City of Wanneroo

Neerabup Industrial Area Structure Plan
Servicing Study

September 2021

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1. Introduction

1.1 Background

GHD have been engaged by the City of Wanneroo (the City) to prepare an infrastructure and servicing study in support of a revised Structure Plan for the Neerabup Industrial Area (NIA). The report has been informed by several other technical studies as well as a concept master plan that has been prepared as part of this project.

The NIA site is approximately 30 km north of the Perth Central Business District. To the southeast of the NIA, there is significant current and future residential development within Banksia Grove. residential estates along the coastal strip of the North West Corridor (including the suburbs of Clarkson, Merriwa, Kinross, Mindarie) are currently developing approximately 3 km to the west of the NIA. The East Wanneroo District Structure Plan, endorsed by the Western Australian Planning Commission in November 2020, identifies new residential and industrial areas to the east of the NIA.

The revised Structure Plan will be prepared for the NIA that provides a contemporary planning and implementation framework for the NIA, informed by several technical studies which include this infrastructure and servicing study. The new planning framework is intended to establish the NIA as a leader in globally recognised industrial and technology precinct planning.

The NIA is currently in the early stages of industrial growth and is currently forecast to reach full build-out within the next 50 years.

Refer to Figure 1-1 for overall site layout plan and Appendix A for a land ownership plan that has been provided by the City. Our study makes reference to Appendix A for lot numbers and ownership details.

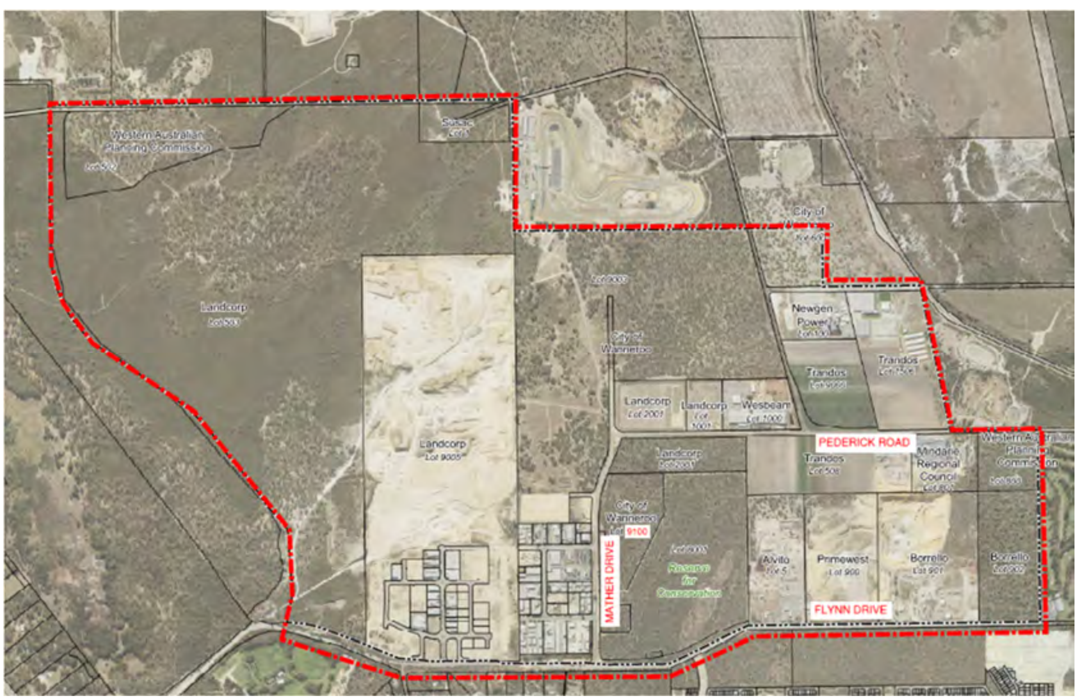


Figure 1-1 Site Locality

GHD has prepared a masterplan for the NIA precinct with consideration of existing infrastructure, a requirement for connector roads, adjacent planning works by others, a requirement for service hubs, drainage areas and urban design principles. Refer to Appendix B for a copy of the master plan.

To support the precinct plan, GHD has completed an assessment of existing utilities in the area, as well as liaised with relevant servicing authorities to determine any planned service upgrades within the NIA site and any upgrades that may be necessary to support proposed development. Key findings arising from this report indicate that the provision of baseline services for the NIA is generally unconstrained on the basis that it is freehold land with the majority undeveloped. The majority of utility authorities have already planning over the NIA on the basis of industrial development.

The findings of these discussions are detailed further within the body of this report.

1.2 Purpose of this report

This report has been prepared by GHD to identify the baseline servicing requirements to support the preparation of a revised planning framework for the NIA.

The report summarises a desktop review of the existing utilities in the area (inclusive of water, sewer, power, telecommunications and gas services) and the outcomes of consultation with relevant utility authorities. As part of this report, a technical and commercial assessment of opportunities to utilise renewable energy sources for industrial development in the NIA has also been conducted and forms a supplementary component to this report.

