Oakdale East Development – Horsley Park

Civil and Stormwater Management Report

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1. Introduction

This Civil Stormwater Management Report supports the proposed development of the Oakdale East at Old Wallgrove Road in Horsley Park. Refer to Figure 1 for location of the proposed development.

AT&L have been engaged by Goodman to prepare a Civil Stormwater Management Report, to discuss the civil and stormwater management requirements for the proposed development.

The aim of the report is to assess the potential impacts of the proposed development with respect to civil, infrastructure, stormwater and services.

This report has been prepared with due regard for the Fairfield City Council controls as a means of providing consistent infrastructure delivery and development standards, where these are appropriate to the context of the site:

- Proposed Oakdale East DCP
- Fairfield Citywide Development Control Plan 2013 – Amendment 16
- Fairfield City Council Stormwater Management Policy – September 2017
- Fairfield City Council Policy for Erosion and Sediment Control
- Fairfield City Council Specification for Roadworks and Drainage associated with subdivision or other development
- Managing Urban Stormwater – Soils and Construction (2004).

Figure 1 - Site Location (Courtesy of Nearmap)

1.1. Existing Site

The site is located within the Fairfield City Council LGA. The site is located within Lot 1 in DP 843901, which fronts Old Wallgrove Road, Horsley Park. The site is approximately 2.5km west of the M7. Existing access to the site is via Old Wallgrove Road to the west.

The area subject of the development application is approximately 108,158m^2 (10.82Ha) in area and is located within Horsley Park.

The existing site is part of a large brick manufacturing plant. The existing site comprises stockpiled materials as part of the brick manufacturing process.

The existing stockpiles located within the Oakdale East development site are proposed to be relocated for storage and use to other locations on the Plant 3 site. This relocation is to be undertaken pursuant to the existing mining DA approval (Permit no.1340, dated 12 July 1971), and does not therefore form part of proposed works under this development. Pads of varying sizes will be handed over for commencement of works proposed under this Oakdale East DA approval.

The site is bound by:

- Austral Brick site to the north.
- Reedy Creek to the east.
- Old Wallgrove Road to the west, and
- Burley Road to the south.

Figure 2 - Site Location

The site generally falls from north to south, and west to east. Refer to the Survey drawings within Appendix A for all features on site along with existing contour levels.

The site is currently zoned as IN1 General Industrial. Refer to Figure 3.

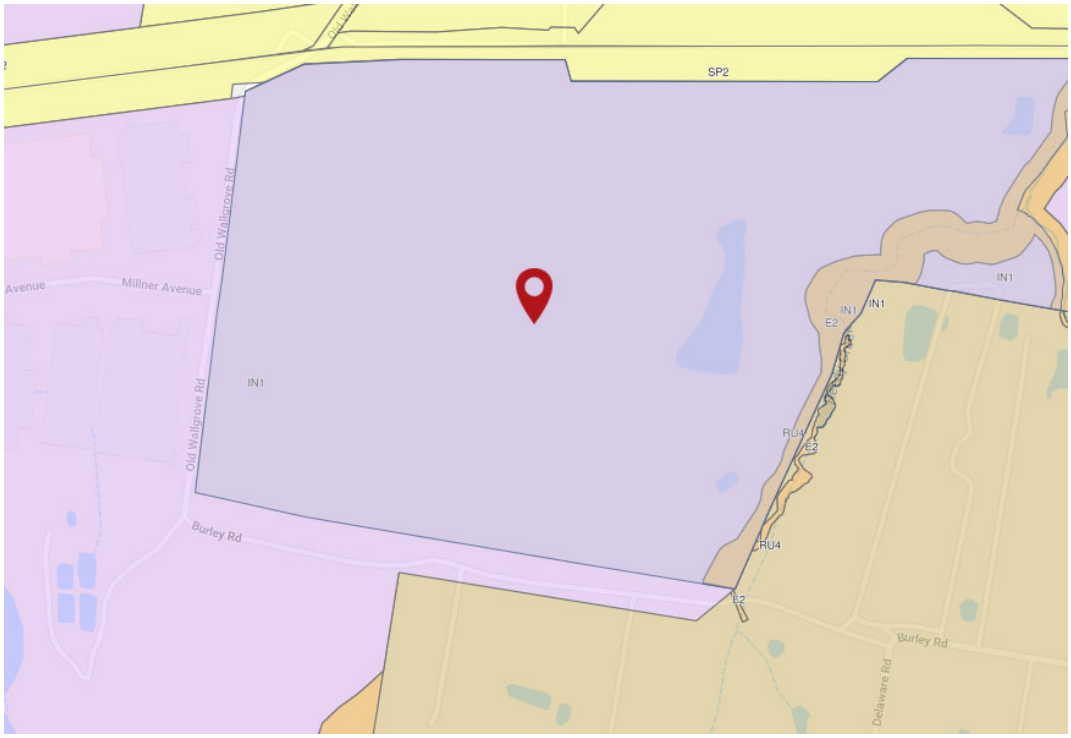

Figure 3 - Zoning Map (Courtesy of NSW Planning Portal)

1.2. Project Description

The proposed development involves the construction of:

- 4 Lots with Warehouse ranging in size from 3,000m^2 to 5,600m^2
- 1 Masonry Plant of approximate building area 11,000m^2
- A 23.0m wide Industrial Estate Road approximately 400m long
- Proposed upgrade works at intersection of Old Wallgrove Road and new Estate Road
- Proposed On-Site Detention basin at eastern end of Estate Road

The proposed general arrangement of the site is shown below in Figure 4.

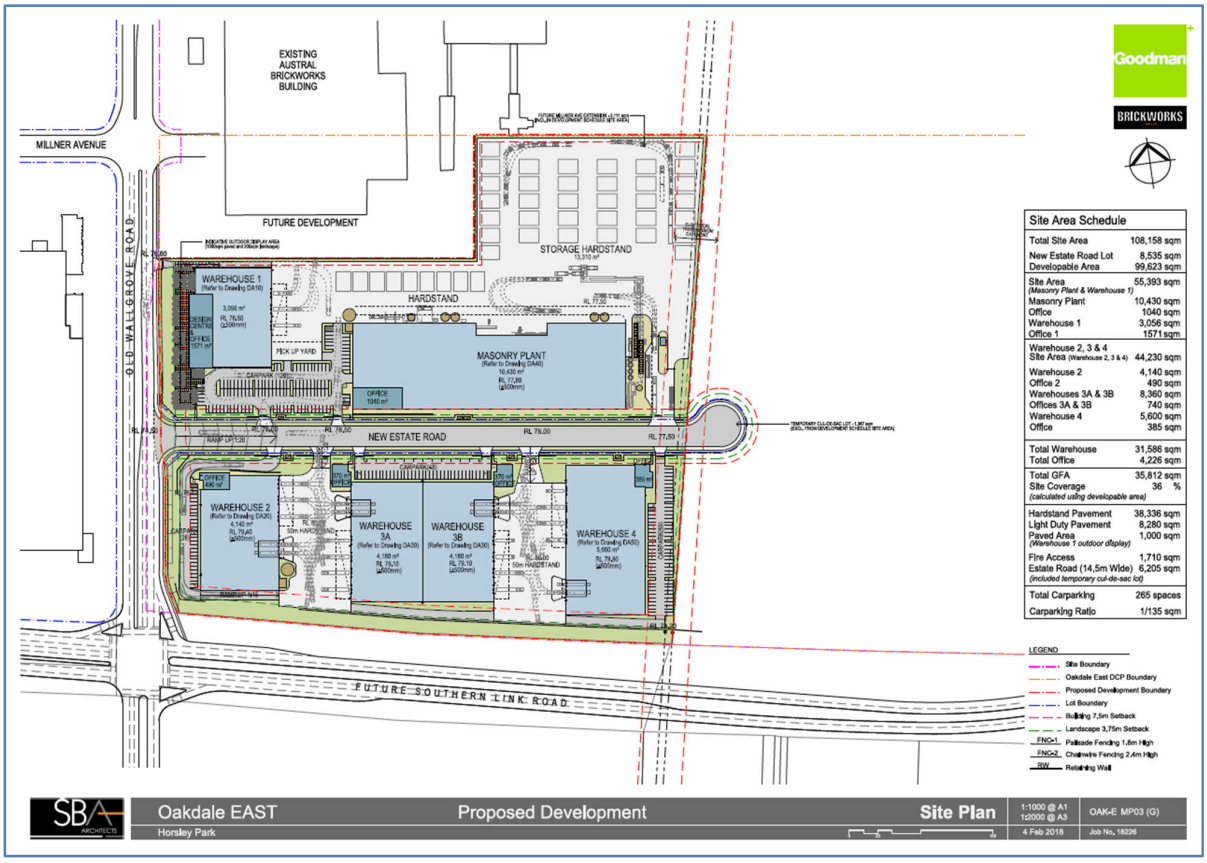

Figure 4 - General Arrangement Plan

1.3. Scope of Report

This report discusses the design philosophy and how stormwater is managed within the Oakdale East development. It includes:

- Sedimentation and Erosion Control
- Stormwater Management:
  - On Site Detention (OSD)
  - Piped and Overland Flows
  - Water Sensitive Urban Design (WSUD)
- Water Balancing
- Flooding
- Utility Servicing
- Road Design

2. Sedimentation and Erosion Control

2.1. Sedimentation and Erosion Control (Construction)

A Soil and Water Management Plan (SWMP) has been prepared in accordance with the NSW Department of Housing Publication titled: Managing Urban Stormwater – Soils and Construction (2004) for the whole site.
The key objective of the SWMP are:

- Acknowledging the activities on a construction site which may contribute to erosion, sedimentation and water quality impacts;
- The implementation of industry best management practices to minimise adverse water quality and sedimentation impacts brought about through construction activities on waterbodies surrounding the work; and
- Establishment of processes that effectively manage erosion, sedimentation and water quality practices during the life of the project.

2.1.1. Sources of Pollution

The activities and aspects of the works that have potential to lead to erosion, sediment transport, siltation and contamination of natural waters include:

- Earthworks undertaken immediately prior to rainfall periods;
- Work areas that have not been stabilised;
- Extraction of construction water from waterways during low rainfall periods;
- Clearing of vegetation and the methods adopted, particularly in advance of construction works;
- Stripping of topsoil, particularly in advance of construction works;
- Bulk earthworks and construction of pavements;
- Works within drainage paths, including depressions and waterways;
- Stockpiling of excavated materials;
- Storage and transfer of oils, fuels, fertilisers and chemicals;
- Maintenance of plant and equipment;
- Ineffective implementation of erosion and sediment control measures;
- Inadequate maintenance of environmental control measures; and
- Time taken for the rehabilitation / revegetation of disturbed areas.

2.1.2. Potential Impacts

The major potential impacts on the riparian environment relate to erosion of distributed areas or stockpiles and sediment transportation. Potential adverse impacts from erosion and sediment transportation can include:

- Loss of topsoil;
- Increased water turbidity;
- Decreased levels of dissolved oxygen;
- Changed salinity levels;
- Changed pH levels;
- Smothering of stream beds and aquatic vegetation;
- Reduction in aquatic habitat diversity;
- Increased maintenance costs; and

- Decrease in waterway capacity leading to increased flood levels and durations;

2.2. RUSLE Analysis

Prior to the design of the SWMP, a Revised Universal Soil Loss Equation (RUSLE) has been undertaken in accordance with the "Blue Book". This analysis has been undertaken to predict the long term, average and annual soil loss from sheet and rill flow from the site under specified management conditions.

Estimating soil loss for a proposed development has four important applications to soil and water management. These are to:

1. Assess the erosion risk at a site;
2. Identify suitable measures to overcome the erosion risk;
3. Estimate the required capacity of sediment retarding basins; and
4. Compare the effectiveness of various erosion control measured.

Refer to Table 1 – RUSLE Analysis

It should be noted the following parameters/assumptions were used for the analysis of this site:

- Rainfall Erosivity Factor (R) = 2,413.51 from (Equation 2, Appendix A2 Blue Book);
- Soil Erodibility Factor (K) = 0.05 (from Appendix C, Table C19 of Blue Book);
- Slope Length (LS): Is assumed to not exceed 80m immediately before forecast rainfall or during shutdown periods and a maximum grade of 5%;
- Erosion Control Factor (P): Is the ratio of soil loss with a nominated surface condition ploughed up and down the slope (from Appendix A5, Blue Book); and
- Cover Factor (C): Is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. With the proposed ESC measures being installed post bulk earthworks, it is assumed that all soil is recently disturbed, thus a C factor of 1 is chosen.

Parameter	Item (Blue Book Reference)
Rainfall Erosivity Factor, R	2,413.51
Soil Erodibility Factor, K (Table C20, Blue Book)	0.05
Slope Length/Gradient Factor, LS	1.19
Erosion Control Practice Factor, P	1.20
Ground Cover and Management Factor, C	1
Computed Soil Loss (tonnes/ha/year), (A = R x K x LS x P x C)	**172.32**
Soil Loss Class	2 (Table 4.2)

Table 1 – RUSLE Analysis

The erosion hazard potential of the site is considered low, due to the calculated soil loss lying in the range of 151 to 225 tonnes/ha/year as per Table 4.2 of the Blue Book.

Table 4.2 The Soil Loss Classes (adapted from Morse and Rosewell, 1996)

Soil Loss Class	Calculated soil loss (tonnes/ha/yr)	Erosion hazard
1	0 to 150	very low
2	151 to 225	low
3	226 to 350	low-moderate
4	351 to 500	moderate
5	501 to 750	high
6	751 to 1,500	very high
7	>1,500	extremely high

Figure 5 - Table 4.2 from the Blue Book

2.3. Soil and Water Management Plan

2.3.1. Overall Strategy

The following construction methodology will be followed to minimise the impact of sedimentation due to construction works:

- Diversion of "clean" water away from the disturbed areas and discharge via suitable scour protection;
- Provision of hay bale type flow diverters to catch drainage and divert to "clean" water drains;
- Diversion of sediment-laden water into temporary sediment control basins to capture the design storm volume and undertake flocculation (if required);
- Provision of construction traffic shaker grids and wash-down to prevent vehicles carrying soils beyond the site;
- Provision of catch drains to carry sediment-laden water to sediment basins;
- Provision of silt fences to filter and retain sediments at source;
- Rapid stabilisation of disturbed and exposed ground surfaces with hydro-seeding areas where future construction and building works are not currently proposed;
- All temporary sediment basins will be located clear of the 100yr ARI flood extent from Reedy Creek and all associated tributaries;
- The weir levels of temporary sediment basins will be located above the 100yr ARI flood event levels from Reedy Creek and tributaries; and
- On-Site Detention basins are to be utilised as temporary sediment control basins. The bio-retention basins shall not be converted into the final/ultimate basins until all building and construction works within the relevant stage has been completed and 90% of the site is stabilised.

Refer to AT&L Drawings C1035 to C0138 for Erosion and Sediment Control Plans, for all proposed control and protection measures across the site until completion of on lot works.

Suitable erosion and sediment controls shall be designed, provided and maintained by the contractor throughout all stages of works, including at completion of the bulk earthworks where shown on AT&L drawings or where directed by the Superintendent or Fairfield City Council's engineers.

Such controls shall be in accordance with the relevant requirements in the latest version of the managing urban stormwater: soils and construction guideline (Landcom).

2.3.2. Design of Sediment and Erosion Control Measures

Suitable erosion and sediment controls shall be provided by the Contractor and maintained throughout all stages of works, including at completion of the bulk earthworks.

All design, documentation, installation and maintenance of sediment and erosion controls will be in accordance with the requirements of:

- Protection of the Environment Operations Act;
- Office of Environment and Heritage's 'Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) (The "Blue Book") Volume 1 and Volume 2.

Ultimately, the final temporary sediment basin locations and sizes will be provided to suit development staging requirements and will be sized and maintained in accordance with the requirements of the above-mentioned authority documents.

With the proposed site being larger than 2,500m2 in disturbed area, sediment basins are required. The following temporary sediment basins are to be in-place at the commencement of demolition works. Refer to drawings in Appendix B and 'Earth Basin Wet' SD6-4 for details, and Table 3 below for basin sizes.

Parameter	Item (Blue Book Reference)
Soil Type	Type F (Appendix C, Table C19, Blue Book)
Design Rainfall Depth (Days)	5
Design Rainfall Depth (Percentile)	85
x-day, y-percentile rainfall event	35.00 (Table 6.3a)
Rainfall Intensity: 2-year, 6-hour storm	10.10
Rainfall Erosivity (R-factor)	**2,413.51**

Table 2 – Site Data

Parameter	Basin 1	Basin 2	Basin 3
Volumetric Runoff Coefficient, C_v (Appendix F3, Blue Book)	0.50	0.5	0.5
Contributing Area, A (ha)	5.6	2.556	2.089
$R_{(85\ \%ile,\ 5\ day)}$	35.00	35.00	35.00
Settling Zone Volume, (m^3)	865	355	330
Sediment Storage Zone Volume, (m^3)	433	178	165
Total Sediment Basin Volume, (m^3)	**1,298**	**533**	**495**

Table 3 – Precinct Temporary Sediment Basins

2.4. Site Inspection and Maintenance

The inspection and maintenance requirements outlined in this section must be carried out while either earthworks or quarrying is being conducted, and all areas re-established.
The Contractor will be required to inspect the site after every rainfall event and at least weekly, and will:

- Inspect and assess the effectiveness of the SWMP and identify any inadequacies that may arise during normal work activities or from a revised construction methodology;
- Construct additional erosion and sediment control works as necessary to ensure the desired protection is given to downstream lands and waterways;
- Ensure that drains operate properly and to affect any repairs;
- Remove spilled sand or other materials from hazard areas, including lands closer than 5 metres from areas of likely concentrated or high velocity flows especially waterways and paved areas;
- Remove trapped sediment whenever less than design capacity remains within the structure;
- Ensure rehabilitated lands have affectively reduced the erosion hazard and to initiate upgrading or repair as appropriate;
- Maintain erosion and sediment control measures in a fully functioning condition until all construction activity is completed and the site has been rehabilitated;
- Remove temporary soil conservation structures as the last activity in the rehabilitation.
- Inspect the sediment basin during the following periods:
    - During construction to determine whether machinery, falling trees, or construction activity has damaged and components of the sediment basin. If damage has occurred, repair it;
    - After each runoff event, inspect the erosion damage at flow entry and exit points. If damage has occurred, make the necessary repairs;
    - At least weekly during the nominated wet season (if any), otherwise at least fortnightly; and
    - Prior to, and immediately after, periods of 'stop work' or site shutdown.
- Clean out accumulated sediment when it reaches the marker board/post and restore the original volume. Place sediment in a disposal area or, if appropriate, mix with dry soil on the site;
- Do not dispose of sediment in a manner that will create an erosion or pollution hazard;
- Check all visible pipe connections for leaks, and repair as necessary;
- Check all embankments for excessive settlement, slumping of the slopes or piping between the conduit and the embankment, make all necessary repairs;

- Remove the trash and other debris from the basin and riser; and
- Submerged inflow pipes must be inspected and de-silted (as required) after each inflow event.

2.4.1. Sediment Basin Maintenance

As stated in Section 5.3.2 above, the proposed development site contains 'Type F' soils, or soils that contain a significant proportion of fine grained (33% or finer than 0.02mm) and require a much longer residence time to settle.

Stormwater within the settling zone should be drained or pumped out within 5 days (design time), if the nominated water quality targets can be met, to the satisfaction of the superintendent. Flocculation should be employed where extended settling is likely to fail to meet the objectives within the 5-day time period. Flocculation is when flocculating agents are applied to the sediment basins causing the colloidal particles to clump into larger units or 'floc' that can either settle in a reasonable time or be filtered.

Refer to Appendix E4 of the Blue Book for flocculation methodologies and manufacturer's instructions for application rates, regarding the proposed sediment basins.

2.5. Conclusion

The erosion control measures proposed for the site will comply with the requirements of Fairfield City Council Engineering Guidelines and The Department of Environment, Climate Change and Water (DECC).

The proposed SWMP will ensure that the best management practice is applied to the development site in controlling and minimising the negative impacts of soil erosion

3. Road Design

3.1. Horizontal and Vertical Geometry

The Estate Road within Oakdale East Estate have generally been designed to meet Austroads requirements and Australian Standards to accommodate B-Double truck movements where possible.

The estate roads connects into Old Wallgrove Road at the western boundary of the site and extends for approximately 400 m to the east, terminating in a temporary turn head.

See drawings within Appendix A for proposed Estate Road layout along with connections into Old Wallgrove Road to the west.

The Estate Road is designed as such:

- 23.0m wide Road Reserve
- 15.5m wide Carriageway comprising:
  - 2x 3.5m wide traffic lanes
  - 2x 4.25m wide traffic lanes adjacent kerb
- Verge 3.75m wide
- Cul-De-Sac have been shown at 30m Diameter to accommodate the largest design vehicle
- The largest design vehicle is a B-Double
- Design Speed of Road = 60km/hr
- No guard fences have been shown and these will be assessed at detailed design stage in accordance with Austroads.

Refer to Figure 6 indicating typical road section.

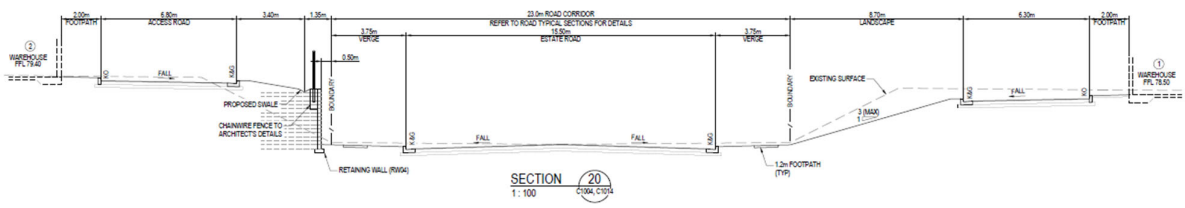

Figure 6 - Typical Estate Road Section

3.2. Pavement

Pavement will be designed based on the requirements of Austroads Pavement Design Guide – A Guide to the Structural Design of Road Pavements and recommendations provided within the Oakdale East Industrial Estate Geotechnical Report prepared by Douglas Partners in report 86545.01 dated December 2018.

3.3. Batter Design

Any batter's steeper than 1 in 5 will be vegetated and all external batters to the development have been limited to 1 in 4 as a minimum generally, with the maximum being 1 in 3.

Any temporary batters constructed during the works will be in accordance with the geotechnical report and ongoing advice from the Level 1 supervisor.

3.4. Conclusion

All road design as demonstrated above is in accordance with Austroads Standards and the requirements of Fairfield City Council, as a minimum.

A professional geotechnical engineer will be engaged to design the structural pavement. This is also in accordance with Austroads Pavement Design Guide – A Guide to Structural Design of Road Pavements.

4. Stormwater Management

4.1. Existing Stormwater Drainage

Currently there is no stormwater infrastructure within the site with all stormwater runoff draining via open swales to the east into Reedy Creek.

The site generally falls north to south and west to east, towards Reedy Creek.

4.2. Council, Precinct Requirements and Recommendations

A meeting was held on the 1st of March 2019 between Fairfield City Council, Goodman and AT&L to discuss the proposed development and relevant Council planning requirements and engineering guidelines to be adopted. Within this meeting the following outcomes were noted:

All stormwater drainage from the Oakdale East development is designed to comply with the following:

- Fairfield City Council Stormwater Management Policy – September 2017
- Fairfield City Council Policy for Erosion and Sediment Control
- Fairfield City Council Specification for Roadworks and Drainage associated with subdivision or other development
- Managing Urban Stormwater – Soils and Construction (2004).

A summary of the design requirements adopted is listed below:

- A precinct basin will serve the development as a detention and bio-retention basin. No on-lot detention basins/ tanks are required
- Based on the Fairfield City Council Stormwater Management Policy – September 2017 Figure 4 the proposed development is situated within the Rural stormwater management zone. As such the following OSD requirements apply:
    - Maximum permissible site discharge (PSD) of 78l/sec/ha for the 5, 15, 30, 60, 180, 360 and 540 minute duration storms for the 5 and 100 year ARIs for the developed site OR
    - Site storage requirements (SSR) of 4.09m^3 per 100m^2 of developed site using the simplified method
- Based on the Fairfield City Council Stormwater Management Policy – September 2017 Section 6.3 as the site is located within the Rural Zone water quality improvement is not required
- Reduce water consumption in non-residential properties by 40% consistent with the BASIX Scheme

Council also requested a pre and post developed stormwater catchment analysis be undertaken to ensure the development does not result in dramatic changes to existing catchment areas and hence adversely impacting downstream stormwater infrastructure. This analysis has been summarised in Section 6.2 of this report.

4.3. Proposed Site Stormwater Drainage

All proposed stormwater drainage from the development will be designed in accordance with the Fairfield City Council engineering requirements and guidelines.

Stormwater on the lots and within the road reserve is proposed to be collected via pits and pipes and ultimately drain into an on-site detention basin located in the south eastern corner of the Estate Road.

The basin will have an outlet structure and overflow weir system to drain into a new piped network to

discharge into Reedy Creek to the east. Refer to the Civil Drawings for layout and details of the proposed stormwater network and catchment areas.

