space	**29.11.11**	**P**

Architect
dKO architecture (NSW) pty ltd
C19 / 38-48 Macaurthur Street
Ultimo, NSW, 2007, AUS
T +61 2 9280 2244 / F+61 2 9280 2264

www.dko.com.au / info@dko.com.au

ABN: 81 956 706 590

Client Details
BECTON

Project
Newleaf

Bonnyrigg

Project Number
10527

Drawing
Proposed Masterplan

Scale 1:2000
Date 8-09-2010

01

Revised Concept Masterplan

+ concept master plan

Key

Precincts & lots
- west precinct boundary
- superlot boundary
- privately owned lot

Open Space & Connections
- pedestrian/cycle connections
- through site link connections
- public open space

Proposed Built Form
- 8 storey
- 6 storey
- 4 storey
- 2 storey
- individual lots
- common open space

1:5000@A3
concept master plan

AJ+C
Allen Jack+Cottier

APPENDIX B DIAL BEFORE YOU DIG (DBYD) PLANS

Sydney Water (Sewer and Water)

A0

DBYD Address:
n/a Humphries Road
Bonnyrigg NSW 2177

DBYD Job No: 12877937

DBYD Sequence No: 64110359

SYDNEY WATER CORPORATION

No warranty is given that the information shown is complete or accurate.

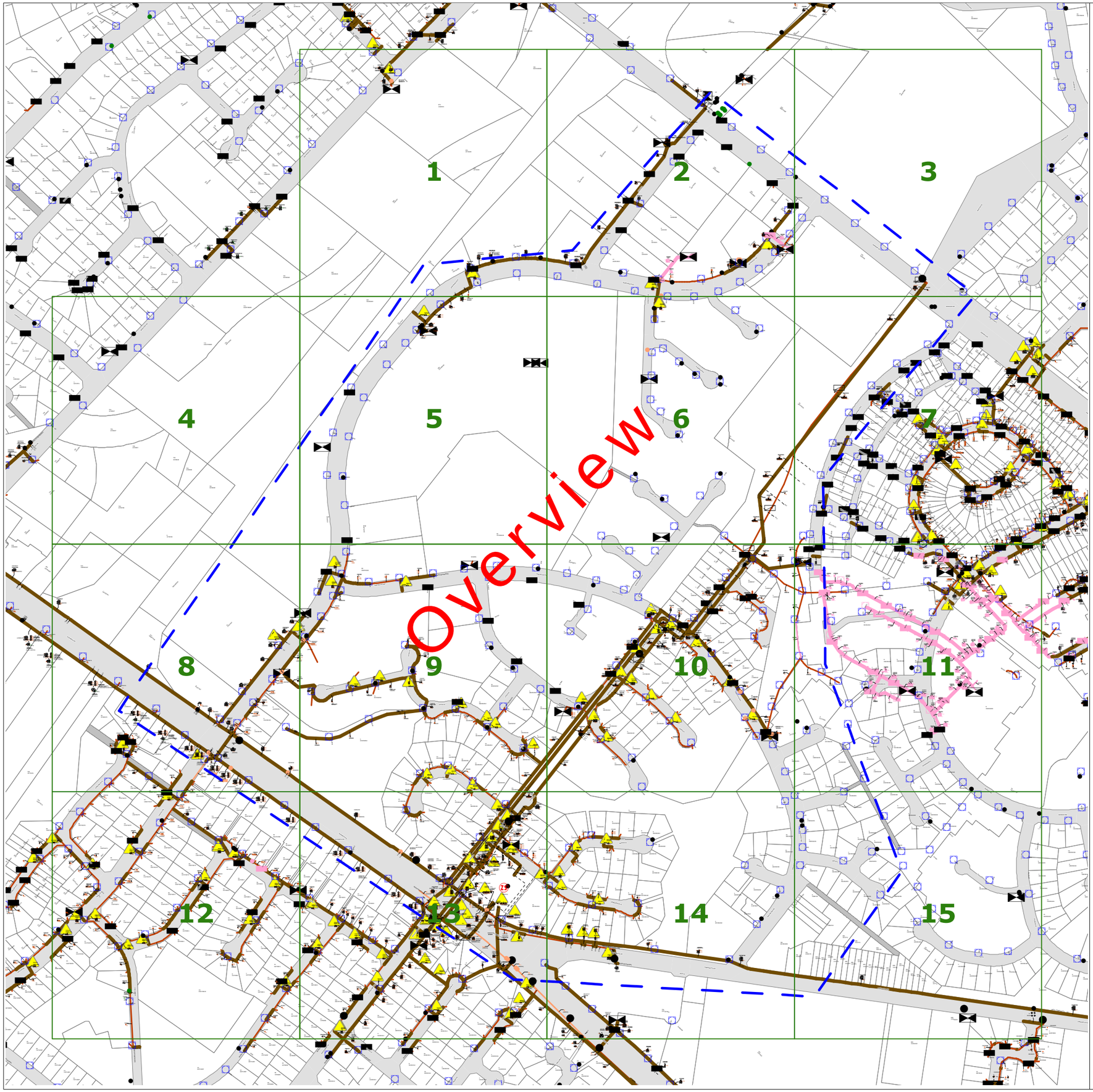
Scale: 1:2000

Date of Production: 01/09/2017 10:29:18

0m 40m 80m 120m 160m

Plan 1 of 1

Endeavour Energy (Electricity)



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- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
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- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

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WARNING
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PLEASE RING **9853 7121** or **MOB. 0407 468 626**
4 WORKING DAYS BEFORE COMMENCING WORK

LEGEND

- Street light column (or)
- Padmount substation
- Overground pillar (O.G.Box) (or)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

NOT TO SCALE

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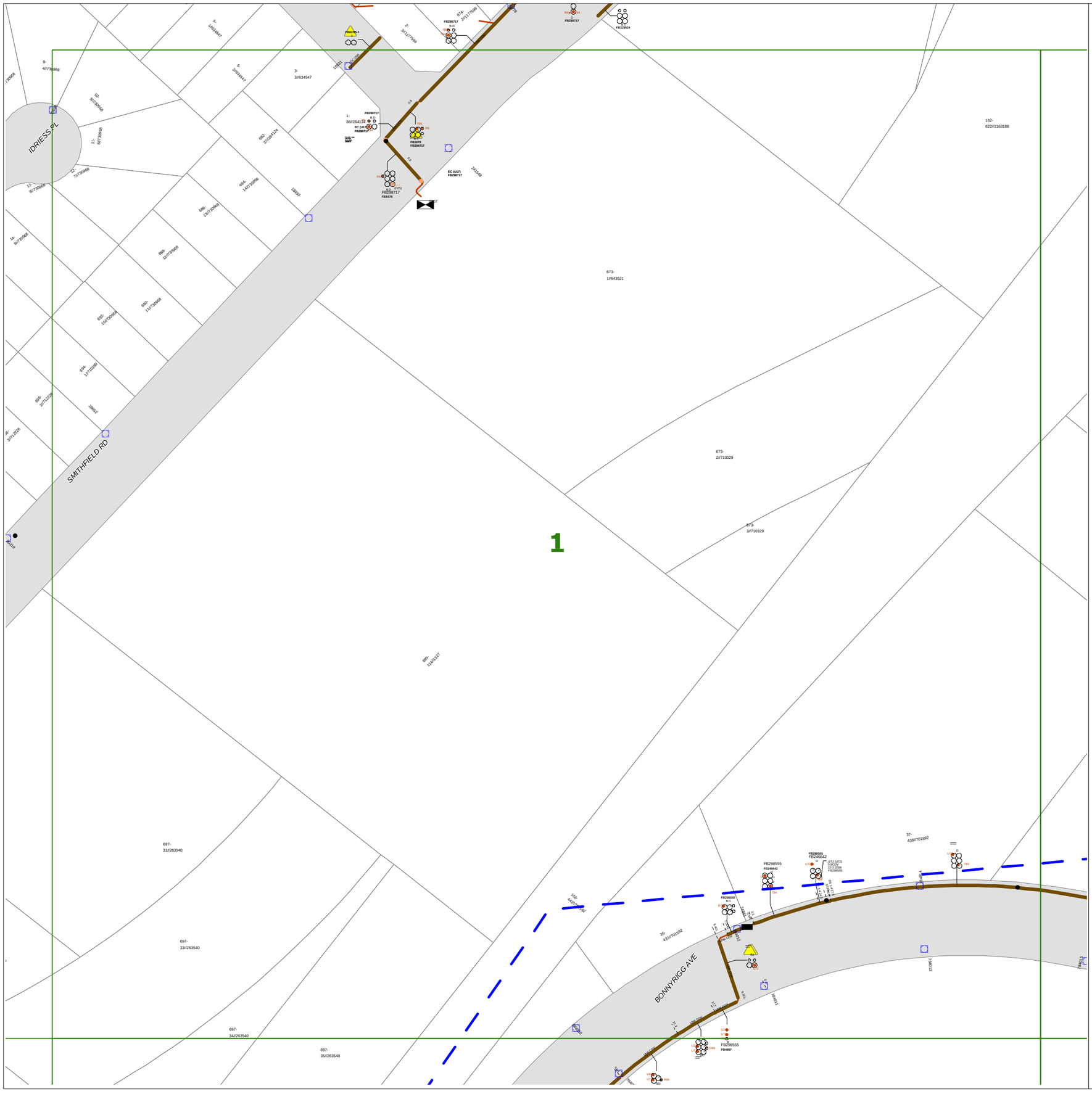
Issued Date:	18/09/2017



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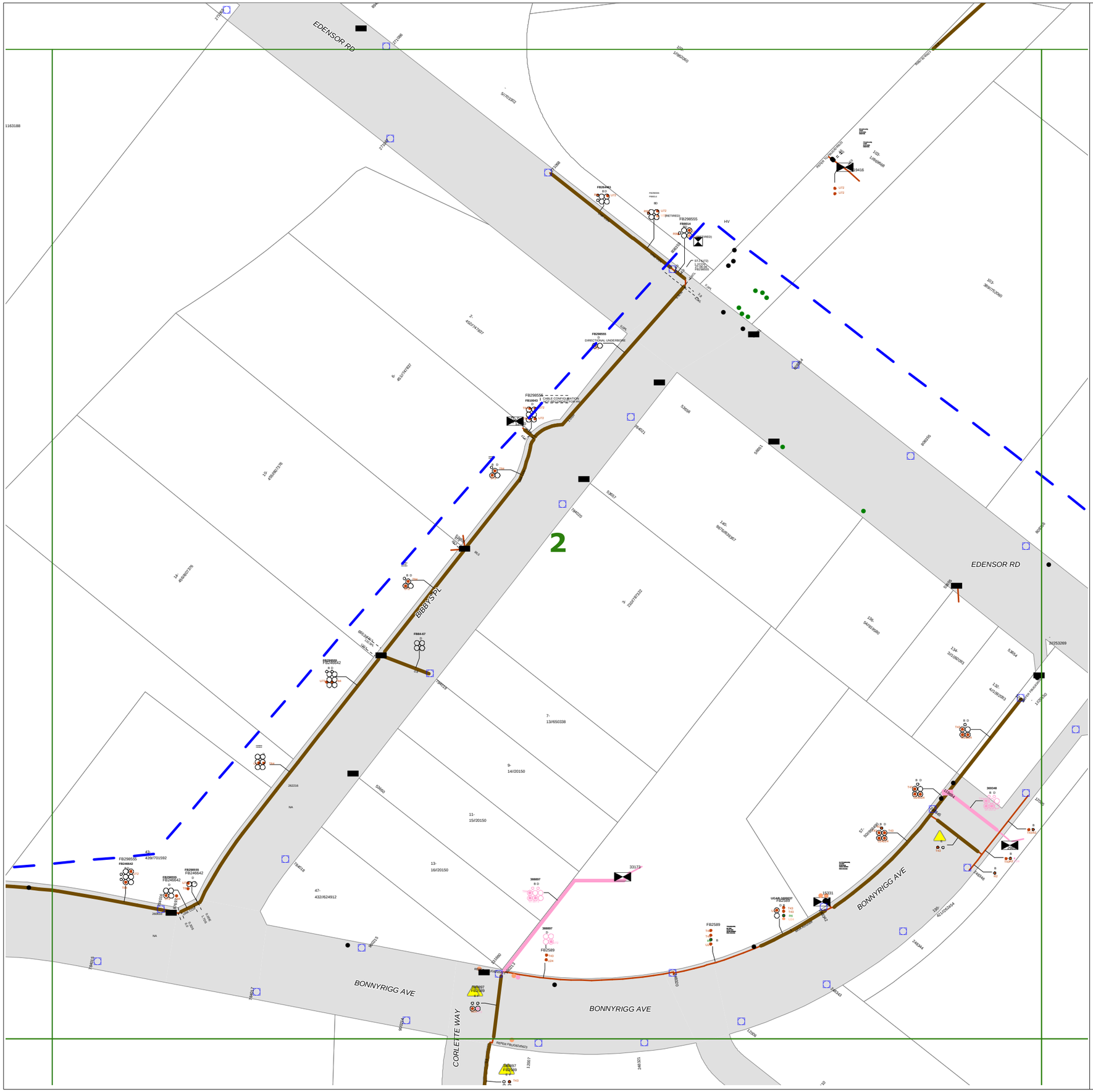

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○ or ■	Street light column
⋈	Padmount substation
▭ or ▬	Overground pillar (O.G.Box)
☒	Underground pit
▬	Duct run
—	Cable run
⚆	Typical duct section
⚠	Asbestos warning

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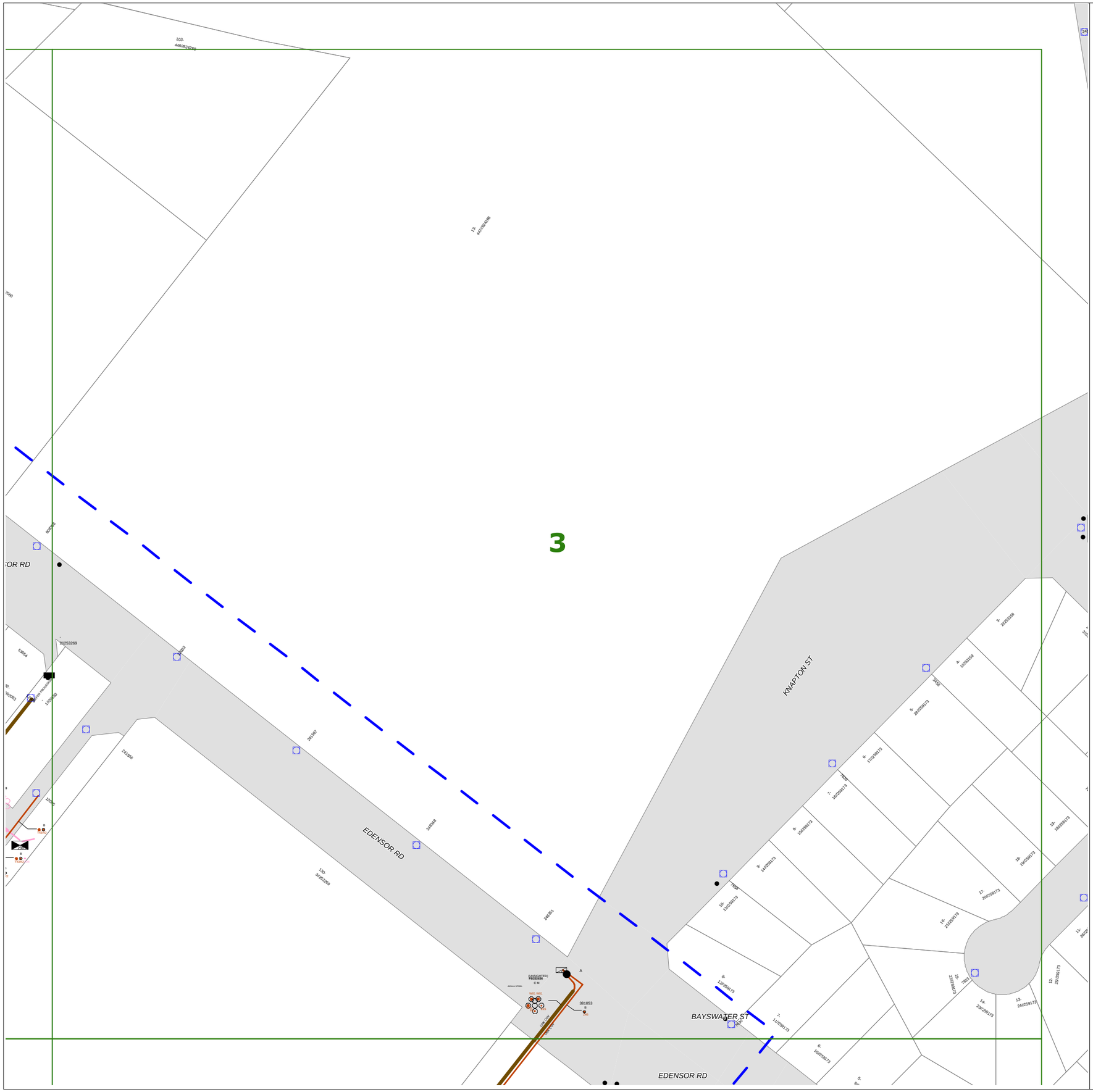

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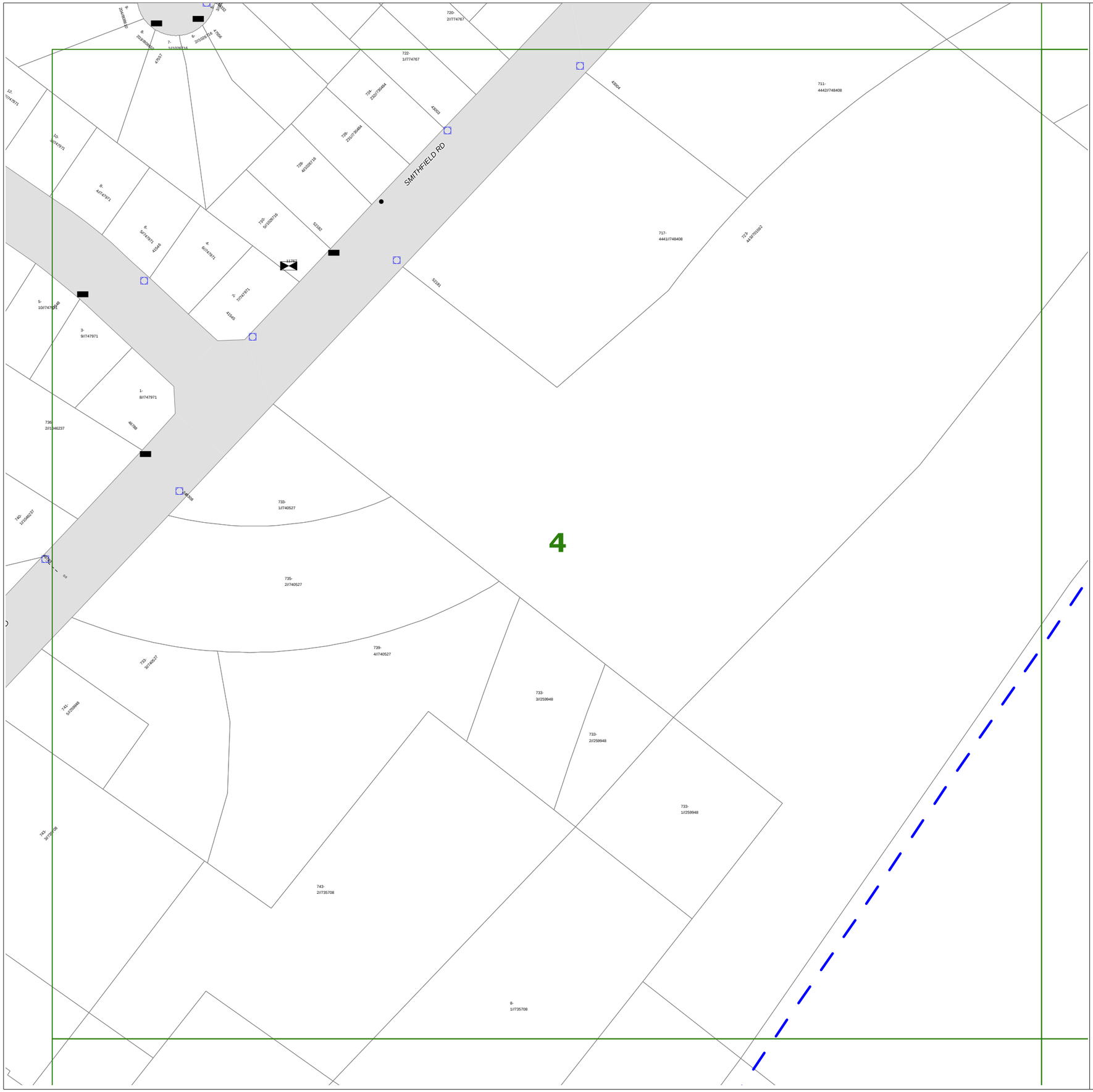

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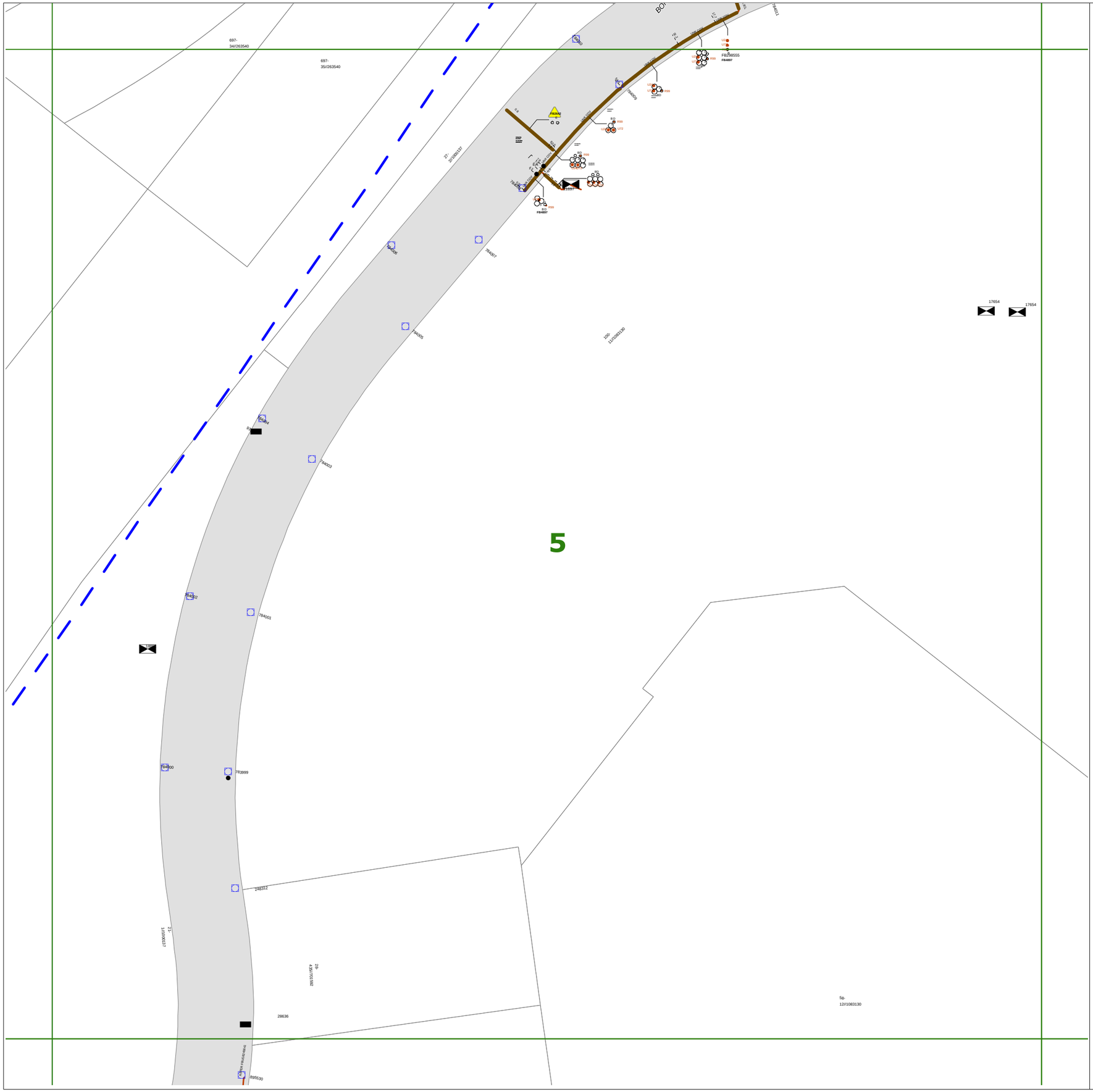