The report is intended for use as a guide for overall development of the NIA and is not intended to provide guidance for subdivision and/or development of specific lots. It is expected that proponents would need to undertake and complete their own feasibilities and servicing studies that are specific to their development requirements in this regard.

The information is current as of June 2021, based upon the latest advice received from authorities, and is subject to change as development proceeds in this corridor.

1.3 Reference Information

- *Neerabup Industrial Area Water Management Engineering – Lot 9003 (85) Mather Drive and Lot 9100 (60) Mather Drive, Neerabup Project No: 19-148*, Pritchard Francis, November 2020.
- *Neerabup Industrial Area Structure Plan No 17*, City of Wanneroo, April 2005.
- *Utility Providers Code of Practice for Western Australia,* Utility Providers Services Committee, May 2016.
- *Underground Distribution Schemes Manual (UDS),* Western Power, February 2020.
- *DS50 – Design and Construction Requirements for Gravity Sewers DN150 to DN600 Ver2 Rev2*, Water Corporation, June 2019.
- *DS60 – Water Supply Distribution Standard Ver5 Rev2,* Water Corporation, September 2018.
- *DS63 – Water Reticulation Pipelines DN250 and Smaller Ver3 Rev14,* Water Corporation, September 2018.
- *Neerabup Industrial Area Economic and Employment Strategy Report*, report prepared for City of Wanneroo, GHD Pty LTD, June 2020.
- *Local Water Management Strategy,* report prepared for City of Wanneroo, GHD Pty Ltd, June 2021.

1.4 Assumptions

All information obtained from third parties (Water Corporation, City of Wanneroo, Landgate, Dial Before You Dig, ATCO Gas, Western Power, telecommunications providers etc) and relied upon to compile this report has been assumed correct at the time this information was obtained from Authorities.

2. Site Background

2.1 Topography

The natural topography ranges from 44 m Australian Height Datum (AHD) to 74 m AHD falling from the north towards the south eastern and south western extents.

There are localised high level areas throughout the NIA. Appendix F shows the natural topography of the site as was considered in wastewater planning.

Meridian Park, located north of Flynn Drive, has already been developed to proposed levels. Lots are generally flat and new road reserves have been graded to ensure adequate stormwater runoff.

Refer to Section 2.3 for further detail regarding the proposed site levels.

2.2 Existing geology

Based on information from the Neerabup Industrial Area Structure Plan No 17 (City of Wanneroo, April 2005), the following has been assumed for the existing geology across the NIA masterplan:

Existing geological knowledge of the Neerabup Industrial Area (NIA) is limited to surface geological mapping by the Geological Survey of Western Australia (Yanchep and Muchea 1:50,000 Environmental Geological Series). In addition, bore logs provided by the Water and Rivers Commission for the Flynn Drive Structure Plan identified one borehole in the southern portion of the study area and two at the northern edge. At the southern bore, karstic limestone was encountered at heights of 20-70 metres AHD and depths of 0-65 metres below ground level. Karsts were recorded at up to 35 metres above the water table.

The geology map divides the area into two types of Tamala limestone:

- *Ls1 A light yellowish brown, fine to coarse grained, sub-angular to well-rounded quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of Aeolian origin.*
- *Ls2 As Ls1, abundant karstic phenomena including caves, dolines, swallows.*

The Tamala limestone is a sandy limestone deposited in the Pleistocene and of Aeolian origin. It was probably laid down in dunes and resolution of shell fragments caused it to become variably cemented. Generally the surface above the Tamala limestone is characterised by a deeply leached sand from which the carbonate has been removed often to be deposited on the underlying limestone surface as a hard calcrete layer. In some cases the solution of carbonate may continue to depth creating karstic cavities particularly where the limestone has more carbonate cement. This effect is unpredictable.

The division in the mapping appears arbitrary and based purely on surface expression. It is unlikely that there are separate units with one liable to developing karst and one without karst features. The Tamala limestone is likely to develop karstic cavities and the most likely areas for these to have developed are where there are other cavities/caves in the local area.

Therefore, the presence of caves in the vicinity of the NIA is considered to indicate that there may be further undiscovered caves within the study area. Some 15 kilometres to the north extensive caves are developed into similar rocks in the Yanchep National Park.

In the Margaret River area caves in similar material have remained undiscovered until relatively recent times.

Further information on the existing geotechnical conditions can be found within GHD Local Water Management Strategy (June 2020).

2.3 Proposed site levels

The existing site levels are varied and do not have a consistent grade. At subdivisional development, individual lots will be earth worked to be generally flat or have minor grades that are suitable for construction of buildings and roads (as is the case within Meridian Park).

Refer to Appendix C for a plan of the site contour levels proposed for the NIA. The plan was developed by Cossill & Webley as a review of levels proposed by TBB in the 2004 Structure Plan.