It should be noted the pipework downstream of the OSD basin to discharge into Reedy Creek has been designed for the ultimate development case. That being when the lot to the east is fully developed (i.e. 90% impermeable / 10% permeable) and the Estate Road is extended to the east to Reedy Creek. This is to ensure the stormwater pipes installed for the DA can be used in the final case developed scenario. Details of this future works will be the subject of another DA.

4.4. Stormwater Management Modelling

DRAINs modelling software has been used to calculate the Hydraulic Grade Line (HGL) of the stormwater pipes. DRAINs is a computer program used for designing and analysing urban stormwater drainage systems and catchments. DRAINs data files and output results are attached in Appendix C.

4.5. Hydrology

- Pipe drainage shall be designed to accommodate the 20-year ARI storm event.
- The combined piped and overland flow paths shall be designed to accommodate the 100-year ARI storm event.
- Where trapped low points are unavoidable and potential for flooding private property is a concern, an overland flowpath capable of carrying the total 100-year ARI storm event shall be provided. Alternatively, the pipe and inlet system may be upgraded to accommodate the 100 year ARI storm event.
- Rainfall intensities shall be as per the Intensity-Frequency-Duration table in accordance with the Australian Rainfall and Runoff (AR&R) volume 2.
- Times of concentration for each subcatchment shall be determined using the kinematic wave equation.
- Runoff coefficients shall be calculated in accordance with AR&R. The fraction impervious shall be determined from analysis of the subcatchments.
- Flow width in gutter shall not exceed 2.5m for the minor design storm event.
- Velocity depth ratios shall not exceed 0.4 for all storms up to and including the 100 year ARI event.
- Blockage factors of 20% and 50% shall be adopted for pits on grade and at sags respectively.

4.6. Hydraulics

- A hydraulic grade line HGL design method shall be adopted for all road pipe drainage design. The HGL shall be shown on all drainage long sections.
- The minimum pipe size shall be 375 diameter RCP.
- The minimum pipe grade shall be 0.5%.
- All pipes shall be Rubber Ring Jointed uno.
- The minimum cover over pipes shall be 450mm in grassed areas and 600mm within carriageways.
- Where minimum cover cannot be achieved due to physical constraints the pipe class shall be suitably increased.
- All trafficable shall be Reinforced Concrete Pipes or Fibre Reinforced Cement equivalent.
- The pipe friction coefficients to adopted shall be:
-

• Materials	• Mannings	• Colebrook-	• Min.
• RCP	• 0.012	• 0.3	• 3
• FRC	• 0.01	• 0.015	• 3

Table 4: Pipe Details

- All pipes classes shall be designed for the ultimate service loads and where applicable, constructions loads will be designed for.
- Pipes discharging to the overland flow path shall adopt a minimum tailwater level equivalent to respective overland flow level.
- Pit Loss coefficients shall be calculated in accordance with Missouri Charts.
- A minimum 150mm freeboard shall be maintained between pit HGL and pit surface levels.
- Overland flowpaths shall maintain a minimum of 300mm freeboard to all habitable floor levels.
- Pits deeper than 1.2m shall contain step irons at 300 mm centres.

5. Onsite Detention (OSD)

5.1. Council Requirements and Recommendations

On Site Detention (OSD) will be provided within the proposed development extents to meet the requirement of:

- Fairfield City Council Stormwater Management Policy – September 2017

The objectives of the FCC OSD policy are:

- To ensure that through the use of OSD, stormwater discharge is controlled thereby ensuring development does not increase the risk of downstream flooding, erosion of unstable waterways or a reduction of the capacity of Council's drainage network

The proposed development site is located within the Rural Stormwater Management Zone as per Figure 4 of the guidelines.

As per the FCC guidelines the following OSD requirements apply:

- Maximum permissible site discharge (PSD) of 78l/sec/ha for the 5, 15, 30, 60, 180, 360 and 540-minute duration storms for the 5 and 100 year ARIs for the developed site OR
- Site storage requirements (SSR) of 4.09m^3 per 100m^2 of developed site using the simplified method

5.2. Catchments

As specified within Section 5.2, FCC requested a pre and post development stormwater catchment analysis be undertaken for this development.

An Existing Stormwater Catchment Plan (Drawing 18-563-C1055) has been prepared highlighting the existing catchment areas. At the time of writing this report the site currently has numerous stockpiles across its extent due to historic quarry works. This existing catchment plan has been prepared assuming the stockpiles are still in place however it has been confirmed by Goodman a mining license (Permit no 1340, dated July 1971) is in place to remove these stockpiles. As such the future catchment (prior r to development) may change slightly with the removal of the stockpiles and overall bulk earthworks. As this extent of works is unknown at this stage the existing survey (and stockpiles) have been used for the existing catchment plan analysis.

Across the site the following catchments exist:

- OWR Catchment 1: includes the site to the north and drains to Old Wallgrove Road to the north west. Total area approximately **15.93Ha**
- OWR Catchment 2: includes the western and southern portion of the site and drains to Old Wallgrove Road to the west. Total area approximately **2.78Ha**
- Existing Quarry Catchment 1: includes the eastern and northern part of the site and drains to the existing sediment pond to the east. Total area approximately **8.66Ha**

A Proposed Stormwater Catchment Plan (Drawing 18-563- C0156) has also been prepared for comparison with the existing catchment plan. Across the site the following catchments are proposed:

- Eastern Catchment – Total area **10.69Ha**. This catchment includes the majority of the Estate Road and all on lot stormwater and is assumed to comprise 90% impermeable areas and 10% permeable areas. For comparison the outlet of this catchment matches into the pre-developed catchment – Existing Quarry Catchment 1.

- Western Catchment – Total area **0.27Ha.** This catchment includes the western portion of the Estate Road and drains to the west connecting into the stormwater network within Old Wallgrove Road. This catchment does not drain into the proposed OSD basin and is assumed to comprise 80% impermeable areas and 20% permeable areas. For comparison the outlet of this catchment matches into the pre-developed catchment – OWR Catchment 2.

Stormwater flow analysis has been undertaken with Drains software to determine the 5 and 100 year ARI events peak flows for both the pre and post development catchments. Refer to Table 5 for these flow rate comparisons.

Catchment	Storm Event (ARI)	Pre-Development Flow (L/sec)	Post Development Flow (L/sec)
Existing Quarry Catchment	5 yr	2,490	614
	100 yr	4,210	815
OWR Catchment 2	5 yr	800	86
	100 yr	1,350	141
OWR Catchment 1 *			

Table 5: Catchment Flows

As indicated within Table 5 the post developed flows from the two proposed catchments are less than the peak flows from the corresponding existing catchment.

*It is also noted as the site is situated within the existing OWR Catchment 1 the peak flows from this catchment will also reduce due to this development. As these peak post developed flow rates have reduced it is proven this development does not adversely impact the downstream stormwater network.

5.3. OSD Basin Design

As discussed previously stormwater from the Eastern Catchment will drain into the proposed on-site detention basin within the open space located in the south east end of the site.

As mentioned in Section 6.1., based on the FCC OSD requirements the basin has been designed to achieve the following outcomes:

Storm Duration	Allowable PSD (78l/sec/Ha)	5 YR ARI flow	100 YR ARI flow
5 min duration	855	206	501
15 min duration		496	666
30 min duration		561	748
60 min duration		614	814
180 min duration		607	815
360 min duration		611	810
540 min duration		597	788

Table 6: Post Developed Catchment Flows

Refer to Drawings C1025 for all basin details inclusive of volume provided which has a volume of 4,450m^3 calculated from base RL73.60 to Emergency Weir Level 75.20.

6. Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design encompasses all aspects of urban water cycle management, including water supply, wastewater and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle and achieve more sustainable forms of urban development.

6.1. Water Quality Improvement

As discussed within Section 5.2 the proposed site is located within an area in Council's LGA which does not require water quality improvement measures.

As such the basin proposed to the east of the road will act as an On-Site Detention basin only.

It is proposed to install a Gross Pollutant Trap (GPT) within each lot prior to connecting into the network within the Estate Road. Refer to the Civil Drawings for location of each GPT.

6.2. Rainwater Tanks / Rainwater Re-use

The use of rain water collected in rainwater tanks from roof runoff of the warehouses would provide a valuable alternative to potable water for a variety of non-potable end uses, such as toilet flushing and irrigation.

We have assumed for this development, irrigation and toilet flushing will be plumbed to the rainwater tanks.

The use of rainwater tanks for each lot will be incorporated at detailed design to ensure the FCC condition to *"Reduce water consumption in non-residential properties by 40% consistent with the BASIX Scheme"* will be met.

7. Flooding

In 2013 Fairfield City Council commissioned BMT WBM to undertake the Reedy Creek Flood study and report. This report formed part of the Rural Area Flood Study.

The Oakdale East site is located within the within the Reedy Creek Catchment, as shown in Figure 7.

A small portion of the site sits outside of the Reedy Creek Catchment area; this is the western most area shown in Figure 7 below.

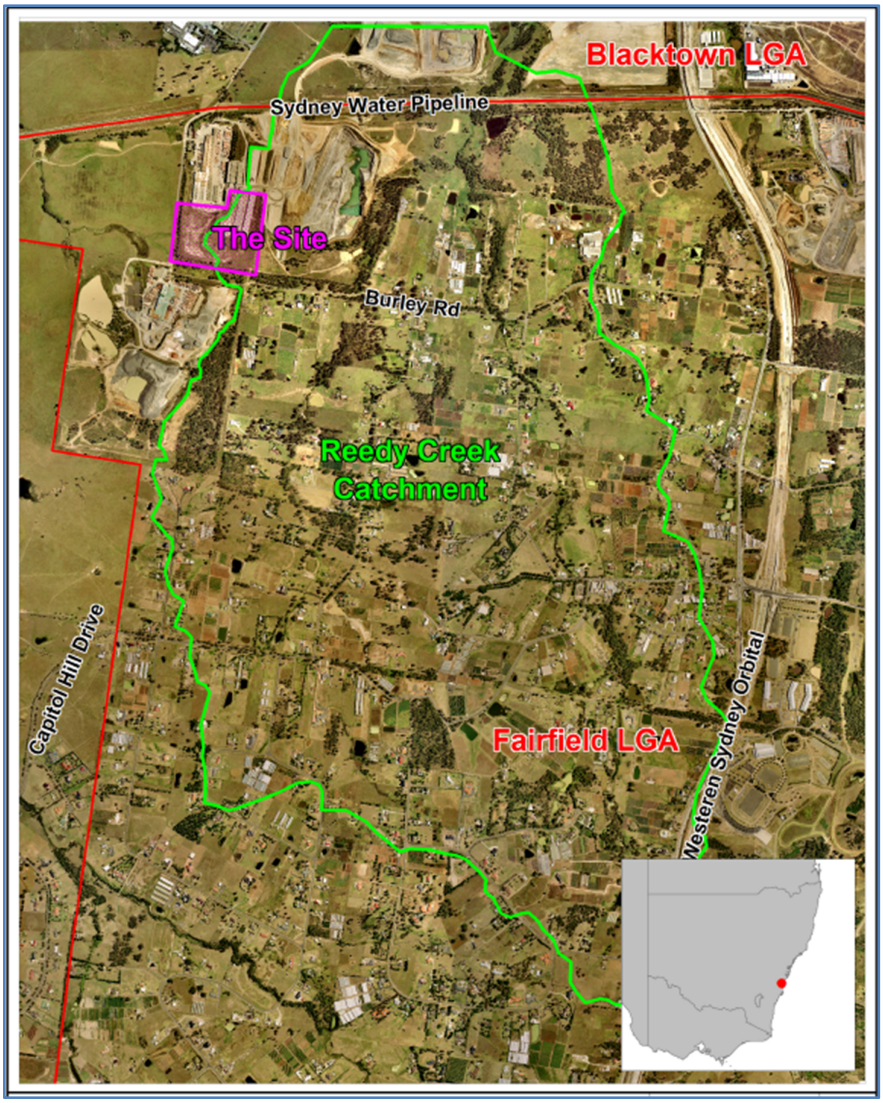

Figure 7 - Rural Area Flood Study (FCC, BMT)

7.1. Purpose of Flood Report

The purpose of the flood report is to update and summarise the final modelling results of the Reedy Creek Catchment using the detailed feature survey and design surface and proposed stormwater drainage network provided by AT&L in February 2019.

7.2. Flood Modelling Results

Based on the BMT flood report the following conclusions were drawn:

- Based on Schedule 2 of Chapter 11 of the Fairfield Citywide Development Control Plan, the Site would be classified as a commercial or industrial development
- Although not shown on the Reedy Creek Flood Planning Map, the proposed development site is not located in any of the identified flood precincts (based on the original mapping undertaken as part of BMT WBM 2013)

In terms of the objectives of the flood risk management identified by Fairfield City Council, the proposed development does not compromise the outlined objectives. Namely, the site is not located in an area of high flood hazard and the proposed development does not result in impacts upon existing and neighbouring developments.

8. Services

This development will incorporate full servicing for the proposed subdivision.

AT&L has previously prepared an Infrastructure Servicing Report for the Oakdale East development (reference 18-563-R001-01 Oakdale East Infrastructure Report, Rev 02, dated 05-10-18). The below is a summary of the findings of this report.

8.1. Existing Services

Based on an initial desk top study conducted from information obtained from Dial Before You Dig (DBYD) records obtained it is apparent the following services existing within the vicinity of the development site.

8.1.1. Sydney Water

8.1.1.1. Water Supply

From Dial Before You Dig (DBYD) information obtained there is the following existing potable water assets within the vicinity:

- 250mm diameter Ductile Iron Cement (mortar) Lined (DICL) main in the western verge of Old Wallgrove Road to the west
- 450mm diameter Ductile Iron Cement (mortar) Lined (DICL) main in the southern verge of Burley Road to the south

Refer to DYBD records within Appendix B.

8.1.1.2. Sewerage

From Dial Before You Dig (DBYD) information obtained there is no existing sewer main within the vicinity. The closest existing sewer main is a 375mm diameter Glass Reinforced Plastics (GRP) pipe located approximately 250m to the west of the southern end of Old Wallgrove Road.

Refer to DYBD records within Appendix B.

8.1.2. Communications

From Dial Before You Dig (DBYD) information obtained there is the following existing telecommunications conduits within the vicinity:

- 100mm and 50mm diameter Telstra conduits within the eastern verge of Old Wallgrove Road to the west
- 100mm diameter Telstra conduits on north and southern verge of Burley Road to the south
- Optus conduit within eastern verge of Old Wallgrove Road and southern verge of Burley Road

Refer to DYBD records within Appendix B.

8.1.3. Gas

From Dial Before You Dig (DBYD) information obtained there is the following existing gas mains owned by Jemena within the vicinity:

- 150mm diameter Secondary main along the eastern verge of Old Wallgrove Road to the west
- 200mm diameter Secondary main along the southern verge of Burley Road to the south

Refer to DYBD records within Appendix B.

8.1.4. Electrical

From Dial Before You Dig (DBYD) information obtained there is the following existing electrical conduits owned by Endeavour Energy within the vicinity:

- Existing overhead conduits along the eastern verge of Old Wallgrove Road to the west
- Bank of 8 underground ducts along the western verge of Old Wallgrove Road to the west

Refer to DYBD records within Appendix B.

8.2. Proposed Servicing Strategy

The following servicing strategy is proposed to ensure the proposed development is serviced by all key services.
AT&L has previously prepared an Infrastructure Servicing Report for the Oakdale East development (reference 18-563-R001-01 Oakdale East Infrastructure Report, Rev 02, dated 05-10-18). T

8.3. Sydney Water

Water and sewer supply to the site is to be provided in accordance with the Local Area Servicing Plan (LASP) prepared by GHD (2016).

The LASP identifies the servicing strategy for the WSEA Precinct No.8 – Area South of Pipeline as shown within Appendix D and E, inclusive of Oakdale East.

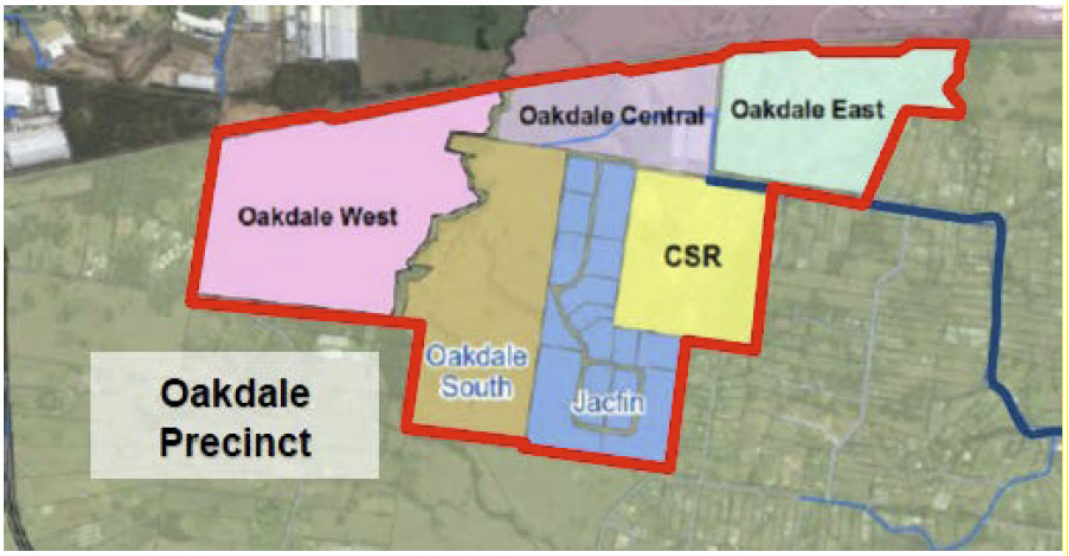

Figure 8 - WSEA Precinct No. 8 - Area South of Pipeline

8.3.1. Water Supply

The LASP for potable water (GHD 2016) states that Oakdale East will be supplied via the proposed DN450 potable water main along Burley Road (Refer report within Appendix D) which is supplied from the Minchinbury Elevated System.

The provision of Oakdale East potable water reticulation will be undertaken in accordance with the Sydney Water endorsed LASP for potable water (GHD 2016), Sydney Water requirements and procurement process.

8.3.2. Sewerage

The St Clair Trunk sewer system has recently been completed which connects the wider Oakdale Precinct to the existing St Clair Sewer Carrier. The sewer connection for Oakdale East ultimately drains to the St Clair Trunk sewer system.

The LASP for sewer (GHD 2016) identified the sizing of sewer infrastructure required to service Oakdale East as DN375 within Burley Road to the south. For further details on proposed sewer alignments for Oakdale East, refer to Appendix E.

The provision of Oakdale East sewer infrastructure will be undertaken in accordance with the Sydney Water endorsed LASP for sewer (GHD 2016), Sydney Water requirements and procurement process.

An overview of the preliminary alignments and sizing of sewer infrastructure within the Sydney Water endorsed LASP for sewer (GHD 2016) is shown within report in Appendix E.

8.3.3. Communications

Communication conduits will be extended from Old Wallgrove Road to service Oakdale East with the pit and pipe network to be extended and reticulated through the roadways to service the proposed lots.

Staging of the pit and pipe network will coincide with the civil stages.

Refer to Drawing SKC014 in Appendix C for an indicative Telecommunications plan to service Oakdale East.

8.3.4. Gas

To service Oakdale East, conduits will be extended and reticulated through the roadways to service the proposed lots. Staging of the reticulation will coincide with the civil stages.

Refer to Drawing SKC013 in Appendix C for an indicative Gas Plan to service Oakdale East.

8.3.5. Electrical

Based on advice received from an ASP3 Electrical Designer, it is likely lead-in HV cables will be required to service the development of Oakdale East. The likely point of supply is from the Eastern Creek Zone Substation, located on Old Wallgrove Road to the north of Oakdale East.

A formal application will need to be submitted to EE to determine existing HV capacity and confirm any lead-in requirements.

Refer to Drawing SKC012 in Appendix C for an indicative HV conduit layout plan.

8.4. Conclusion

This section demonstrates that services including sewer, water, power, telecommunications and gas can be made available to the site.

Internal reticulation will be coordinated at the Construction Certificate (CC) stage of works and applications to the relevant authorities.

9. Conclusion

As highlighted within this report all civil/stormwater drainage for the development, that is the Oakdale East development, has been designed in accordance with the Fairfield City Council requirements and guidelines.

Appendix A

Survey Drawings

LEGEND

BENCH MARK	▲
POWER POLE	● PP

NOTES

1. THE BOUNDARIES HAVE NOT BEEN MARKED
2. BOUNDARIES WITHIN THIS FILE HAVE BEEN ADDED FROM DCDB DATA OBTAINED FROM NSW LAND REGISTRY SERVICES AND ARE APPROXIMATE ONLY
3. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM **PM182649** R.L. **74.947** (A.H.D.) IN OLD WALLGROVE ROAD
4. CONTOUR INTERVAL **1.0 m**
5. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
6. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

0 16 24 32 48 64 80

SCALE 1:800 @ A1

Revision	Date	Description	Reference
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:

.....

Registered Surveyor NSW

LTS LOCKLEY
Registered Surveyors NSW
www.ltsl.com.au
Suite 1, Level 1
810 Pacific Highway
Gordon NSW 2072
Locked Bag 5
Gordon NSW 2072
P 1300 587 000
F 02 9499 7760

Client GOODMAN PROPERTY SERVICES (AUST) PTY LTD

Drawing title

PLAN OF DETAIL AND LEVELS OVER PART OF LOT 1 IN DP843901 KNOWN AS OAKDALE EAST ESTATE, KEMPS CREEK

datum AHD (GPS)

site Area N/A

LGA FAIRFIELD

reference number 50404 001DT

scale 1:800 @A1

date of survey 25/07/18

SHEET 1 OF 5

MGA

TN

APPROX 10DEC

1
DP 843901

ROAD

BITUMEN

FENCE

MESH

WIRE

EDGE

OF

ROAD

GRASS

EDGE

DIRT

TRACK

OF

GROUP OF TREES

BASE

TOP

STOCKPILE

STOCKPILE

GROUP OF TREES

BANK

BANK

ROAD

STOCKPILE

STOCKPILE

STOCKPILE

STOCKPILE

OF

OF

OF

OF

TOP

TOP

BASE

BASE

HAUL

TOP

WATER TANK

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REFER TO NOTES AND LEGEND

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

Revision	Date	Description	Reference
D	00/00/00	-	00
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datum AHD (GPS)
site Area N/A
LGA FAIRFIELD

reference number 50404 001DT
scale 1:400 @A1
date of survey 25/07/18
SHEET 2 OF 5

MGA

TN

APPROX

1
DP 843901

HAUL ROAD

HAUL ROAD

ROAD

STOCKPILE

BASE

TOP

OF

DIAL BEFORE YOU DIG
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REFER TO NOTES AND LEGEND

0 8 12 16 24 32 40
SCALE 1: 400 @ A1

Revision	Date	Description	Reference
D	00/00/00	-	00
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datum AHD (GPS)
site Area N/A
LGA FAIRFIELD

reference number 50404 001DT
scale 1:400 @A1
date of survey 25/07/18
SHEET 3 OF 5