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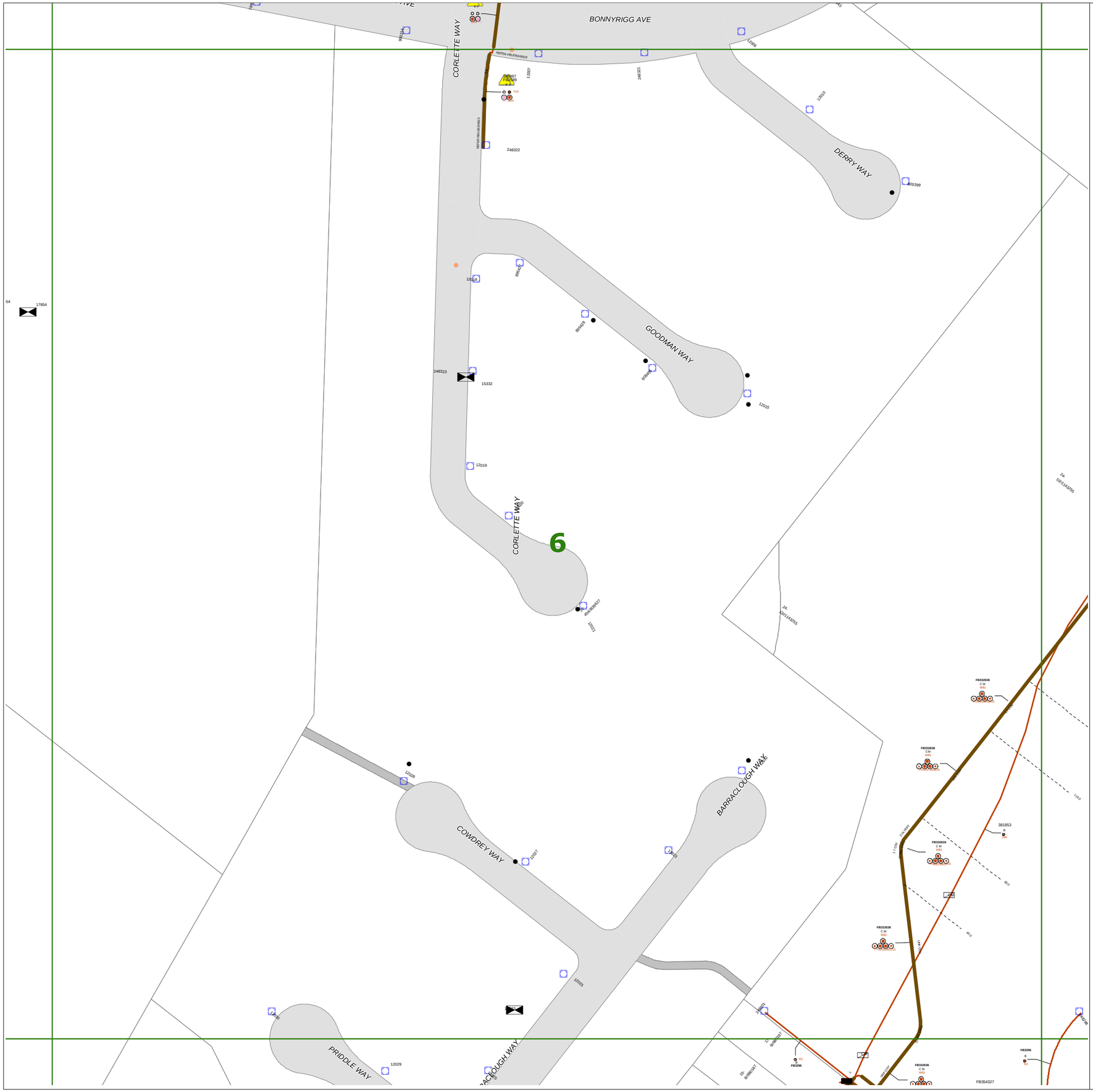

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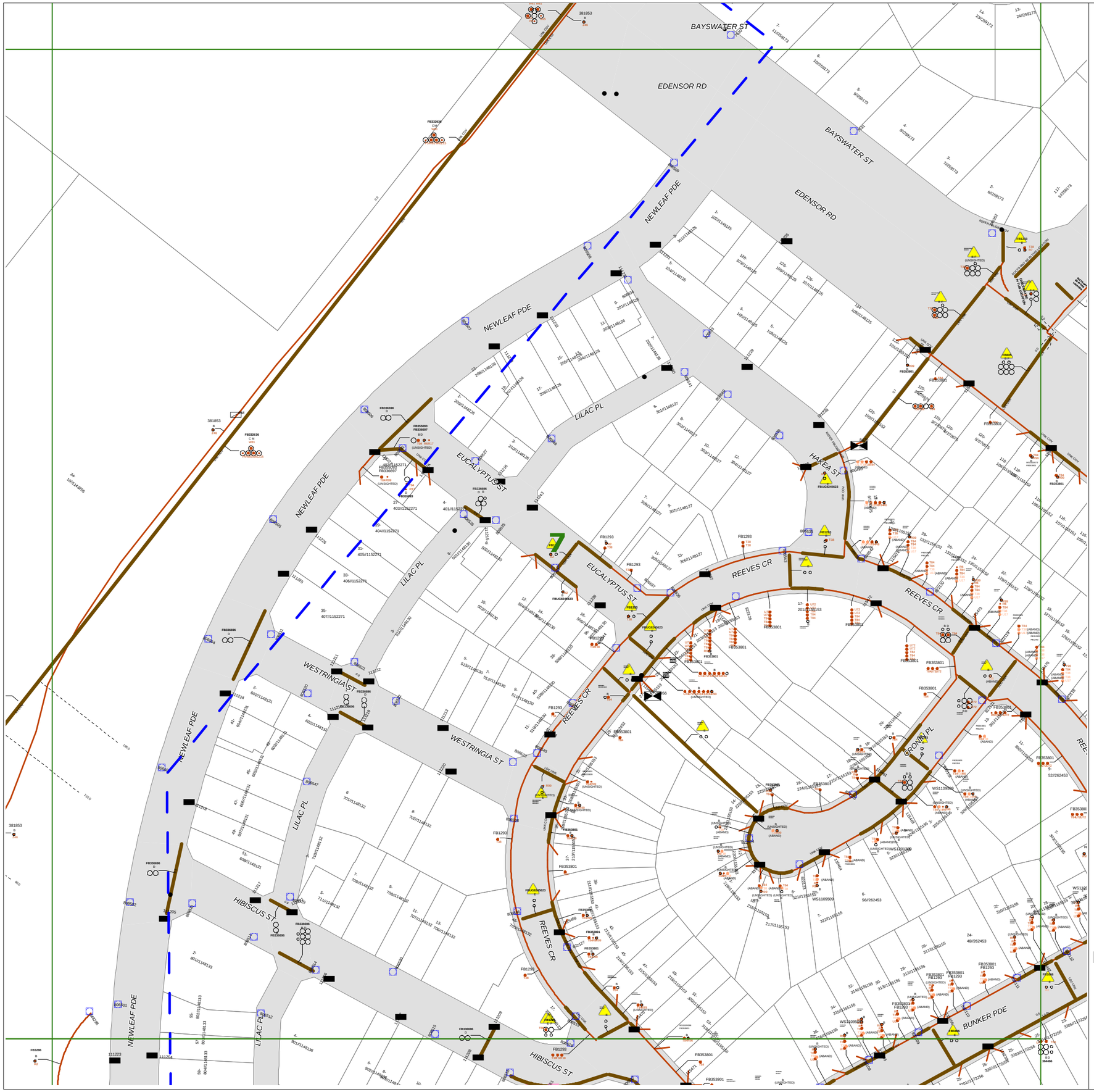

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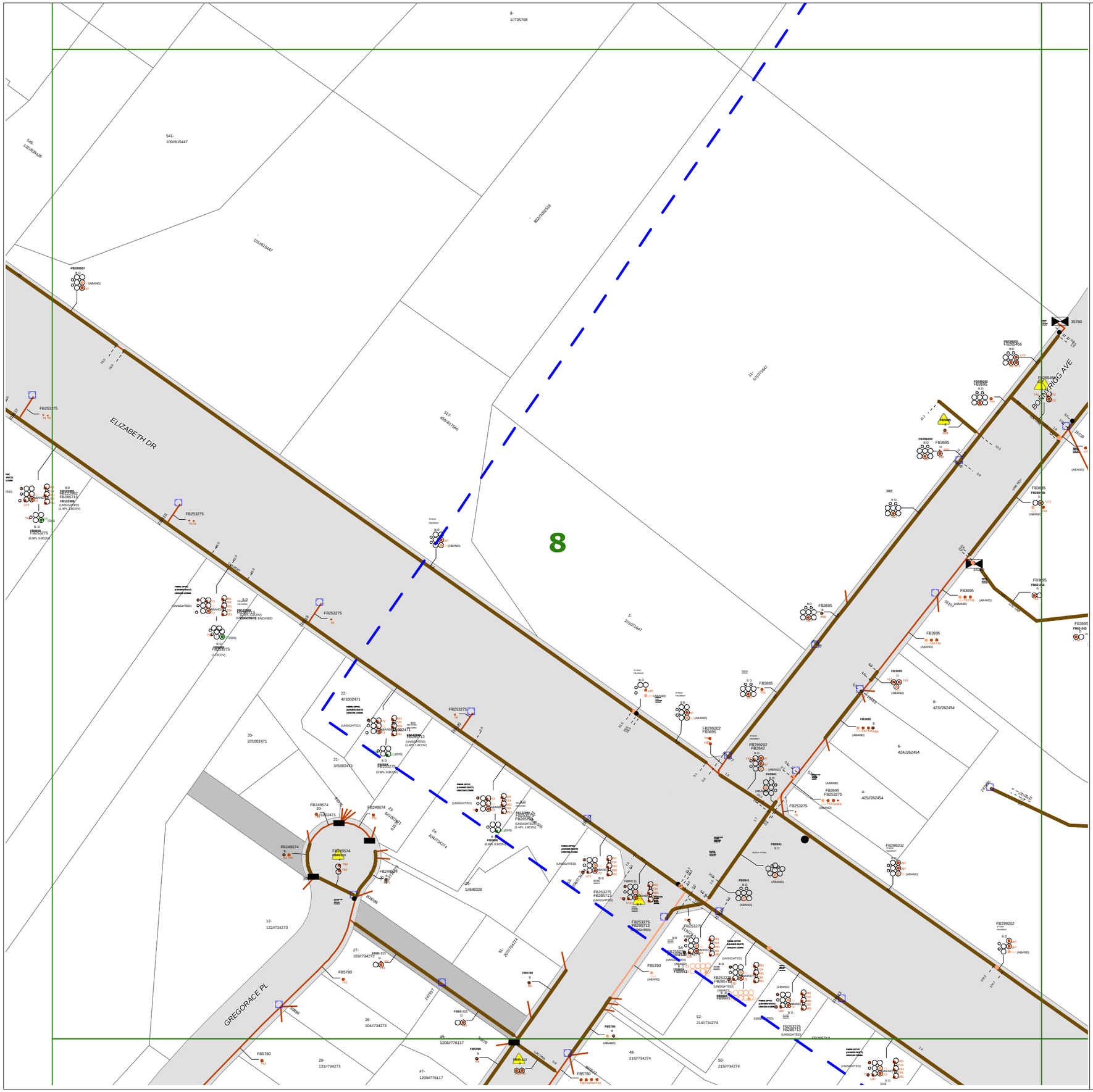

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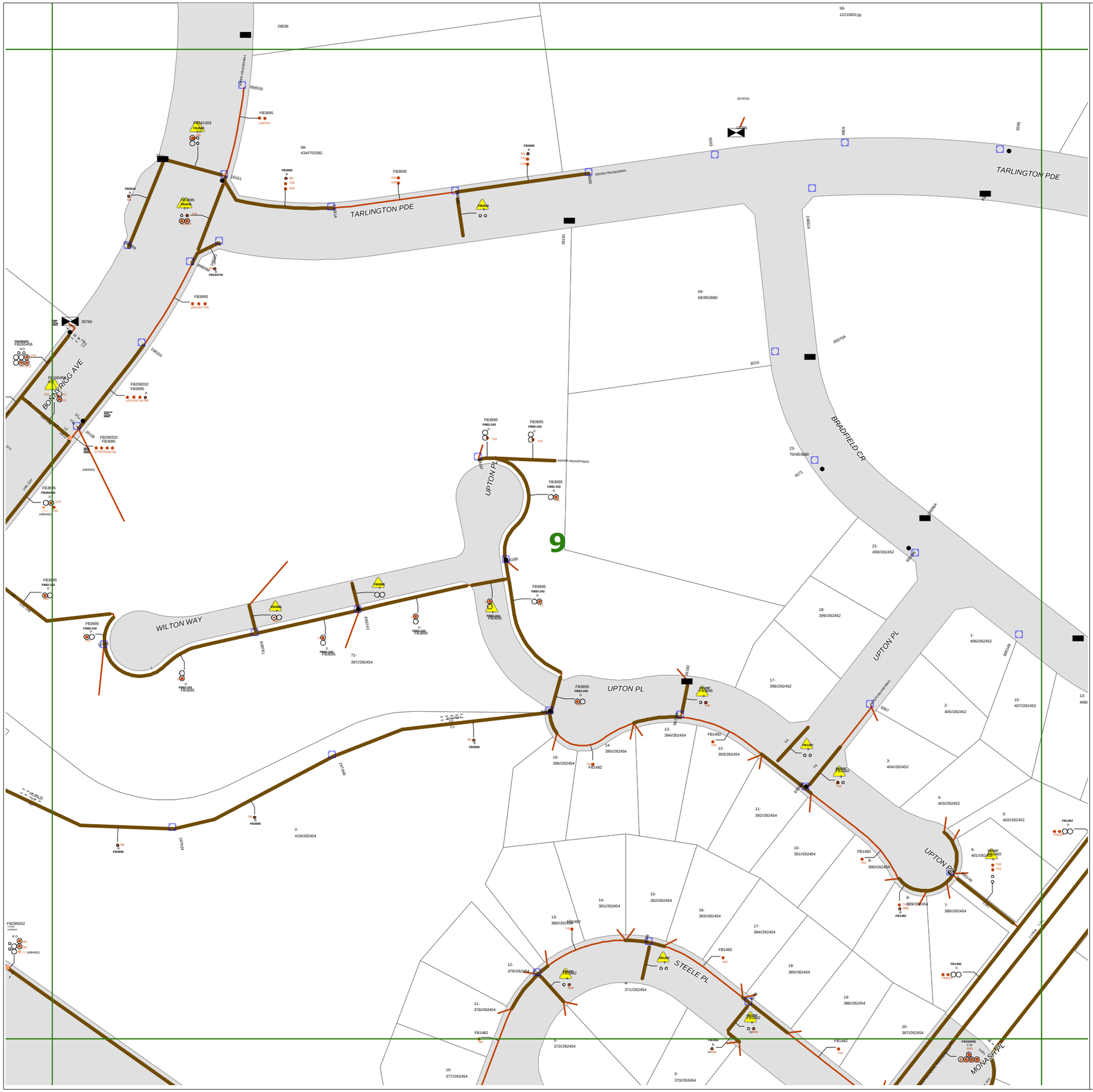

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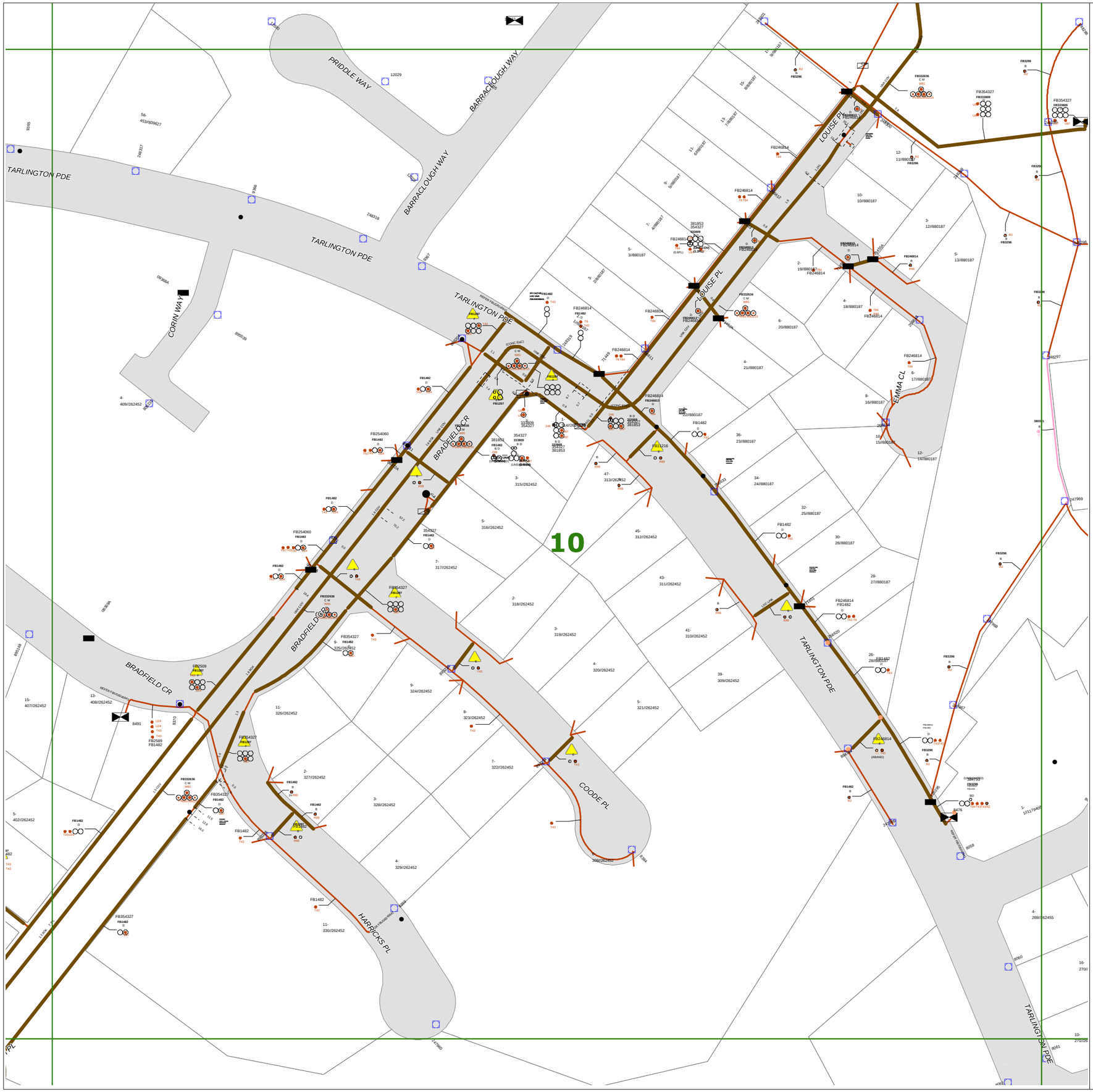

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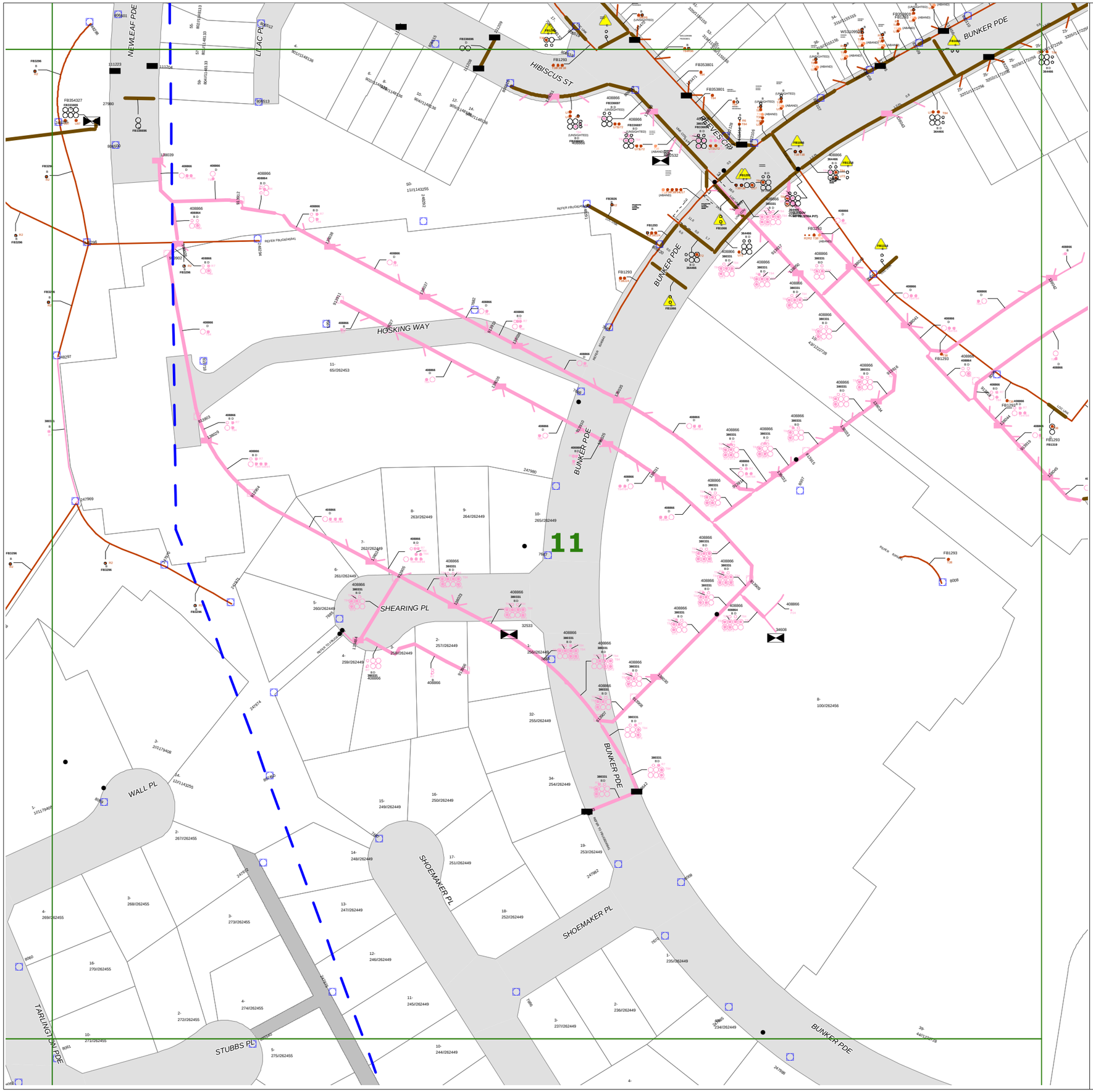

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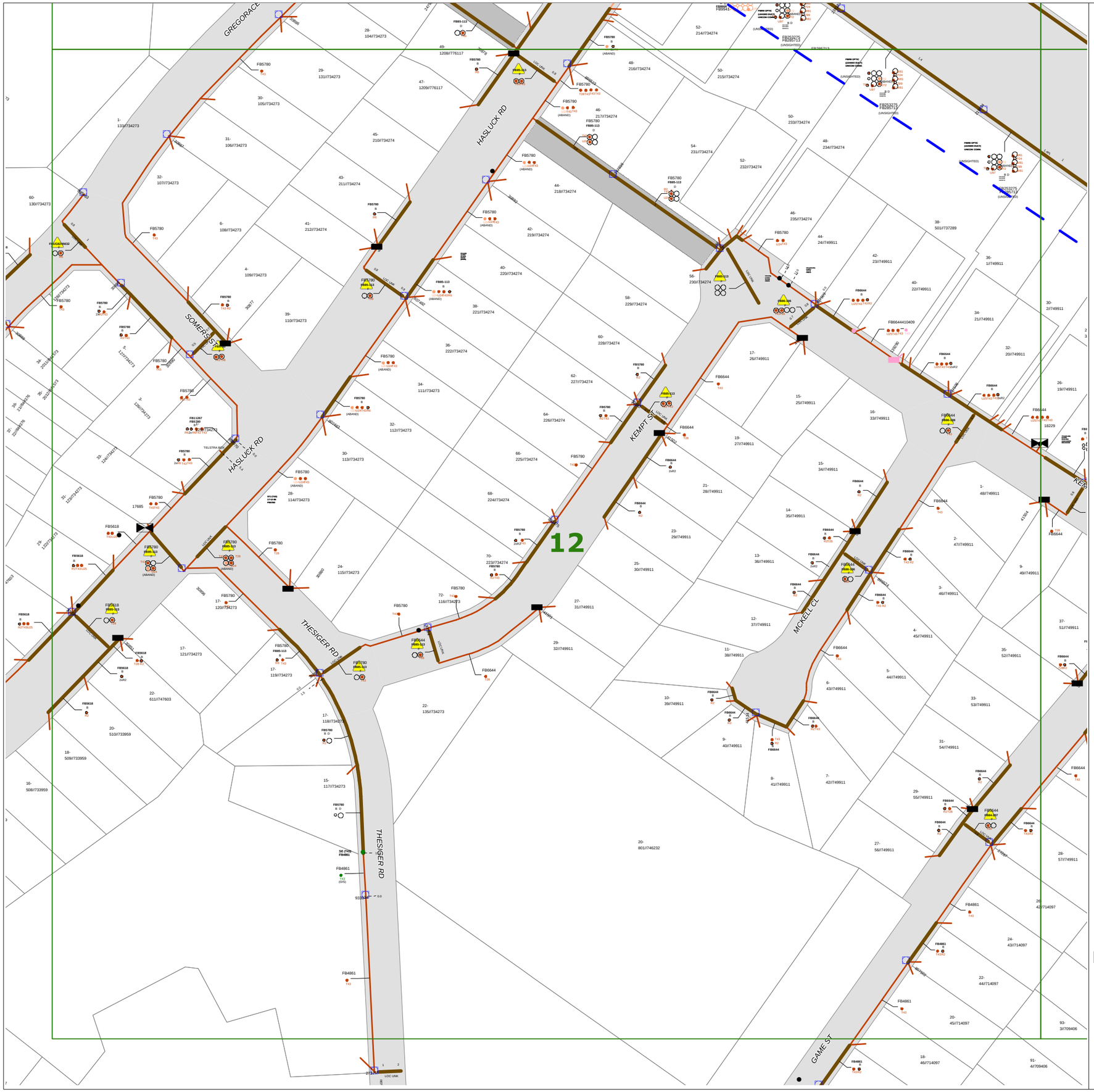