The proposed site levels across the NIA range from 48 m Australian Height Datum (AHD) to 76 m AHD with general gradients rising from the southern, eastern and western extents of the site towards the northern boundary of the site along Lots 9005 and 9003. Development levels are constrained by matching into levels at boundaries (such as the Bush Forever site to the east) as well as attempting to replicate the existing landform for efficient development.

Table 1 below provides a summary of proposed levels from Appendix C for clarity. These lot levels are referenced in this report where commentary is provided on service accessibility (such as availability for Water Corporation water and wastewater) and planning.

Table 1 Proposed Development Levels

Lot No.	Proposed levels within lot (m AHD)*
Lot 801 (DWA)	54 (min) to 79 (max)
Lot 9006	52 (min) to 73 (max)
Lot 9003	54 (min) to 76 (max)
Lot 9100	57 (min) to 64 (max)
Lot 2001 north	Previously earthworks to 64.8 (existing pad)
Lot 2001 south	58 (min) to 65 (max)
Lot 8001	No changes to existing (conservation reserve)
Lot 1001	63 (min) to 64 (max) (existing pad)
Lot 1000	56 (min) to 62 (max) (existing pad)
Lot 100	No changes to existing (existing substation site)
Lot 9000	51 (min) to 58 (max)
Lot 508	58 (min) to 62 (max)
Lot 5	58 (min) to 64 (max)
Lot 1506	45 (min) to 61 (max)
Lot 801	61(min) to 70 (max) to match into conservation
Lot 900	60 (min) to 70 (max)
Lot 901	62 (min) to 70 (max)

Lot 800	74 (max) is existing, proposed levels subject to retention requirements of existing vegetation and approved subdivision layout
Lot 902	75 (max) is existing, proposed levels subject to retention requirements of existing vegetation and approved subdivision layout

1. Refer Appendix A for Land Ownership Plan (City of Wanneroo, May 2021)

*Approximate only, refer Appendix C for site contours map for further details.

2.4 Development timeframes

The NIA Economic and Employment Strategy Report (GHD 2020) identifies land development build out over a period of 50 years. This timeframe is based on discussion with key landholders including City of Wanneroo and DevelopmentWA, and in recognition of expected short term demand for industrial land and other drivers.

Staging is proposed around provision of essential infrastructure and services to ensure cost-effective development to meet demand for industrial floorspace. In particular, development staging will be impacted by the delivery of water and wastewater infrastructure, and accordingly we provide further commentary on staging within Sections 4 and 5 of this report.

3. Service Alignments

3.1 Standard Alignments

The NIA concept master plan that has been developed includes the upgrade or widening and extension of existing road reserves as well as illustrating indicative new road reserves as development proceeds.

The services discussed below will be located within these road reserves, with the alignments for services within greenfield developments guided by the Utility Providers Code of Practice for Western Australia (the UPCP).

An extract from the document is included as Appendix D (including explanatory notes), and the general arrangement is summarised below in Table 2.

Table 2 Road Reserve Service Corridors

Distance from Property Boundary (within Road Reserve)	Allocation to Service Provider
0 -500mm	Power
500 – 1300mm	Communications
1300 – 1800mm	Gas
1800 – 2400mm	Drinking and non-drinking water
2400 – 3000mm	Power poles, trees, streetlights and power
3000 – 4200mm	Sewer or Local Authority stormwater or non drinking water
4200 – 5000mm	Trunk services or storm water or sewer

The minimum verge width proposed in the NIA is 5.0m, on each side of the road reserve, and as such there is considered ample allowance for placement of all necessary services. It is noted that unlike infill / brownfield development scenarios, given the NIA is predominantly undeveloped and as road reserves have been designed wider to accommodate industrial vehicles, there is ample space to accommodate utility services now and into the future.

The UPCP does make allowance for services to be located beneath the pavement in certain circumstances, however this poses potential difficulties with maintenance and should be avoided unless necessary.

3.2 Non-standard alignments

We understand that some existing services within the NIA have been installed on a non-standard alignment.

There is no requirement for service alignments to be corrected in a brownfields site if the alignment remains mutually accepted by all stakeholders. If alignment correction is required to avoid service clashes, then amendment should be agreed between the relevant service providers and stakeholders.

3.3 Service Rail Crossing

A future rail corridor is detailed on the masterplan to the northern area of the NIA. We understand that the Public Transport Authority has given only minimal consideration to the rail at this time.

Service crossings will need to comply with the Public Transport Authority’s minimum cover clearances under rail or appropriate provision made on road over rail bridges.

4. Water Reticulation

4.1 Existing infrastructure

Information on the existing water reticulation network was received from the Water Corporation through a DBYD enquiry in May 2021. Further review of the Water Corporation's ESInet portal was also completed at this time.

A summary of the existing water network is provided on an annotated plan, included as Appendix E.