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REFER TO NOTES AND LEGEND

0 8 12 16 24 32 40

SCALE 1:400 @ A1

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datum AHD (GPS)

site Area N/A

LGA FAIRFIELD

reference number 50404 001DT

scale 1:400 @A1

date of survey 25/07/18

SHEET 4 OF 5

DIAL BEFORE YOU DIG www.1100.com.au

REFER TO NOTES AND LEGEND

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SCALE 1: 400 @ A1

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site Area N/A

LGA FAIRFIELD

reference number 50404 001DT

scale 1:400 @A1

date of survey 25/07/18

SHEET 5 OF 5

Appendix B

Dial Before You Dig Records

A0

MILLNER AVE

RD

OLD WALLGROVE RD

BURLEY RD

RESERVED

20.12 W.

Railway

CL

DBYD Address:
n/a Millner Avenue
Eastern Creek NSW 2175

DBYD Job No: 14448220

DBYD Sequence No: 72756370

SYDNEY WATER CORPORATION

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

Scale: 1:2000

Date of Production: 23/06/2018 13:40:24

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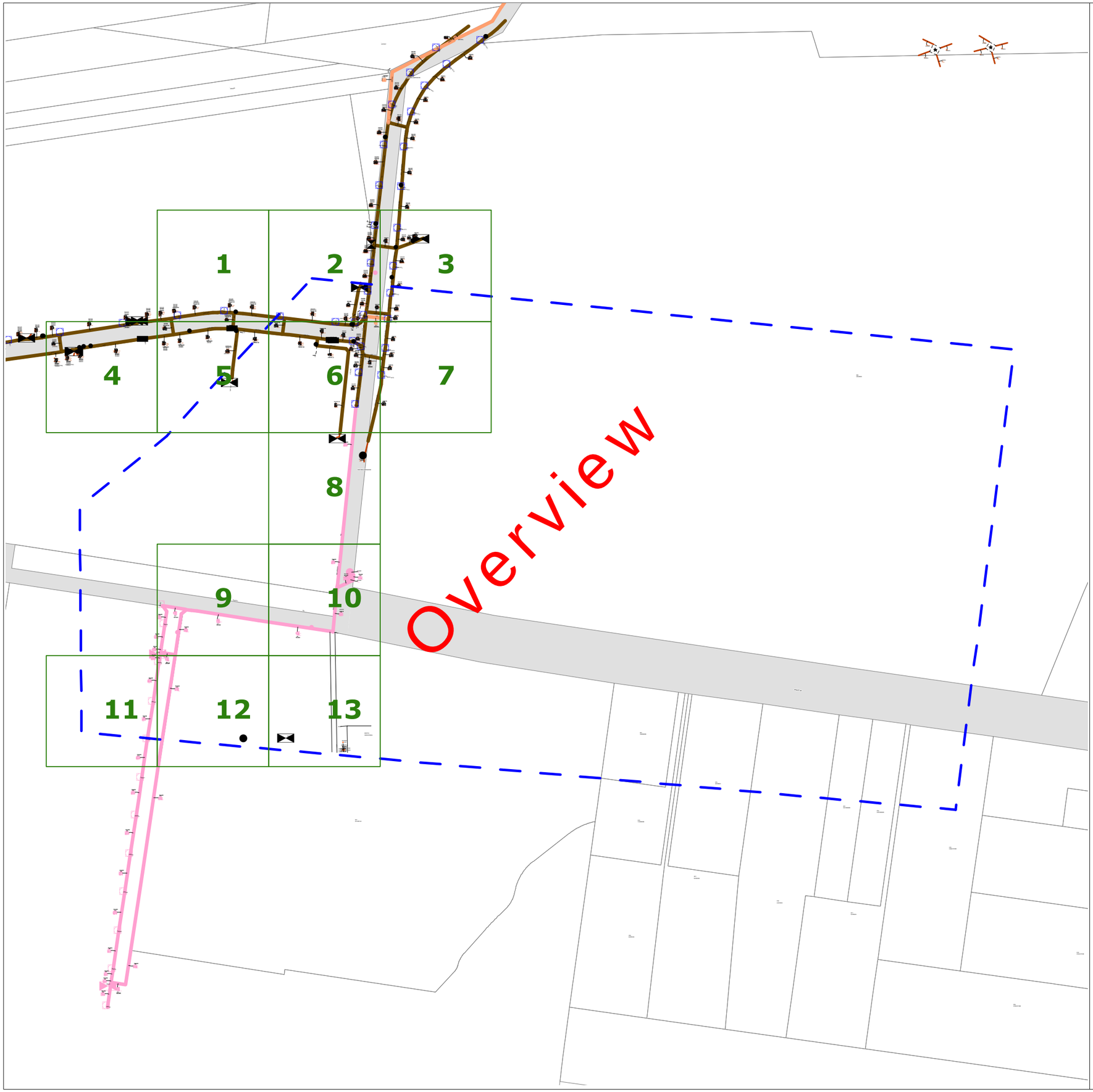

Endeavour Energy

WARNING

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- The customer must contact Endeavour Energy if any of the plans provided have blank pages, as some underground asset information may be incomplete.
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LEGEND

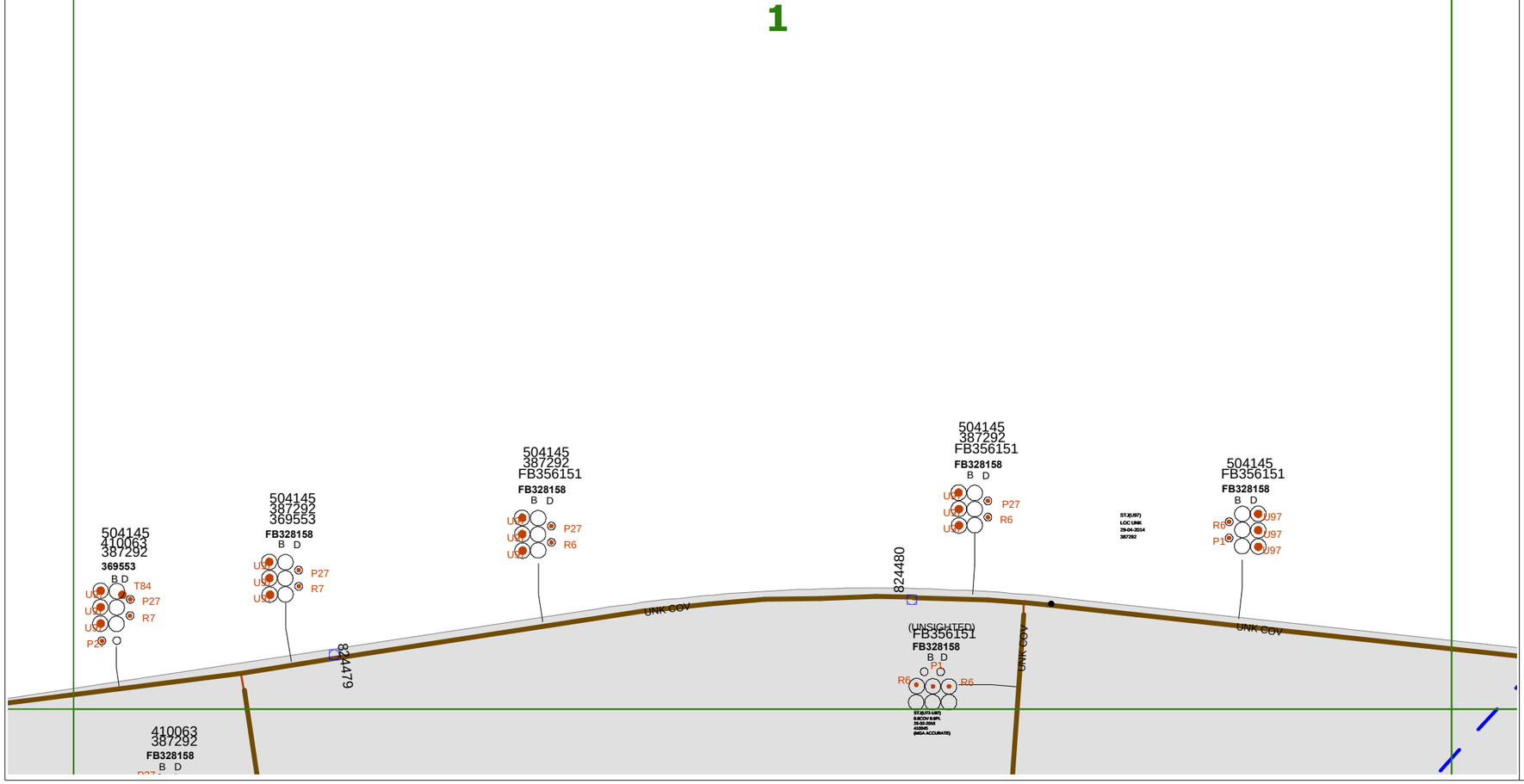
- or — Street light column
- Padmount substation
- or — Overground pillar (O.G.Box)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

NOT TO SCALE

DBYD Sequence No.:	72756366
Issued Date:	23/06/2018

1



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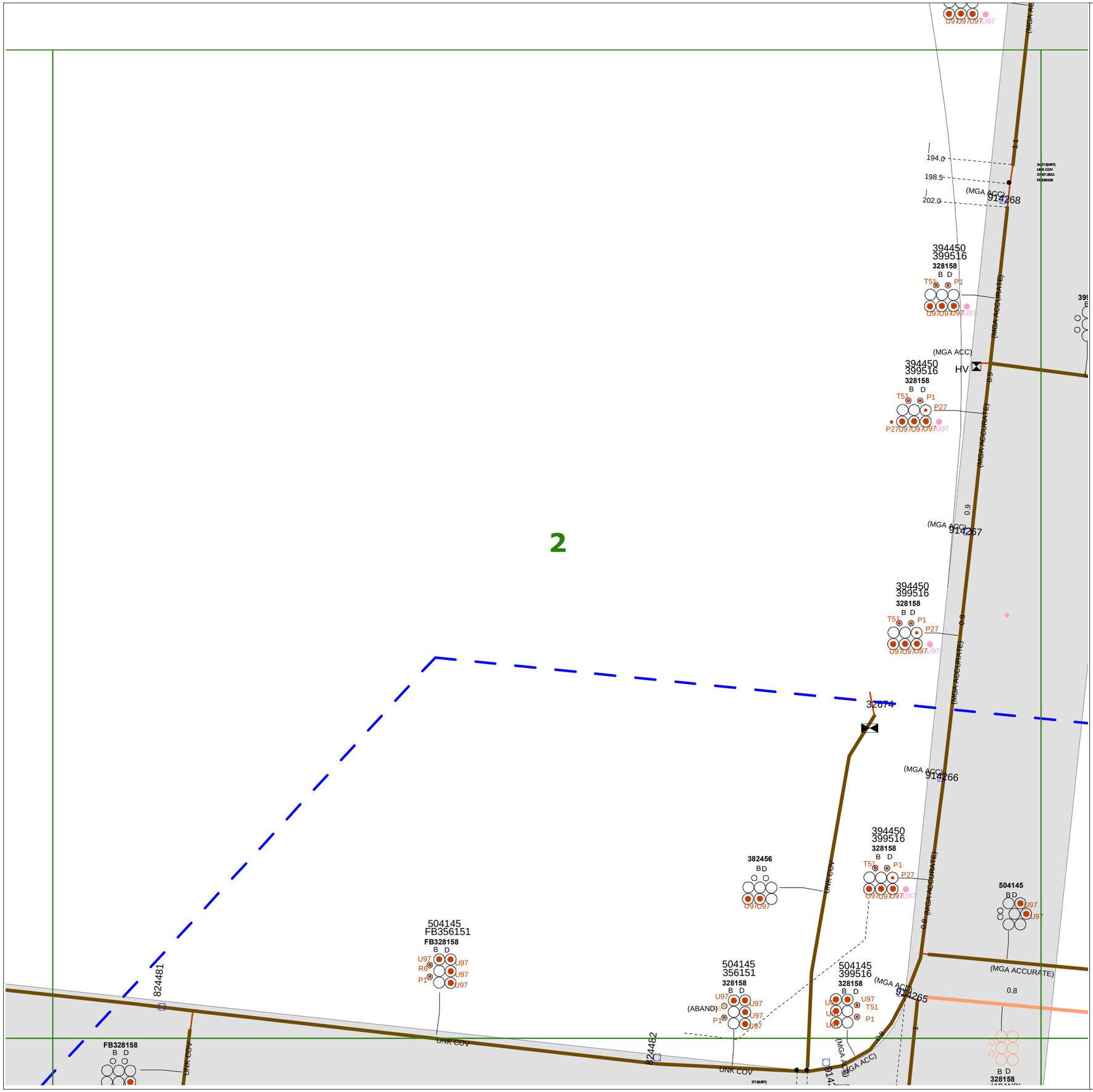

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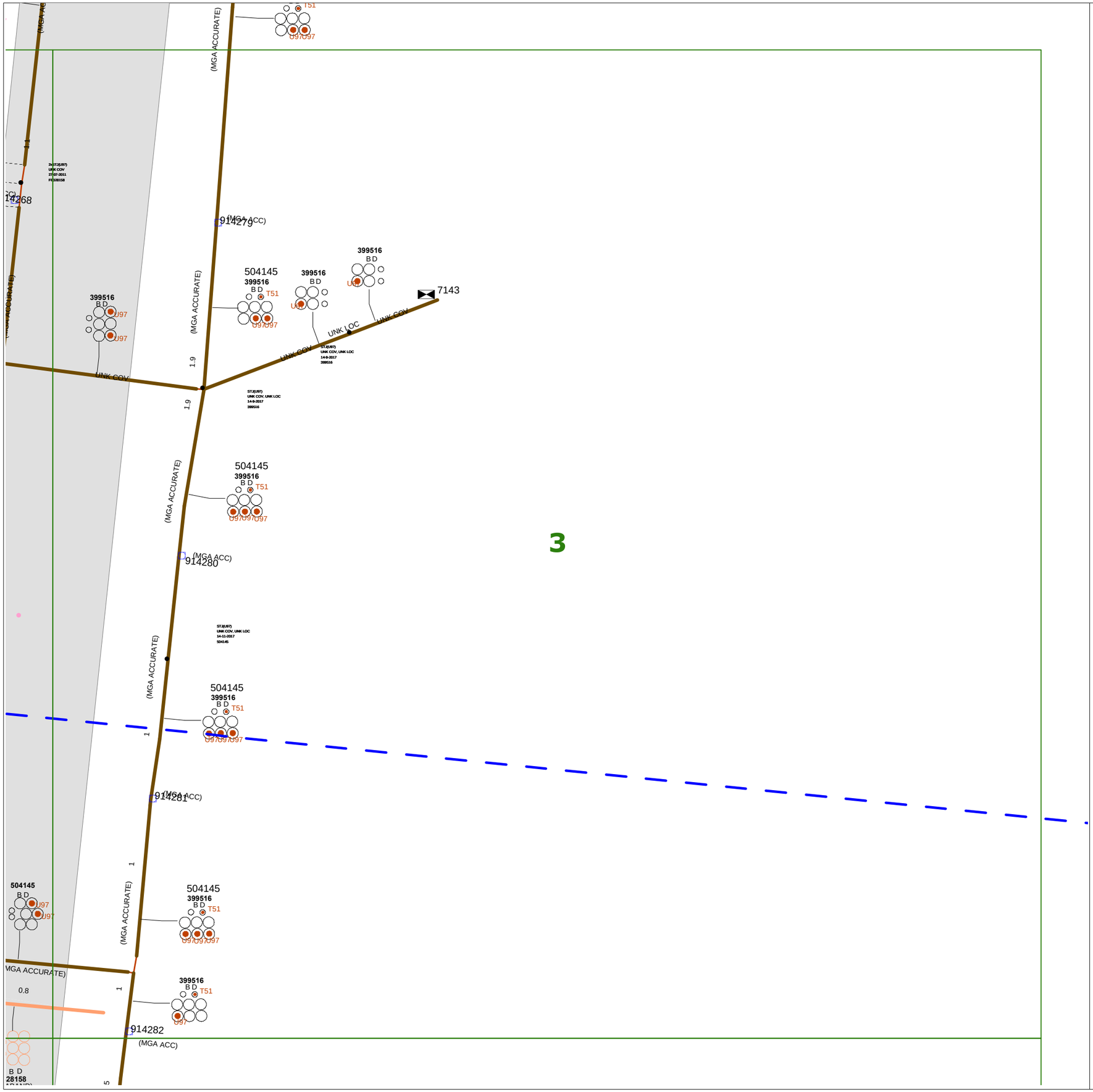

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- Padmount substation
- Overground pillar (O.G.Box) (or)
- Underground pit
- Duct run
- Cable run
- Typical duct section
- Asbestos warning

N

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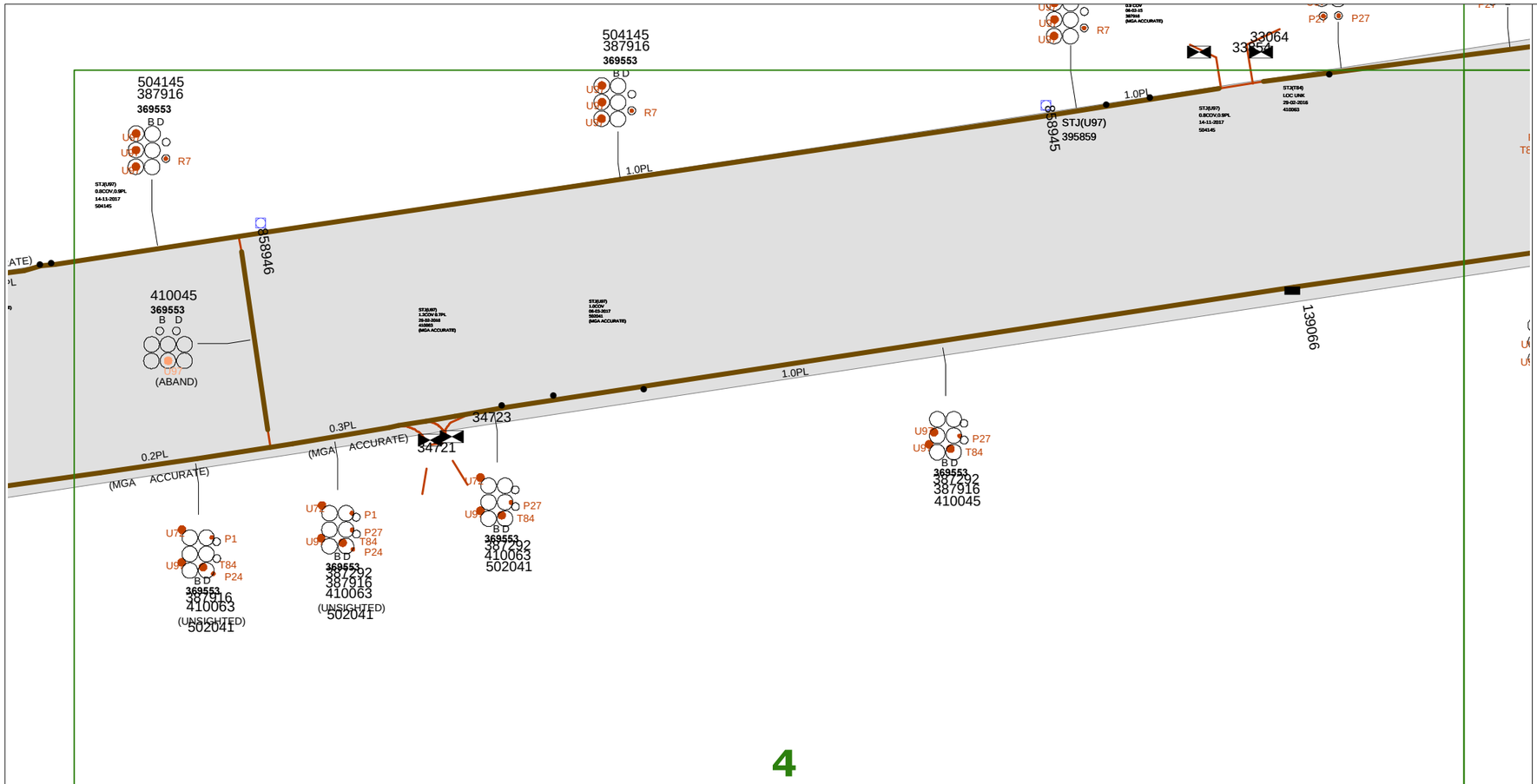

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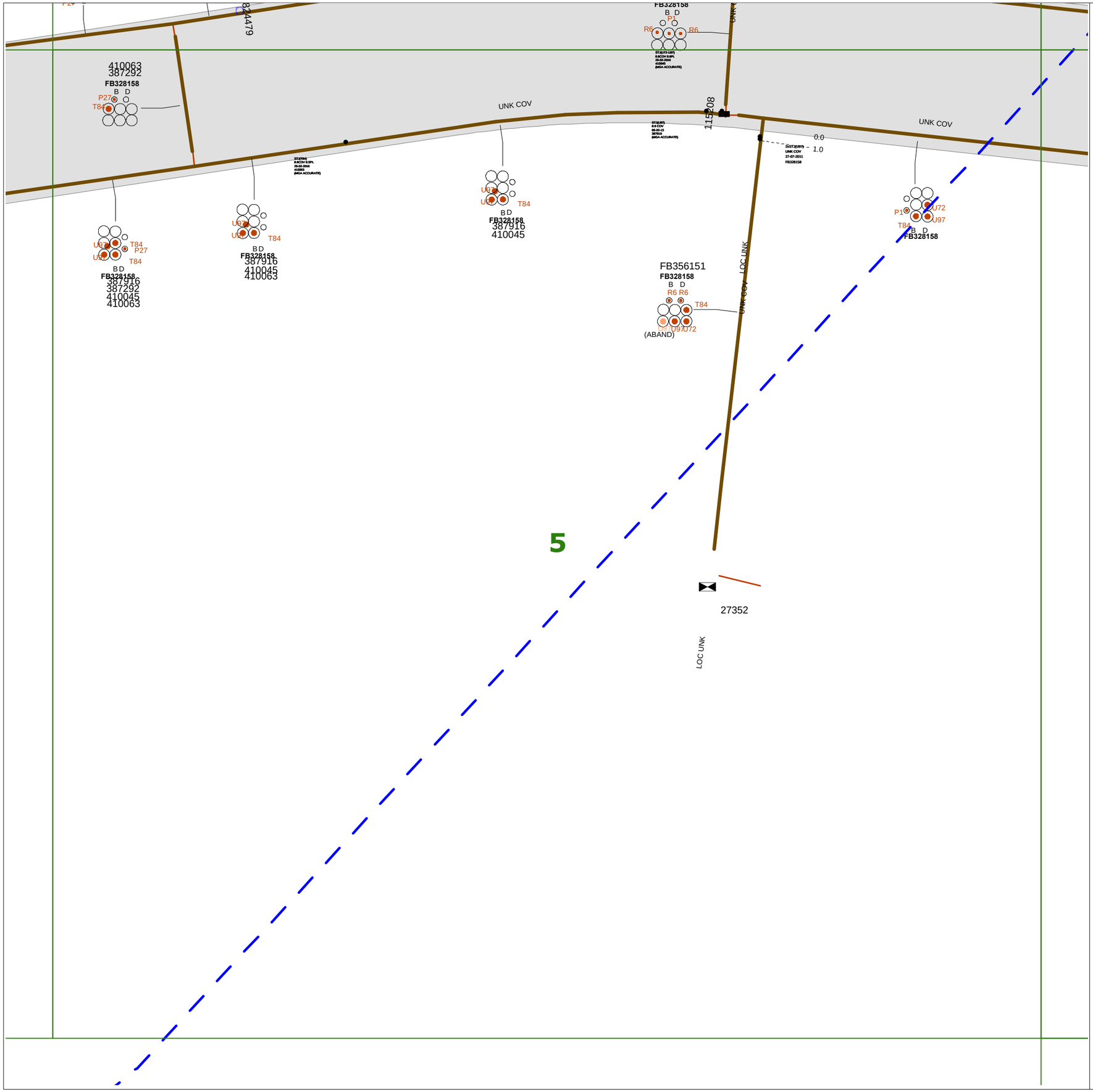

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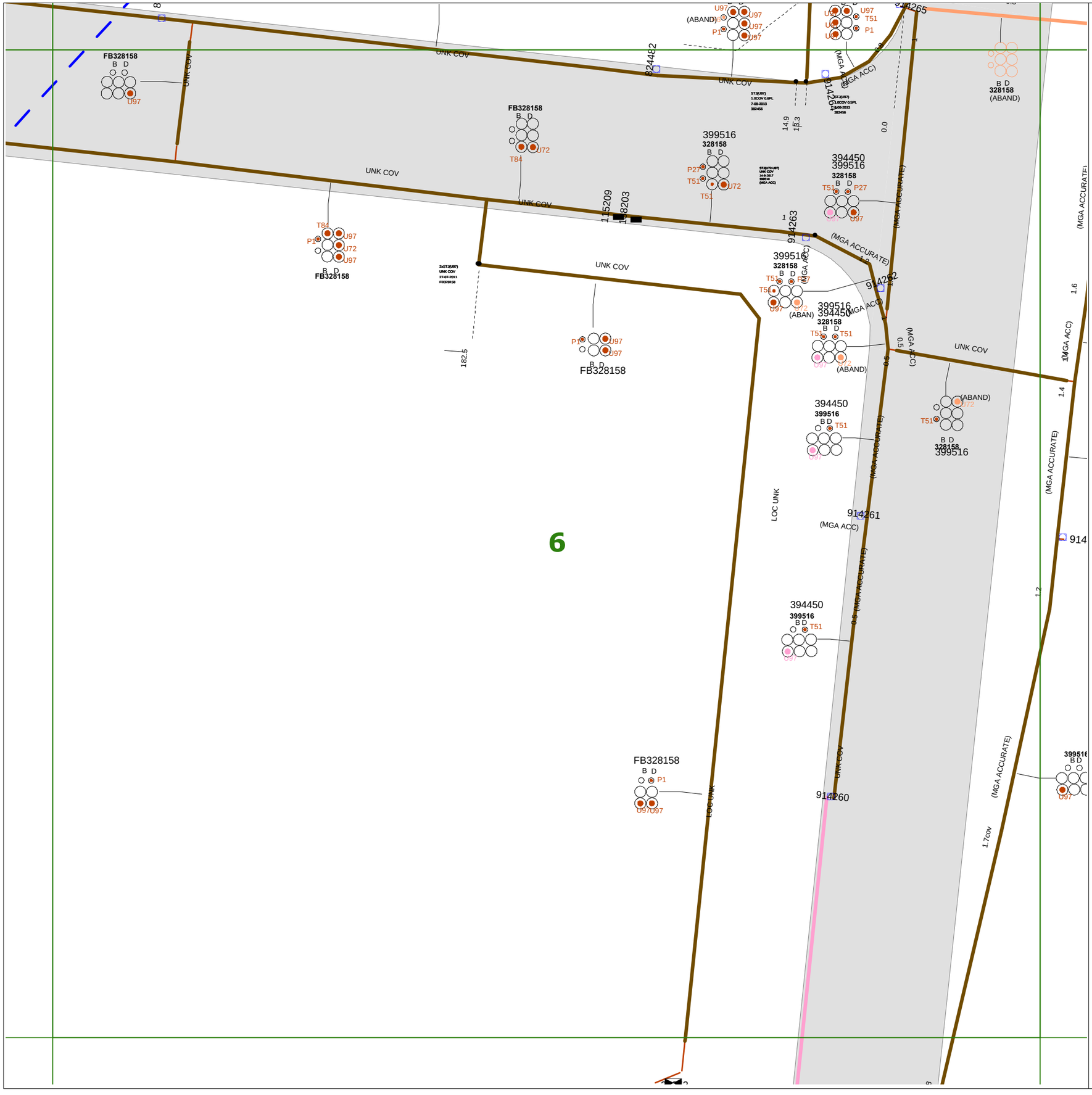
Issued Date:	23/06/2018