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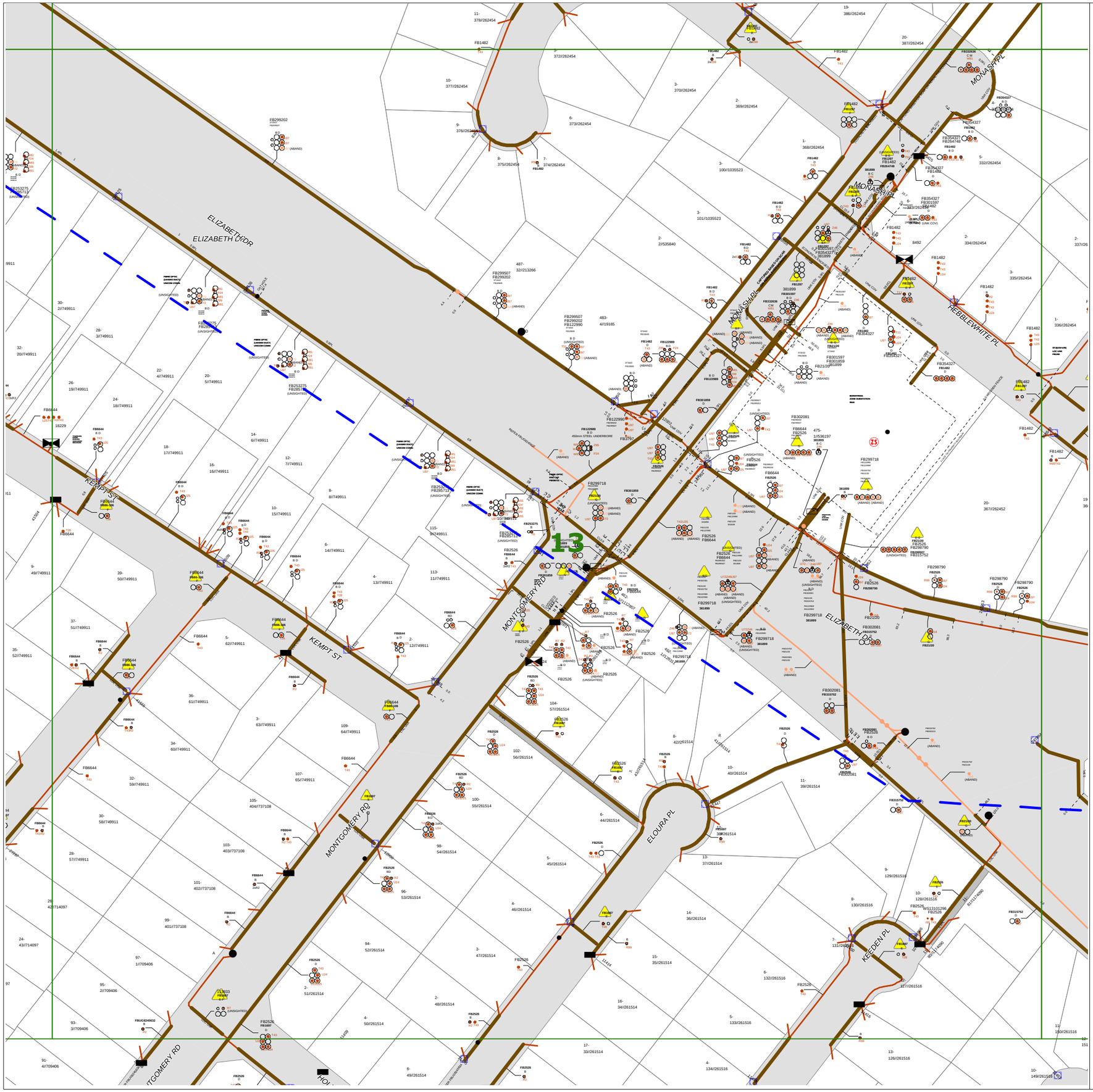

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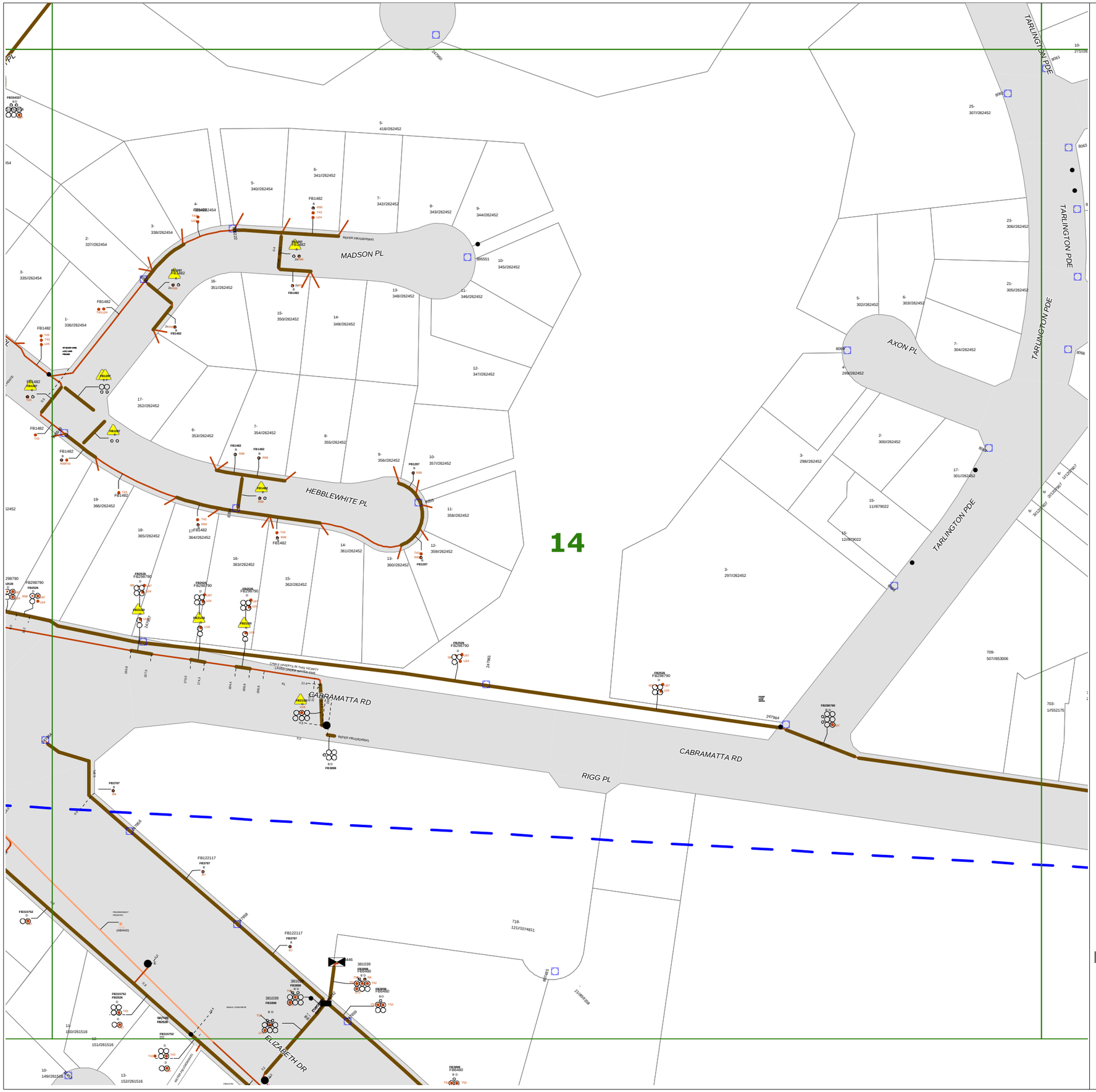

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- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

WARNING
THIS EXCAVATION IS IN THE VICINITY OF ENDEAVOUR ENERGY TRANSMISSION, PILOT, COMMUNICATION OR FIBRE OPTIC CABLES
PLEASE RING **9853 7121** or **MOB. 0407 468 626**
4 WORKING DAYS BEFORE COMMENCING WORK

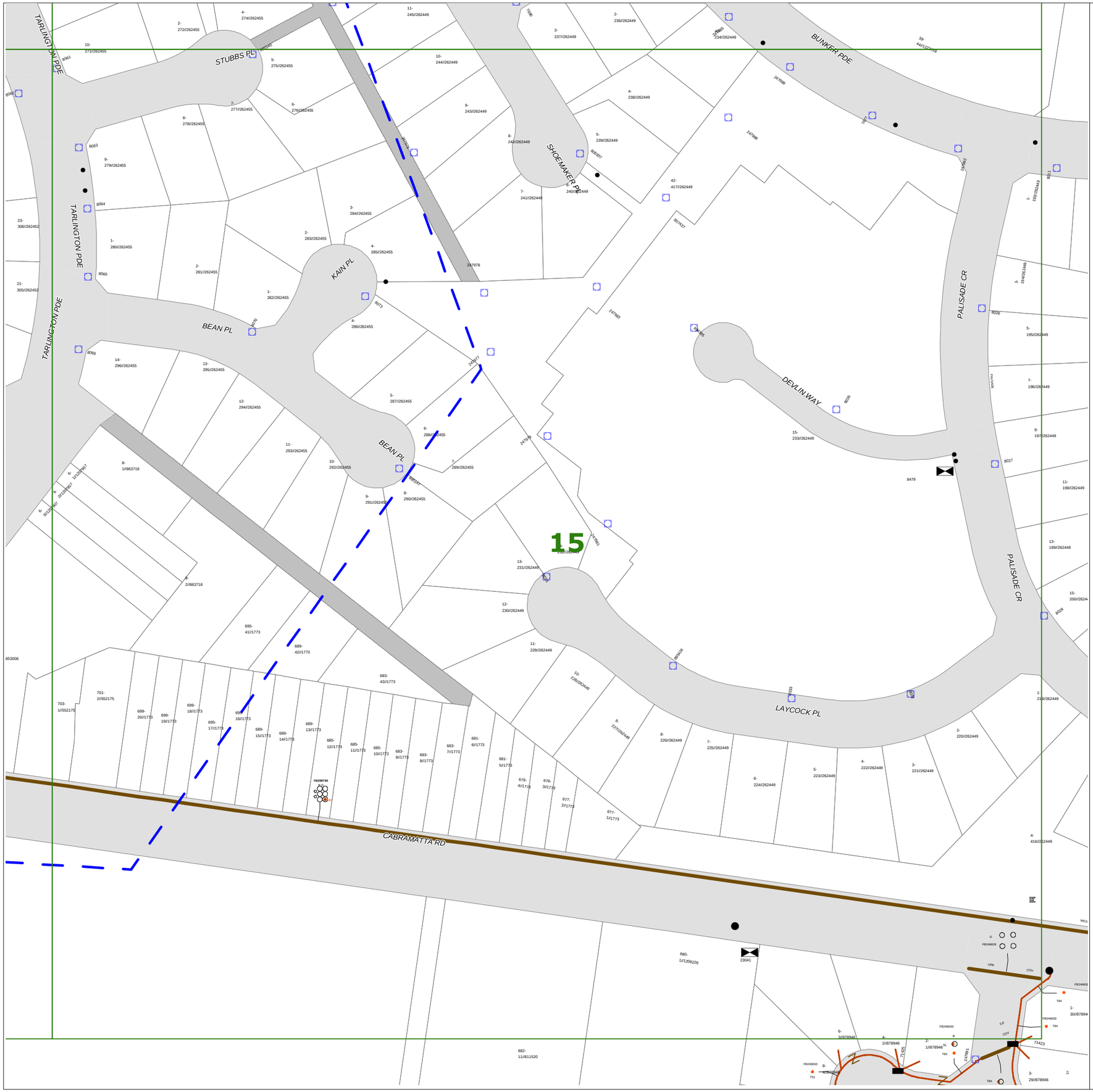
LEGEND

- Street light column
- Padmount substation
- Overground pillar (O.G.Box)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

NOT TO SCALE

DBYD Sequence No.:	64544531
Issued Date:	18/09/2017



Endeavour Energy

WARNING

- **All electrical apparatus shall be regarded as live until proved de-energised.** Contact with live electrical apparatus will cause severe injury or death.
- In accordance with the *Electricity Supply Act 1995*, you are obliged to report any damage to Endeavour Energy Assets immediately by calling **131 003**.
- The customer must obtain a new set of plans from Endeavour Energy if work has not been started or completed within twenty **(20)** working days of the original plan issue date.
- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
- Endeavour Energy underground earth grids may exist and their location **may not** be shown on plans. Persons excavating are expected to exercise all due care, especially in the vicinity of padmount substations, pole mounted substations, pole mounted switches, transmission poles and towers.
- Endeavour Energy plans **do not** show any underground customer service mains or information relating to service mains within private property.
- Asbestos or asbestos-containing material may be present on or near Endeavour Energy's underground assets.
- Organo-Chloride Pesticides (OCP) may be present in some sub-transmission trenches.
- All plans must be printed and made available at the worksite where excavation is to be undertaken. Plans must be reviewed and understood by the crew on site prior to commencing excavation.

INFORMATION PROVIDED BY ENDEAVOUR ENERGY

- Any plans provided pursuant to this service are intended to show the approximate location of underground assets relative to road boundaries, property fences and other structures at the time of installation.
- Depth of underground assets may vary significantly from information provided on plans as a result of changes to road, footpath or surface levels subsequent to installation.
- Such plans have been prepared solely for use by Endeavour Energy staff for design, construction and maintenance purposes.
- All enquiry details and results are kept in a register.

DISCLAIMER

Whilst Endeavour Energy has taken all reasonable steps to ensure that the information contained in the plans is as accurate as possible it will accept no liability for inaccuracies in the information shown on such plans.

WARNING
THIS EXCAVATION IS IN THE VICINITY OF ENDEAVOUR ENERGY TRANSMISSION, PILOT, COMMUNICATION OR FIBRE OPTIC CABLES
PLEASE RING **9853 7121** or **MOB. 0407 468 626**
4 WORKING DAYS BEFORE COMMENCING WORK

LEGEND

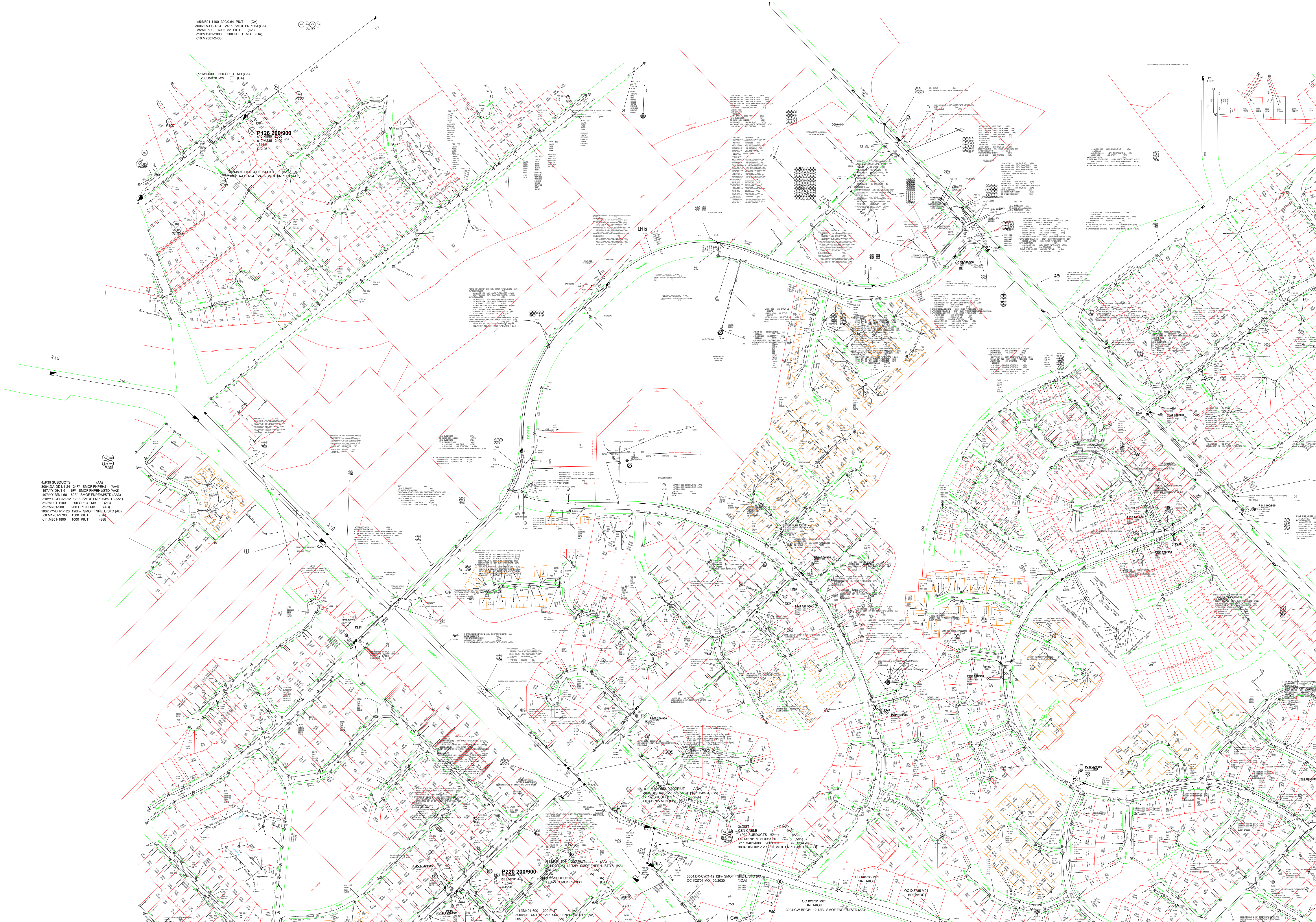
- Street light column (or)
- Padmount substation
- Overground pillar (O.G.Box) (or)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