The NIA is located outside of the Water Corporation's Wanneroo Gravity Supply Zone. We have been advised that the NIA has never been considered as part of the Water Corporation's water planning, however the area has evolved as a temporary extension of the Wanneroo Gravity Supply zone as the NIA area has developed over time. For this reason, planning information received from the Water Corporation is limited and, to date, has been reactive to development of the NIA.

Currently the NIA is primarily fed by a DN375 PVC / DN400 steel water main extending along Flynn Drive from Old Yanchep Road to Mather Drive. Development both south and north of Flynn Drive is fed from this main.

A DN250 main branches from the DN400 at Mather Drive and extends north to Peak Road, where it terminates. The existing industrial lots west of Mather Drive are fed from the DN250 by a network of DN200 and DN150 mains. As per Water Corporation design standards, the lots have minimum DN150 sized mains for industrial areas.

There is no Water Corporation water infrastructure within the NIA north of Peak Road or along Pederick Road.

The Water Corporation has advised that the existing network only has capacity to provide a water service to all areas below a ground level of 65m AHD. Discussions with the Water Corporation noted that recent modelling confirmed this level limit.

4.2 Future infrastructure

4.2.1 Areas below 65.0m AHD

The Water Corporation advised their preference for development of the NIA to proceed for lots and development levels below 65m AHD before development of higher land. This is primarily to make use of the existing capacity of the system before high capital cost infrastructure is required.

The Water Corporation also confirmed that areas below 65m AHD can adequately be served via extension of the existing network mains.

Lots 801 (DWA), 9006, 9003, 9100, 2001, 1001, 1000, 9000, 508, 5, 1506, 801 (MRC), 900, 901, 800 and 902 have portions of developable areas of proposed design levels below 65m AHD.

Areas below 65m AHD will be serviced with water via extension of the DN250 main (along Mather Drive and Pederick Road) or a connection and extension off the DN375/DN400 main on Flynn Drive, depending upon the location of the lot.

When a lot is subdivided water reticulation mains will be sized as DN200 or DN150. The internal reticulation layout will follow the subdivisional roads layout, and the mains will be placed on the standard water reticulation alignment.

The Water Corporation advised that there may be the need for private funding of upgrades (either by individual developers or a developer's contribution scheme) in order to serve the ultimate demand, if the ultimate demand exceeds Water Corporation's assumptions for the industrial land water usage. For example, these upgrades could include duplication of the DN250 main along Mather Drive with another supply main coming off the DN375 distribution main, or with an upgrade to a larger main. In general, the Water Corporation do not fund upgrade works for mains sized less than DN300.

In addition to the above, Water Corporation identified a requirement to plan for and fund larger distribution mains (>300mm diameter) further back into the Wanneroo gravity system to the south. It is noted that major infrastructure costs are built into Water Corporations fee structure. In instances where a developer does provide / pay for upfront major infrastructure for an area, there is a reimbursement built into fees where costs of providing this infrastructure is then off-set.

While a single feed DN250 diameter main has considerable capacity (able to service approximately 500 residential lots), industrial water demands are more difficult to determine because there are more supply variables (i.e. fire flow requirements, peak instant demand, peak day demands) that need to be addressed by proponents in industrial developments.

The timing and extent of these upgrades will therefore be dependent upon the required water demands of the proposed industries at time of development. As development progresses, continuous liaison and engagement with the Water Corporation's water planners will provide further clarity on how and when upgrades are required. The Water Corporation will typically not progress utility service planning until such time that the need arises.

4.2.2 Areas above 65.0m AHD

Short Term

We understand that there is no immediate plan or funding within the Water Corporation for development of higher land above 65m AHD in the NIA.

This advice affects lots, or large portions of lots,801 (DWA), 9006, 9003, 801 (MRC), 900 and 901.

In the short term in lieu of Water Corporation supporting infrastructure, water supply to areas above 65m AHD could occur by private funding on a case by case basis. Options could include private booster stations located within private property, or only developing the portion of area below 65m AHD.

Long Term

In the long term, water servicing of levels higher than 65m AHD will require additional Water Corporation infrastructure, such as booster stations or high level water tanks.

We have been advised that the Water Corporation has recently concluded its review of the Wanneroo gravity and Wanneroo high level zone water planning. The primary driver for this planning review was to take account of the ultimate service numbers that will arise from the development of the proposed East Wanneroo urban area.

The Water Corporation has identified the possibility of a local booster station being provided as a future Water Corporation capital works project (i.e. funded by the Water Corporation), on the corner of Flynn Drive and Mather Drive, to supply a higher ground level that would be determined through a design and feasibility exercise. We understand the level would be a maximum of 80m AHD, when supported by other upstream distribution main upgrades constructed as planned by 2028. The site at this location is currently owned by the City, and this option would require a land purchase by the Water Corporation. Design would also determine other infrastructure that would be required, and the Water Corporation has advised that speculation on the extent of this infrastructure is premature to the outcome of a planning process and design exercise.