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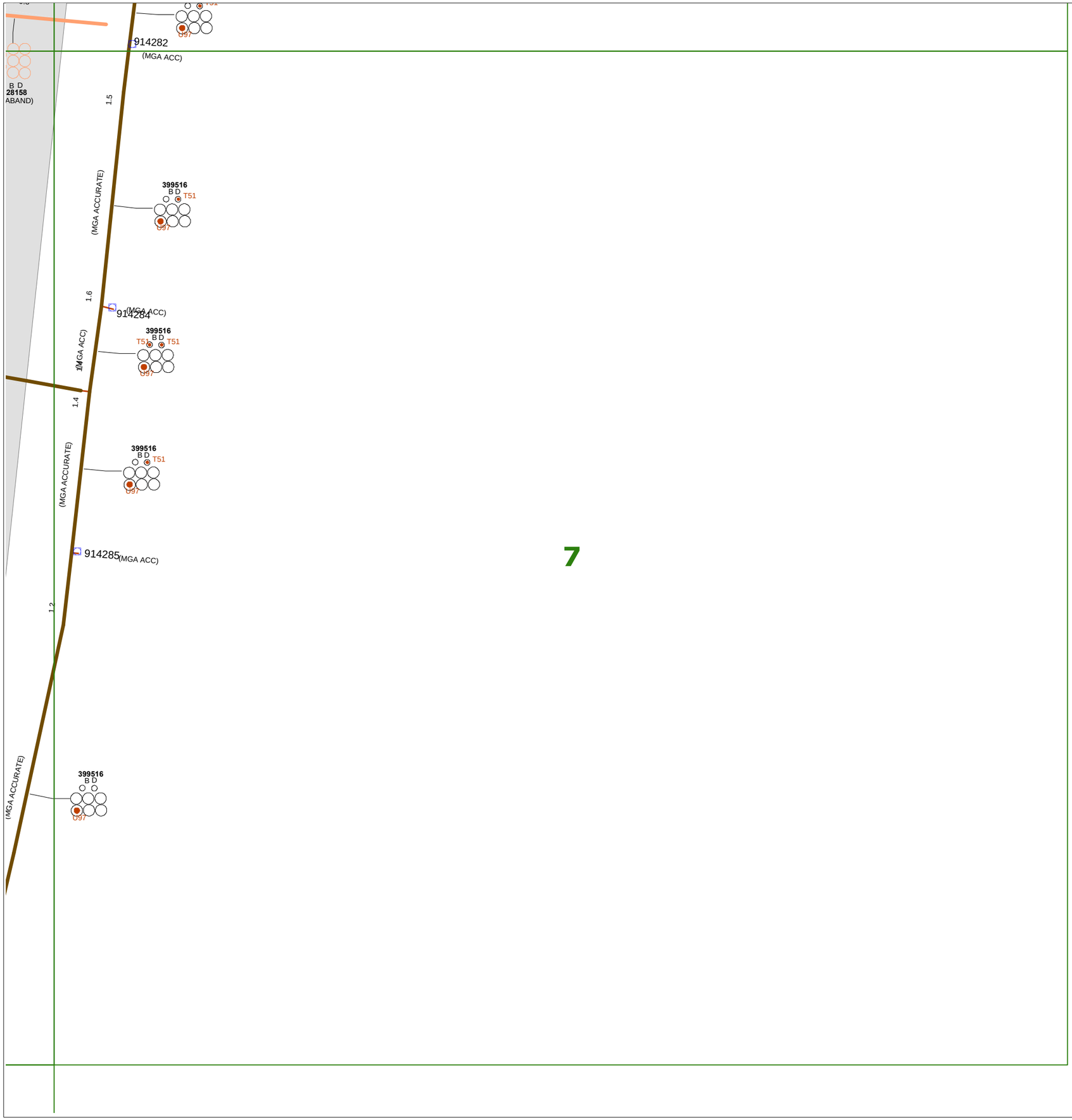

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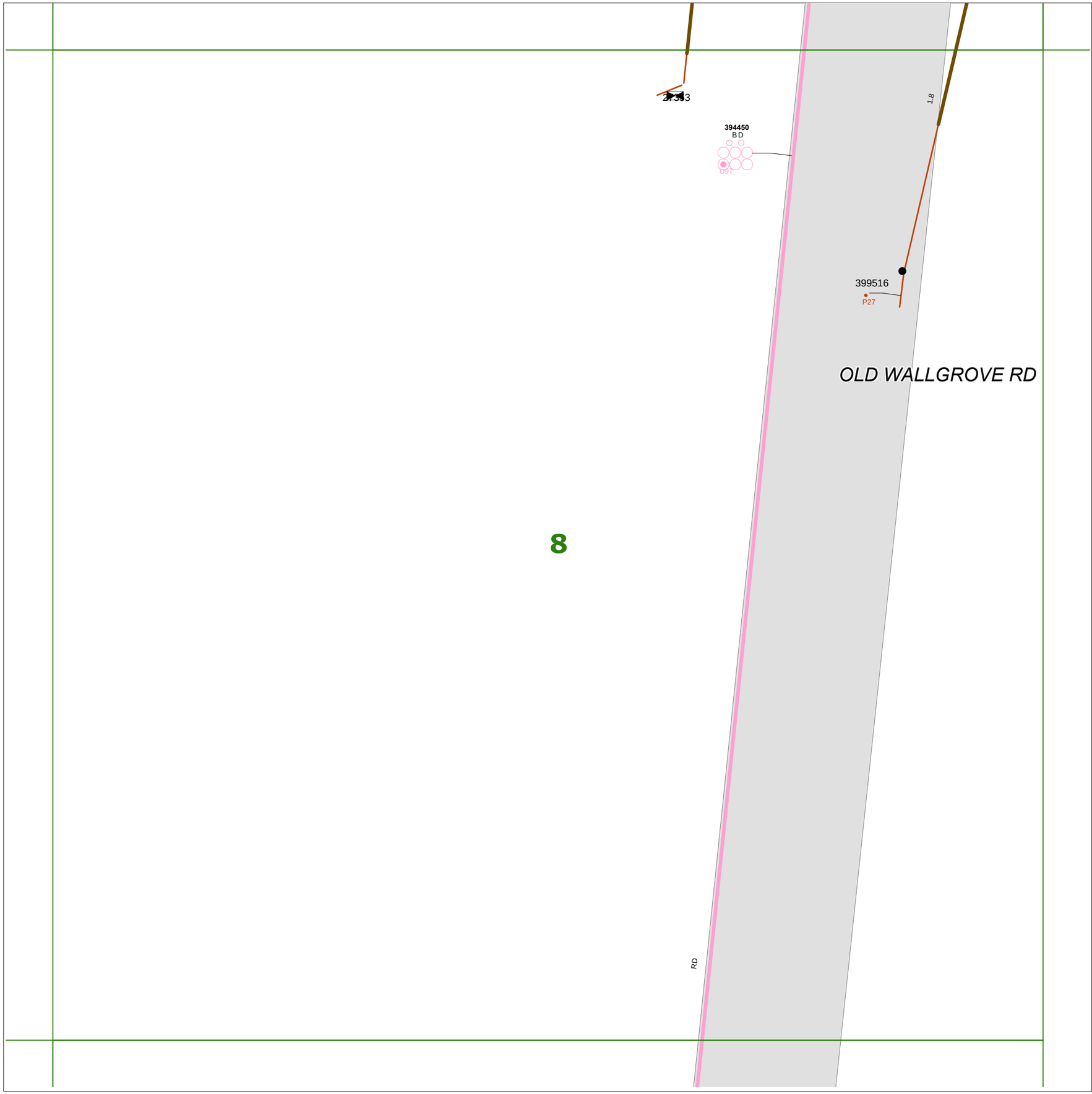

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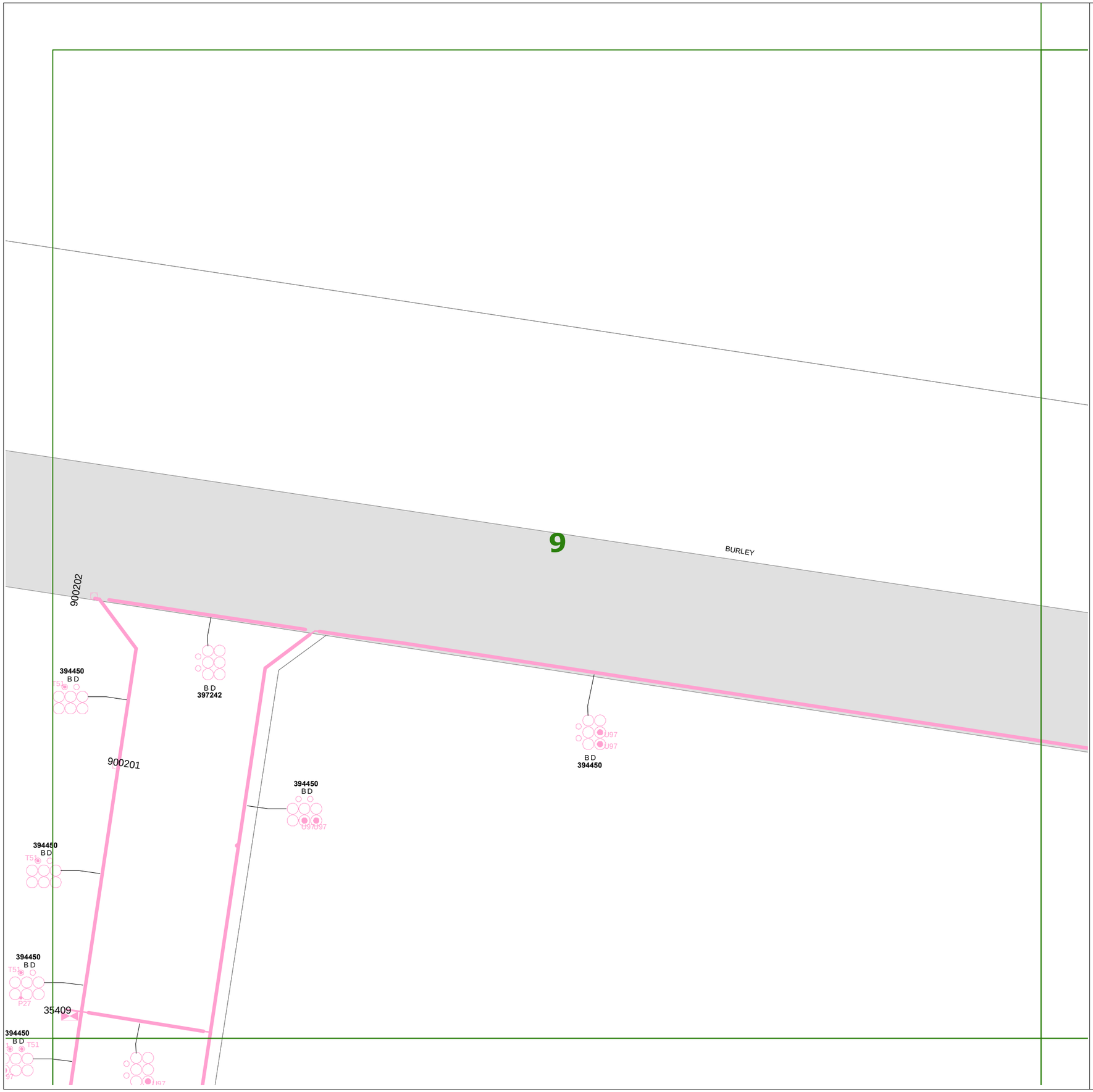

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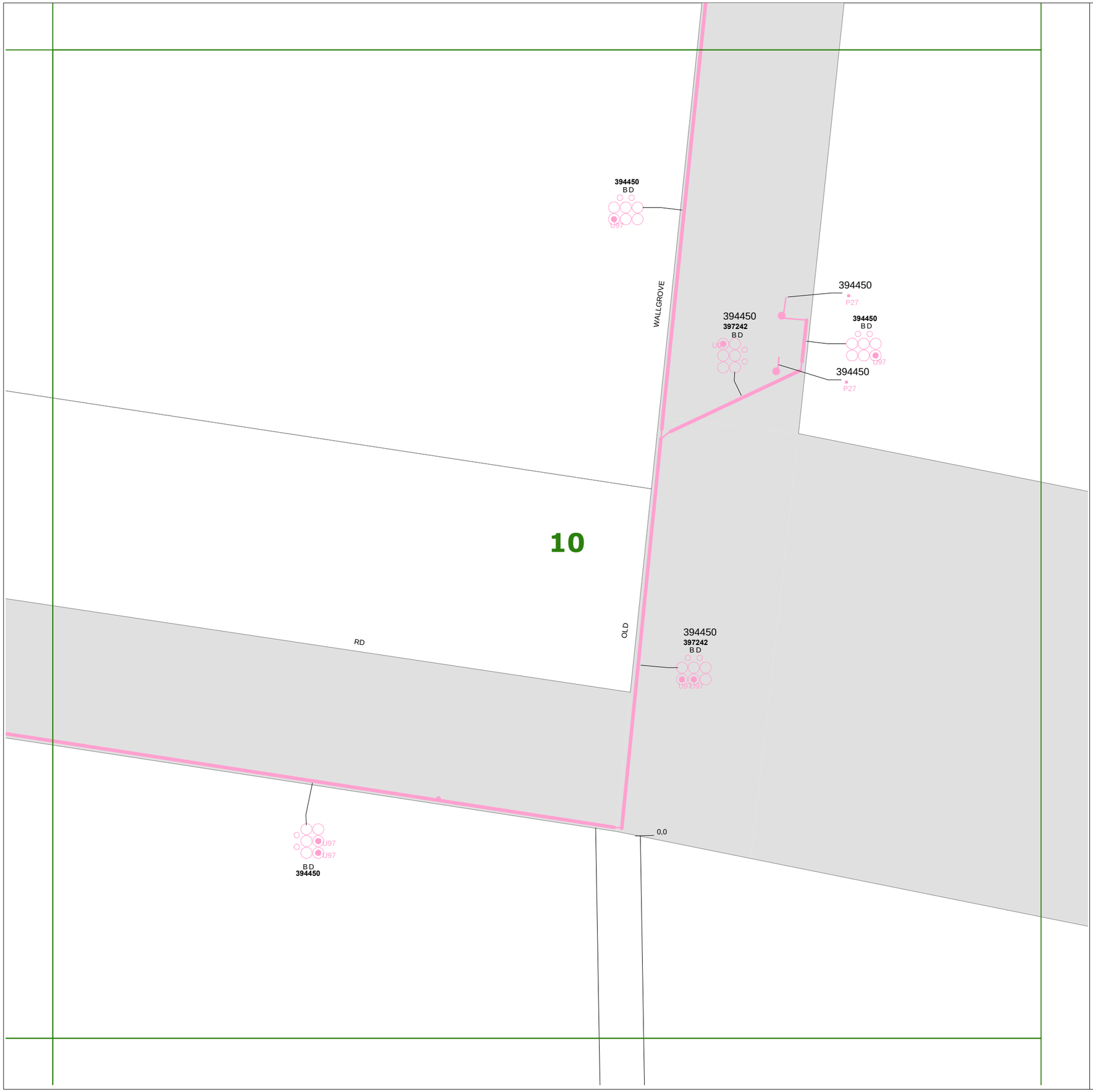

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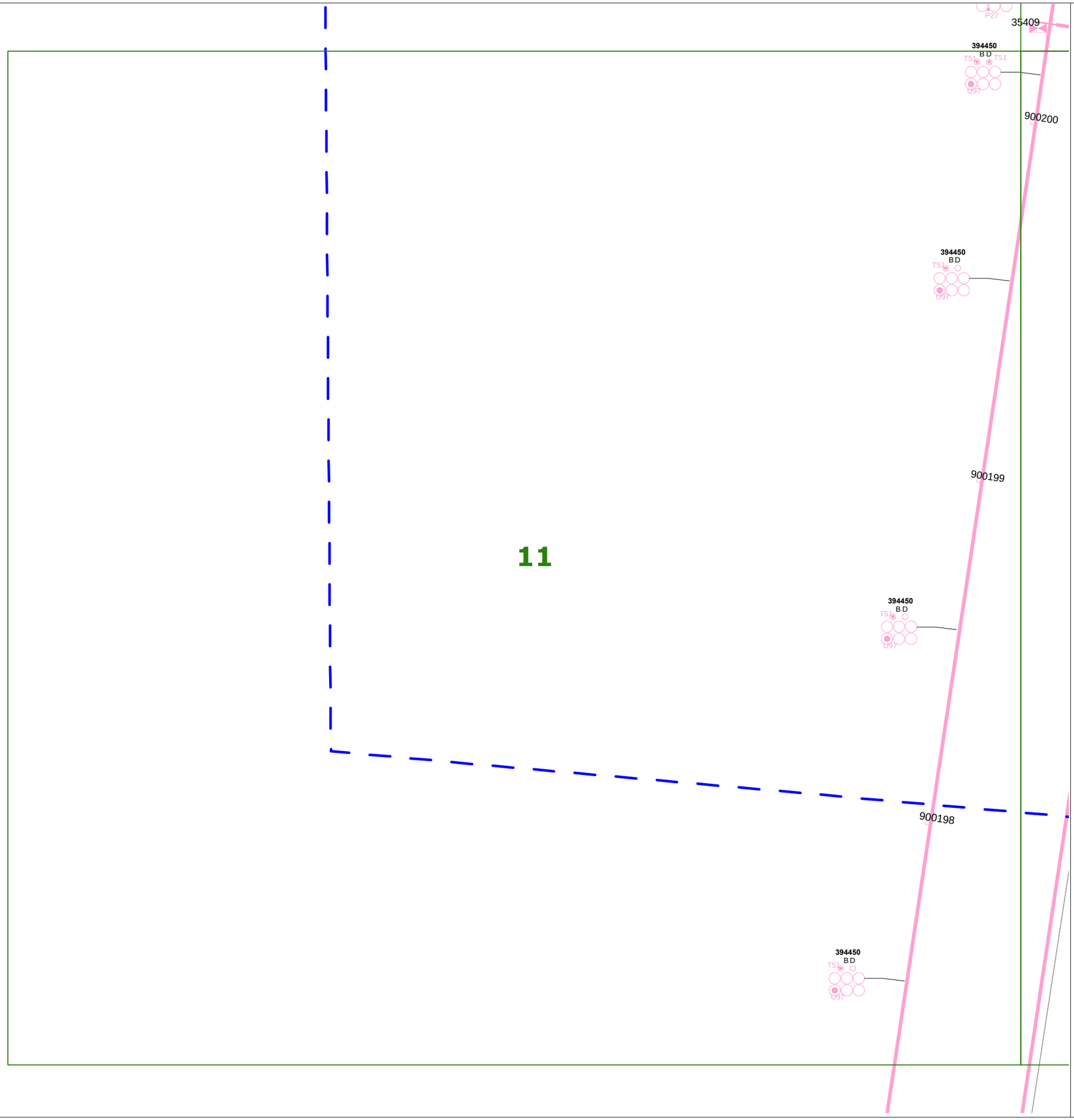

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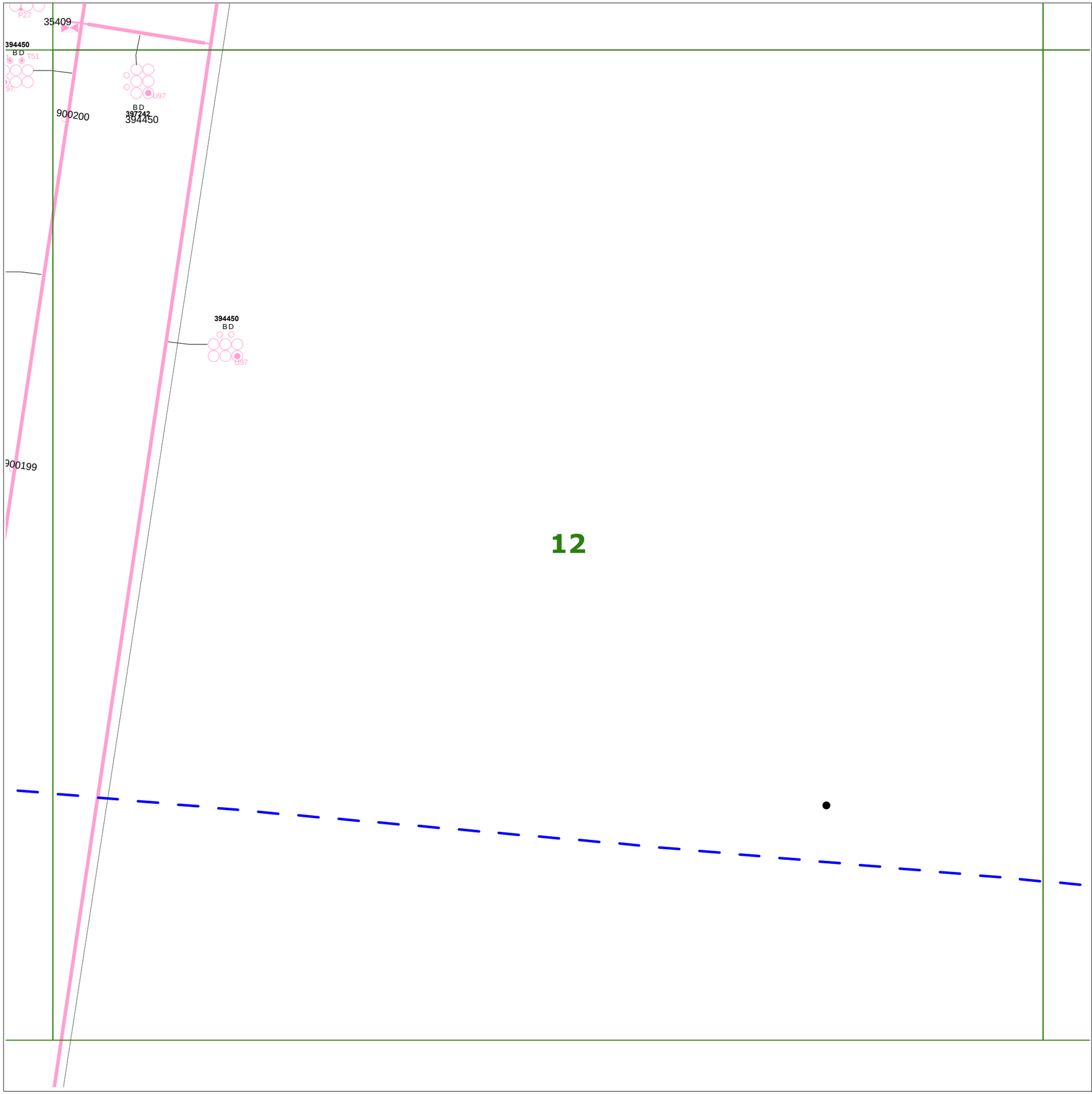

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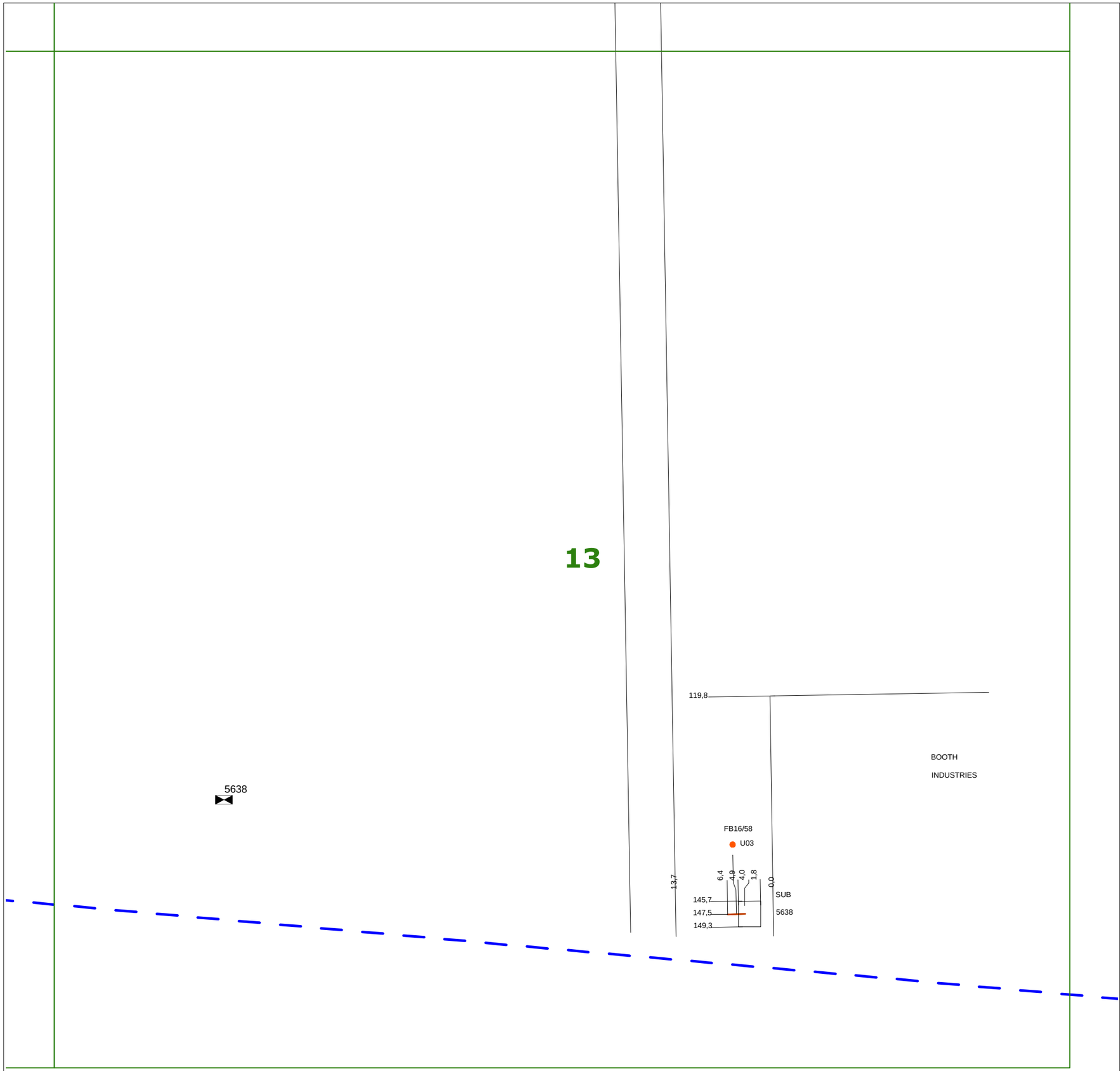