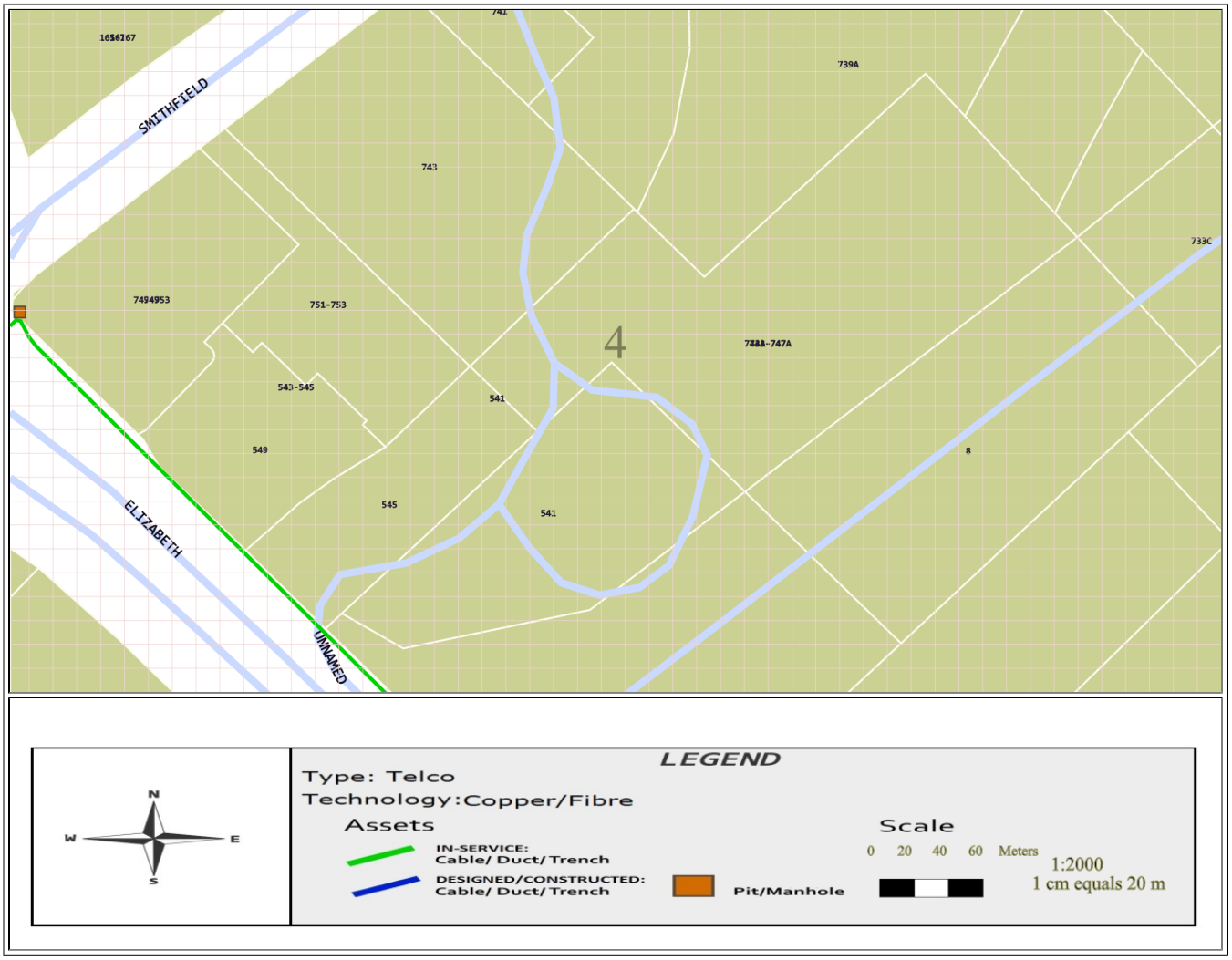
NOT TO SCALE

DBYD Sequence No.:	64544531
Issued Date:	18/09/2017

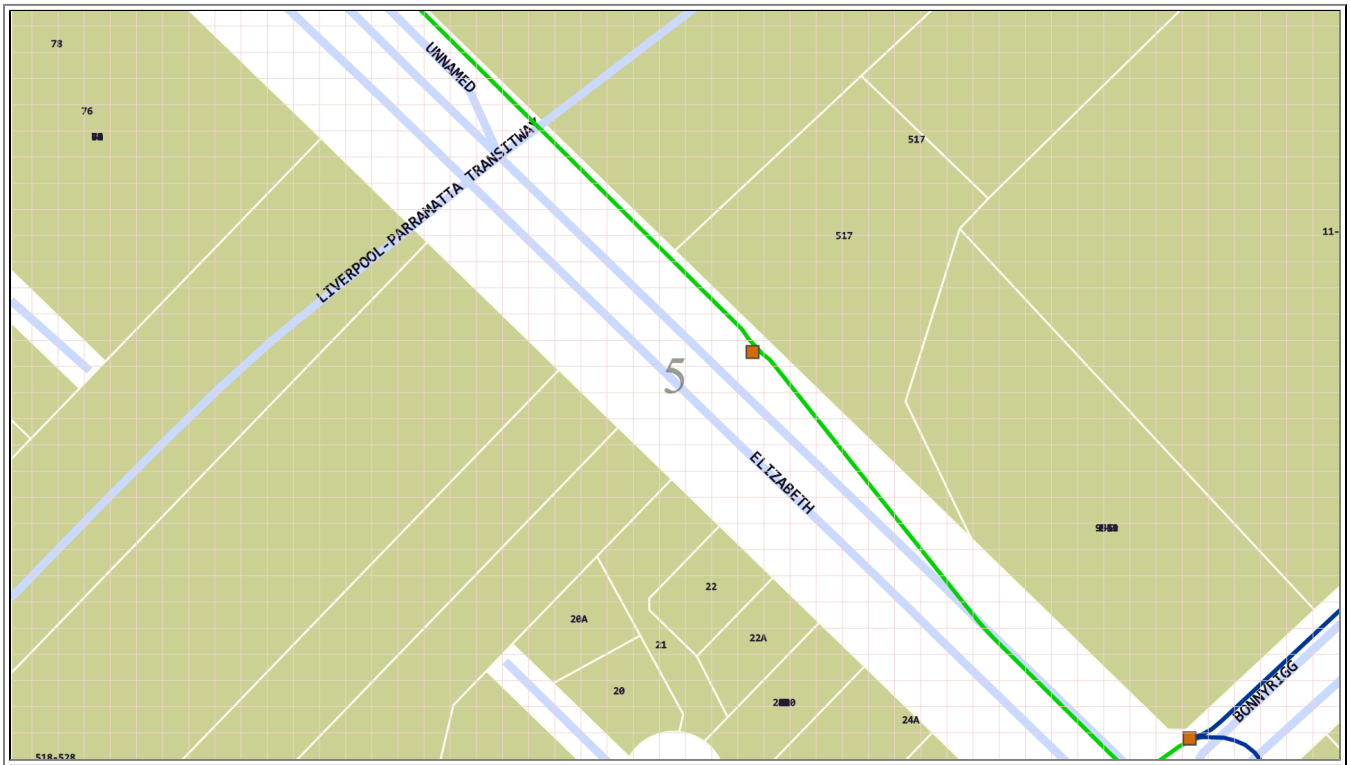
Telecommunications

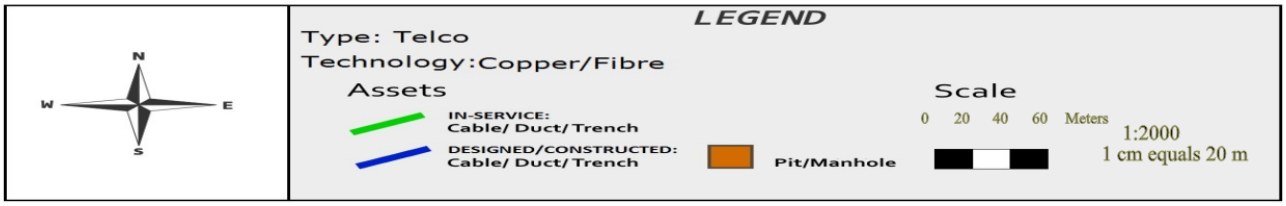


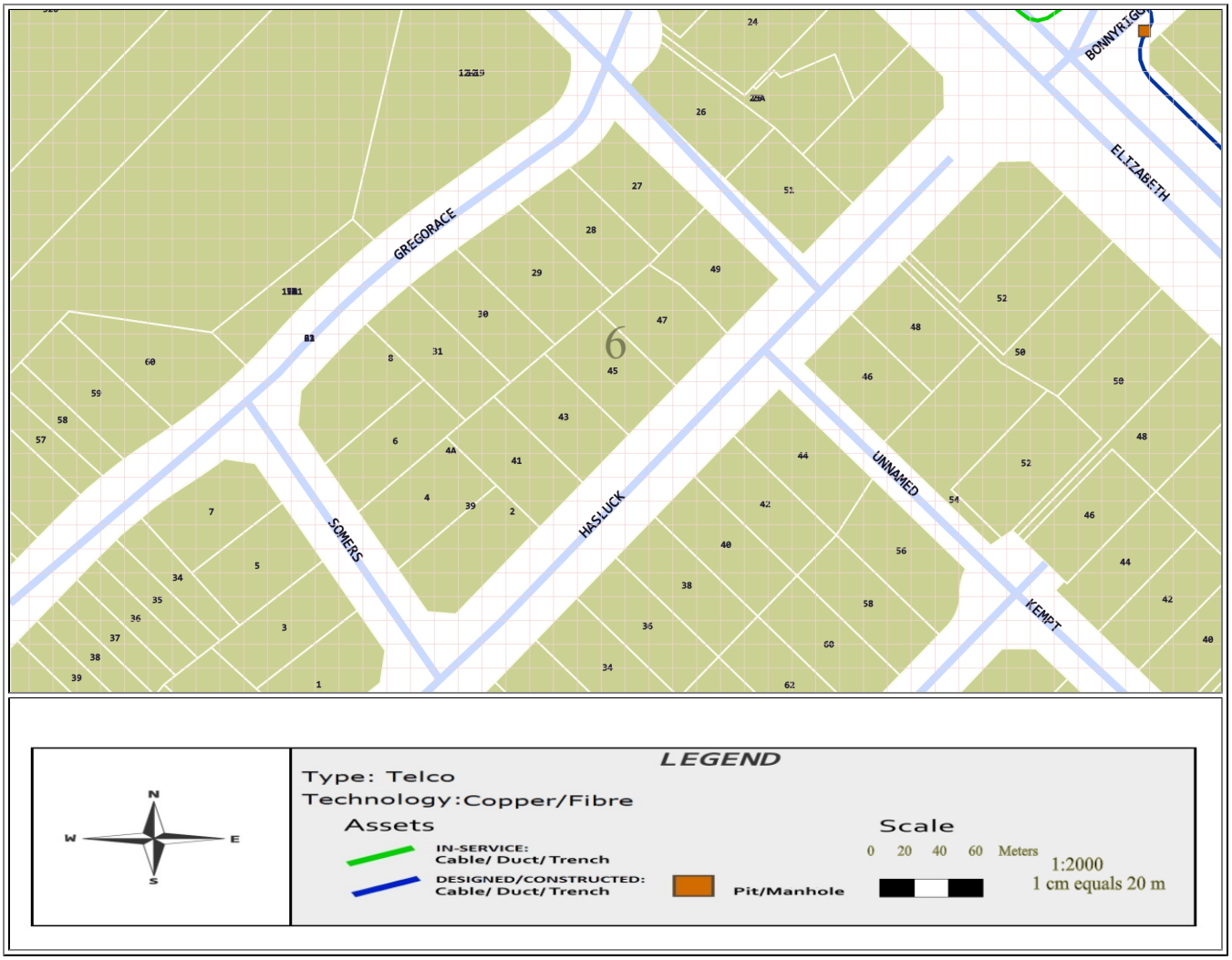
c5:M801-1100 300/0.64 PIUT (CA)
3006:FA-FB/1-24 24F/- SMOF FNPEHJ (CA)
c5:M1-600 600/0.52 PIUT (DA)
c10:M1901-2000 200 CPFUT MB (DA)
c10:M2301-2400
c5:M1-600 800 CPFUT MB (CA)
200UNKNOWN (CA)
P126 200/900
4xP35 SUBDUCTS (AA)
3004:DA-DD/1-24 24F/- SMOF FNPEHJ (AA4)
157:YY-DH/1-6 6F/- SMOF FNPEHJ/STD (AA2)
497:YY-BR/1-60 60F/- SMOF FNPEHJ/STD (AA3)
318:YY-CEPJ/1-12 12F/- SMOF FNPEHJ/STD (AA1)
c17:M901-1100 200 CPFUT MB (AB)
c17:M701-900 200 CPFUT MB (AB)
1002:YY-DH/1-120 120F/- SMOF FNPEHJ/STD (AB)
c8:M1201-2700 1500 PIUT (BA)
c11:M801-1800 1000 PIUT (BB)
P220 200/900
3004:DX-CW/1-12 12F/- SMOF FNPEHJ/STD (AA)
OC IX2701 MO1 09/2030
OC IX8785 M01
BREAKOUT
OC IX2701 M01
BREAKOUT
3004:CW-BPCI/1-12 12F/- SMOF FNPEHJ/STD (AA)
c11:M401-600 200 PIUT
3004:DB-DX/1-12 12F/- SMOF FNPEHJ/STD
DIST
P50
CW



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







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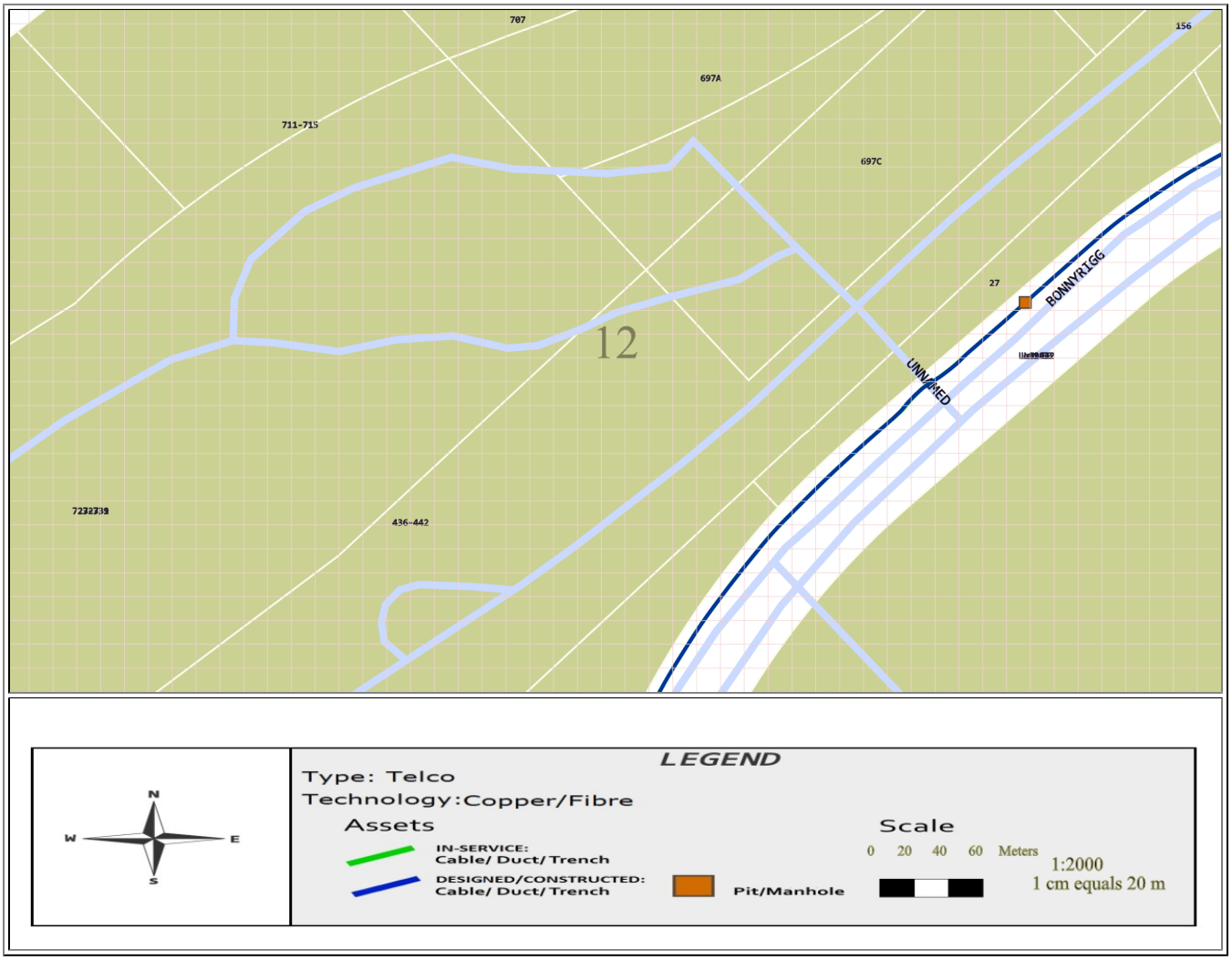
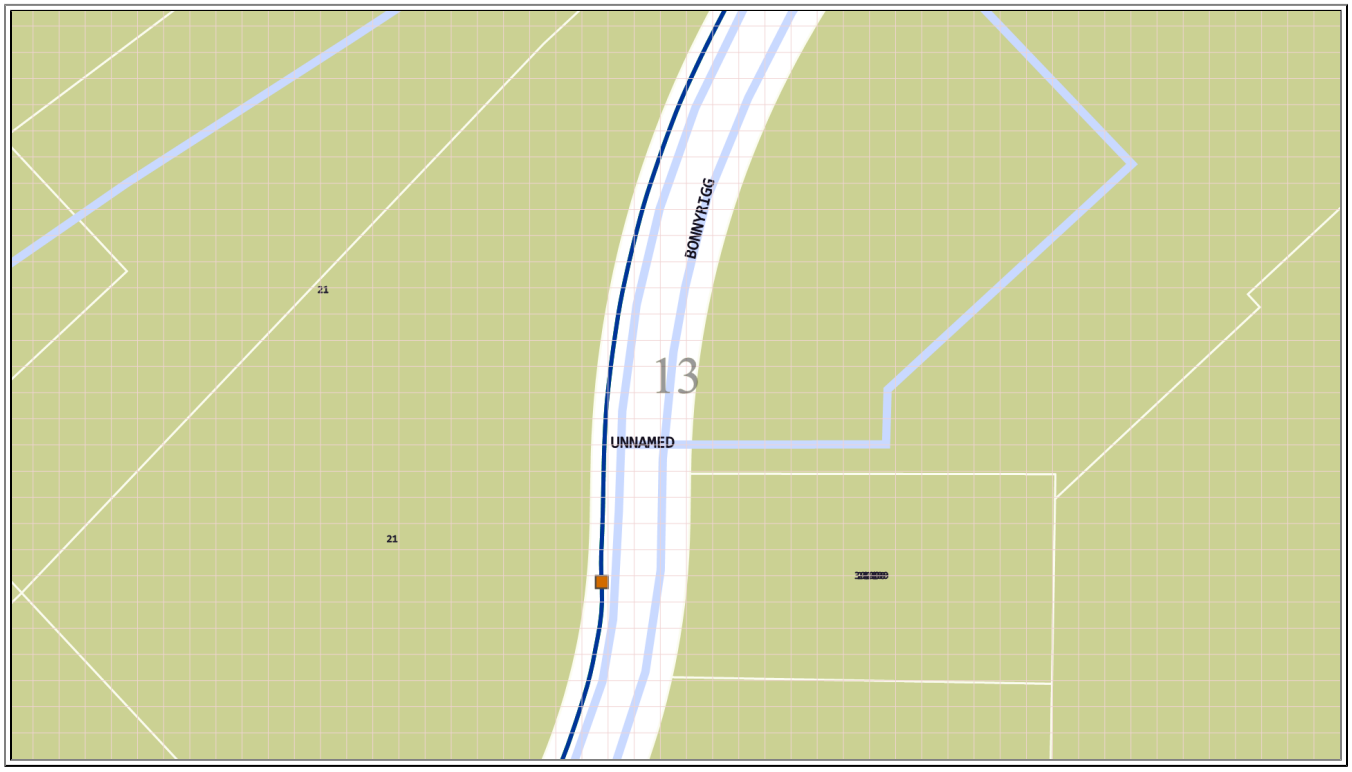
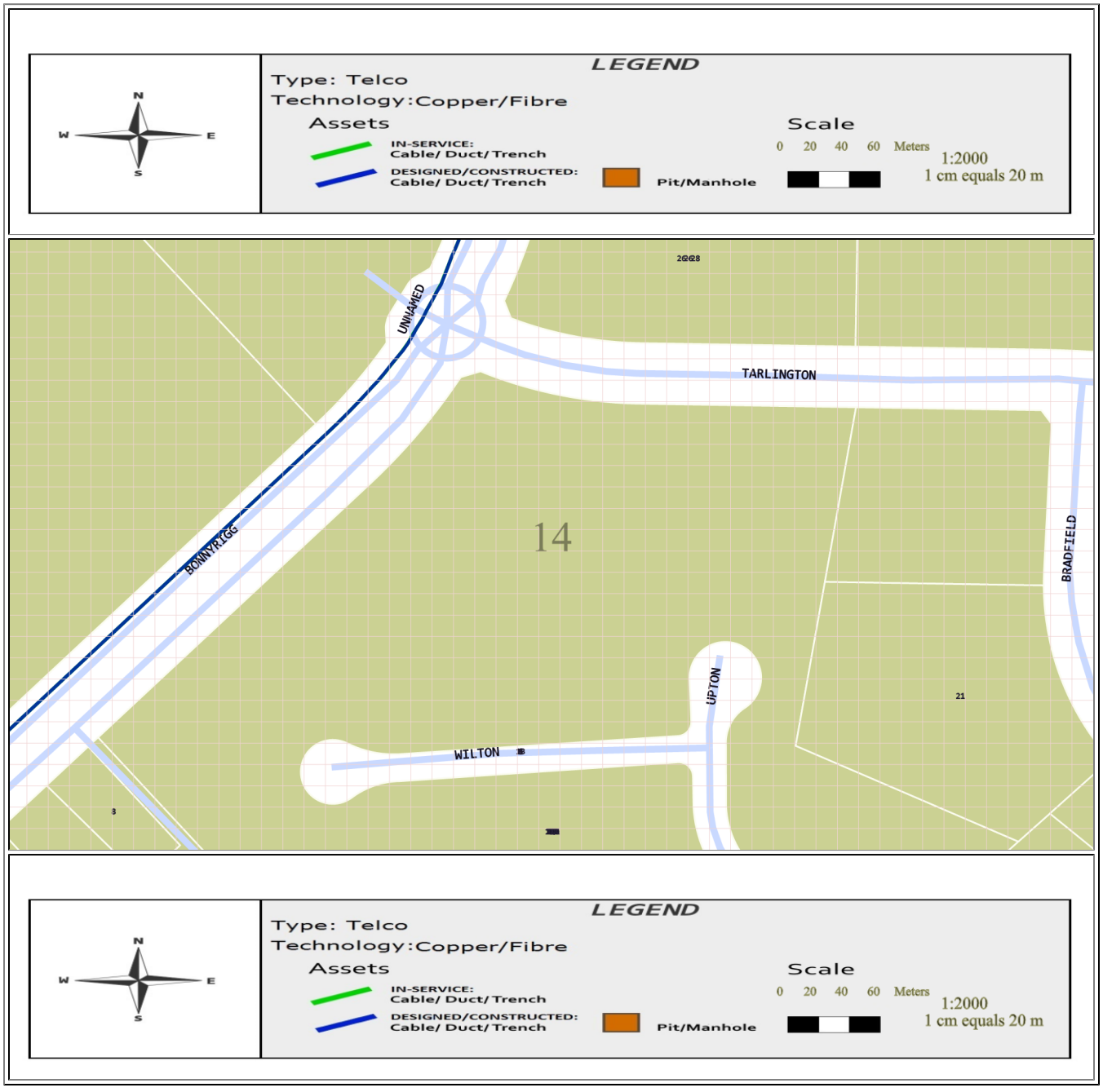