The Water Corporation has recently purchased a site at Lot 10 Wattle Ave West (approximately 12 hectares) to accommodate a possible future storage tank (/s) if and when they need to develop a future Nowergup water supply scheme. Water Corporation’s long term planning indicates that these works may be required around 2040 or beyond. We understand that there is no intention or capital assigned to construct storage tanks at the site in the short to medium term.

5. Wastewater

5.1 Existing infrastructure

Information on the existing wastewater network was received from the Water Corporation through a DBYD enquiry in May 2021. Further review of the Water Corporation's ESInet portal was also completed at this time.

A summary of the existing wastewater network is provided on an annotated plan, included as Appendix G.

Currently wastewater from the development west of Mather Drive discharges to the Redheart Road Wastewater Pump Station (WWPS), also known as WWPS 4, via a DN225 pipe.

Wastewater within Meridian Park, including development off Greenwhich Parade, currently discharges to a temporary tankering arrangement at the end of Horizon Terrace.

Existing wastewater pipe sizes with the development are DN225 pipes with DN150 connections to each lot, in accordance with the Water Corporation design standard for connections to industrial lots.

5.2 Proposed infrastructure

The Water Corporation has provided wastewater planning information, long term conceptual planning, included in this report as Appendix F. Note that this plan is subject to updates as development proceeds, or if a proponent wishes to amend or alter the plan.

In summary, the NIA is separated into five proposed wastewater catchments shown indicatively in Figure 5-1 below.

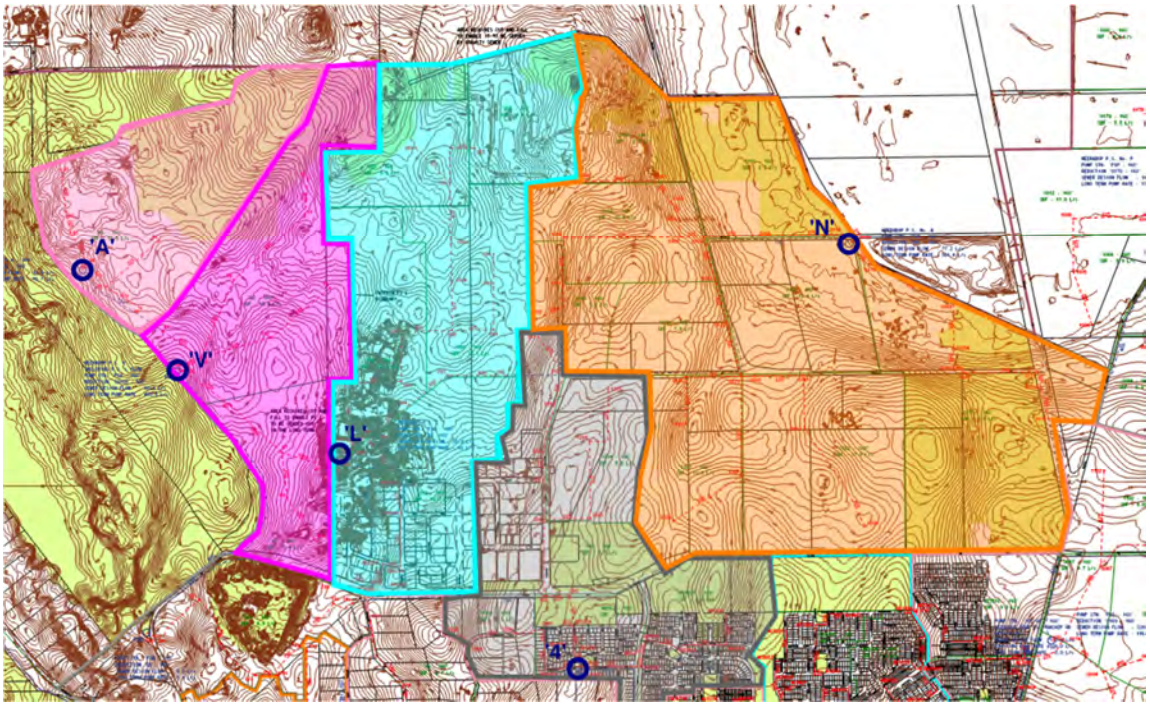


Figure 5-1 NIA Wastewater Catchment Areas (indicative) with WWPS

WWPS '4' is existing on Redheart Road south of Flynn Drive and will take future flows from some lots east and west of Mather Drive, including Lot 9100, Lot 2001 (south) and a portion of Lot 9003 (south). These lots will be serviced via connection to an extension of the existing DN225 on Mather Drive.

WWPS ‘L’ is currently activated and expected to be completed by the end of 2021. Completion of this infrastructure will include removal of the tankering arrangement on Horizon Terrace, as this line will be connected to the future pump station. This WWPS will take flows from Meridian Park (Lot 9006), a portion of Lot 9003 (west) and a portion of Lot 801 (DWA) (east). Ultimately, as development proceeds through the NIA, WWPS will be graded out, with all flows directed to WWPS ‘V’.