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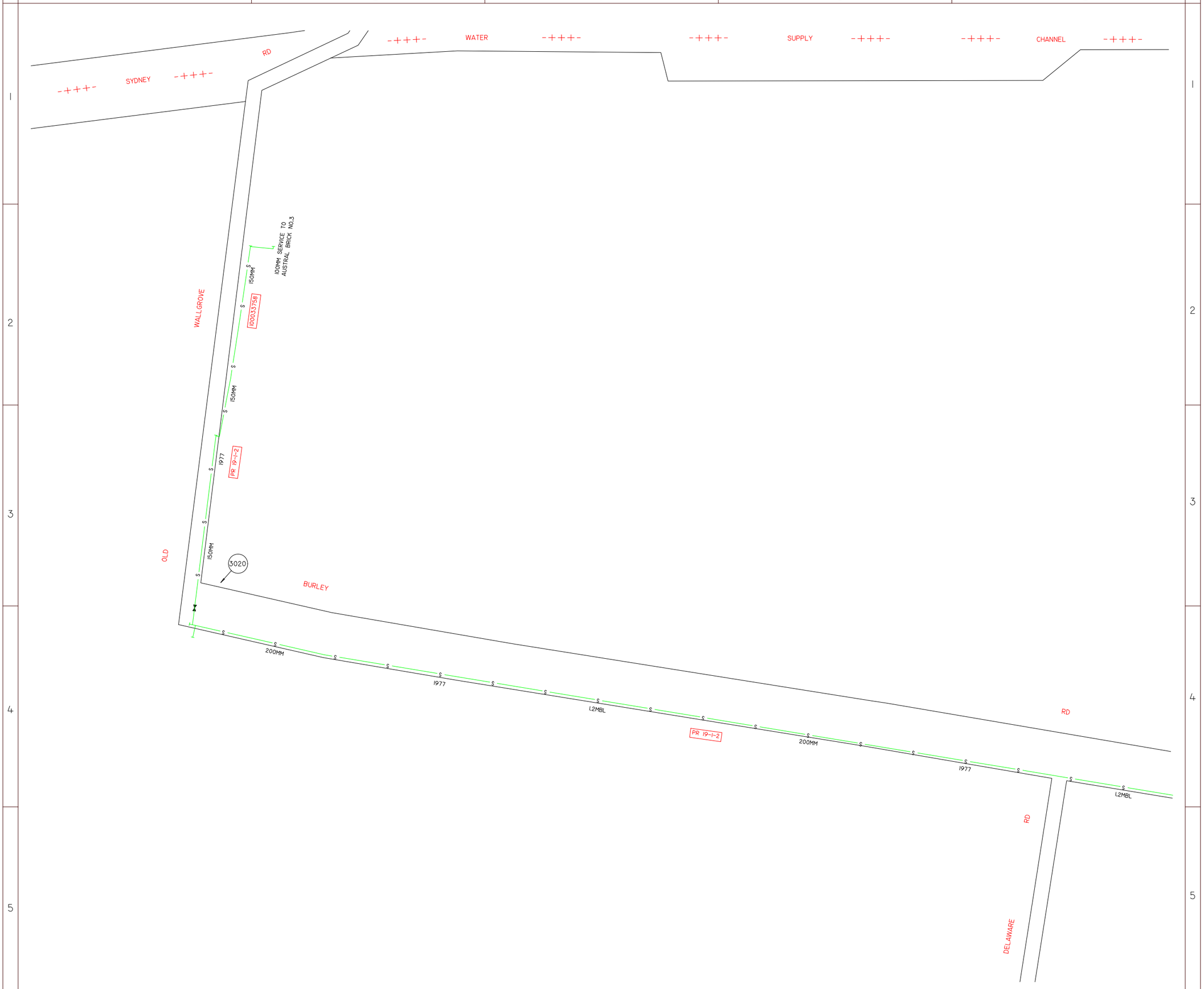

HORSLEY PARK 4D

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 04/03/2016
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

HP4A	HP4B	HP5A
HP4C	HP4D	HP5C
HP7A	HP7B	HP8A

ADJOINING MAPS

NETWORK AREA

BLACKTOWN
FAIRFIELD

MUNICIPALITY AREA

Jemena NG

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
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

HORSLEY PARK 4D

Sequence Number: 72756368

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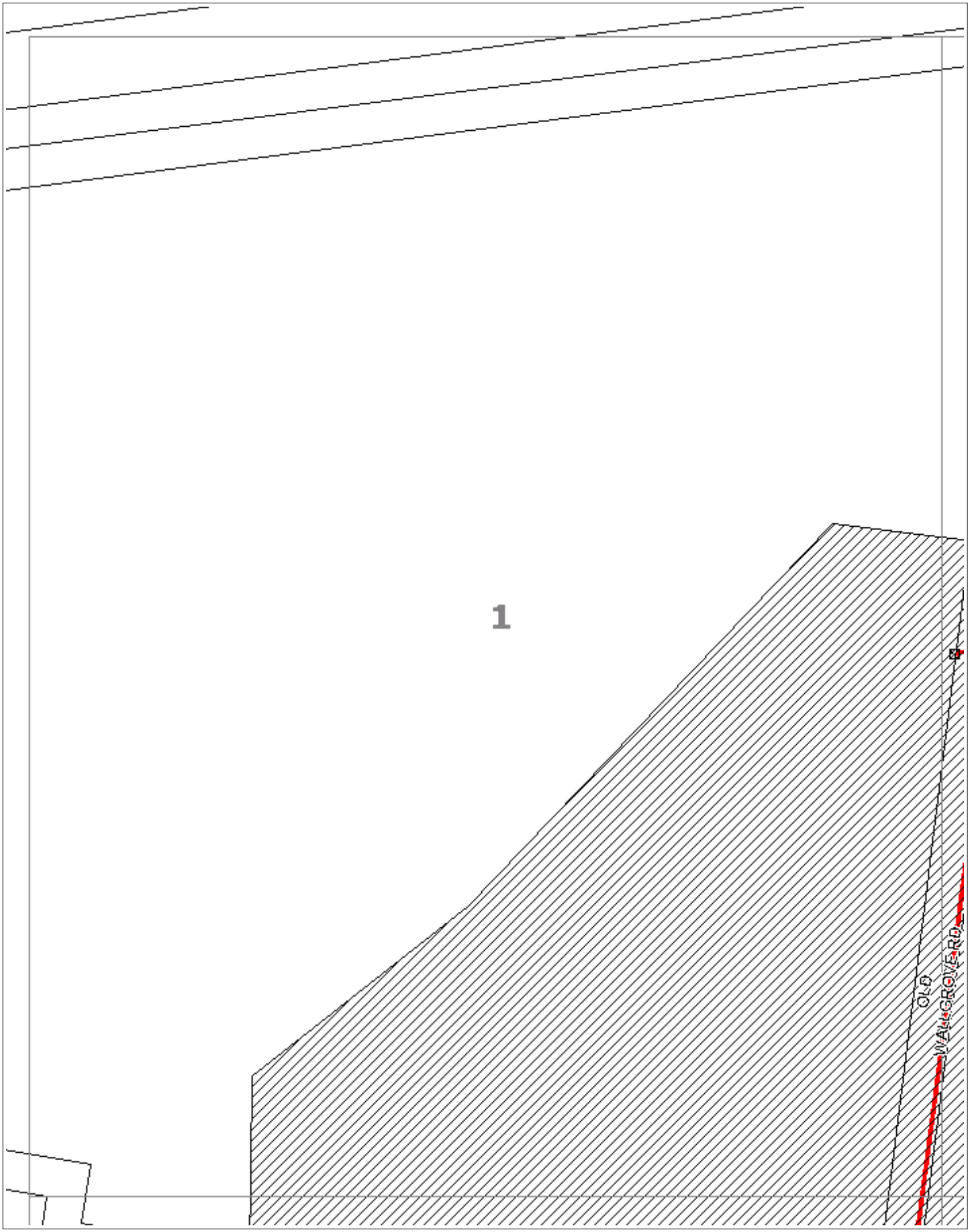

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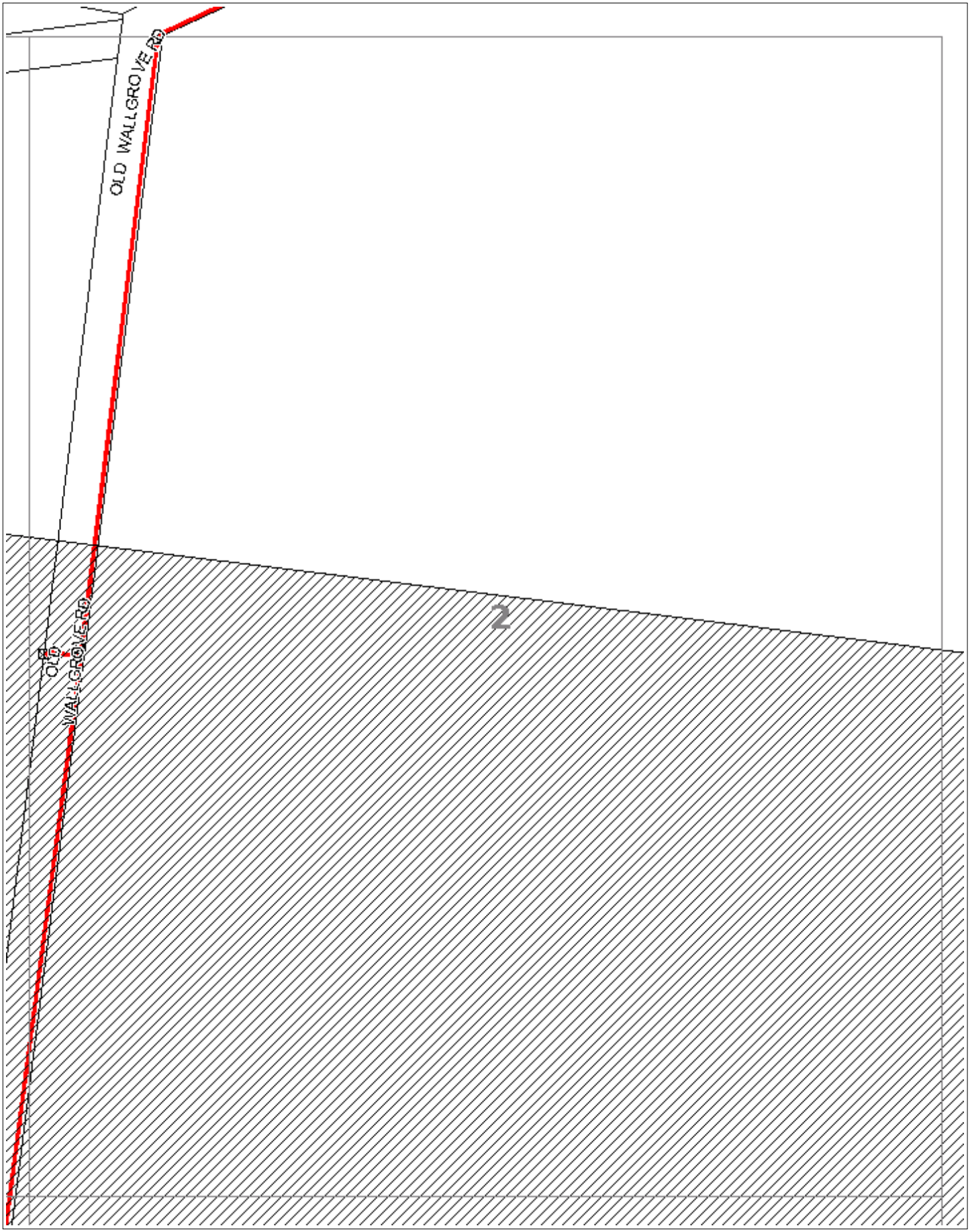

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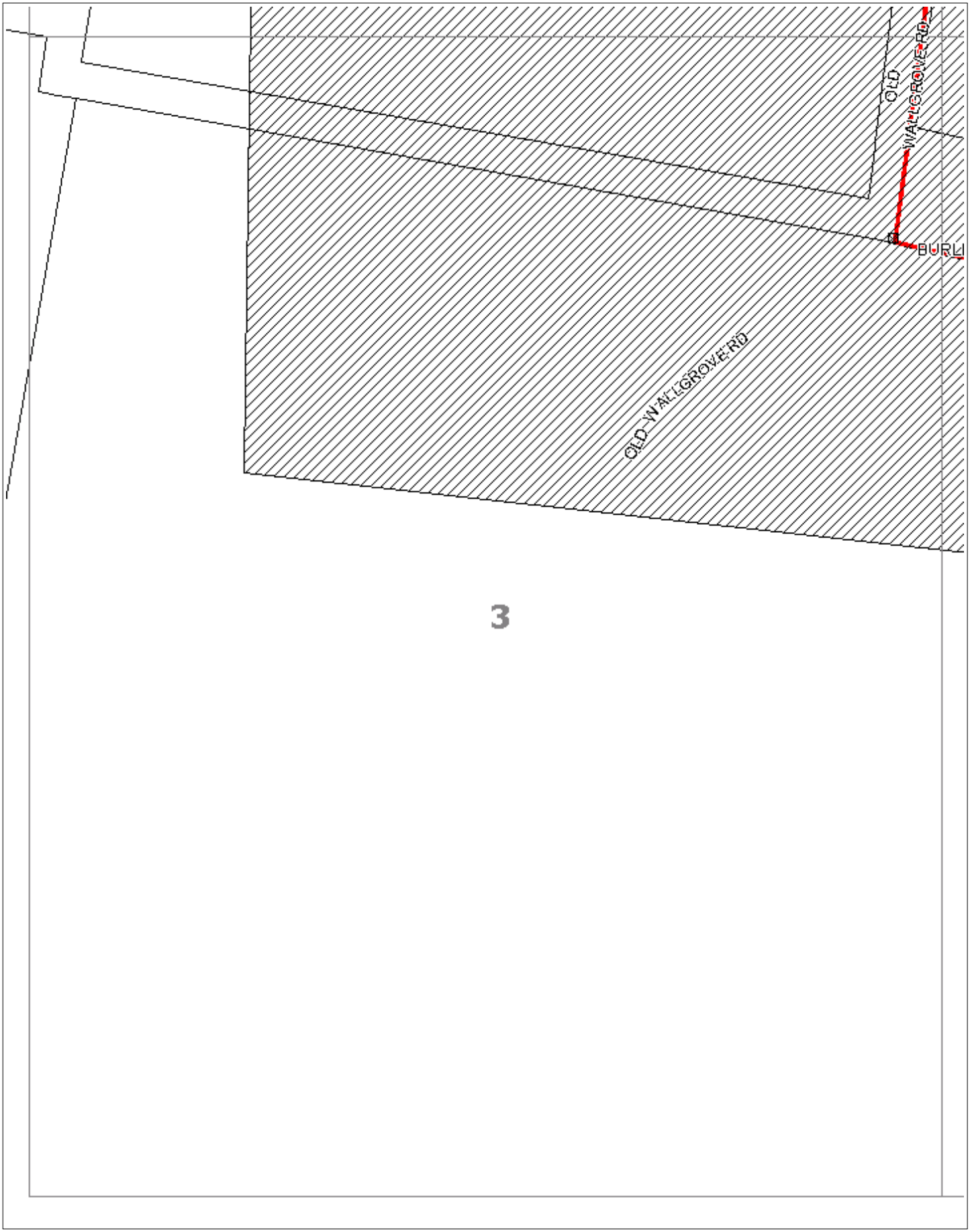

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LEGEND

IT'S HOW WE CONNECT

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

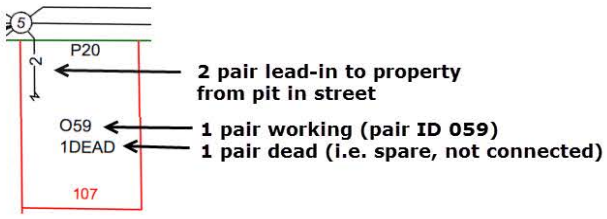
Exchange
(major cable present)

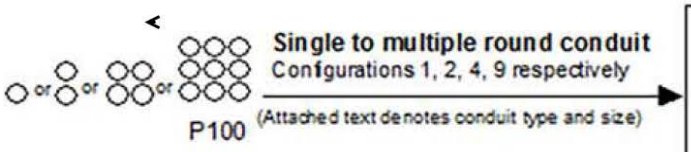
Footway access chamber
(can vary from 1-lid to 12-lid)

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

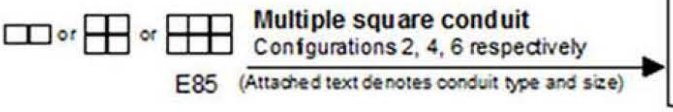
Above ground complex equipment housing (eg RIM)
Please Note: This equipment is powered by 240V electricity.

OC **other carrier**





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



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

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

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

Cable jointing pit
(number indicating pit type)

Elevated cable joint
(above ground joint on buried cable)

Telstra Plant in shared utility trench

Aerial Cable
(above ground)

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

Direct buried cable

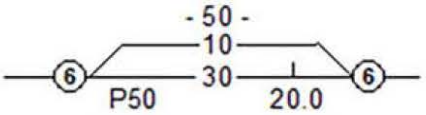
M **Marker post installed**

TR **Buried transponder**

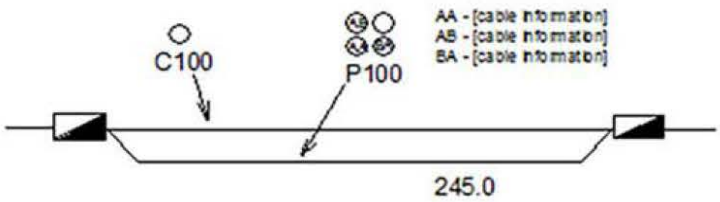
MT **Marker, transponder**

SMOF **Optical fibre cable direct buried**

Some examples of how to read Telstra plans:

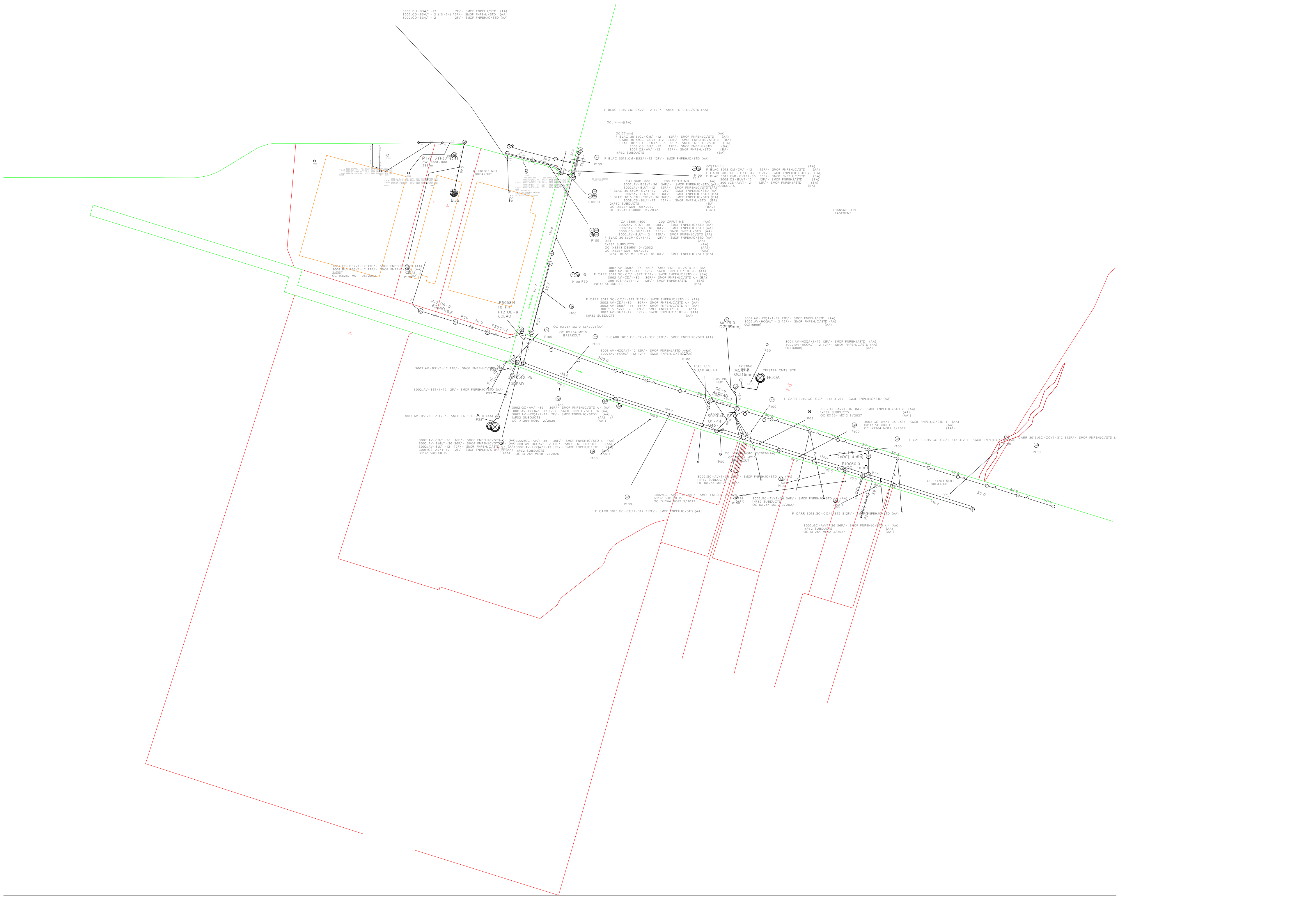


One 50mm PVC conduit (P50) containing a 50-pair and a 10-pair cable between two 6-pits, 20.0m apart, with a direct buried 30-pair cable along the same route.