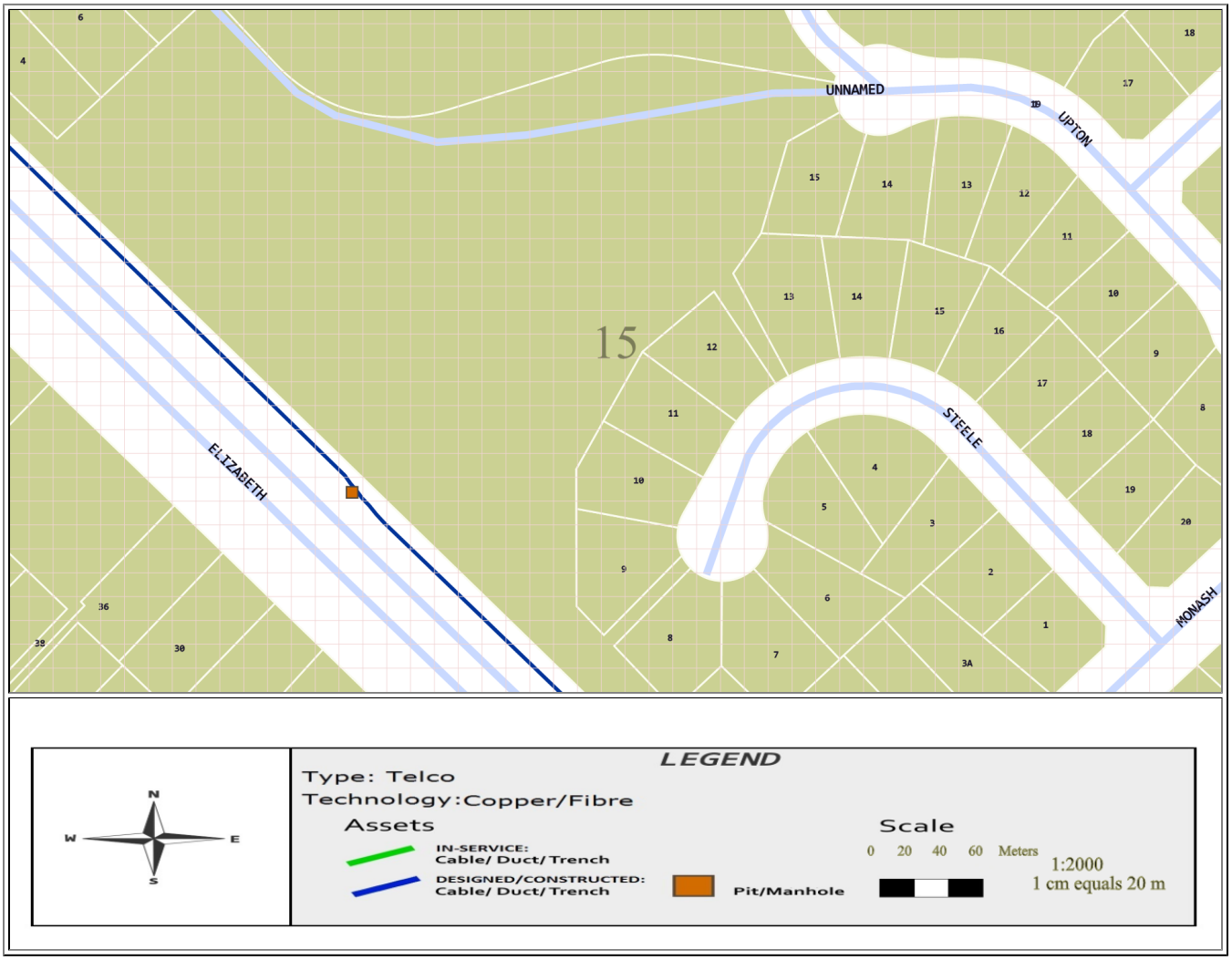


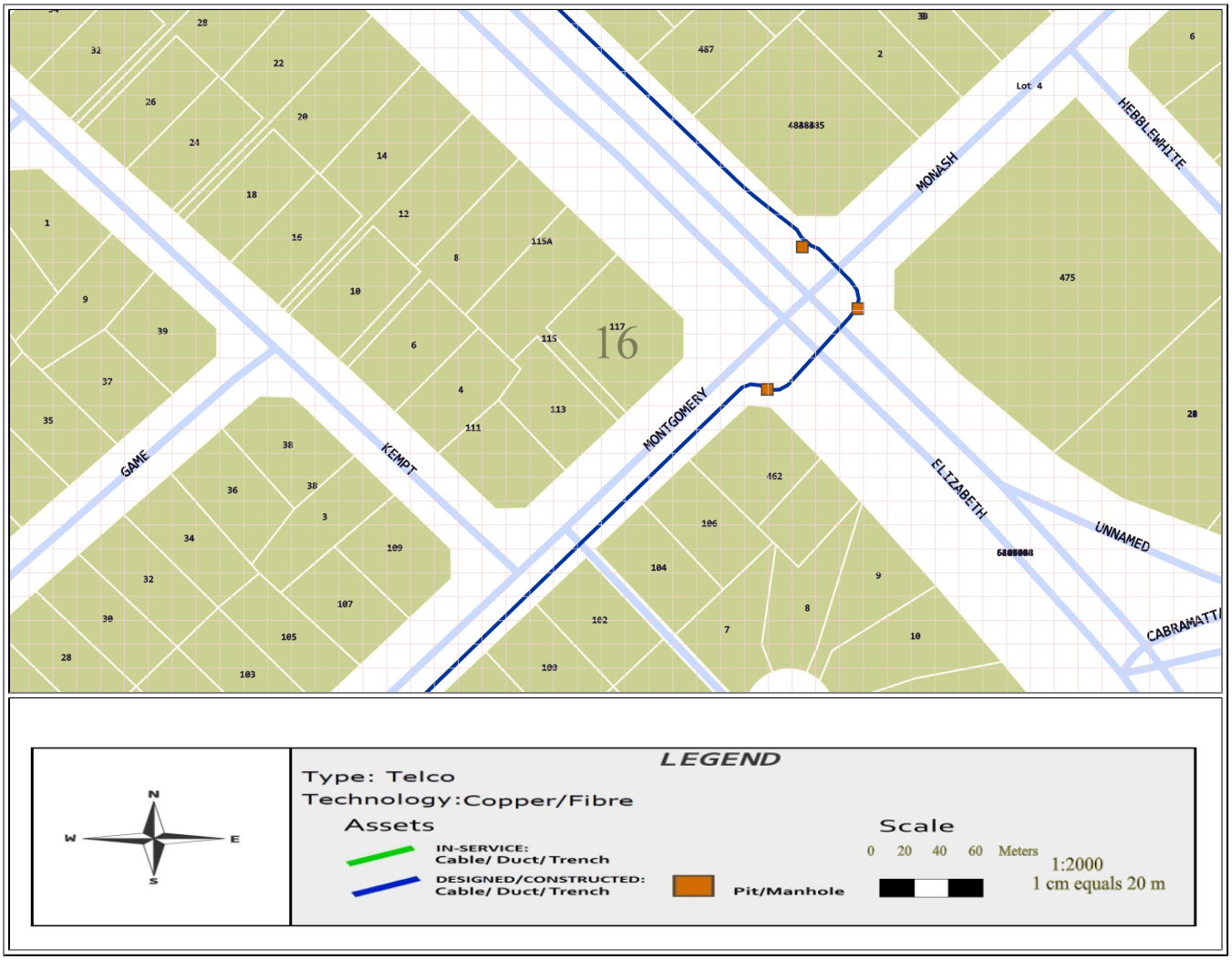
Emergency Contacts

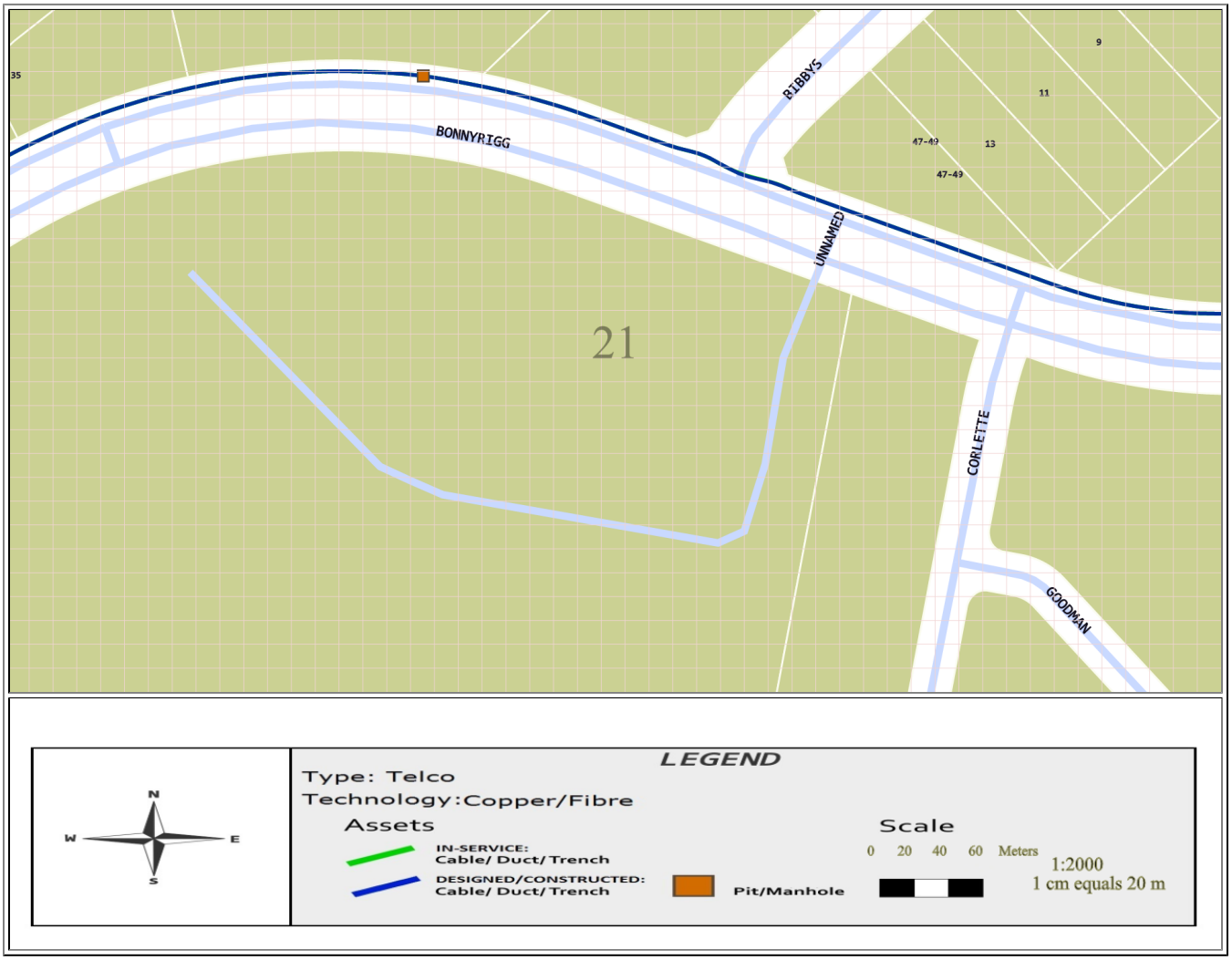
You must immediately report any damage to **nbn™** network that you are/become aware of. Notification may be by telephone - 1800 626 329.

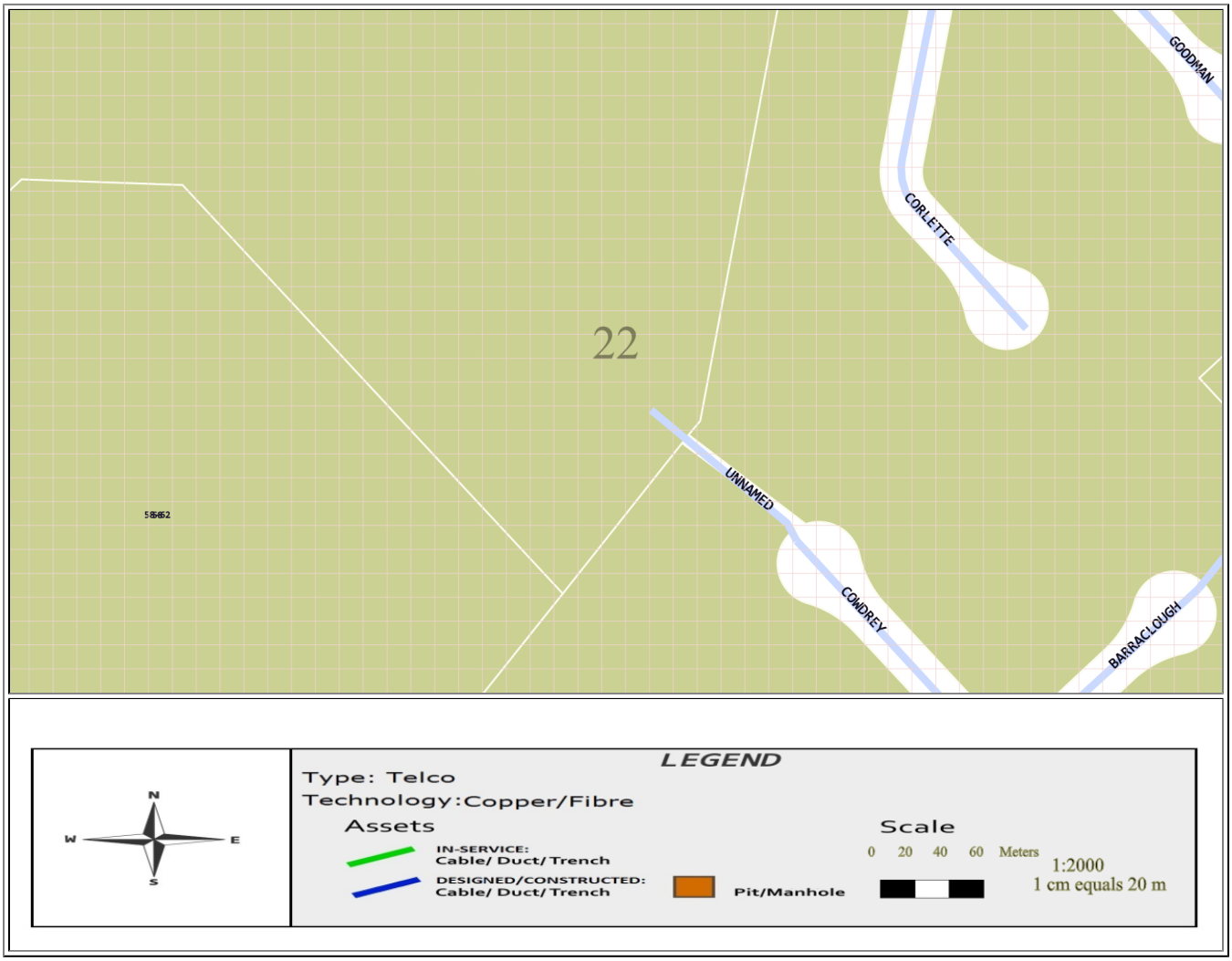
Cont- PDF for Job Number: 12877937 , Sequence Number: 64110361 , Issue Date: 01/09/ 2017