WWPS ‘V’ will be located on the mid-western edge of Lot 801 (DWA) and will be the major pump station for the NIA. This WWPS will take flows from the central area of Lot 801 (DWA). Note the location of the WWPS is at a proposed design level low point.

WWPS ‘A’ will be located to the north west of Lot 801 (DWA) and will take flows from development in the north west of Lot 801 (DWA). Note the location of the WWPS is at a proposed design level low point.

WWPS ‘N’ will take flows from the eastern side of the NIA, including Lot 5, Lot 900, Lot 901 and Lot 902 on Flynn Drive, and Lot 800, 801 (MRC), 508, 1506, 9000, 1000, 1001, 2001 (north), lot 600 and the northern portion of Lot 903. Note the location of the WWPS is at a proposed design level low point.

The Water Corporation was asked to confirm whether development on Flynn Drive and other areas within Catchment ‘N’ could proceed prior to the WWPS, and they advised that the preference remains for tankering to only be a temporary arrangement in the lead-up to a new WWPS being completed and commissioned.

The timing for funding and commissioning of the pump stations would be subject to the level and timing of development in the area. The pump stations are unlikely to be funded by the Water Corporation prior to development demand presenting itself in the NIA.

6. Power

6.1 Existing Network

The existing power network in the area consists of generation, transmission and distribution infrastructure. The NewGen Neerabup 330MW gas fired Power Station is connected to the Western Power Neerabup Terminal via a 330kV transmission line that runs in the vicinity of Old Yanchep Road.

There are also two 132kV transmission lines that pass through the development site to Western Power's Neerabup Terminal from Wanneroo in the south west and Pinjar in the north.

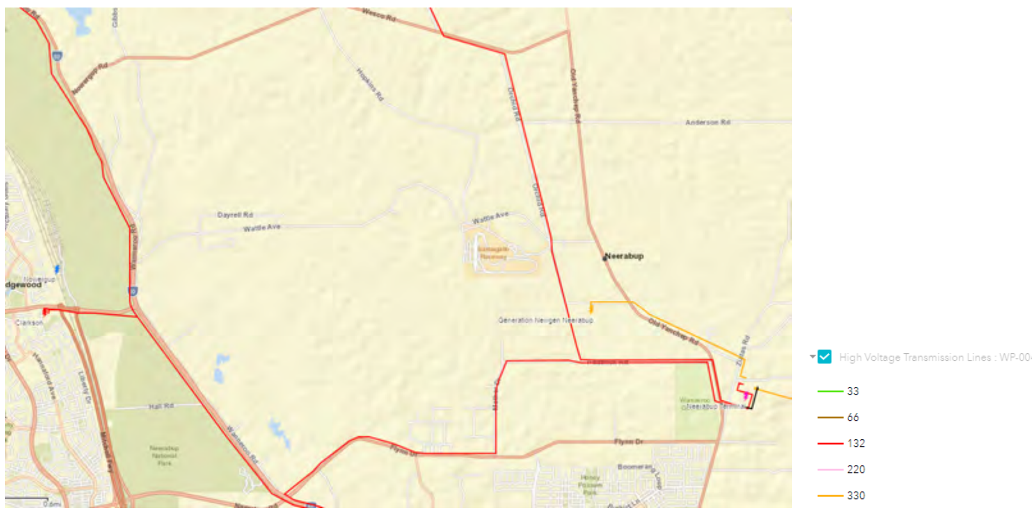


Figure 6-1 Western Power Transmission Network

The existing Western Power 22kV distribution network within the development area is composed of overhead lines and underground cables.

The initial stages of the NIA development near Flynn Drive (see area circled in Figure 6-2) have already been serviced from this distribution network in accordance with standard Western Power requirements. The existing distribution transformers that have been installed under these initial stages may have spare capacity to service some of the future lots in this area.

Figure 6-2 Western Power 22kV Distribution Network

The Western Power Network Capacity Mapping Tool currently shows a forecasted remaining capacity of <5MVA in the south and west sections of the development area and up to 25MVA in the vicinity of the 132kV Transmission line on the east of the development that connects with Pinjar. There is a projected reduction in the available network capacity in the area by 2036.