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

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


3008:BU-B34/1-12 12F/- SMOF FNPEHJC/STD (AA)
3002:CD-B34/1-12 (13-24) 12F/- SMOF FNPEHJC/STD (AA)
3002:CD-B34/1-12 12F/- SMOF FNPEHJC/STD (AA)
F BLAC 3015:CM-B52/1-12 12F/- SMOF FNPEHJC/STD (AA)
P16 200/900
B32
OC IX8287 M01 BREAKOUT
P100
P100CE
TRANSMISSION EASEMENT
3002:CD-B32/1-12 12F/- SMOF FNPEHJC/STD (AA)
P12:06-9 6DEAD
P50
OC IX1264 M010 12/2026(AA)
OC IX1264 M010 BREAKOUT
F CARR 3015:GC-CC/1-312 312F/- SMOF FNPEHJC/STD (AA)
3001:AV-HOQA/1-12 12F/- SMOF FNPEHJC/STD (AA)
3002:AV-HOQA/1-12 12F/- SMOF FNPEHJC/STD (AA)
3002:AV-B51/1-12 12F/- SMOF FNPEHJC/STD (AA)
P35 0.5
50/0.40 PE
EXISTING HUT
TELSTRA CMTS SITE
HOQA
P63
3002:GC-AV/1-36 36F/- SMOF FNPEHJC/STD (AA)
1xP32 SUBDUCTS
OC IX1264 M012 3/2027
OC IX1264 M012 BREAKOUT
P100

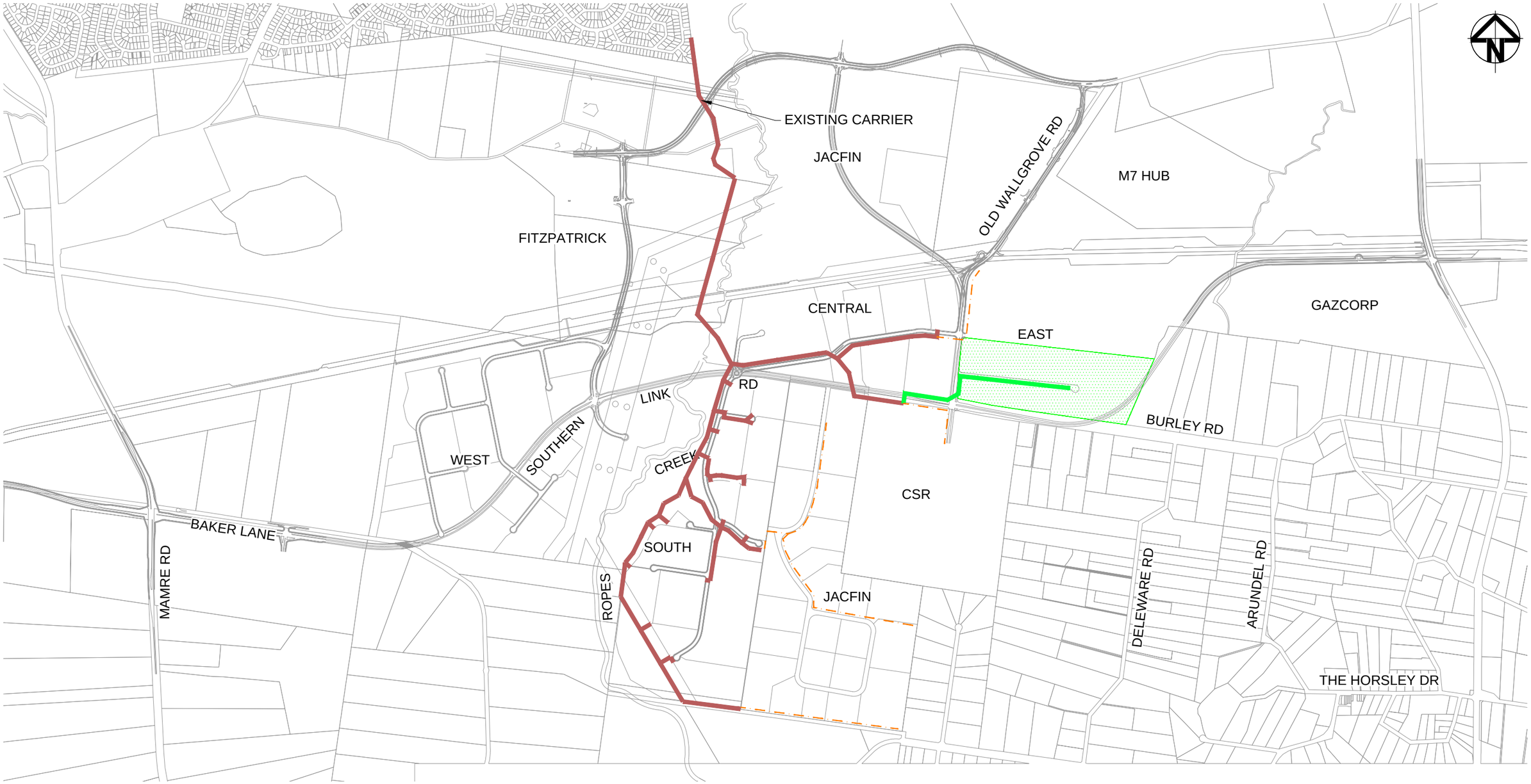
Appendix C

Indicative Utility Servicing Strategy Drawings

OAKDALE EAST INDUSTRIAL DEVELOPMENT

SEWER STRATEGY
CONCEPT SCHEME PLAN
SEPTEMBER 2018

at&l



PROPOSED SCHEME
Diameter (mm)
Existing
Proposed
Future Connections

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC010	18-563	P1

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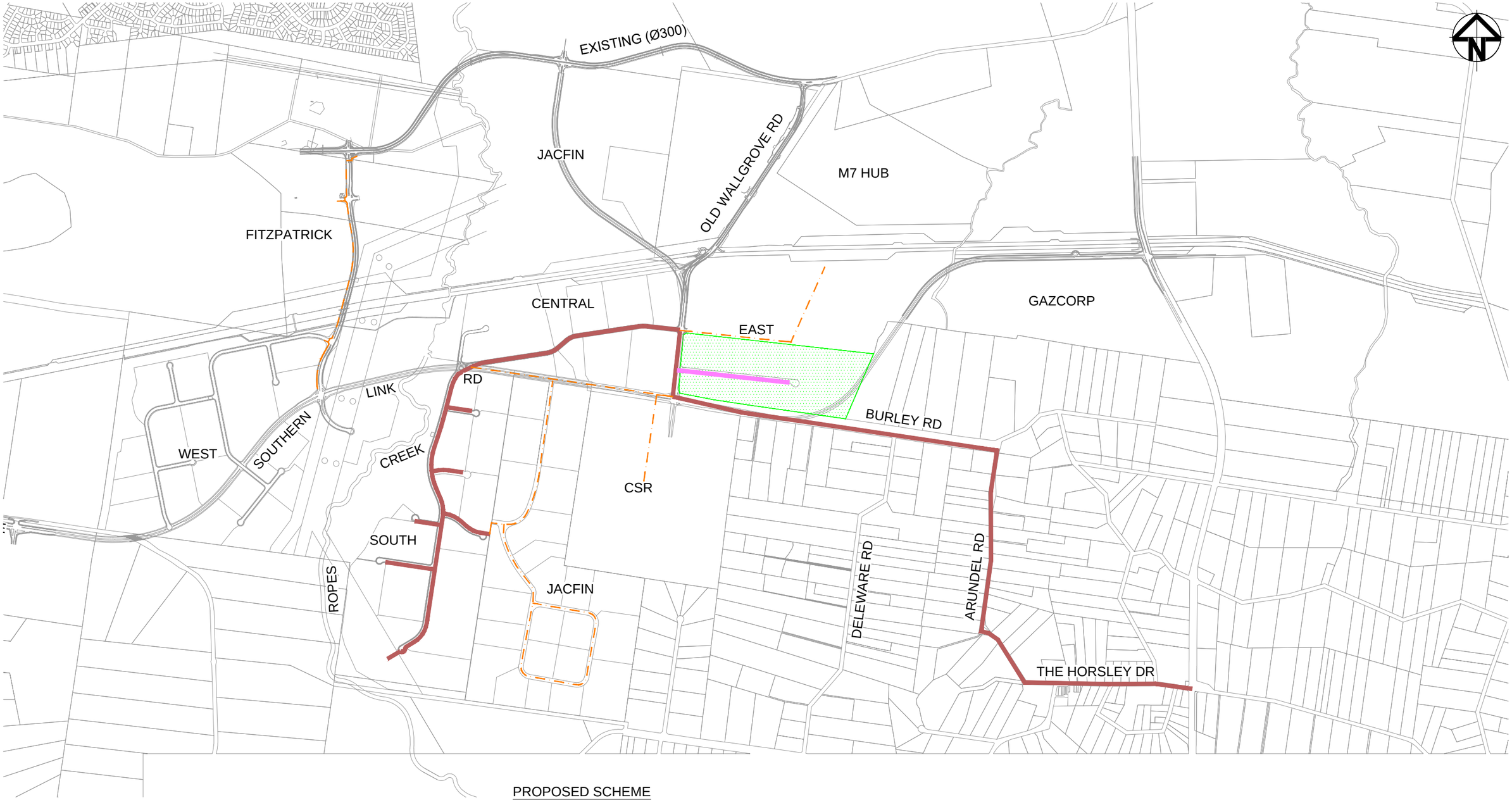
OAKDALE EAST INDUSTRIAL DEVELOPMENT

POTABLE WATER STRATEGY
CONCEPT SCHEME PLAN
SEPTEMBER 2018

at&l



PROPOSED SCHEME
Diameter (mm)
Existing
Proposed
Future Connections

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		A3
CONCEPT		
Drawing No.	Project No.	Issue
SKC011	18-563	P1

F:\18-563 Oakdale East\Drgs\Civil\Sketches\SKC011-POTABLE WATER STRATEGY.dwg

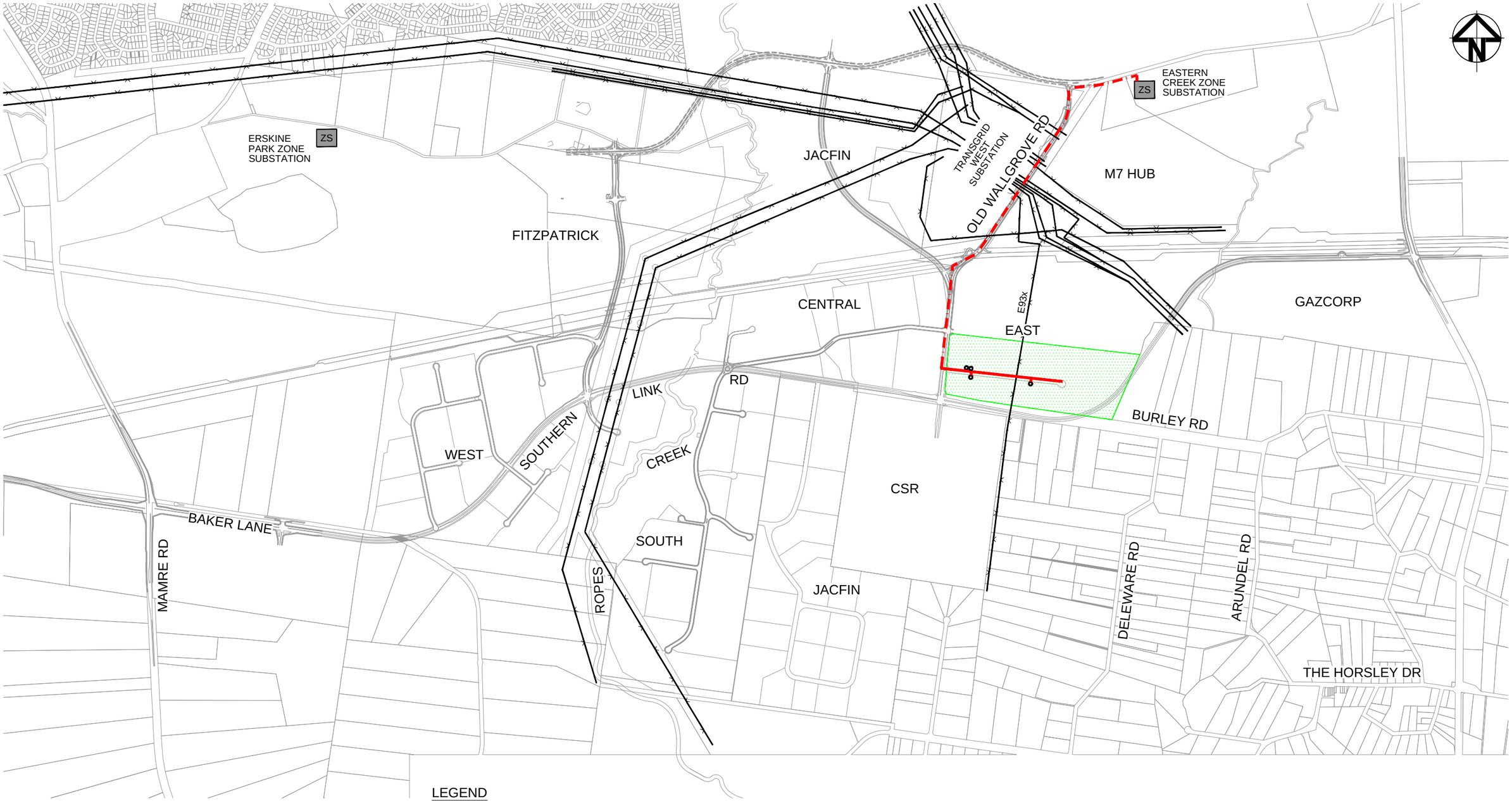
OAKDALE EAST INDUSTRIAL DEVELOPMENT

HIGH VOLTAGE

CONCEPT SCHEME PLAN

SEPTEMBER 2018

at&l



LEGEND

- Proposed Pad Mount Kiosk
- Proposed 11kV Reticulation
- Proposed Stage 1 11kV feeds to Eastern Creek Zone Substation
- Existing Overhead Transmission Cables

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC012	18-563	P1

F:\18-563 Oakdale East\Drgs\Civil\Sketches\SKC012-HIGH VOLTAGE CONCEPT SCHEME.dwg

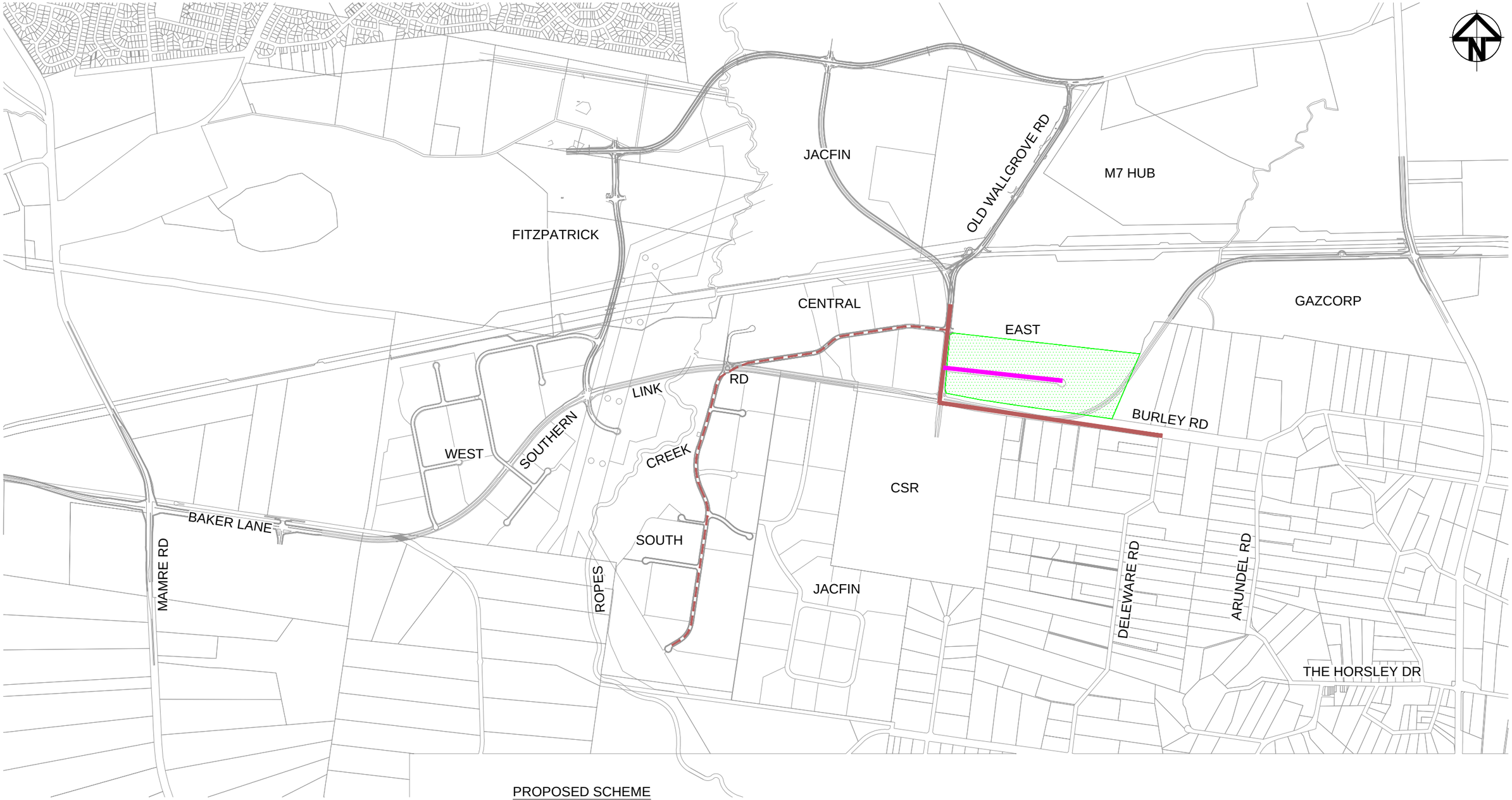
OAKDALE EAST INDUSTRIAL DEVELOPMENT

PROPOSED GAS MAIN STRATEGY

CONCEPT SCHEME PLAN

SEPTEMBER 2018

at&l



PROPOSED SCHEME

- Existing HP Gas Main
- Existing Gas Duct Only
- Proposed Gas Duct Only

OAKDALE EAST

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		A3
CONCEPT		
Drawing No.	Project No.	Issue
SKC013	18-563	P1

F:\18-563 Oakdale East\Drgs\Civil\Sketches\SKC013-GAS STRATEGY.dwg

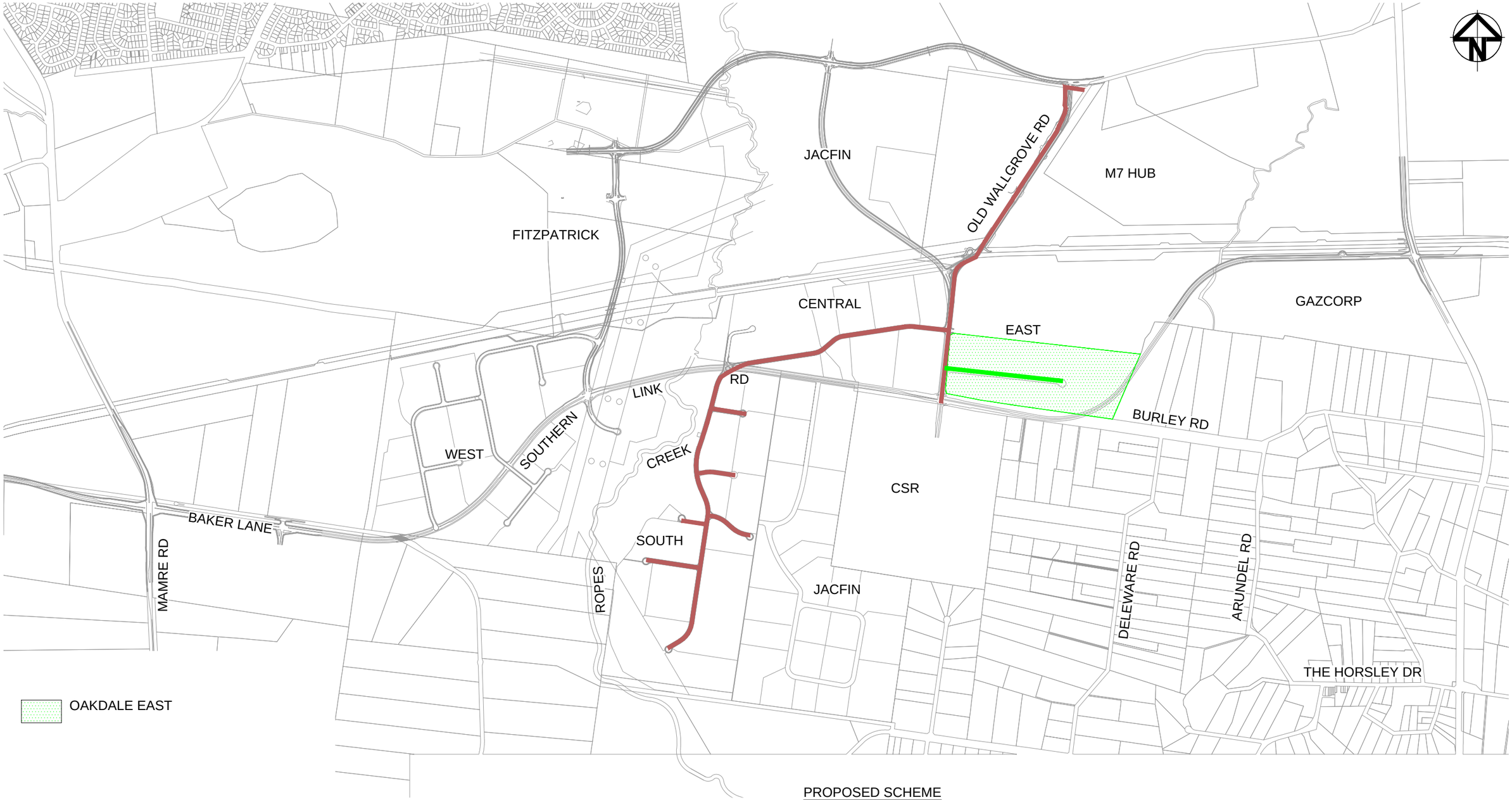
OAKDALE EAST INDUSTRIAL DEVELOPMENT

TELECOMMUNICATIONS STRATEGY

CONCEPT SCHEME PLAN

SEPTEMBER 2018

at&l



PROPOSED SCHEME

Existing Telecommunications

Proposed Telecommunications

0 500 1000 1500 2000m

1 : 20000 @ A3

Status		
CONCEPT		A3
Drawing No.	Project No.	Issue
SKC014	18-563	P1

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Appendix D

Local Area Servicing Plan (Water) -GHD

Oakdale Industrial Development - Planning of Water Related Services

Final Report - Water

July 2016

Commercial in Confidence

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev. 01	A Rashidi	M Healey		M Healey		15/06/16
Rev. 02	A Rashidi	M Healey		M Healey		5/07/16
Final	A Rashidi	M Healey, Sydney Water, Goodmans		M Healey		28/07/2016

Document Status

Oakdale Industrial Development - Planning of Water Related Services July 2016

This report has been prepared by GHD

Approved for issue

Signature	Date	Signature	Date	Signature	Date
	29/07/16		29/07/16.		
Kym Dracopoulos		Russell Hogan		Amir Rashidi	
Manager, Technical		Project Manager		Project Manager	
Goodman Property Services (AUST) Pty Ltd		AT&L Associates		GHD	

Endorsed

I confirm that impacted parties within my business have been consulted, their inputs have been considered and the decisions have been communicated to relevant parties.

Signature	Date	Signature	Date
Suhanti Thirunavukarasu		Richard Schuil	
Principal Planner		Engineering & Planning Manager	
Engineering & Environmental Services		Growth Centres	
Sydney Water		Sydney Water	

Approved

Signature	Date
Jim Price	
Development Services Officer	
Liveable City Solutions	
Sydney Water	

Executive Summary

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

Growth and water demand projections

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of developable area. This includes Goodman, CSR and Jacfin lands. Their lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1.

Table 1 Growth Projections

Development site	Nett Development (ha)	Development type	Connection (1)
Oakdale Central	45.2	IN1- General Industrial (2)	2016- 2017
Jacfin	87.8	IN1- General Industrial/ Residential	2016- 2017
Oakdale South	70.2	IN1- General Industrial	2017- 2019
CSR	63.4	IN1- General Industrial	2017-2020
Oakdale West	90.5	IN1- General Industrial	2019- 2021
Oakdale East	95.0	IN1- General Industrial	2022- 2024
Total	**452**		

Note 1: The proposed timing of connection is subject to change

Note 2: water demand assessed based on Light industrial / warehouse

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". Table 2 below summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 2 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
Oakdale South	2017-2019	0.65	1.0
CSR	2017-2020	0.58	0.93
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Total		**4.4**	**7.5**

The key opportunities and constraints associated with water servicing of the Oakdale Industrial Development is summarised below.

Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario.

Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. Sydney Water will address growth servicing requirements in the broader region.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

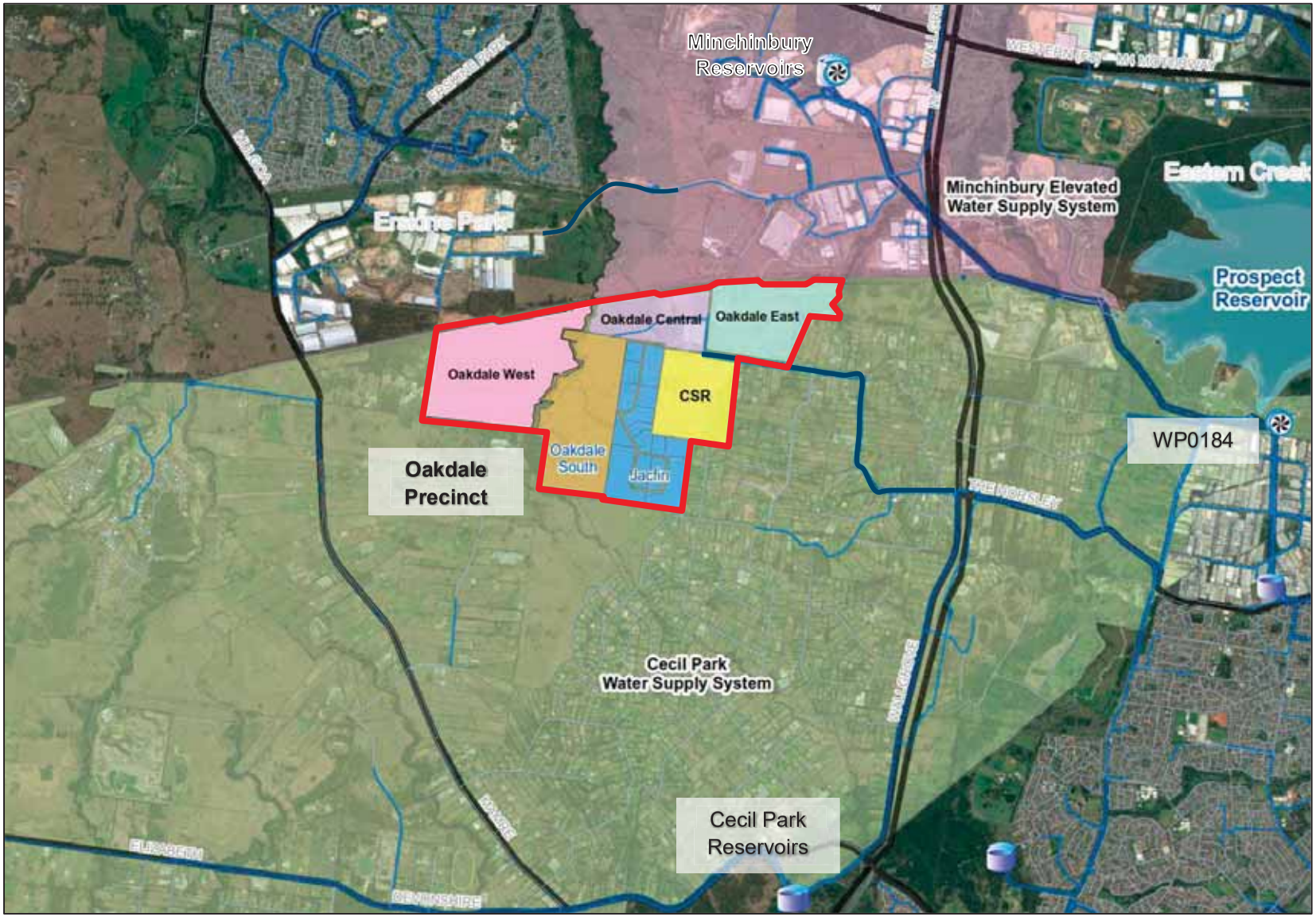

Figure 1 Oakdale Industrial Development Overview

The Oakdale Servicing Strategy is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 2) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 2) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 2) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 2) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 2) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 2) within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

The preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 3. The Oakdale servicing plan overview is presented in Figure 2.

Table 3 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-2017	$2.21 M
4-5	0.9 km DN250	2016-2017	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

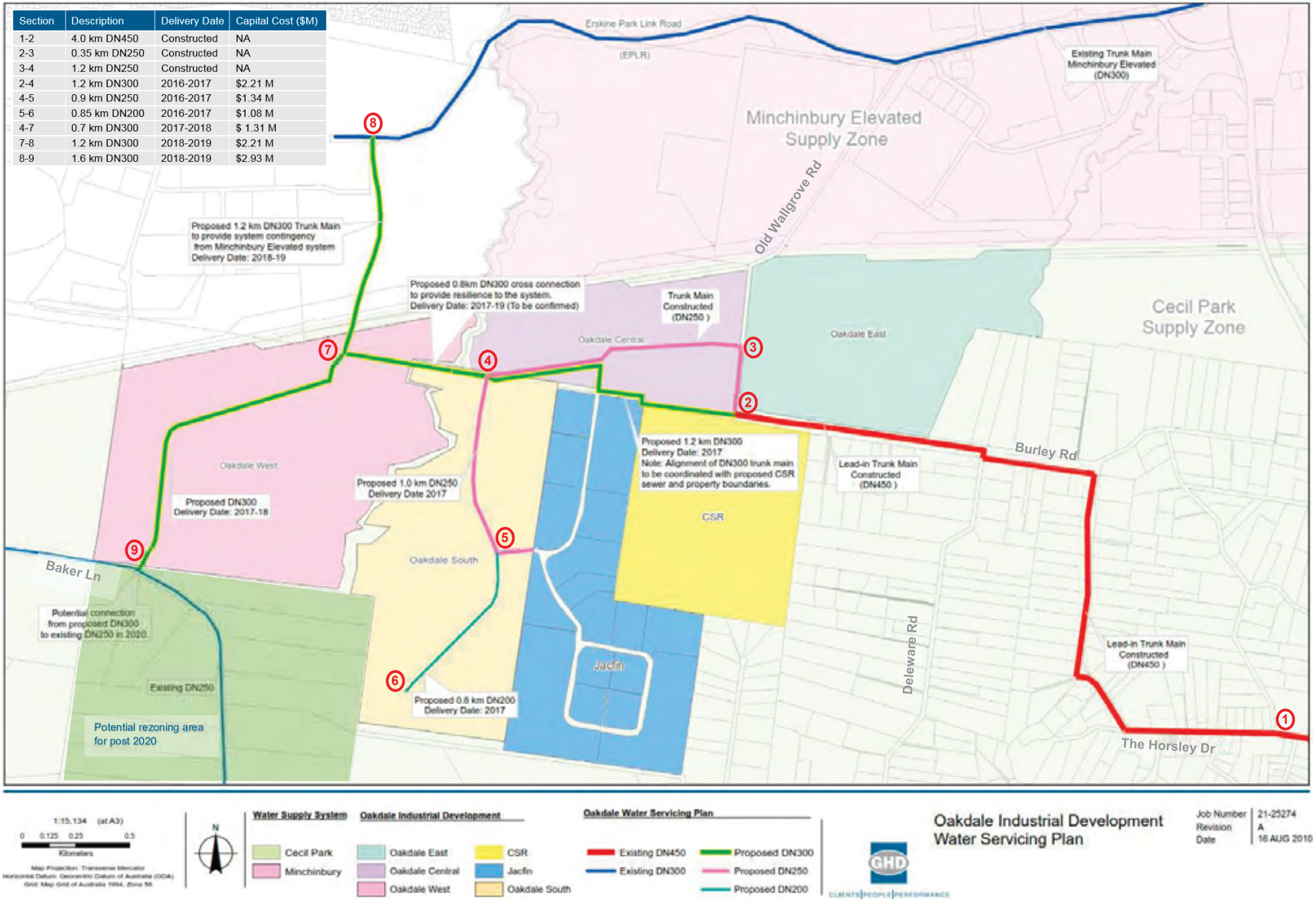

Figure 2- Oakdale Industrial Water Servicing Plan

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Appendices

1. Introduction

1.1 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

The initial water servicing plan scheme was to supply Oakdale from existing DN450 lead-in main within Cecil Park supply system. Minchinbury Elevated supply system also will provide connection to Oakdale from the existing DN300 within Erskine Park Link Road (EPLR).

Assets required to service proposed Goodman, Jacfin and CSR developments within Oakdale precinct are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

1.2 Purpose of this report

The purpose of this report is to document the:

- Revised growth and water demand forecasts,
- Key opportunities and constraints,
- Outcomes of the assessment work undertaken, and
- Water servicing plan for the Oakdale Industrial Development.

This Local Area Servicing Plan (LASP) for potable water has been prepared at the request of Sydney Water to provide a servicing strategy for the existing WSEA Precinct No. 8–Area South of Pipeline, including Goodman's Oakdale development. This servicing strategy identifies the Sydney Water infrastructure required to service the Oakdale Precinct, anticipated costs, sizing, preliminary alignments and trigger points (i.e. development timing and staging) for the delivery of potable water infrastructure required to service the Oakdale Precinct.

2. Growth Projections

This section provides details of growth and water demand projections within the study area including the expected timing, and scale of growth.

2.1 Summary of Growth

Growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is an ongoing industrial development with approximately 452 nett hectares of development area. This includes Goodman, CSR and Jacfin lands. There lands are predominately zoned IN1 'General Industrial' under the State Environmental Planning Policy (Western Sydney Employment Area) 2009 The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 4.

Table 4 Growth Projections

Development site	Precinct	Nett Development (ha)	Development type	Connection
Oakdale South	1	18.8	IN1- General Industrial (5)	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	1	95.0 (3)	IN1- General Industrial	2022-2024 (1)
Oakdale West	1	21.7		2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		
Oakdale Central	1A	4.1	IN1- General Industrial	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built

Development site	Precinct	Nett Development (ha)	Development type	Connection
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	IN1- General Industrial	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density (2)	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	IN1- General Industrial	2017
	2	20.8		2018
		11.5		
	3	21.0		2020 (1)
	Total	**63.4**		
Grand Total		**452**		

Note 1: The proposed timing of infrastructure proposed is subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) – Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager	Via Email	29th Feb 2016

Note 5: Water demand assessed based on Light industrial / warehouse

2.2 Water Demand Projections

An evidence based approach to forecasting future demands in the study area, based on observed demands in an adjacent water supply system, was adopted as per the "Water System Planning Guidelines 2014". The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with evidence based industrial demand assumptions. i.e. 9.2 ML/d. the proposed demand previously calculated for this development removed from the model.
- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfers into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d

The revised future demand projections for the Cecil Park supply system are presented in Table 5.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

The detailed methodology for projecting average day and maximum day demands is described in Tech Memo 1 (Appendix A).

Table 6 summarises the projected water demands for the Oakdale Industrial Development. Total projected max day demand in the Oakdale Precinct is 7.5 ML/d.

Table 6 Summary of Water Demand - Oakdale Industrial Development

Development site	Timing	Average Day Demand (ML/d)	Max Day Demand (ML/d)
Oakdale South	2017-2019	0.65	1.0
Oakdale West	2019-2021	0.83	1.3
Oakdale East	2022-2024	0.87	1.4
Oakdale Central	2016-2017	0.42	0.7
Jacfin	2016-2017	1.04	2.12
CSR	2017-2020	0.58	0.93
Total		**4.4**	**7.5**

3. Opportunities and constraints

The following is a summary of the key opportunities and constraints associated with water servicing of the Oakdale Industrial Development.

3.1 Opportunities

- Based on the supplied Oakdale growth projections, Cecil Park reservoir and Prospect Creek pumping station WP0184B have sufficient capacity to supply the entire Cecil Park zone including Oakdale Development for the 2020 demand scenario.
- A DN450 lead-in water main has been constructed as part of previous site works and has sufficient capacity to supply the entire Oakdale Development.
- Minchinbury Elevated supply zone has 2.5 ML/d transferable capacity to provide supply contingency to Oakdale Industrial. Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km.
- The Growth Servicing Strategy (GSS) proposed augmentations are adequate to supply the entire Cecil Park zone including Oakdale Development for the post 2031 demand scenario. Additional augmentations as a result of the GSS study include 30 ML new reservoir will provide system reliability.
- Customers along Aldington Rd that experiencing low pressure under current maximum day demand could be rezoned to Oakdale development. i.e. 1.0 ML/d

3.2 Constraints

- Cecil Park reservoir and pumping station WP0184 has insufficient capacity to supply the entire Cecil Park zone including Oakdale Development post 2020 demand scenario, when Austral and Leppington North will be rezoned to Cecil Park supply system. The GSS system augmentations (i.e. Prospect Creek pumping station WP0184B and raising main upgrade) proposed for 2031 demand scenario will address the long term system capacity issues within Cecil Park supply system.
- Erskine Park Elevated supply system has insufficient head to supply Oakdale Industrial system.

The opportunities and constraints identified in Oakdale Industrial water servicing plan is presented in Figure 3.

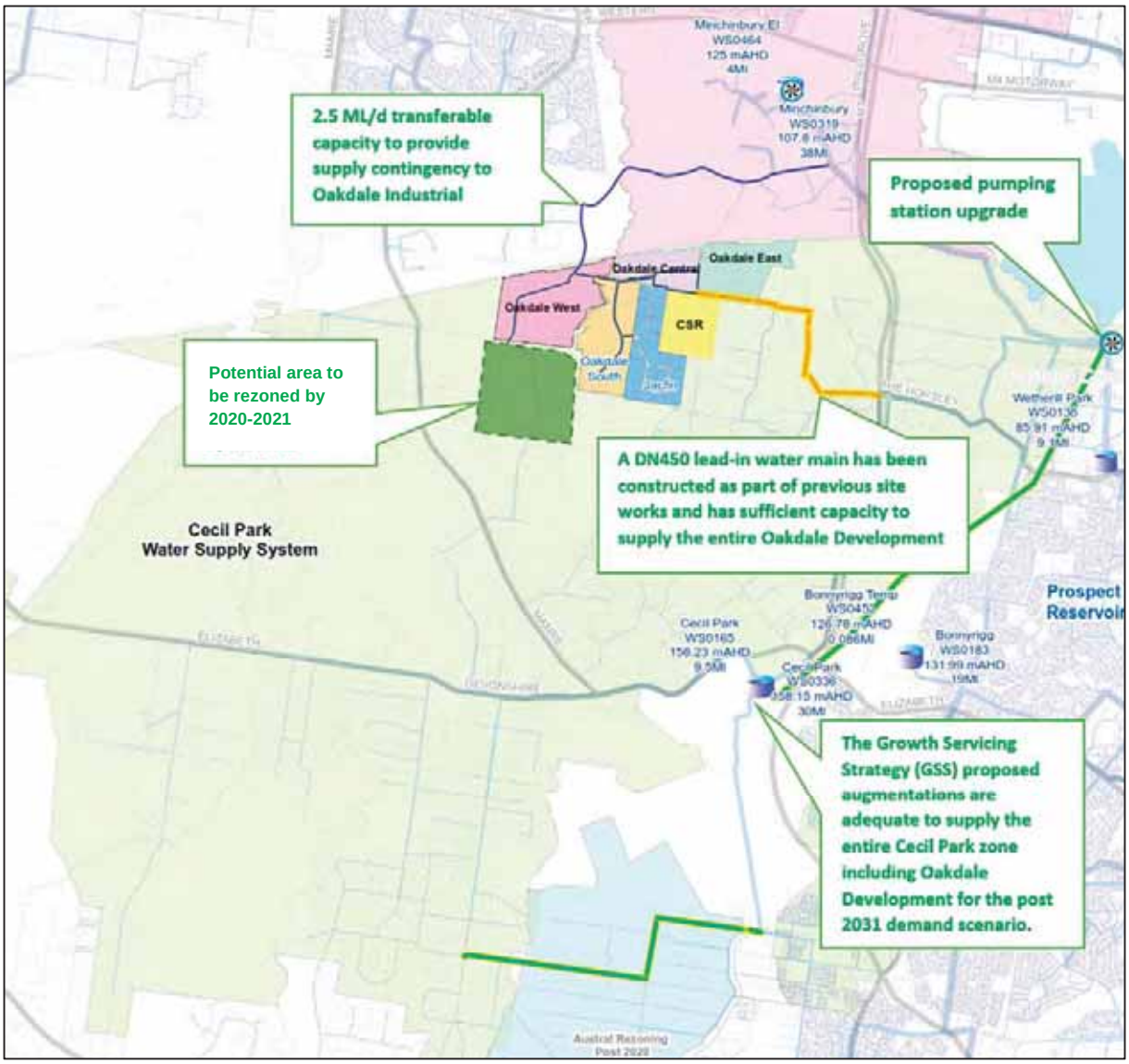

Figure 3 Opportunities and constraints

4. Water servicing

4.1 Oakdale Industrial water servicing

4.1.1 Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue (refer section 3-4 on figure 4) which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection (refer section 4-7 on Fig. 4) between the existing DN250 potable water main within Millner Avenue (refer section 3-4 on Fig. 4) to the proposed DN300 within Oakdale West (refer section 7-8 on Fig. 4) which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

4.1.2 Oakdale South

Oakdale South will be supplied via extension (refer section 4-6 on Fig. 4) of the existing DN250 potable water main (Refer Section 3-4 on Fig. 4) within Millner Avenue which is supplied from the Cecil Park Supply System.

4.1.3 Oakdale West

Oakdale West will be supplied via a proposed DN300 (refer section 8-9 on Fig. 2) connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection (refer section 4-7 on Fig. 2) to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

4.1.4 Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.5 CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

4.1.6 Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

4.2 Short-term servicing plan (Current- 2020)

Under this short-term supply configuration, Oakdale development will be supplied from Cecil Park supply system using existing DN450 lead-in main. The proposed internal pipework within Oakdale South need to be completed. i.e. 850 m DN250 and 850 m DN200.

Cecil Park reservoirs have sufficient capacity to supply the Cecil Park zone for the current max day scenario including proposed 2020 growth in the Oakdale Development as summarised below:

- Oakdale South, (i.e. 2020 MDD: 1.0 ML/d)
- Oakdale Central, (i.e. 2020 MDD: 0.7 ML/d)
- Oakdale West, (i.e. 2020 MDD: 1.0 ML/d)
- Jacfin, (i.e. 2020 MDD: 2.1 ML/d) and
- CSR. (i.e. 2020 MDD: 0.9 ML/d)

4.3 Mid-term servicing plan (2020- 2031)

Cecil Park reservoirs and transfer system have capacity to supply Cecil Park zone for the 2020 max day scenario including proposed 2020 growth in the Oakdale Development.

Between 2020 and 2024 the following actions are proposed:

- Rezoning to occur @ 2020 of Austral onto Cecil park (MDD: 2.8 ML/d @ 2020 and through to MDD: 4.8 ML/d @ 2024-25) (South West Priority Land Release Area "SWPLRA"; May 2016)
- Further growth within the Oakdale Development 1.7 ML/d (Oakdale Industrial will be fully developed at 2024)

The above contribute to significant capacity deficiencies within the system. i.e. WP0184 and Cecil Park reservoirs cannot keep up with a max week demand. By rezoning Oakdale West and Central on to Minchinbury Elevated relieves demand of 1.6 ML/d provides sufficient capacity relief to accommodate the forecasted demand and rezoning up to 2024.

Therefore, under mid-term servicing plan, Oakdale West and Oakdale Central will be supplied from Minchinbury Elevated supply zone using existing DN300 trunk main (i.e. gravity supply from elevated reservoir). Extensions off Sydney Water's existing DN300 trunk main will need to be built. i.e. approx. 1.2 Km. Customers along Aldington Rd (i.e. approx. 28 customers) that experiencing low pressure under current maximum day demand could also be rezoned to Minchinbury Elevated supply zone using the proposed DN300 trunk main within Oakdale West.

The Oakdale Industrial remainder including Jacfin and CSR would be supplied from Cecil Park using existing DN450 and proposed DN300 lead-in main.

From 2024 through to 2030 there is insufficient capacity within both the Minchinbury Elevated and Cecil Park supply systems to accommodate growth within the Oakdale Industrial area. Between 2024 and 2030 the following actions are proposed:

- Further growth in the Austral rezoned area now being fed from Cecil Park
- Rezoning to occur @ 2024 of Leppington North onto Cecil Park (7.3 ML/d @ 2024) (South West Priority Land Release Area "SWPLRA"; May 2016)

Accordingly, further investigation into the proposed rezoning and or required amplification of the system prior to this date is required.

4.4 Long-term servicing plan (Post 2030)

The Oakdale Industrial development will be supplied from Cecil Park and Minchinbury Elevated supply systems. Cecil Park reservoirs (i.e. including any proposed new reservoir) and upgraded Prospect Creek pumping station WP0184B have sufficient capacity to supply the Cecil Park zone for the 2036 max day scenario including ultimate growth within the Oakdale Development. This is based on an indicative scheme included in the GSS but subject to detailed planning before finalisation of preferred option.

The Oakdale servicing plan overview is presented in Figure 4.

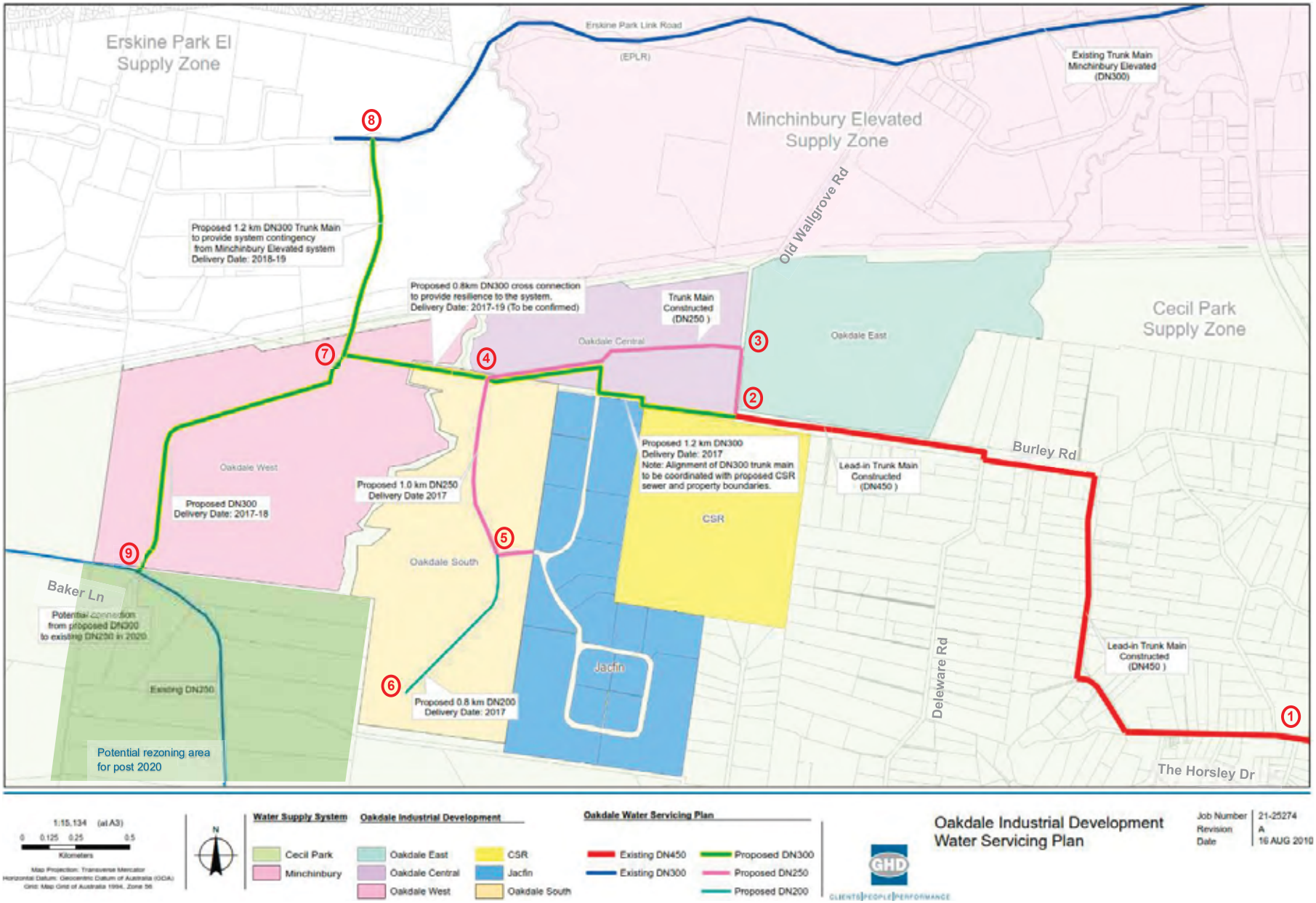

Figure 4- Oakdale Industrial Water Servicing Plan

4.5 Preliminary capital cost assessment

Preliminary capital cost estimates were developed for Oakdale Development. The water mains indirect and total delivery costs were estimated using the Sydney Water Cost Estimator tool (version 09-2015.11). The following assumptions were adopted for preliminary cost estimation:

- 75% scope contingency was adopted for all options as per advice from Sydney Water
- An allowance was made for rock excavation for 30% of the length of the water mains
- 25% Road restoration was allowed for all pipework

A summary of the preliminary capital cost estimates associated with Oakdale Industrial water servicing is presented in Table 7. Detailed cost estimates are provided in Appendix B.

Table 7 Preliminary capital cost estimates

Section	Description	Delivery Date	Capital Cost ($M)
1-2	4.0 km DN450	Constructed	NA
2-3	0.35 km DN250	Constructed	NA
3-4	1.2 km DN250	Constructed	NA
2-4	1.2 km DN300	2016-17	$2.21 M
4-5	0.9 km DN250	2016-17	$1.34 M
5-6	0.85 km DN200	2016-2017	$1.08 M
4-7	0.7 km DN300	2017-2018	$ 1.31 M
7-8	1.2 km DN300	2018-2019	$2.21 M
8-9	1.6 km DN300	2018-2019	$2.93 M

5. Conclusions and Recommendations

This study investigated the assets required to service the proposed Goodman, Jacfin and CSR developments within the Oakdale Precinct to meet development timeframes. The water servicing plan for the Oakdale Industrial Development is made up of the following:

Oakdale Central

Oakdale Central is currently supplied from the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System. To improve system reliability, it is proposed to supply Oakdale Central from the Minchinbury Elevated supply system via a proposed DN300 connection between the existing DN250 potable water main within Millner Avenue to the proposed DN300 within Oakdale West which ultimately connects to the existing DN300 within Erskine Park Link Road (EPLR). The proposed DN300 is proposed to be delivered at the same time as the Oakdale West development.

Oakdale South

Oakdale South will be supplied via extension of the existing DN250 potable water main within Millner Avenue which is supplied from the Cecil Park Supply System.

Oakdale West

Oakdale West will be supplied via a proposed DN300 connection to the existing DN300 within Erskine Park Link Road (EPLR). This proposed DN300 will be supplied from the Minchinbury Elevated Supply System. As mentioned above, a DN300 cross connection to Oakdale Central will be delivered at the same time as the Oakdale West development to supply Oakdale Central from the Minchinbury Elevated Supply System which will improve the system reliability.