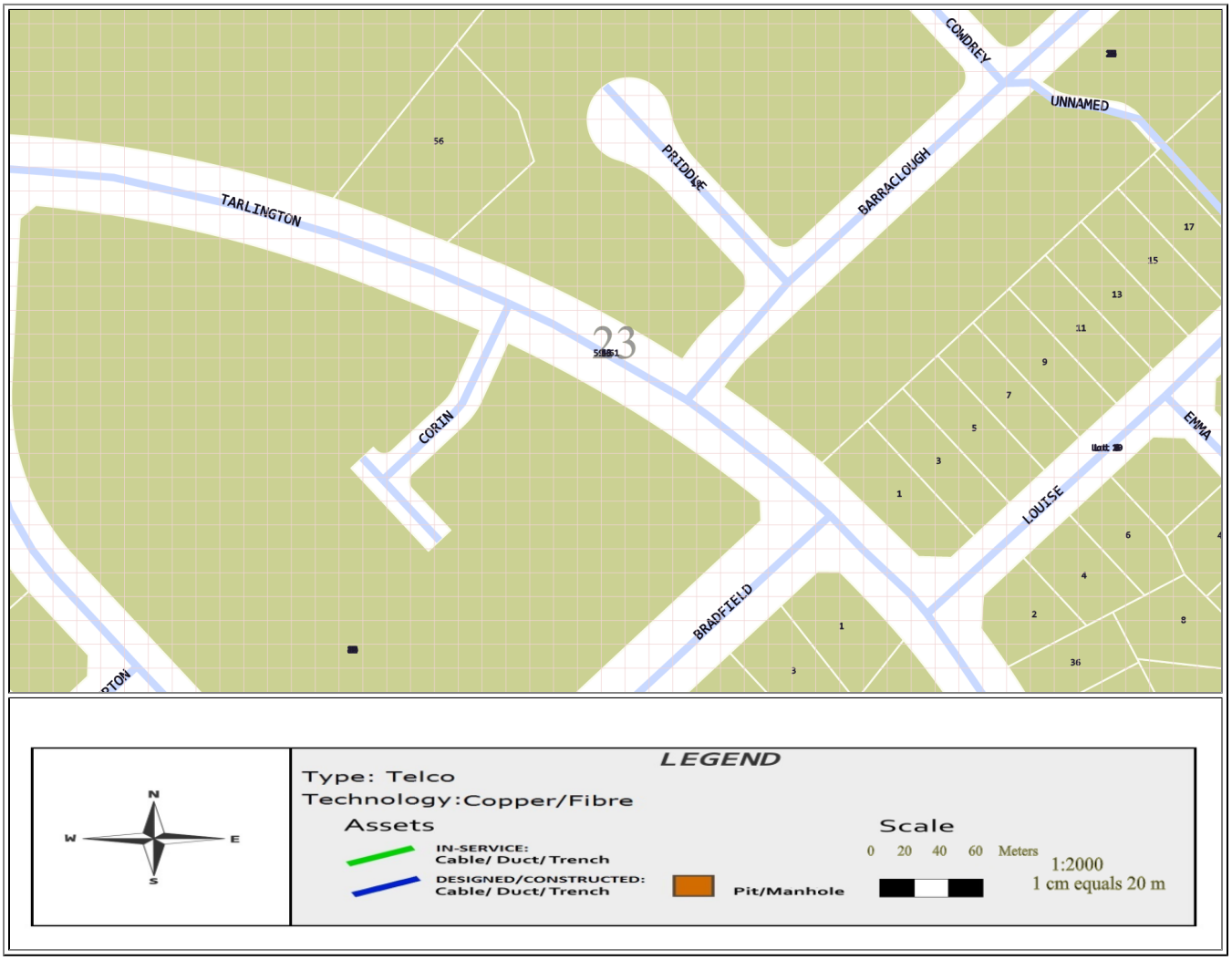




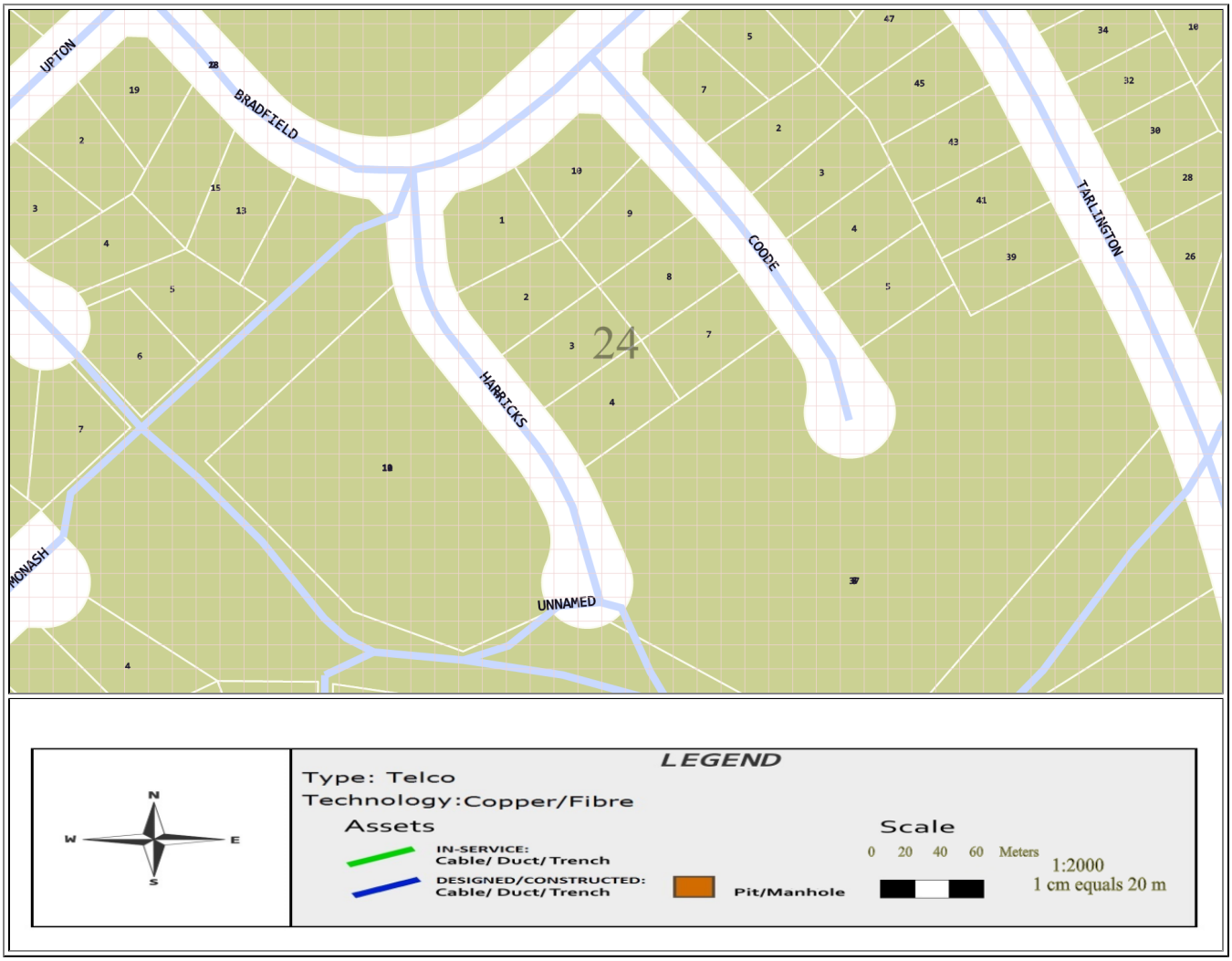


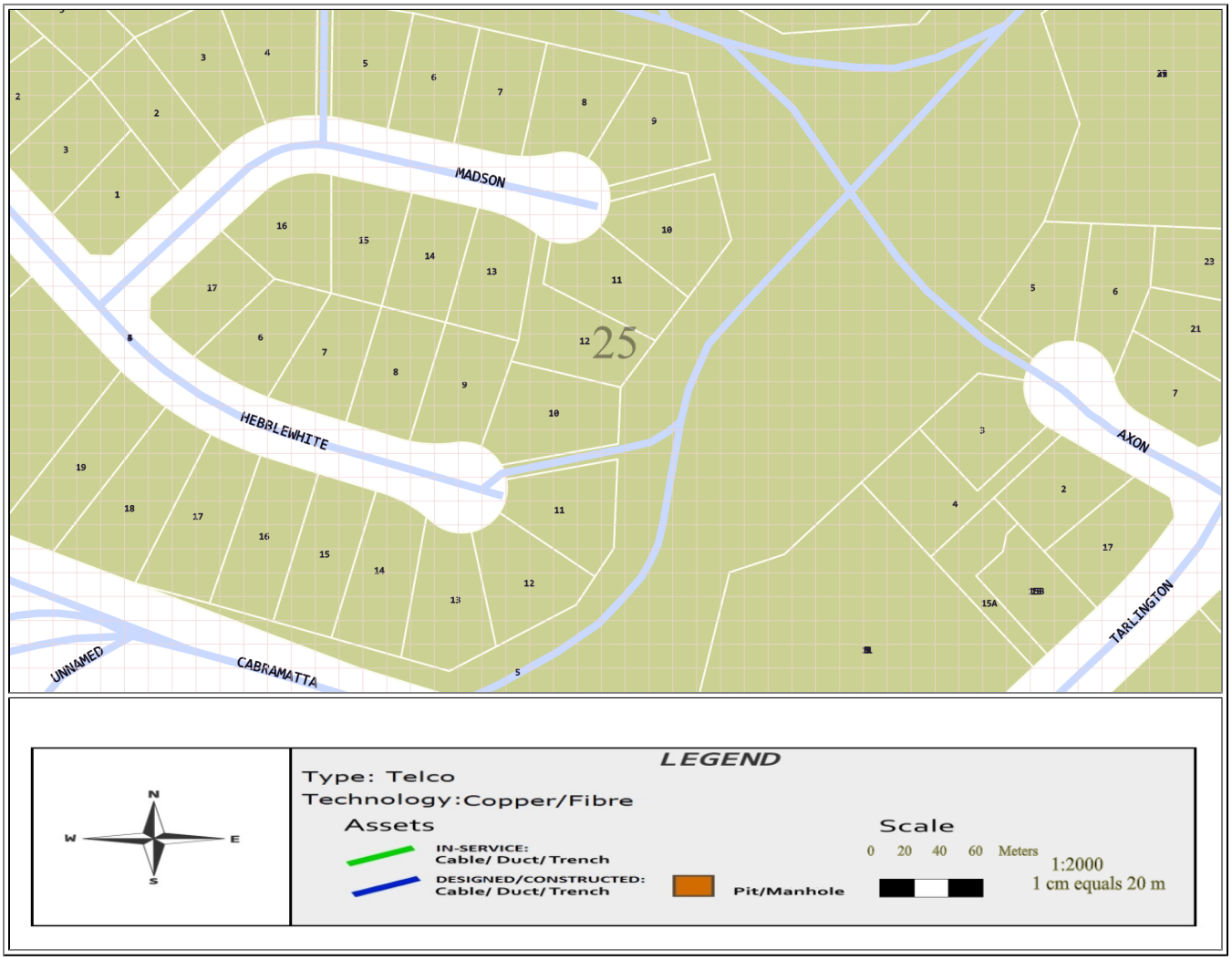


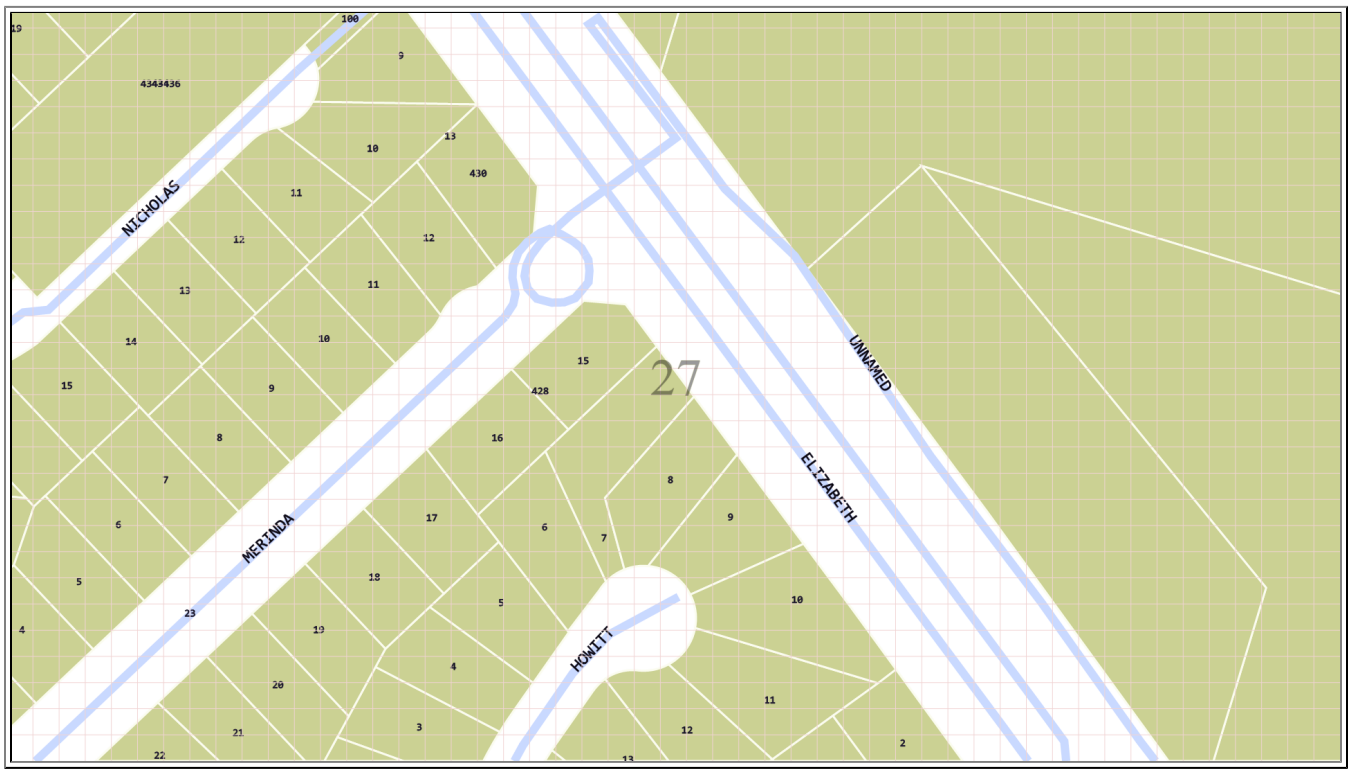
Email info@nbn.com.au Web nbn.com.au

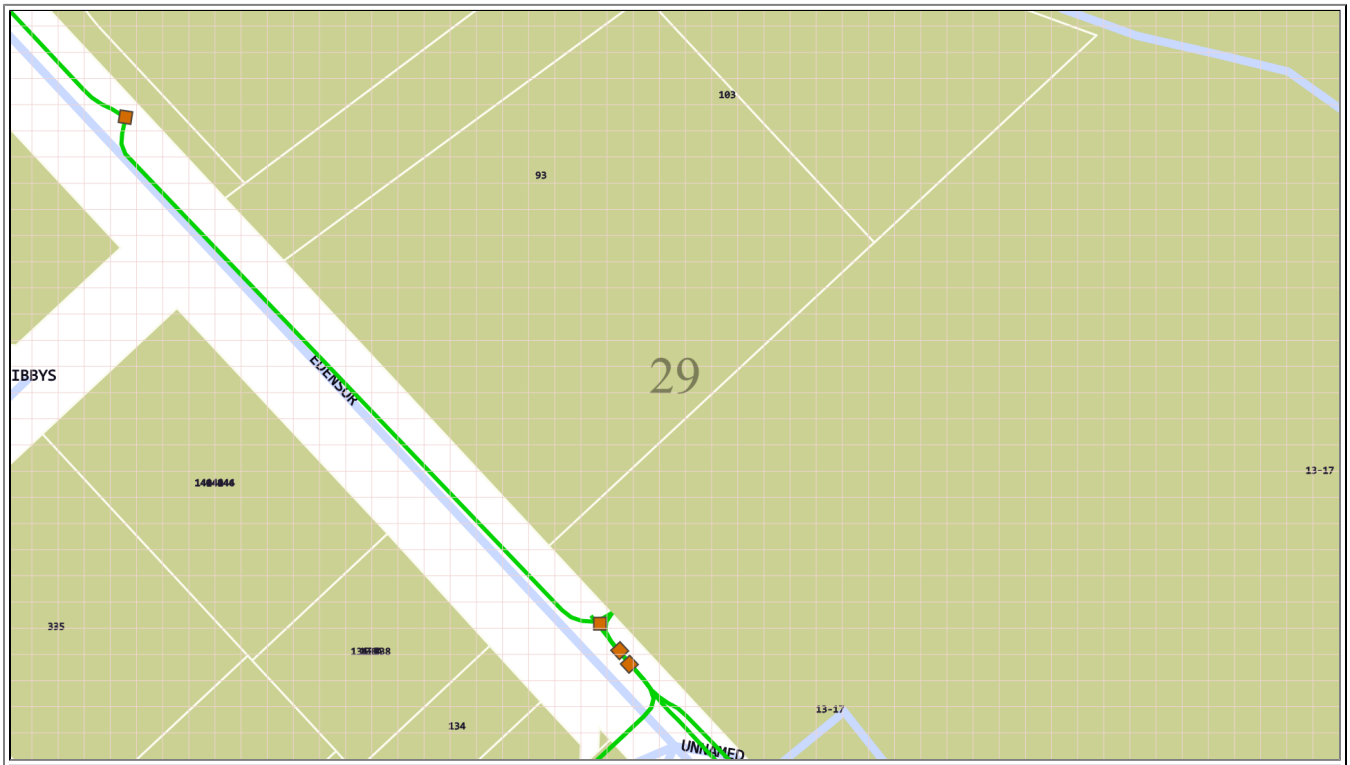


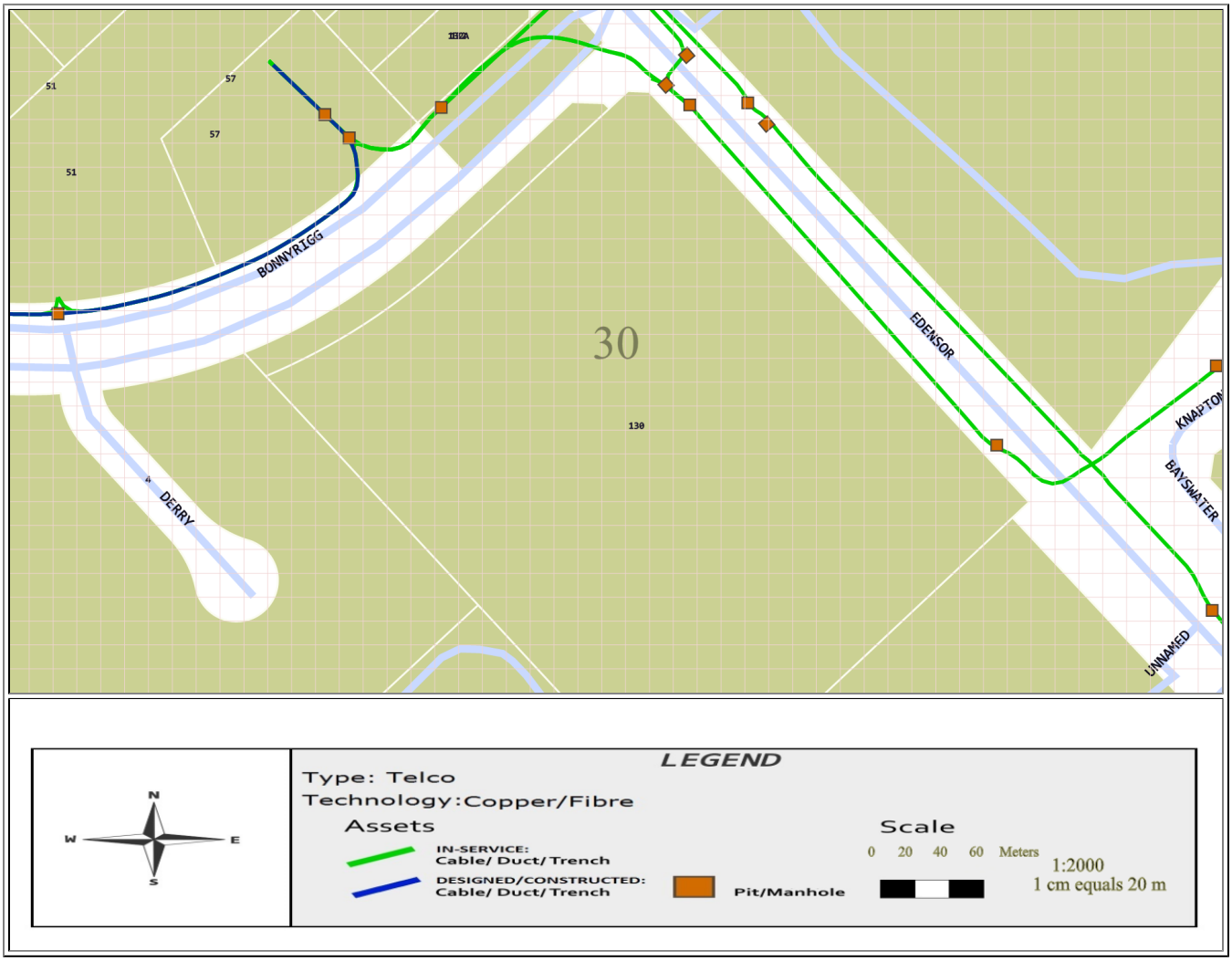
Email info@nbn.com.au Web nbn.com.au

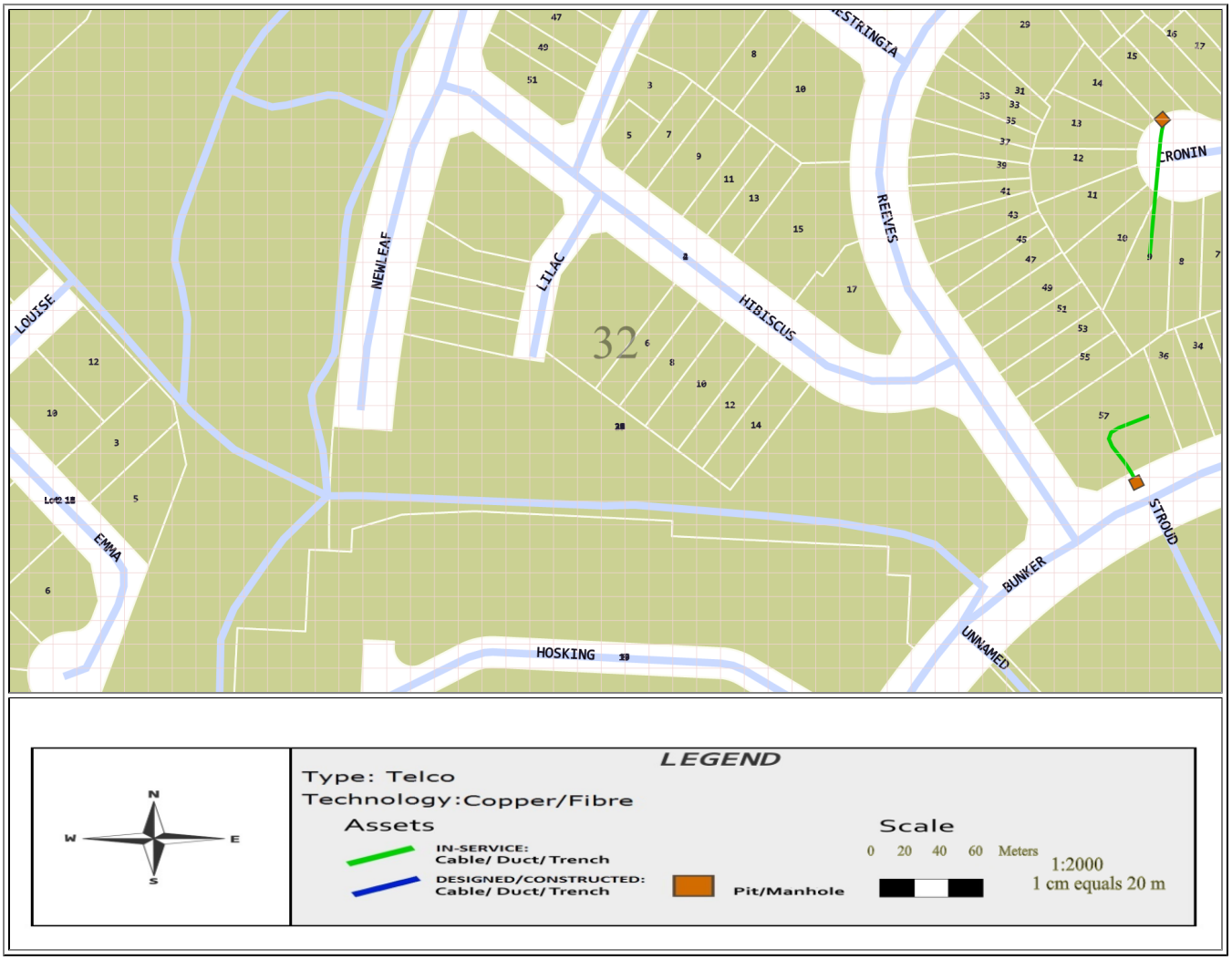


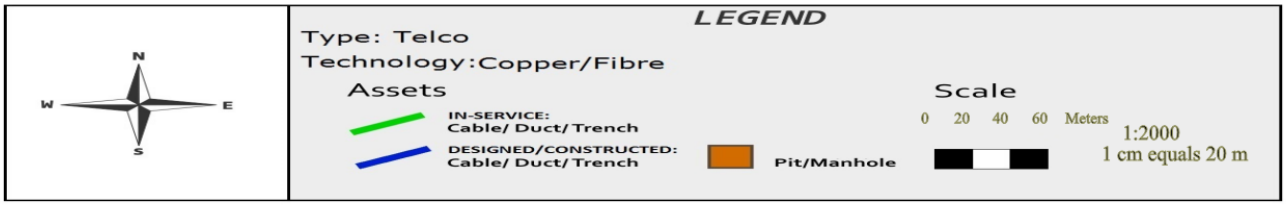


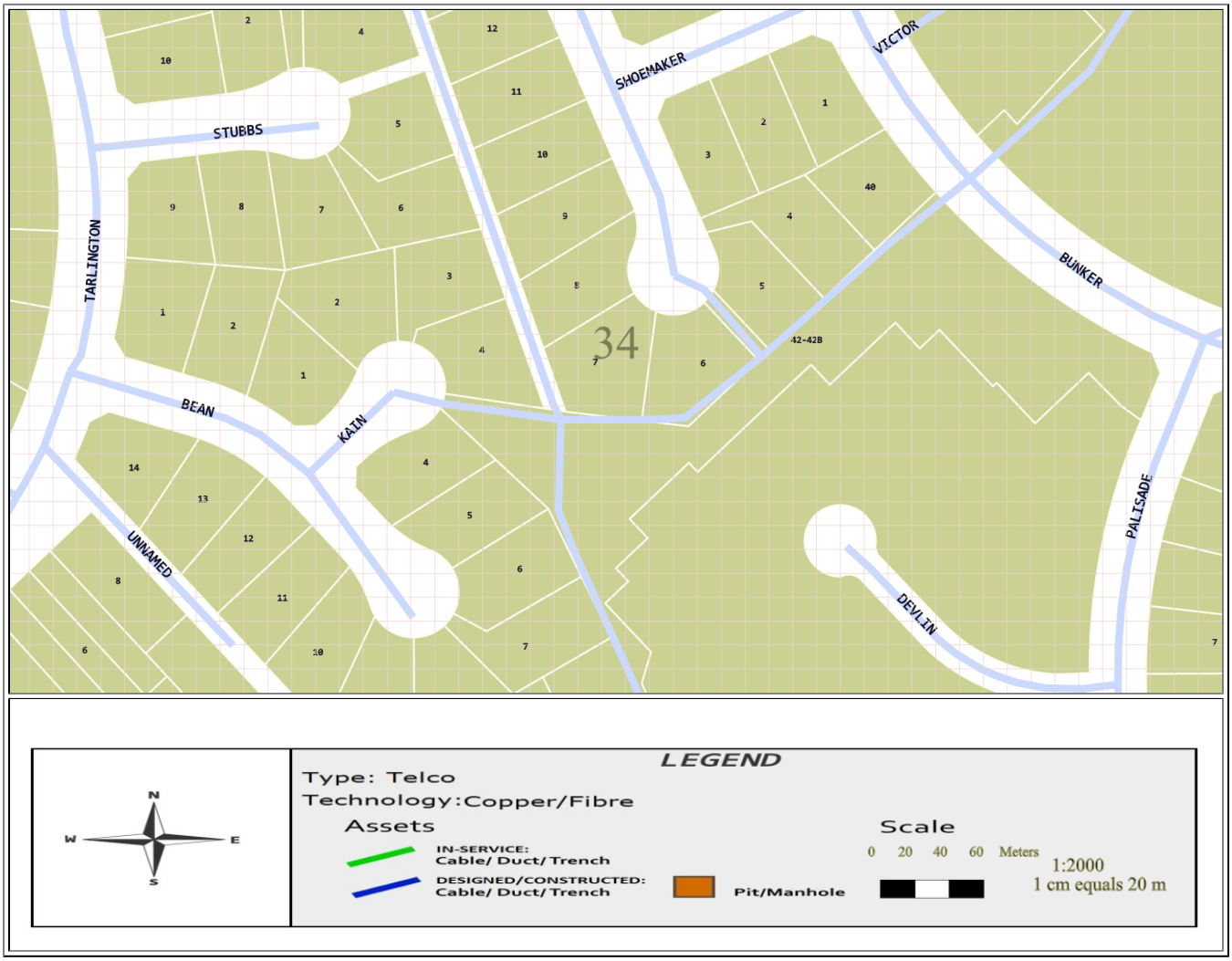


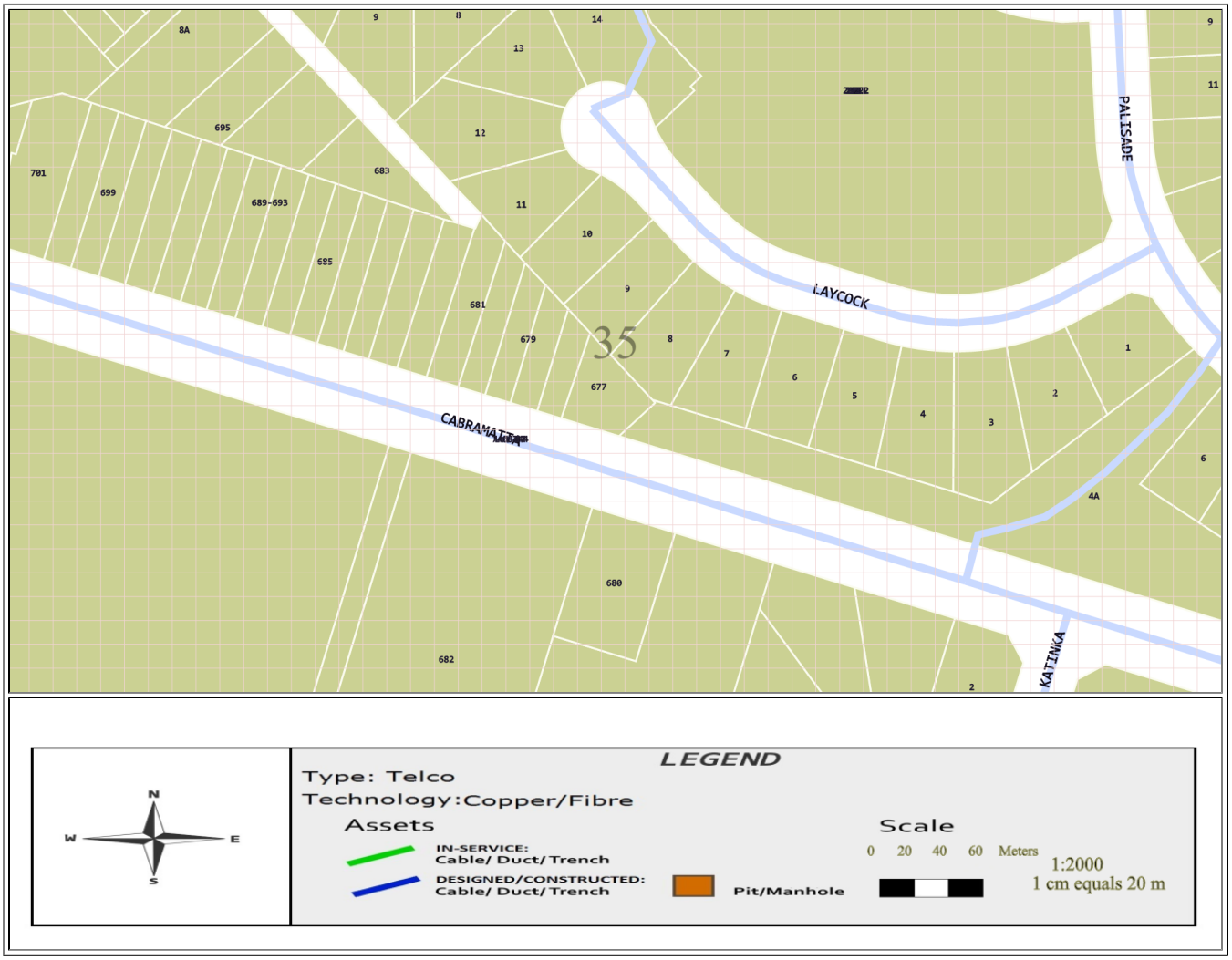


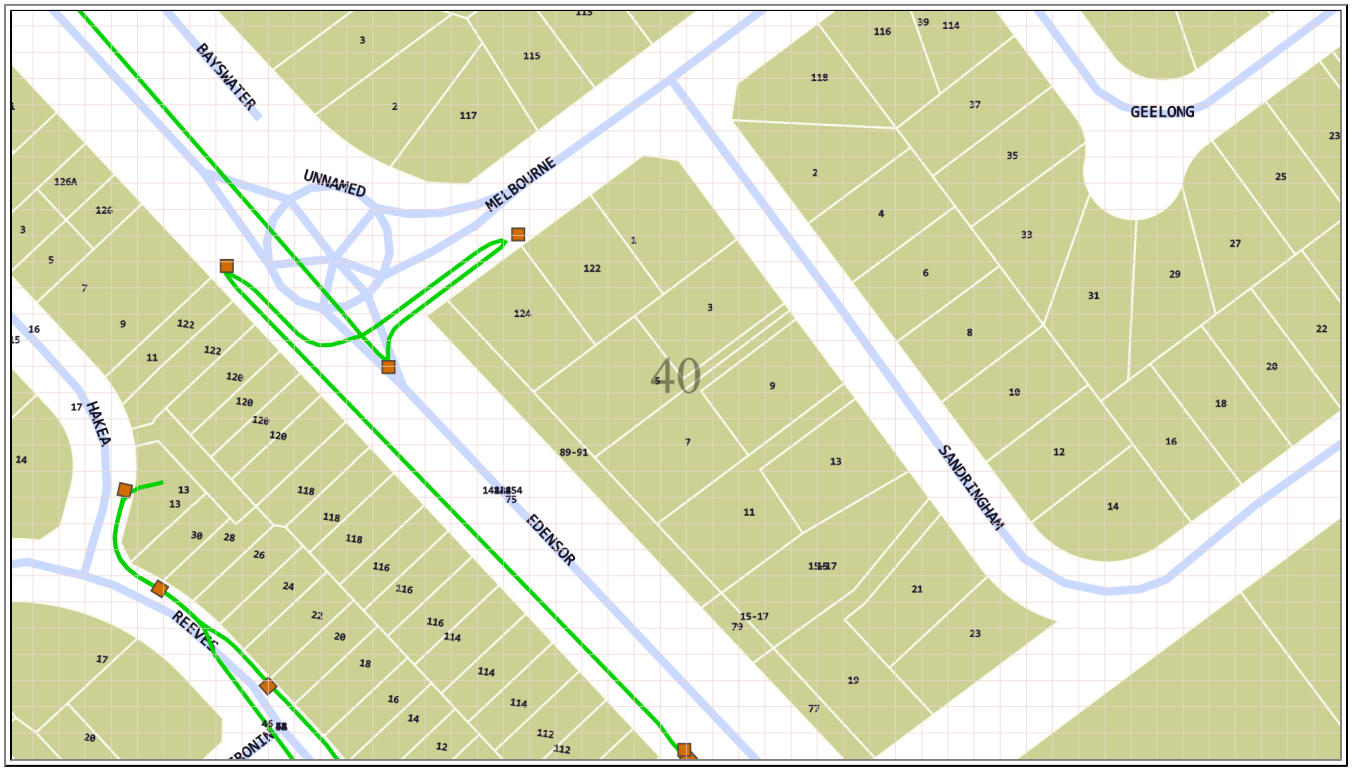




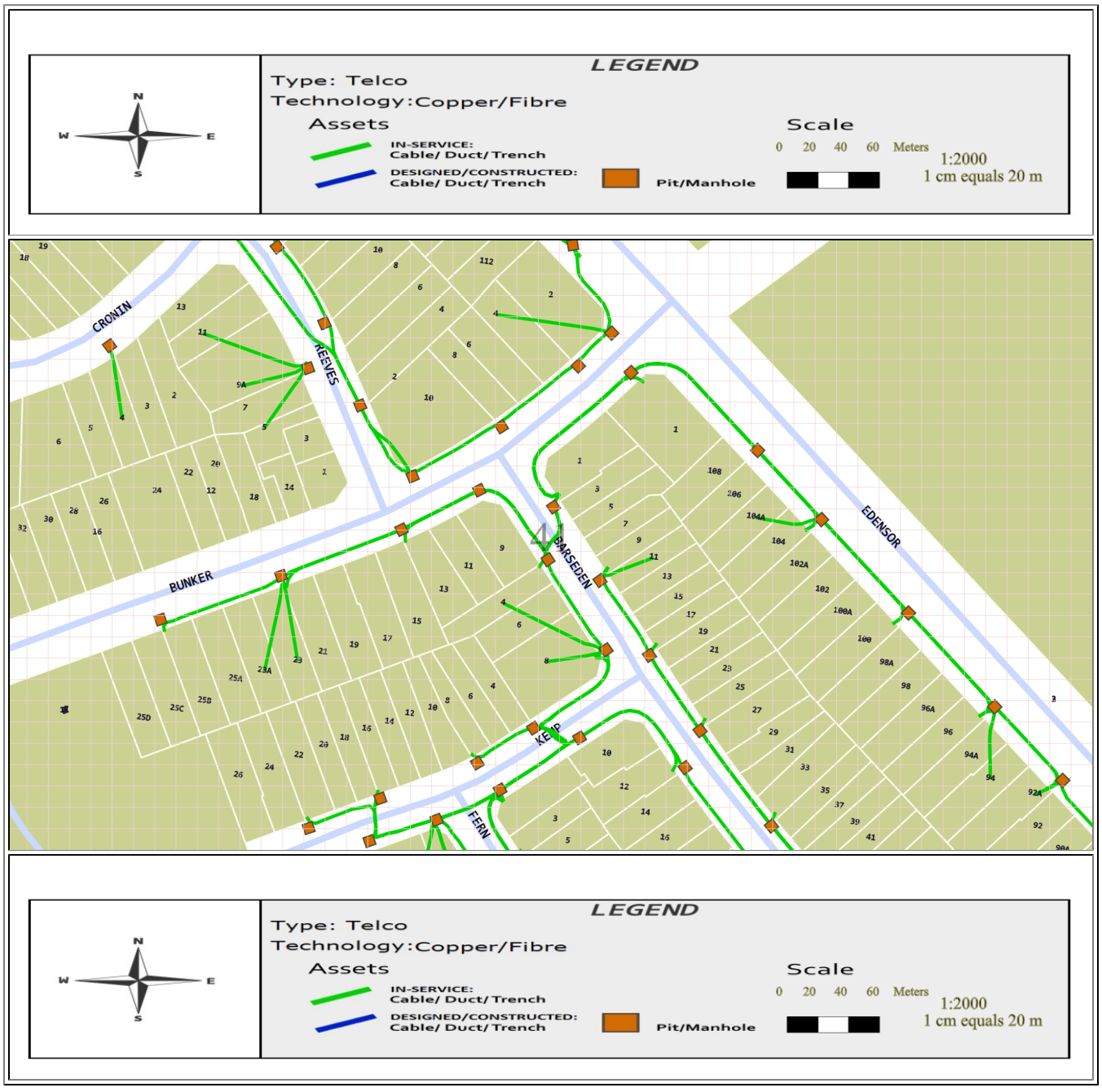


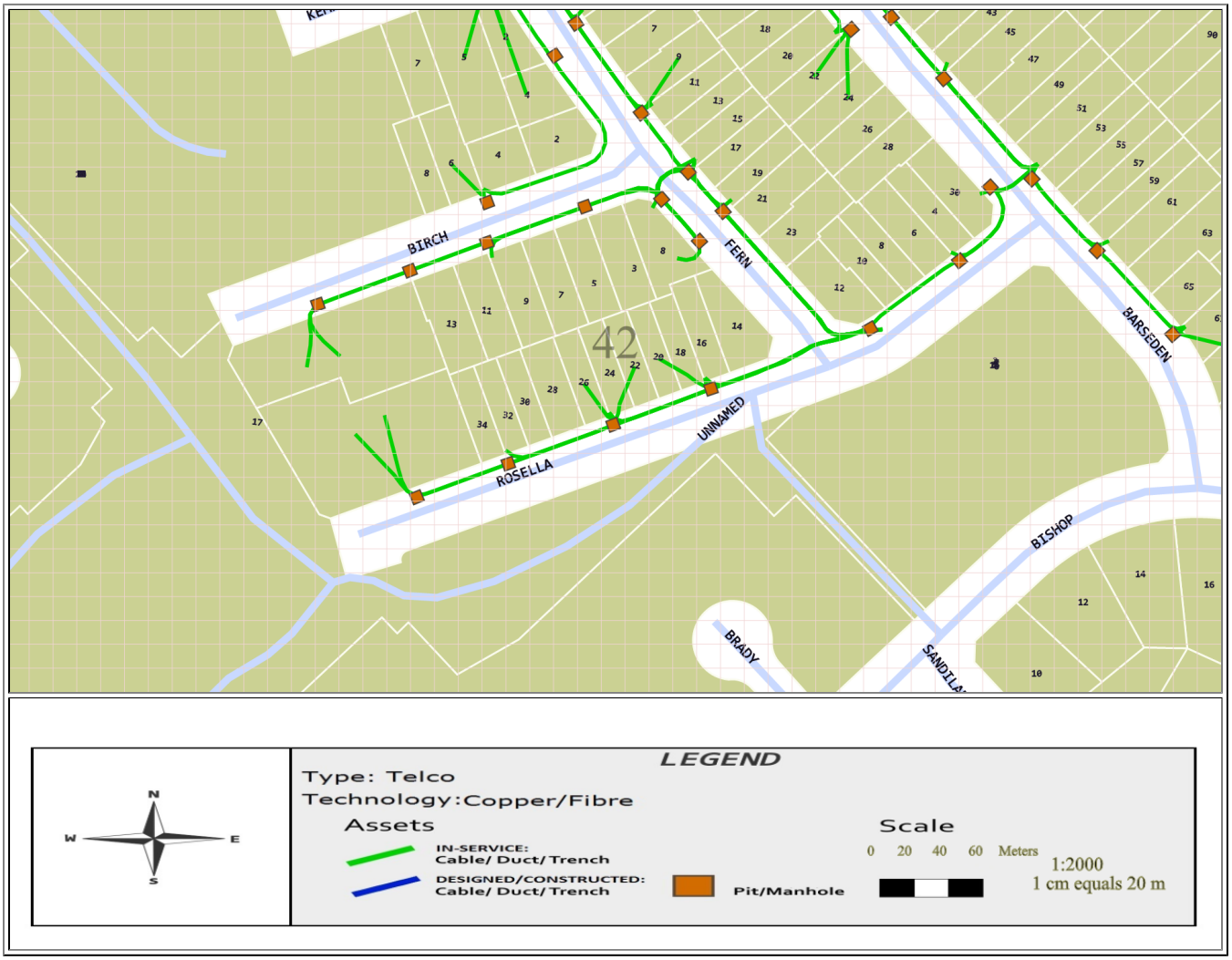


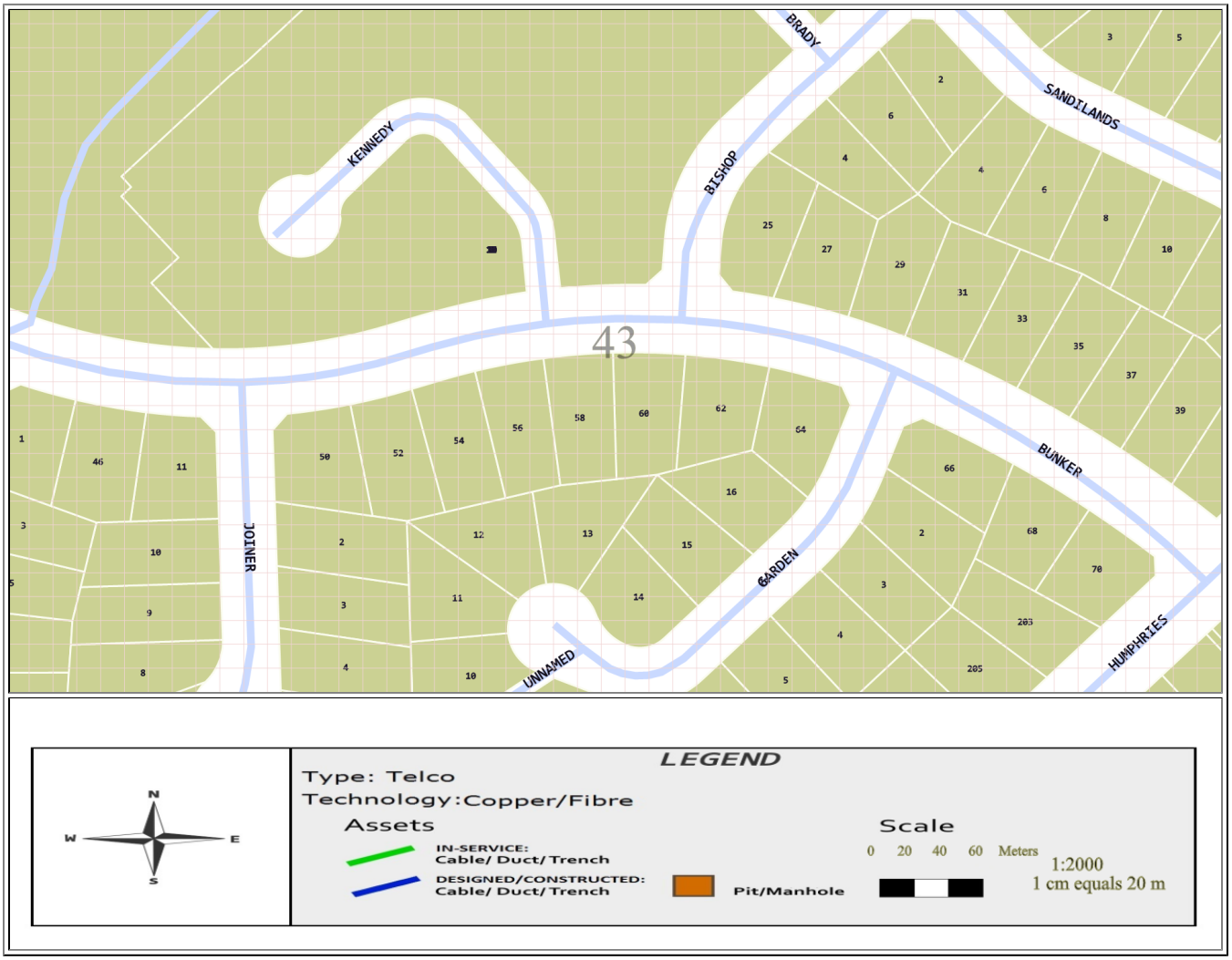




Cont- PDF for Job Number: 12877937 , Sequence Number: 64110361 , Issue Date: 01/09/ 2017

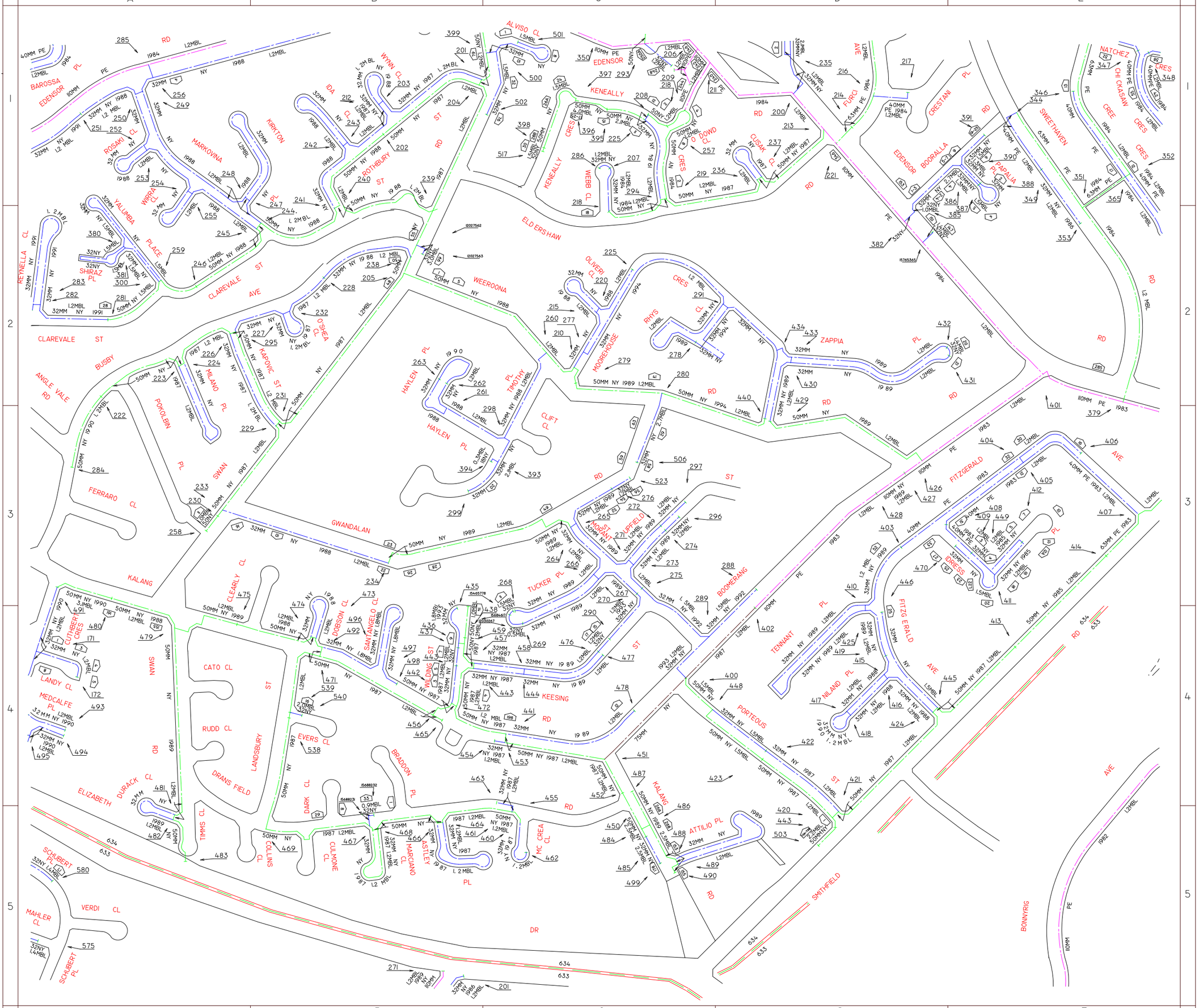






Email info@nbn.com.au Web nbn.com.au

Jemena (Gas)



CECIL PARK 6A

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 28/03/2017
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

CP2D	CP3C	CP3D
CP5B	CP6A	CP6B
CP5D	CP6C	CP6D

ADJOINING MAPS

634 / 633 / 633

NETWORK AREA

FAIRFIELD

MUNICIPALITY AREA

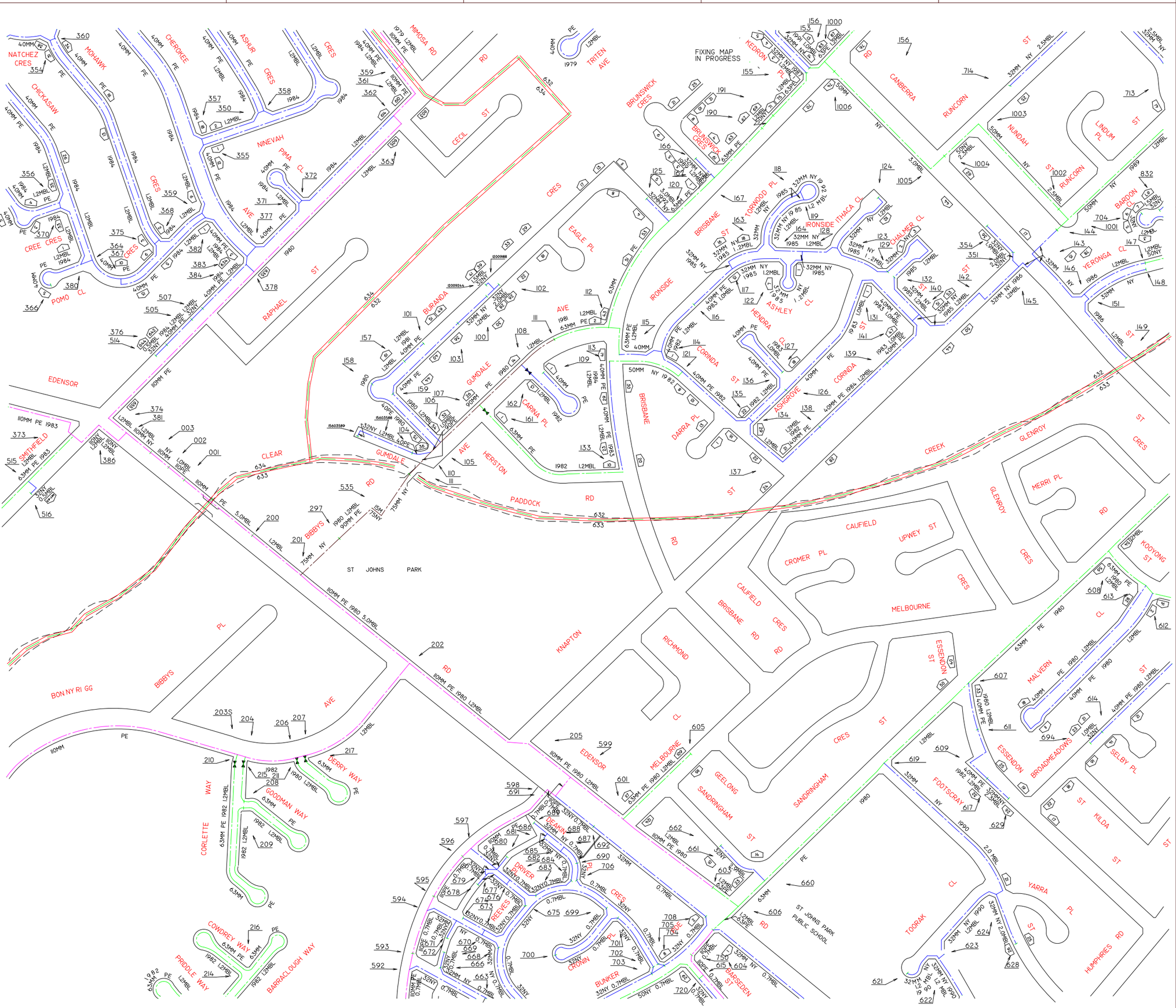
Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

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

CECIL PARK 6A



CECIL PARK 6B

SCALE 1:2000

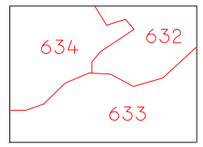
50 0 50 100 150 200

THIS MAP UPDATED ON 26/08/2016
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

CP3C	CP3D	FIC
CP6A	CP6B	F4A
CP6C	CP6D	F4C

ADJOINING MAPS



NETWORK AREA

FAIRFIELD

MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
	NETWORK MAIN	300 kPa
	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
	NETWORK MAIN	7 kPa
	NETWORK MAIN	2 kPa
	PROPOSED MAINS	

PR II-2 3	STEEL MAIN PROJECT NUMBER
P	PRESSURE MONITORING STATION
	VALVE
	SYSTEM PRESSURE REGULATOR
S	SIPHON
123	NETWORK NODE
123S	NETWORK VALVE NODE
(298)	VALVE NUMBER
6NB	6 INCH CAST IRON MAIN
150MM	150MM STEEL MAIN
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN
(6)NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE
1957	YEAR LAID
	MUNICIPALITY BOUNDARY
	NETWORK BOUNDARY
123	HOUSE NUMBER

CECIL PARK 6B

CECIL PARK 6C

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 15/11/2016
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.
DATE ALTERED:..... BY:.....

CP5B	CP6A	CP6B
CP5D	CP6C	CP6D
CP8B	CP9A	CP9B

ADJOINING MAPS

633
714

NETWORK AREA

FAIRFIELD
LIVERPOOL

MUNICIPALITY AREA

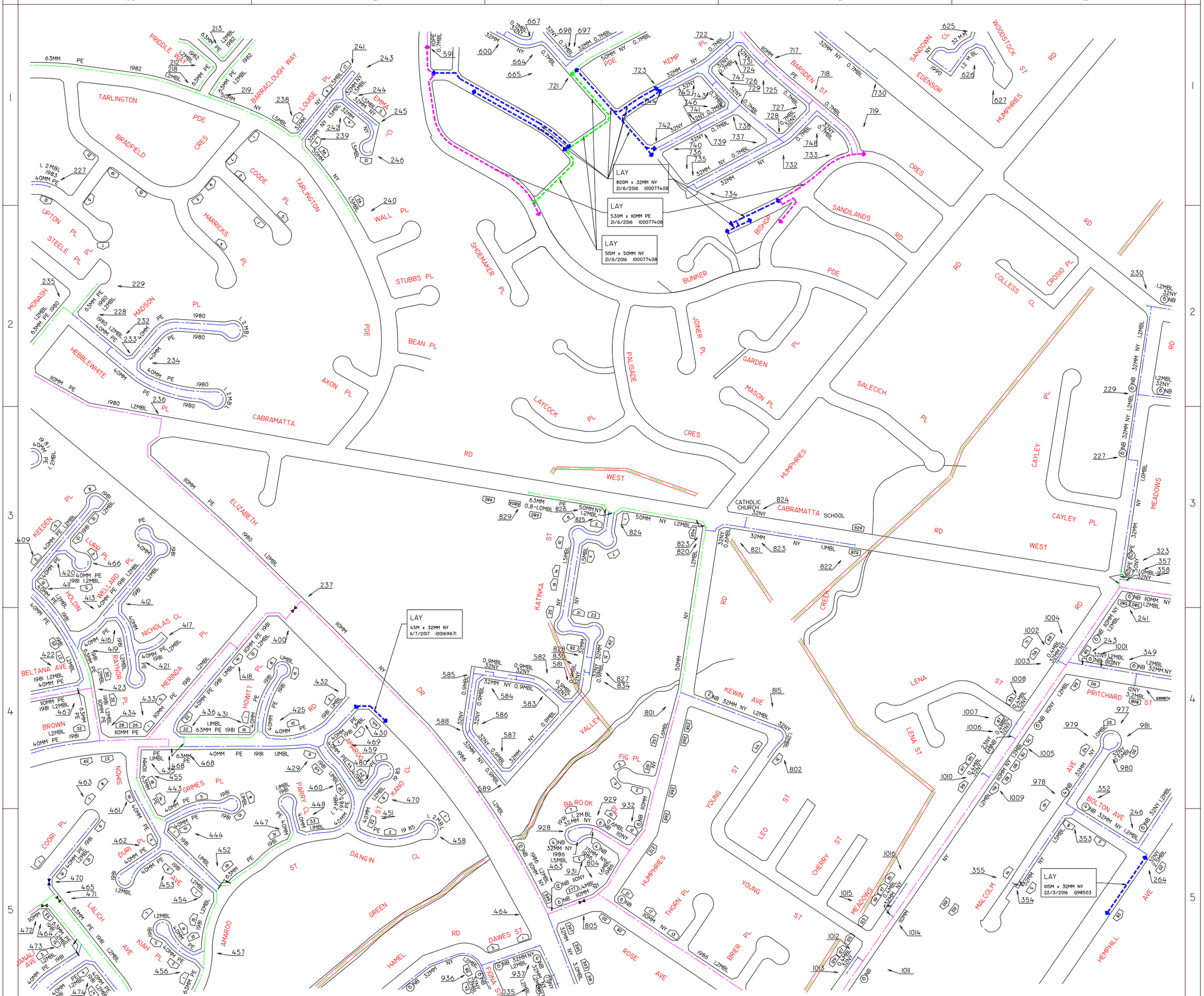
Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
	NETWORK MAIN	300 kPa
	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
	NETWORK MAIN	7 kPa
	NETWORK MAIN	2 kPa
	PROPOSED MAINS	
PR II-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODE	
123S	NETWORK VALVE NODE	
(298)	VALVE NUMBER	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
(6)NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE	
1957	YEAR LAID	
	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

CECIL PARK 6C



CECIL PARK 6D

SCALE 1:2000

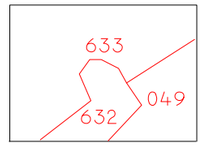
50 0 50 100 150 200

THIS MAP UPDATED ON 11/07/2017
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

CP6A	CP6B	F4A
CP6C	CP6D	F4C
CP9A	CP9B	F7A

ADJOINING MAPS



NETWORK AREA

FAIRFIELD

MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

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

CECIL PARK 6D

ARCADIS Design & Consultancy for natural and built assets

APPENDIX C – ENDEAVOUR ENERGY CORRESPONDANCE LETTER

17 August 2018

Endeavour Energy Ref: ENL3098 – 2014/02306/001
Customer Ref:

Pomelo Consulting Pty Ltd
Suite 105A, 203-233 New South Head Road
EDGECLIFF NSW 2027

Attention: Jai Vikram Singh

TECHNICAL REVIEW REQUEST

ENL3098 – Lot 5131 DP 1208108 Cabramatta Rd, Bonnyrigg (stages 8-18)

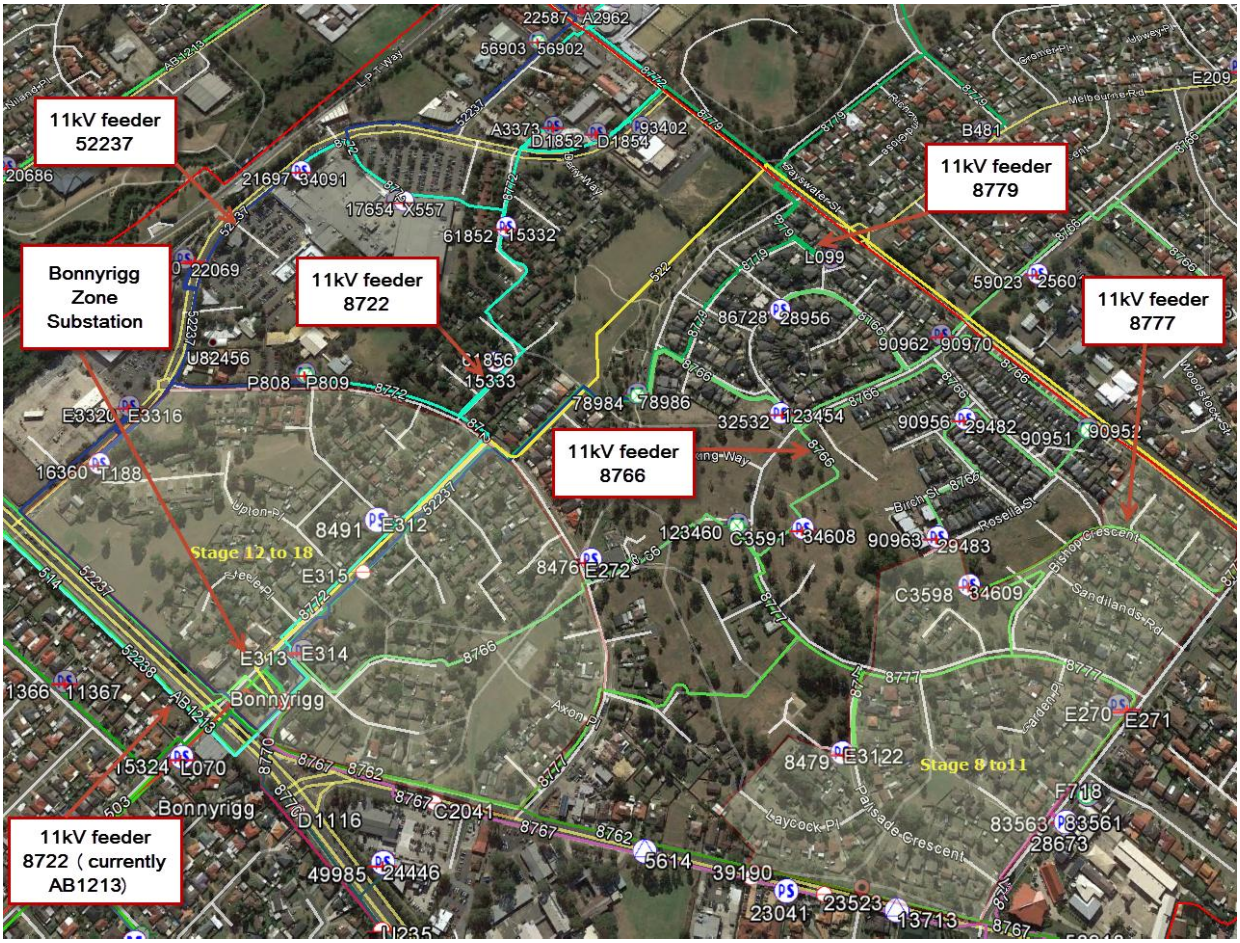
Thank you for your enquiry application and the payment of fees to facilitate the enquiry request at the above location. Your application has been registered under ENL3098. Please quote this reference number on all future correspondence.