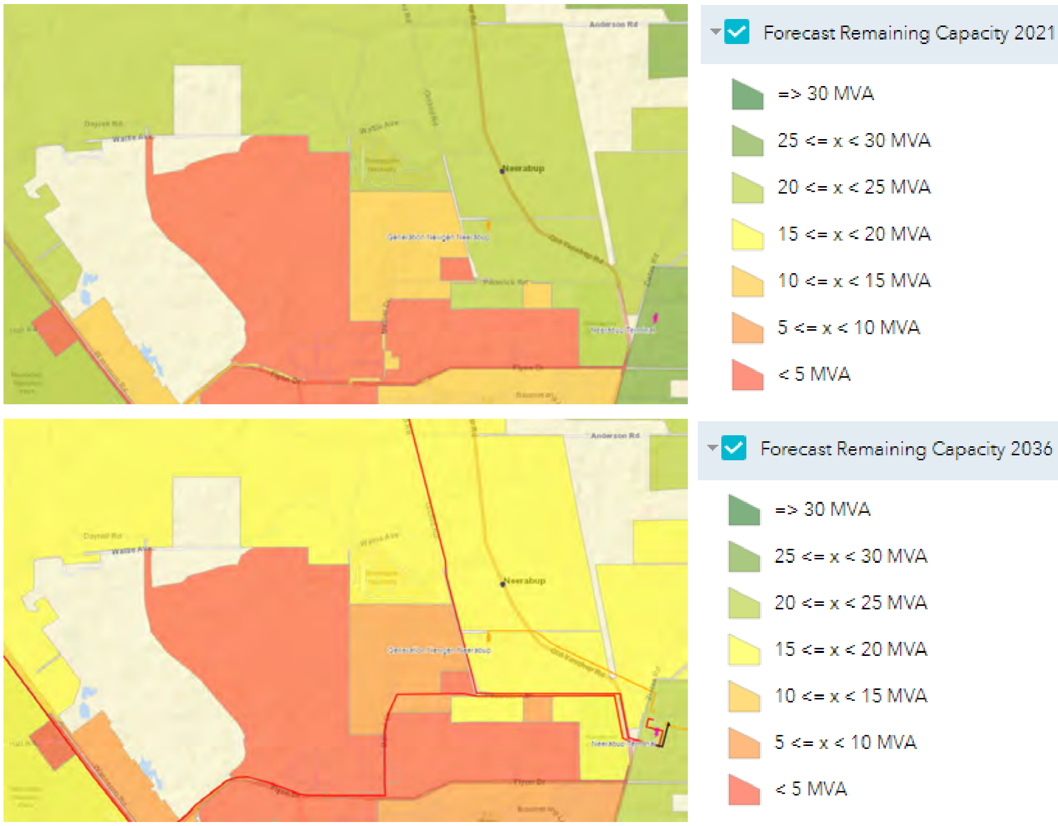


Figure 6-3 Western Power Capacity Mapping Tool (Western Power, Dec 2020)

It is understood that there are potential generation constraints on the Western Power network that could limit exports from an embedded network solution to <1.5MVA based on the current network configuration.

6.2 Proposed Network – Conventional Supply Arrangement

Western Power's minimum design requirements for commercial and industrial developments is currently 200kVA per hectare as specified within the Underground Distribution Schemes (UDS) manual.

Using the above requirements, Western Power require a minimum designed network capacity in the range of 120MVA to service the total developable area under a conventional subdivision servicing arrangement. This is unless specific loading requirements for individual lots can be confirmed at the time of servicing or an agreement can be reached with Western Power to accept a reduction for the lot servicing requirements based on comparable usage data for similar developments.

A total demand in this range would require a minimum of one new Western Power zone substation. Western Power will review demands as development proceeds to determine the timing for the substation. It is expected that this new substation would be located at Western Power owned Lot 40 and connected to the existing 132kV network by an overhead line extension from the 132kV transmission line that runs along Flynn Drive. Multiple 22kV distribution feeders would then reticulate through the NIA as development progresses to provide supply to Western Power transformers that would power the various low voltage distribution networks. It is understood that Lot 40 is currently constrained by a Bush Forever designation which would require Western Power to engage with DPLH to facilitate any clearing to accommodate requisite infrastructure. Western Power will typically not commence any planning to resolve constraints such as this until such time that the demand for this infrastructure arises. Timing of this planning phase would be at the discretion of Western Power and at the time of writing, was unknown.

Proponents with large power demands may require their own network connection at the 22kV voltage to supply their own internal HV distribution networks.

Proponents are unlikely to seek direct connection to the existing 330kV network in the area due to the higher costs and approval processes required to install new infrastructure at this voltage.

6.3 Proposed Network – Alternative Supply Arrangement

Detailed analysis of alternative supply arrangements has been provided in a separate Neerabup Renewables Study report for the City of Wanneroo's consideration. This report is included as Appendix H.

This renewable study assesses the use of solar PV generation (ground mounted arrays and roof top installations) supplemented by battery storage to create a grid-connected microgrid supply arrangement to service the Neerabup Industrial Area.

The report considers the use of Lot 9100 and Lot 9003 for the location of single axis ground mounted solar PV arrays and large-scale battery storage infrastructure. It is understood the City would prefer to use Lot 600 as the permanent site for solar PV generation and storage in the future.

Under this type of supply arrangement, the power network within the NIA would be installed, operated and maintained by an assigned service provider (rather than Western Power as per a conventional supply arrangement). It is still anticipated that a zone substation on Lot 40 will eventually be required to service the ultimate development with a connection to the 132kV transmission network on Flynn Drive.