Oakdale East

Oakdale East will be supplied off the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

CSR

CSR lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System.

Jacfin

Jacfin lands will be supplied via a proposed DN300 connected to the existing DN450 within Burley Road which is supplied from the Cecil Park Supply System. Jacfin internal reticulation will be via a proposed DN250 which will be connected to the proposed DN250 within Oakdale South to improve the system reliability.

Appendices

Appendix A –Revised Basis of Water Planning

Memorandum

25 May 2016

To	Amir Rashidi		
Copy to	Russell Hogan, Suhanti Thirunavukarasu, Suganthini Niranjan		
From	Amir Rashidi	Tel	02 92397010
Subject	Oakdale Industrial- Revised Basis of Water Planning	Job no.	21/25274

1. Introduction

1.1 Purpose of this memorandum

The purpose of this memorandum is to document and seek endorsement from Sydney Water on the design and system performance criteria to be adopted for the investigation associated with the water system within the Oakdale Industrial development. It is important that Sydney Water agrees to these criteria prior to substantial commencement of the planning tasks.

1.2 Background

The Oakdale industrial site is part of the existing Western Sydney Employment Area (WSEA 8 – Area South of Pipeline Precinct), located approximately 40 kms west of the Sydney CBD, adjacent to the M7 and M4 intersection, adjacent south to the Eastern Creek Precinct and Warragamba Water Pipeline at Horsley Park. The site was rezoned in September 2009 through the WSEA SEPP 2009, and Goodman is the lead developer of the precinct. An overview of study area is presented in Figure 1.

Water: The initial scheme was to supply the site from Cecil Park; however, there is an alternative option to supply Oakdale through a combination of the Minchinbury and Cecil Park supply zones. Extensions off Sydney Water's existing system will need to be built to provide the full site with drinking water services.

Assets required to service proposed Goodman development at Oakdale are to be staged to meet development timeframes, with lead-in infrastructure funded up front and delivered by the lead developer and to be reimbursed by Sydney Water in accordance with its policy on Funding Infrastructure to Service Growth.

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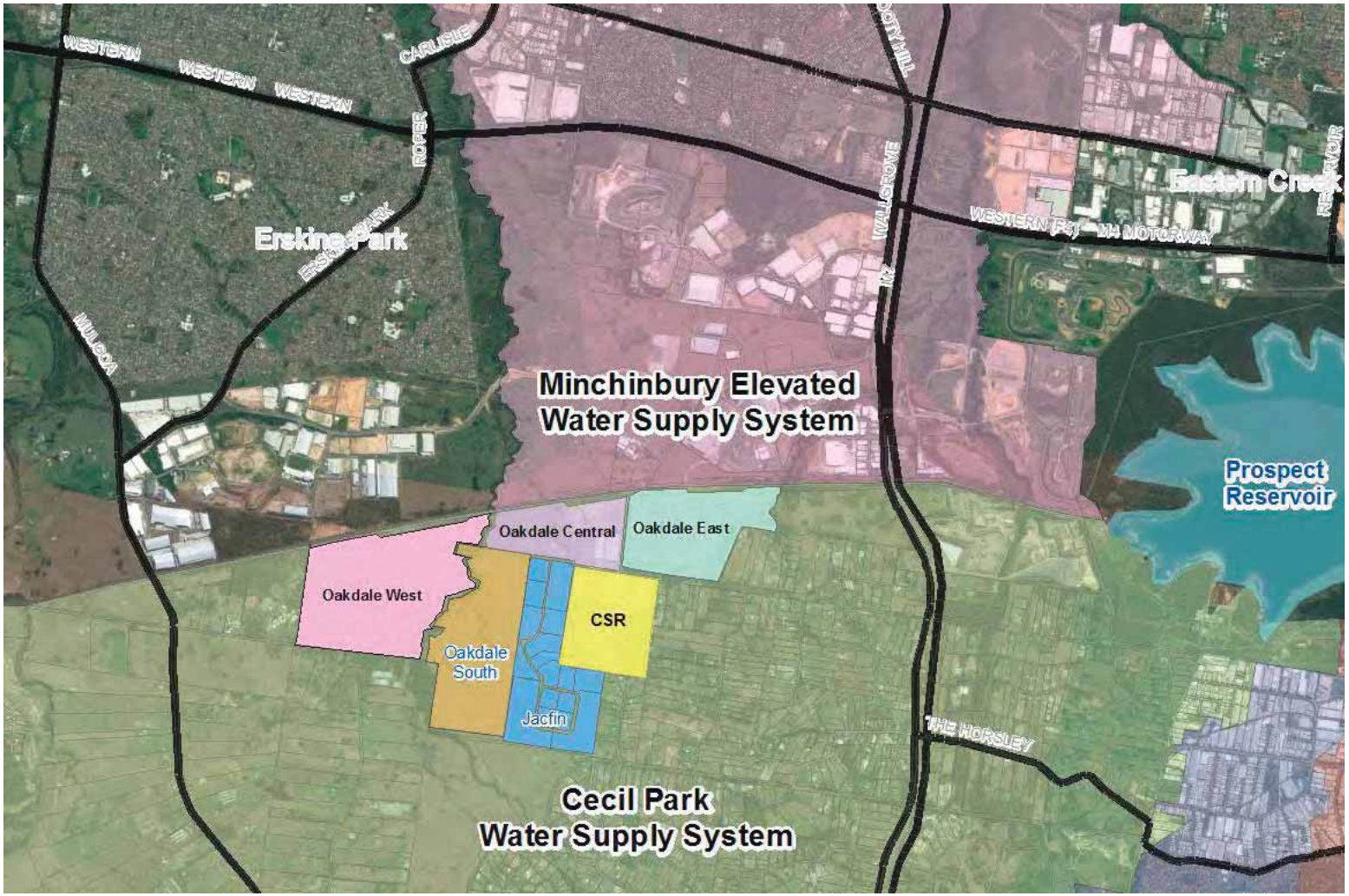

Figure 1 Oakdale Industrial Development Overview

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2. Summary of Growth

This section provides details of growth projections within the study area including the expected timing, and scale of growth.

2.1 Growth

Population growth forecasts are a key input into the planning process and provide an insight into future infrastructure needs as well as future capital investment needs.

Oakdale Estate is a future industrial development with approximately 300 nett hectares of development lots anticipated in the ultimate stage. The site spans two local government areas of Penrith and Fairfield.

The growth projections listed for this study are supplied by AT&L in conjunction with Jacfin, CSR and Goodman. The list of the growth projection within the Oakdale Industrial Development is summarised in Table 1. Detailed figures for each of the developments are included in Appendix A.

Table 1 Growth projections

Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale South	1	18.8	Light industrial/warehouse	2017-2018
	2	4.4		2018
	3	16.5		2017-2019
	4	9.5		2019
	5	14.0		2017
	6	7.0		2019
	Total	**70.2**		
Oakdale East	**1**	**95.0** [(3)]	Light industrial/warehouse	2022-2024 [(1)]
Oakdale West	1	21.7	Light industrial/warehouse	2019
	2	21.6		2019-2020
	3	18.5		2020
	4	22.6		2020-2021
	5	6.1		2020
	Total	**90.5**		

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Development site	Precinct	Nett Development (ha)	Development type	Timing
Oakdale Central	1A	4.1	Light industrial/warehouse	Built
	1B	5.9		Built
	1C	4.6		Q1-2016
	2A	7.5		Built
	2B	6.0		Q1-2016
	3A	1.6		2017
	3B	5.8		Q4-2016
	3C	5.6		2017
	3D	1.9		2017
	Lot 4	2.2		2017
	Total	**45.2**		
Jacfin	1	3.6	Light industrial/warehouse	2016
	2	17.4		2016
	3	21.6		2017
	4	25.7	Residential low density [2]	2016
	5	19.5		2016
	Total	**87.8**		
CSR	1	10.1	Light industrial/warehouse	2017
	2	32.3		2018
		11.5	Environmental /Open Space	
	3	21.0	Light industrial/warehouse	2020 [1]
	Total	**74.9**		
Grand Total		**463.6**		

Note 1: The timeframes are subject to change

Note 2: Rural Residential

Note 3: Further growth listed for this study is in addition to current East Oakdale development plan

Note 4: The above growth projections have been provided be the following:

Developer	Contact(s) - Role	Received	Date received
CSR	Wayne Pasalich – CSR Senior Development Manager	Via Email	1st March 2016
Jacfin	Emma Sunderland – Calibre Consulting on behalf of Jacfin	Via Email	29th Feb 2016
Goodman	Richard Seddon – Goodman Development Manager Russell Hogan – AT&L on behalf of Goodman	Via Email	29th Feb 2016

3. Planning criteria

3.1 Water planning criteria

This section details the water planning criteria relevant to this investigation. We request Sydney Water's endorsement of the design criteria as a hold point for the project prior to commencement of the system performance assessment.

3.2 Water planning references

The following documents, referenced in Table 2, were consulted in developing the planning criteria:

1. Water and Recycled Water System Growth Servicing Strategy – Criteria and Guidelines 2012
2. Water System Planning Guideline (ver. 1- September 2014)
3. Water Supply Code of Australia (WSA 03-2011-3.1 - Sydney Water Edition 2012)
4. Recommendation – Water-main renewal program interim sizing rules to address fire-fighting needs
5. Precinct Structure Plan

Table 2 Water Planning Criteria

Item	Design Criteria	Units	Water	Reference
System Demands (existing areas)				
Max Day Demand (MDD)	Max Day Demand /Average Day Demand (MDD/ADD) Factor	NA	An analysis of the last ten consecutive financial years of IICATS data to select the day with the highest demand over 24 hours. The peaking factor will be derived from calculated MDD and ADD. (i.e. peaking factor: MDD/ADD) • Cecil Park Supply System peaking factor: 2.8 • Cecil Park maximum day demand : 18.75 ML/d • Minchinbury Supply System peaking factor: 1.6 • Minchinbury maximum day demand : 5.2 ML/d	Reference 2 See Appendix C
Max Hour Demand	Max Hour Demand /Max Day Demand Factor	NA	An analysis of the last ten years of 15 minutes of IICATS data to select the maximum hour event. If the results are inconsistent then the default WMS maximum day demand diagram will be adopted	Reference 2
Performance Requirements				
Trunk Mains	Minimum Pressure	Meter	Trunk mains (no customer connections) will maintain 3 m at all times under max day demand condition	Reference 1

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Item	Design Criteria	Units	Water	Reference
Reticulation Mains	Minimum Pressure	m	Maintain at the property boundary: >25 m residual pressure (desirable) (2)	
	Maximum Pressure	m	The long-term aim is to reduce to 60 m or less where financially viable	Reference 2
	Maximum headloss	km/ hr.	Maximum headloss of 5 m/km for ≤ DN150 and 3 m/km for ≥ DN200. (secondary criteria)	Reference 3
	Maximum Velocity	m/s	>2 m/s (i.e. The optimum velocity is in the range 0.8 m/s to 1.4 m/s.)	
Critical water-mains (Fire flow criteria)	Fire-Fighting Enquiries	L/s	High density residential, major special uses and heavy commercial and industrial : Not less than 10 m residual head with assume flow of 25 L/s (at 95th percentile domestic demand)	Reference 4
Minimum Pipe Size	Flow rates & residual pressure	mm	Industrial and Commercial: Cast iron outside diameter series: 150; Steel and Polyethylene pipes: 180	Reference 3
WMS model for water planning purposes (1)				
Minchinbury			***Current MDD***: > Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - Current Max Day Run 1.1 ***2031 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2031 Max Day Run 1.1 ***2036 MDD Model Run:*** >Potable Retic>04. Prospect South>4.1 Minchinbury>Minchinbury-Minchinbury Elevated>20 Projects>GSS 2013-14>HP2 System Performance>Max Day>GSS - 2036 Max Day Run 1.1	
Cecil Park			***Current MDD :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>WSEA - Structure Plan Update>GSS Run Group>Current Max Day ***2031 MDD Model Run :*** >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2031 Max week GSS_Solutions ***2036 MDD Model Run*** : >Potable Retic>04. Prospect South>4.4 Cecil Park>Cecil Park>20 Projects>GSS>Run Group>2036 Max week_Solutions_N	

Note 1: The GSS model for Minchinbury was used as this was the latest study in the local area and included an update of key assets and system demands. This will be validated and forecast demands updated as part of this project. The GSS model for Cecil Park was referenced in the recent SWPLRA / SWGC 2nd release precincts detailed planning investigation and is the latest version of the Cecil Park model available. This will be validated and forecast demands updated to reflect latest data. This has been discussed and confirmed with Sydney Water.

Note 2: The minimum pressure specified in the Operating Licence is 15 metres, however, some exceedances of this limit are permitted. Refer to Sydney Water Operating Licence. A lower minimum service pressure may be provided based on financial and risk considerations, and is subject to Sydney Water approval.

4. Water demand assessment

A baseline maximum day demand of 40 kL/Nha/day for light industrial new development was employed from Water System Planning Guideline to estimate the Oakdale Industrial water demand. During this assessment, it was observed that new development that anticipated occurring in Oakdale industrial will be typically warehouses with commercial / office land use. Consequently, Sydney Water advice to reassess the Oakdale industrial future demand based upon the Moorebank and Wetherill Park industrial areas that exhibit a similar type of development. The evidence based average day water demand summarised in Table 3. Figure 2 also shows the location of the Moorebank and Wetherill Park industrial areas in relation to the Oakdale Industrial precinct. .

Table 3 Evidence based average day water demand for comparable Industrial Areas (1)

Average Day Demand	Units	Moorebank	Wetherill Park	Weighted Average
Area demand (average)	kL/day	1,324	4,520	-
Area	Hectares	182	456	-
Demand per net hectare	kL/net ha/day	7.3	9.9	9.2

Note 1: The evidence based industrial demand employed from Broader WSEA Water Services Study (Nov 2013)

4.1 Summary of Oakdale Industrial water demand forecasts

The following outline of potable water demand provides predicted average day (ADD), maximum day (MDD) and maximum hour demand (MHD) based on projected development yield.

The calculations are based on the forecast development yield (i.e. Table 1) and evidence base design demands (Table 3). Detailed calculations for MDD and MHD demand are provided in Appendix B. The Oakdale Industrial demand forecast summarised in Table 4.

Table 4 Summary of revised water demand- Oakdale Industrial fully developed

Development site	Demand Scenario (ML/d)		
	ADD	**MDD**	**MHD**
Oakdale South	0.65	1.0	1.65
Oakdale West	0.83	1.3	2.13
Oakdale East	0.87	1.4	2.24
Oakdale Central	0.42	0.7	1.08
Jacfin	1.04	2.12	4.1
CSR	0.58	0.93	1.49
Total	**4.4**	**7.5**	**12.7**

Note 1: the maximum demand was estimated based on Industrial peaking factor of 1.6 (i.e. MDD/ADD)

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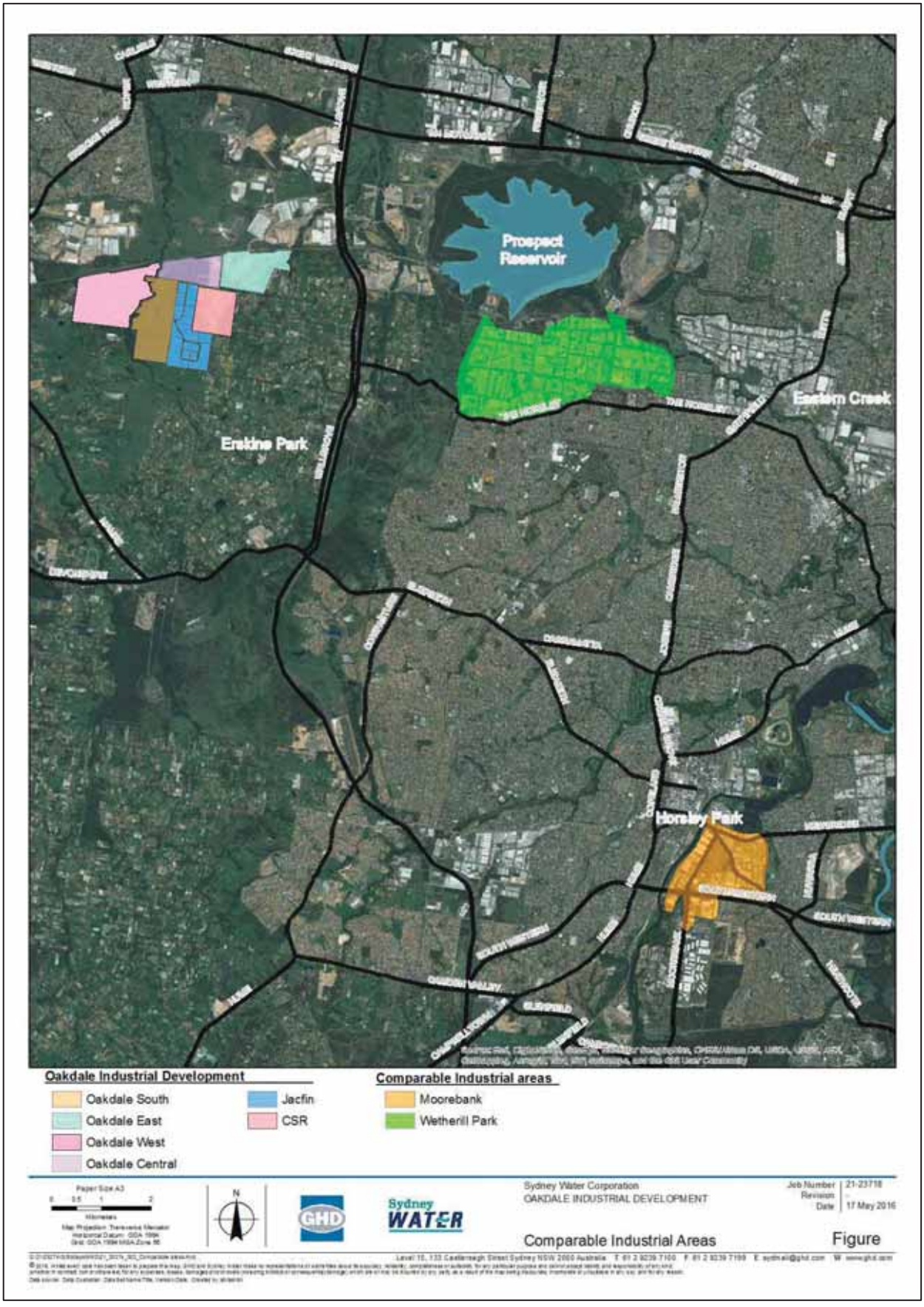

Figure 2- Comparable Industrial Areas

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4.2 Future Max Day Demand Projections

The Growth Servicing Strategy (GSS) demand estimation revised based on the following updated growth data:

- Additional forecast growth within the Parkbridge Estate i.e. 264 dwellings
- Defer rezoning from Austral to Cecil Park supply system to post 2020 i.e. 450 dwellings. The 2020 sensitivity analysis with Austral demand will be developed.
- Potable top-up transfer into the Hoxton Park recycled water scheme reduced from 1.2 ML/d to 1.1 ML/d (i.e. The Hoxton Park Recycled Water top-up water demand pattern will be employed)
- The proposed Oakdale Industrial demand within GSS model (i.e. 0.2 ML/d) will be replaced with revised demand assumptions (Table 4)

The revised future demand projections are presented in Table 5. The residential growth sites details are provided in Appendix D.

Table 5 Summary of revised future water demand- Cecil Park Supply System

Demand Category	2016 MDD ML/d	2020 MDD ML/d	2031 MDD ML/d	2036 MDD ML/d
Residential (LD)	6.2	10.2	31.7	47.7
Residential (HD)	0.03	4.9	5.3	5.4
Dual Retic Res (LD)	0.2	1.1	1.2	1.4
Dual Retic Res (HD)	0.03	0.1	0.1	0.1
Industrial	1.6	1.8	4.1	7.7
Commercial	8.6	13.8	24.7	40.6
Other	2.1	2.1	5.6	5.64
Oakdale Industrial	0.0	5.8	7.5	7.5
Total	**18.8**	**39.8**	**80.3**	**116.0**

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Appendix A- Oakdale Industrial Detailed Development

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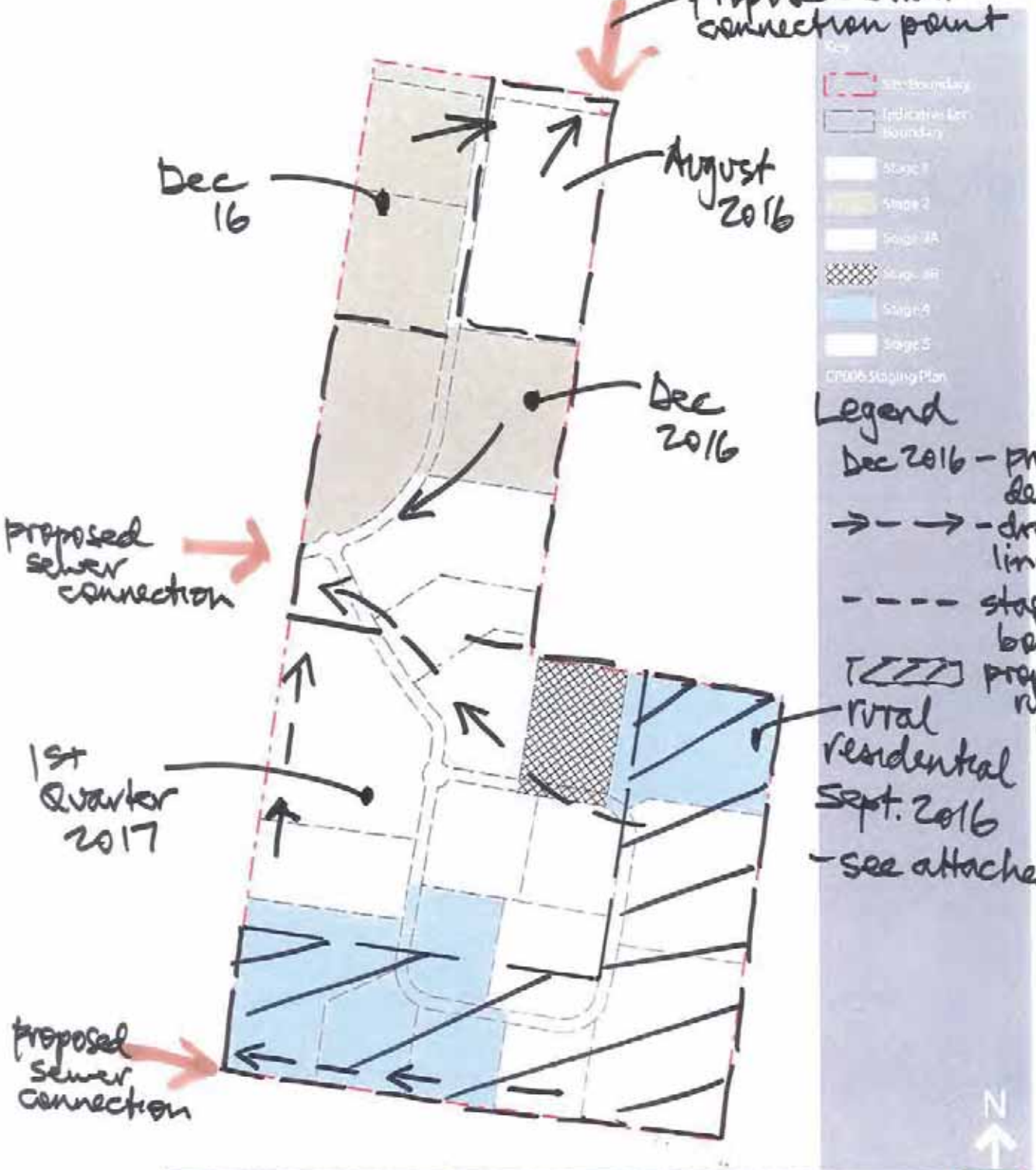
CENTRAL Area Schedule

TOTAL LAND AREA		612,065 sqm
Lot	**Site Area**	**Building Area**
Lot 1A	41,368 sqm	20,220 sqm
Lot 1B	58,760 sqm	31,745 sqm*
Lot 1C	46,417 sqm	27,145 sqm*
Lot 2A	74,693 sqm	36,570 sqm
Lot 2B	60,010 sqm	31,080 sqm*
Lot 3A	16,016 sqm	7,283 sqm*
Lot 3B	58,493 sqm	36,965 sqm*
Lot 3C	55,622 sqm	33,426 sqm*
Lot 3D	18,795 sqm	8,275 sqm*
SUB TOTAL	414,158 sqm	232,709 sqm*
Lot 4	21,615 sqm	0 sqm*
CENTRAL TOTAL	435,773 sqm	232,709 sqm*
Services Lot	10,000 sqm	
Biodiversity Lot A	18,367 sqm	
Biodiversity Lot B	40,812 sqm	
Biodiversity Lot C	41,533 sqm	
Road Widening Lots	4,572 sqm	

* Areas subject to Survey.

APPENDIX 1
STAGING PLAN



Lot A Burley Road, Horsley Park Employment Precinct - Staging Plan
Prepared for Jacfin Pty Ltd
13 June 2012
1:5000 @ A3

JBA planning

NSW Government
Department of Planning and Infrastructure

Jacfin
Staging / Development Timing