Your enquiry wishes to determine if any upgrades are required to Bonnyrigg Zone Substation, if any cross-feeder ties are expected, if any dedicated feeder are required and how much spare capacity is on the existing 11kV network and how much development can proceed without major upgrades.

Proposed stages 8-18 development is situated in an existing 11kV network area with 11kV feeders 8777 and 8766 from Bonnyrigg Zone Substation supplying a majority of this area. Preliminary calculations provided, estimate 8.4MVA will be required for stages 8-18. Based on load assessment provided, this appears to be close however Endeavour Energy's ADMD schedule calculates 3.5kVA for each townhouse. We have calculated based on technical review load for the time being.

Based on the load assessment and the existing network available, it has been determined that no upgrade to Bonnyrigg Zone Substation will be required to supply 8.4MVA load. To supply stages 8-18, reconfiguration of the 11kV network will be required. This will be done using up to 6 existing 11kV feeders, 52237, 8722, 8766, 8779, 8777 and 8781 all from Bonnyrigg Zone Substation. Some redirecting, and extensions and changing of open points will be required. Most of these feeders will need a cross feeder tie to maintain backup and to satisfy Endeavour Energy Network Policy 9.2.1 – Network Planning however the 11kV linkage points are in close proximity to one another.

After planning analysis, and assessment of feeder distribution, it is estimated that up to 9.1MVA can be provided by all these feeders. No new 11kV feeders are envisaged as the existing 11kV network is in place. No major works will be required at this for stages 8-18. Any assessment of load for future staging will need an assessment done to determine supply availability from Bonnyrigg Zone Substation.



The above staging works will be contestable and anticipated to be customer funded and constructed.

If you wish to proceed with this project, a developer or developer representative will need to submit an Application for Connection of Permanent Load and/or Subdivision to Endeavour Energy via fax or email as detailed on the form. I have attached the application form for you.

Once the application is processed and a Supply Offer has been issued by Endeavour Energy, which is essentially a brief desktop assessment of the load provided on the application form, you will need to engage a level 3 Accredited Service Provider who will submit a formal Method of Supply.

A list of the Accredited Service Providers is available at the NSW Trade and Investment website: *http://www.energy.nsw.gov.au/electricity/network-connections/contestable* or can be obtained via phone 13 77 88.

Please note this enquiry is only a preliminary assessment and does not guarantee supply availability or final conditions of supply. Exact determination of supply will be made once an Application for Connection of Permanent Load is submitted to Endeavour Energy.
Should you have any enquiries regarding your application please contact me.

Yours faithfully,

M Grimwood

Matthew Grimwood
Contestable Works Project Manager
Ph: 02 9853 7916
Fax: 9853 7925
Email: matthew.grimwood@endeavourenergy.com.au

APPENDIX D – JEMENA CORRESPONDANCE LETTER

8 June 2018

Arcadis P/L
Level 16, 580 George St
Sydney NSW 2000
Attn. M. Lai

Jemena Limited
ABN 95 052 167 405

Level 9-15
99 Walker St
North Sydney NSW 2060
PO Box 1220
North Sydney NSW 2060
T +61 2 9867 7000
F +61 2 9867 7010
www.jemena.com.au

Dear Mai

RE: PROPOSED DEVELOPMENT OF
NEWLEAF Stgs 8 to 11

Natural Gas is available adjacent to the above subdivision and could be extended to supply any proposed development at this site depending upon it's commercial viability. Jemena does not reserve capacity for any individual project.

Extension of the existing network from Newleaf Ave and surrounding streets will be required to supply these Lots. Please note that Jemena does not reserve capacity for any individual project. It is anticipated that the Developer will supply trenching and restorations during the construction phase for Jemena as staging takes place.

Caution should be exercised when carrying out any road works that may expose the Natural Gas mains existing in this location. Contact Dial B4 you Dig, ph 1100 to confirm their location.

We appreciate the opportunity to be involved in the forward planning of this development and would like to pursue the potential for the connection to the natural gas network. An offer for supply could be made available once Staging and construction is imminent. Please provide the preliminary electrical reticulation (PDF) and a CAD file of the Lot layout(DWG) when available to assist Jemena prior to construction taking place. Shared trenching is encouraged for services to minimise coordination and maximise benefits.

Caution should be exercised when carrying out any road works that may expose the Natural Gas mains existing in this location. Contact Dial B4 you Dig, ph 1100 to confirm their location.

Thank you for your inquiry. If further information or assistance is required, please do not hesitate to contact me on 0402 060 151.

Yours faithfully,

Neale Hilton

Neale Hilton
Network Development Manager

APPENDIX E – SYDNEY WATER CORRESPONDANCE LETTER

Case Number: 170594

14 June 2018

NSW LAND & HOUSING CORPORATION
c/- MGP BUILDING & INFRASTRUCTURE SERVICE PL

FEASIBILITY LETTER

Developer:	**NSW LAND & HOUSING CORPORATION**
Your reference:	**2018-0147**
Development:	**Lot 454 DP839627 BONNYRIGG AVE, Bonnyrigg**
Development Description:	**NSW Land Housing is proposing to increase the lots in the area from 2500 dwelling to 3000 dwellings.**
	The development is the same location as CN170486 howeaver, the proposed usage / density has increased to 3,000 dwellings
	NSW Land Housing is proposing to increase the lots in the area from 2500 dwelling to 3000 dwellings.
Your application date:	**16 March 2018**

Dear Applicant

This Feasibility Letter (Letter) is a guide only. It provides general information about what Sydney Water's requirements could be if you applied to us for a Section 73 Certificate (Certificate) for your proposed subdivision. **The information is accurate at today's date only.**

If you obtain development consent for that subdivision from your consent authority (this is usually your local Council) they will require you to apply to us for a Section 73 Certificate. You will need to submit a new application (and pay another application fee) to us for that Certificate by using your current or another Water Servicing Coordinator (Coordinator).

Sydney Water will then send you either a:

- Notice of Requirements (Notice) and Developer Works Deed (Deed) or
- Certificate.

These documents will be the definitive statement of Sydney Water's requirements.

There may be changes in Sydney Water's requirements between the issue dates of this Letter and the Notice or Certificate. The changes may be:

- if you change your proposed development eg the development description or the plan/ site layout, after today, the requirements in this Letter could change when you submit your new application; and

- if you decide to do your development in stages then you must submit a new application (and pay another application fee) for each stage.

You have made an application for specific information. Sydney Water's possible requirements are:

- **Please see response under Water and Sewer Works**

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

What You Must Do To Get A Section 73 Certificate In The Future.

To get a Section 73 Certificate you must do the following things. You can also find out about this process by visiting www.sydneywater.com.au > Plumbing, building & developing > Developing > Land development.

1. **Obtain Development Consent from the consent authority for your subdivision proposal.**

2. **Engage a Water Servicing Coordinator (Coordinator).**

   You must engage your current or another authorised Coordinator to manage the design and construction of works that you must provide, at your cost, to service your subdivision. If you wish to engage another Coordinator (at any point in this process) you must write and tell Sydney Water.

   For a list of authorised Coordinators, either visit www.sydneywater.com.au > Plumbing, building & developing > Developing > Providers > Lists or call **13 20 92.**

   The Coordinator will be your point of contact with Sydney Water. They can answer most questions that you might have about the process and developer charges and can give you a quote or information about costs for services/works (including Sydney Water costs).

3. **Developer Works Deed**

   It would appear that your feasibility application is served from existing mains and does not require any works to be constructed at this time. Sydney Water will confirm this with you after you have received Development Approval from Council and your Coordinator has submitted a new Development application and Sydney Water has issued you with a formal Notice of Requirements.

4. Water and Sewer Works

4.1 Water

Each lot in your subdivision must have:

- a frontage to a drinking water main that is the right size and can be used for connection; and
- its own connection to that water main and a property service (main to meter) that is available for the fitting of a meter.

Sydney Water has assessed your application and found that:

- All developments need to comply with the building height and minimum pipe size requirements as described within WSSA code re minimum requirements for height and number of units , dwellings more detailed information on further requirements will be given when a section 73 application is received . You will need to amplify mains in certain parts of the development to meet code with minimum requirements .

- **You must provide a water service connection and property service (also known as a "property service (main to meter)") at your cost for all lots off the water main construction required above and the existing water main within your development and your Coordinator must manage the work. See section below for details.**

- **Property Service (Main to Meter) Installation Details**

The property service connection must be carried out by a Sydney Water listed Driller and the installation of the property service must either be carried out or supervised by a licensed plumber. They must meet the:

(a) Administrative requirements of the New South Wales Code of Practice for Plumbing and Drainage; and
(b) Sydney Water Property Service (Main to Meter) Installations Technical Requirements.

- **Before the Certificate can be issued, your Coordinator must give Sydney Water certification that the property service works comply with Sydney Water's requirements.**

4.2 Sewer

Each lot in your subdivision must have a sewer main that is the right size and can be used for connection. That sewer must also have a connection point within each lot's boundaries.

Sydney Water has assessed your application and found that:

- Depending on the grade of the developed land, multiple sewer connections are possible. You will need to amplify mains in certain parts of the development to meet code with minimum requirements .

5. Ancillary Matters

5.1 Asset adjustments

After Sydney Water issues this Notice (and more detailed designs are available), Sydney Water may require that the water main/sewer main/stormwater located in the footway/your property needs to be adjusted/deviated. If this happens, you will need to do this work as well as the extension we have detailed above at your cost. The work must meet the conditions of this Notice and you will need to complete it **before we can issue the Certificate**. Sydney Water will need to see the completed designs for the work and we will require you to lodge a security. The security will be refunded once the work is completed.

5.2 Entry onto neighbouring property

If you need to enter a neighbouring property, you must have the written permission of the relevant property owners and tenants. You must use Sydney Water's **Permission to Enter** form(s) for this. You can get copies of these forms from your Coordinator or the Sydney Water website. Your Coordinator can also negotiate on your behalf. Please make sure that you address all the items on the form(s) including payment of compensation and whether there are other ways of designing and constructing that could avoid or reduce their impacts. You will be responsible for all costs of mediation involved in resolving any disputes. Please allow enough time for entry issues to be resolved.

OTHER THINGS YOU MAY NEED TO DO

Shown below are other things you need to do that are NOT a requirement for the Certificate. They may well be a requirement of Sydney Water in the future because of the impact of your development on our assets. You must read them before you go any further.

Approval of your building plans

Please note that the building plans must be approved when each lot is developed. This can be done at Sydney Water Tap in™. Visit www.sydneywater.com.au > Plumbing, building & developing > Building > Sydney Water Tap in™.

This is not a requirement for the Certificate but the approval is needed because the

construction/building works may affect Sydney Water's assets (e.g. water, sewer and stormwater mains).

Where a Sydney Water stormwater channel, pipe or culvert is located within ten (10) metres of your development site it must be referred to Sydney Water for further assessment.

Your Coordinator can tell you about the approval process including:

- Possible requirements;
- Costs; and
- Timeframes.

Please note that your building plans must be approved. This can be done at Sydney Water Tap in™. Visit www.sydneywater.com.au > Plumbing, building & developing > Building > Sydney Water Tap in™ or call 13 20 92.

This is not a requirement of the Certificate but the approval is needed because construction/ building works may impact on existing Sydney Water assets (e.g. water and sewer mains). In any case, these works MUST NOT commence until Sydney Water has granted approval.

Your Coordinator can tell you about the approval process including:

- Possible requirements;
- Costs; and
- Timeframes.

Note: You must obtain our written approval before you do any work on Sydney Water's systems. Sydney Water will take action to have work stopped on the site if you do not have that approval. We will apply Section 44 of the *Sydney Water Act 1994.*

Backflow Prevention Water supply connections

A backflow prevention containment device appropriate to the property's hazard rating must be installed at the property boundary. The device is to be installed on all water supplies entering the property, regardless of the supply type or metering arrangements. It is needed to reduce the risk of contamination by backflow from these supplies.

A licensed plumber with backflow accreditation can advise you of the correct requirements for your property. To view a copy of Sydney Water's Backflow Prevention Policy and a list of backflow accredited plumbers visit www.sydneywater.com.au > Plumbing, building & developing > Plumbing > Backflow prevention.

The water service for your development

Sydney Water does not consider whether the existing water main(s) talked about above is adequate for fire fighting purposes for your development. We cannot guarantee that this water supply will meet your Council's fire fighting requirements. The Council and your hydraulic consultant can help.

You must make sure that each dwelling/lot has its own 20mm meter.

When access to the water supply is required, the property owner or agent must apply to Sydney Water online. Sydney Water must install a water meter before any water is used. It is illegal for anyone other than a Sydney Water employee to remove the locking mechanism on the water meter.

The online application can be found by visiting our website www.sydneywater.com.au **>** Plumbing, building & developing > Plumbing > Connections & disconnections. The applicant will need to have the:

1. Account (Property) Number which can be obtained from the Coordinator; and
2. Serial Number which can be found on the metal tag on your property service.

You can find more information by using the "Ask Sydney Water" section of our website.

Fire Fighting

Definition of fire fighting systems is the responsibility of the developer and is not part of the Section 73 process. It is recommended that a consultant should advise the developer regarding the fire fighting flow of the subdivision and the ability of Sydney Water's system to provide that flow in an emergency. Sydney Water's Operating Licence directs that Sydney Water's mains are only required to provide domestic supply at a minimum pressure of 15 m head.

Disused Water Service Sealing

You must pay to disconnect all disused private water services and seal them at the point of connection to a Sydney Water water main. This work must meet Sydney Water's standards in the Plumbing Code of Australia (the Code) and be done by a licensed plumber. The licensed plumber must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Disused Sewerage Service Sealing

Please do not forget that you must pay to disconnect all disused private sewerage services and seal them at the point of connection to a Sydney Water sewer main. This work must meet Sydney Water's standards in the Plumbing Code of Australia (the Code) and be done by a licensed drainer. The licensed drainer must arrange for an inspection of the work by a NSW Fair Trading Plumbing Inspection Assurance Services (PIAS) officer. After that officer has looked at the work, the drainer can issue the Certificate of Compliance. The Code requires this.

Soffit Requirements

Please be aware that floor levels must be able to meet Sydney Water's soffit requirements for property connection and drainage.

Other fees and requirements
The requirements in this Notice relate to your Certificate application only. Sydney Water may be involved with other aspects of your development and there may be other fees or requirements. These include:

- plumbing and drainage inspection costs;
- the installation of backflow prevention devices; and
- council fire fighting requirements. (It will help you to know what the fire fighting requirements are for your subdivision as soon as possible. Your hydraulic consultant can help you here.)

No warranties or assurances can be given about the suitability of this document or any of its provisions for any specific transaction. It does not constitute an approval from Sydney Water and to the extent that it is able, Sydney Water limits its liability to the reissue of this Letter or the return of your application fee. You should rely on your own independent professional advice.

END

APPENDIX F – NBN CO LIMITED CORRESPONDANCE LETTER

Tuesday, 3rd July 2018

Mr Mike Williams

LANDCOM
mwilliams@urbangrowth.nsw.gov.au

Dear Mr Williams,

Post Execution of AYCA-472ENU Bunker Parade, Bonnyrigg
NBN Co and LANDCOM have entered into an agreement in relation to the installation of fibre infrastructure at AYCA-472ENU Bunker Parade Bonnyrigg. Provided LANDCOM complies with the terms and conditions of that agreement (including in relation to the construction of pit and pipe infrastructure at the development site), NBN Co will agree to procure the installation of fibre infrastructure at the development.

Regards,

Jaye Rust
Customer Delivery Specialist – Build partnerships

Level 11, 100 Arthur Street, North Sydney NSW 2060
Phone (02) 9926 1900
Fax (02) 9926 1901
Email info@nbn.com.au
Web nbn.com.au

APPENDIX G – SEWER CATCHMENT PLAN

Ø450mm CICL
(POTABLE WATER MAIN)

Ø400mm VC
(SEWER MAIN)

PROPOSED SEWER CONNECTION LOCATION FOR:
- CATCHMENT A1
- CATCHMENT A2
- CATCHMENT C1

PROPOSED SEWER CONNECTION LOCATION FOR:
- CATCHMENT B1

CATCHMENT A1:
184,466 m²

CATCHMENT A2:
299,492 m²

CATCHMENT B1:
117,962 m²

CATCHMENT C1:
26,716 m²

CATCHMENT D1:
13,162 m²

CATCHMENT D2:
18,351 m²

CATCHMENT E1:
137,497 m²

CATCHMENT F1

Bonnyrigg Square
2,041 m²

Village Green
4,207 m2

Community Park
19,170 m²

Valley Creek Park
22,647 m²

PARK
9,207 m²

Retention
1,729 m²

Superlot A
Superlot B
Superlot C
Superlot D
Superlot E1
Superlot E2
Superlot F
Superlot G
Superlot H
Superlot I
Superlot J
Superlot K1
Superlot K2
Superlot L
Superlot M
Superlot AA
Superlot BB
Superlot CC
Superlot DD
Superlot EE
Superlot FF
Superlot GG
Superlot HH
Superlot II
Superlot JJ
Superlot KK
Superlot LL

Bonnyrigg Avenue
Edensor Road
Elizabeth Drive
Cabramatta Road
Humphries Road
Newleaf Parade

West Precinct, Stages 12-16
Site Area 301,648 m²

East Precinct, Stages 8-11
Site Area 137,599 m²

Ø225mm VC
(SEWER MAIN)

Ø300mm VC
(SEWER MAIN)

Ø225mm VC
(SEWER MAIN)

PROPOSED SEWER CONNECTION LOCATION FOR:
- CATCHMENT D1
- CATCHMENT D2
- CATCHMENT E1

ARCADIS | Design & Consultancy for natural and built assets

BONNYRIGG DEVELOPMENT - CONCEPT MASTERPLAN REVISION P

TITLE:
SEWER CATCHMENT PLAN

DRAWING NO:
SKC-001

PROJECT NO:
AA004421

APPENDIX H – BONNYRIGG DEVELOPMENT LOT INFORMATION

Bonnyrigg East Precinct

Table 14 – Bonnyrigg East Precinct Lot Information

Lot/Building No.	Development Lot Area (m^2)*	New Dwellings**
Superlot AA	9,875	31
Superlot BB	8,343	25
Superlot CC	7,901	21
Superlot DD	2,190	9
Superlot EE	6,375	64
Superlot FF	10,478	33
Superlot GG	7,341	22
Superlot HH	1,401	4
Superlot II	3,392	8
Superlot JJ	8,468	21
Superlot KK	10,764	18
Superlot LL	6,921	58

* As per Latest Concept Masterplan Revision P

** As per Concept Masterplan Revision M

Bonnyrigg West Precinct

Table 15 – Bonnyrigg West Precinct Lot Information

Lot/Building No.	Development Lot Area (m^2)*	New Dwellings**
Superlot A	16,046	207
Superlot B	12,332	213
Superlot C	14,369	157
Superlot D	4,006	34
Superlot E	22,777	242
Superlot F	6,601	19
Superlot G	17,493	250
Superlot H	12,738	104
Superlot I	13,091	141
Superlot J	11,794	147
Superlot K1	20,976	223
Superlot K2	4,042	29
Superlot L	6,429	11
Superlot M	14,989	89

* As per Latest Concept Masterplan Revision P

** As per Concept Masterplan Revision M

APPENDIX I – SEWER EP CALCULATIONS

Sewer catchment EP calculations are detailed below in Tables 16 to 18. Calculation of EP varies depending on the building type, but for the purposes of this report we have adopted the following in accordance with WSA 02 – 2002-2.2, Appendix A, Table A1.

- 2.5 EP per lot for the East and West Precinct;
- 20 EP / Ha for Parks;

Ø400mm VC Main

Table 16 – Ø400mm VC Main Anticipated Load Calculation

Sewer Catchment (Appendix G)	Superlot ID (Appendix A)	New Dwellings (Appendix H)	EP
A1	Superlot A	207	207 x 2.5 = 518
	Superlot B	213	213 x 2.5 = 533
	Superlot C	157	157 x 2.5 = 393
	Superlot D	34	34 x 2.5 = 85
	Superlot E	242	242 x 2.5 = 605
	Superlot H	104	104 x 2.5 = 260
	Superlot J	147	147 x 2.5 = 368
	Superlot K1	223	223 x 2.5 = 558
	Superlot K2	29	29 x 2.5 = 73
A2	Additional Load 2	$299{,}492m^2 \times 0.6 \times \frac{1}{450}m^2 = 399$	399 x 3.0 = 1198
C1	Park	$26{,}716m^2 / 10{,}000m^2 = 2.67$	2.67 x 20 = 53
		Total	**4644**

Ø225mm VC Main

Table 17 – Ø225mm VC Main Anticipated Load Calculation

Sewer Catchment (Appendix G)	Superlot ID (Appendix A)	New Dwellings (Appendix H)	EP
D1	Additional Load 2	13,162m^2 x 0.6 x $\frac{1}{450}$m^2 = 18	18 x 3.0 = 54
D2	Additional Load 2	17,798m^2 x 0.6 x $\frac{1}{450}$m^2 = 24	24 x 3.0 = 72
E1	Superlot AA	31	31 x 2.5 = 78
	Superlot BB	25	25 x 2.5 = 63
	Superlot CC	21	21 x 2.5 = 53
	Superlot DD	9	9 x 2.5 = 23
	Superlot EE	64	64 x 2.5 = 160
	Superlot FF	33	33 x 2.5 = 83
	Superlot GG	22	22 x 2.5 = 55
	Superlot HH	4	4 x 2.5 = 10
	Superlot II	8	8 x 2.5 = 20
	Superlot JJ	21	21 x 2.5 = 53
	Superlot KK	18	18 x 2.5 = 45
	Superlot LL	58	58 x 2.5 = 145
		Total	**914**

Ø300mm VC Main

Table 18 – Ø300mm VC Main Anticipated Load Calculation

Sewer Catchment (Appendix G)	Superlot ID (Appendix A)	New Dwellings (Appendix H)	EP
B1	Superlot F	19	19 x 2.5 = 48
	Superlot G	250	250 x 2.5 = 625
	Superlot I	141	141 x 2.5 = 353
	Superlot L	11	11 x 2.5 = 28
	Superlot M	89	89 x 2.5 = 223
F1	Additional Load 1	-	1600
		Total	**2877**

ARCADIS Design & Consultancy for natural and built assets