6.4 Further Information From Western Power

A formal request to Western Power to perform a feasibility study will provide a better understanding of the timing, extent and projected costs for network reinforcement that may be required to support the City's preferred supply arrangement to service the Neerabup Industrial Area.

Should a feasibility study be sought, it is recommended that the following minimum information is requested from Western Power:

- Latest network planning capacity forecasts for the area
- Spare capacity on existing distribution transformers that can supply initial stages
- Available network capacity before a new zone substation would be required
- Planned Western Power works on the distribution and transmission networks
- Network constraints associated with exporting power to the grid
- Further information on actual load profiles for similar development

7. Gas Reticulation

7.1 Existing infrastructure

7.1.1 ATCO Gas Network

Information on the existing ATCO Gas network was received from ATCO Gas via DBYD enquiries in May 2021. The plans provided by ATCO Gas are provided as Appendix I, including associated legend.

A summary of this information is provided below.

Flynn Drive & Lot 9006 development

A high pressure (1900kPa) steel DN250 gas main runs along the southern verge of Flynn Drive for the extent of the NIA.

Meridian Park is connected to this main, via a crossing beneath Flynn Drive and extension of 350kPa PE DN110 gas main on Greenwich Parade. The DN110 gas main is reticulated throughout Meridian Park, including on Axis Parade, Longitude Avenue, Horizon Tce and Global Road.

Mather Drive

A high pressure (350kPa) PE DN110 gas main is located in the eastern verge of Mather Drive. The main is connected to the DN250 steel main on Flynn Drive and extends on Mather Drive to Pederick Road.

Pederick Road

A high pressure (350kPa) PE DN110 gas main is located in the northern verge of Pederick Road. The main is an extension of the main from Mather Drive, and terminates just prior to Orchid Road in the east.

7.1.2 NewGen Neerabup Partnership Gas Main

The NewGen Neerabup Partnership Gas Main asset is owned by NewGen Neerabup Partnership and managed by Shell Energy (formerly ERM Power).

The Neerabup Gas pipeline system is only used to provide natural gas to Neerabup Power Station (also owned by NewGen Neerabup Partnership and managed by Shell Energy).

The gas main extends from the Neerabup Power Station, east along Trandos Road and north on Old Yanchep Road.

KP28-30 (PL75) ...the location of NewGen Neerabup Pipeline is indicated in red

Figure 7-1 NewGen Neerabup Partnership Gas Main

7.2 Proposed infrastructure

ATCO Gas have confirmed that subdivisional development of the larger individual lots would necessitate connection to the existing high pressure DN250 steel main located on Flynn Drive, PE main on Mather Drive or PE main on Pederick Road. For example, Lots 5, 900 and 901 would have gas supplied via a lower pressure connection to the high pressure main on Flynn Drive. Installation of a lower pressure network would then extend throughout the subdivided lot, with the extent determined by each property owner. Such is the case with current development of Lot 9006.

Individual lot connection arrangements will be confirmed by ATCO Gas upon request for a gas design from each developer.

Lots that are not subdivided but that require a gas connection could have a direct connection to the high pressure gas main network, however the cost and arrangement of such would be determined through a connection request to ATCO Gas. Discussions with ATCO Gas have indicated that the cost of direct connection would be prohibitive and unnecessary for the demands that are expected.

ATCO have advised that a 600kPa high pressure mains extension proposed in the near future for Avery Street, connection between Mather Drive and Lot 1067 Pinnacle Drive. This is also shown on Appendix I.

GHD have held discussions with ATCO Gas to confirm any plans for infrastructure upgrades to further service development of the area. Based upon current expected development and anticipated gas requirements and usage, upgrades to the existing high pressure mains are not expected. This advice may change pending the individual gas requirements which arise from future (individual) developments. Nevertheless, based on the development type that has been attracted to the NIA to-date, there would not appear to be any significant gas requirements.

ATCO have noted that they are happy to provide guidance and assistance to prospective commercial or industrial developers of the vacant lots. Information required would include a summary of the individual energy profile, i.e. peak capacity / hourly flow rates and appliance pressure requirements (Min kPa inlet pressure).

8. Telecommunications

8.1 Legislative Requirement

The need to provide telecommunications infrastructure as part of land subdivision is governed under the *Telecommunications Act 1997*. Specifically, Part20A requires the following:

- providing nbn^{TM} (formerly NBN Co) is the default requirement
- where nbn^{TM} is not available now or into the future, then one can opt for an alternative (e.g. alternative fibre providers, copper cables, satellite etc)
- a corporation must not sell or lease a lot unless it is fibre-ready
- there are instances where one is exempt from having to provide a telecommunications connection (e.g. defence of intelligence related works, transport authorities, broadcasting services, electricity supply bodies or where the Minister has exercised his/her discretion).

Put simply, it is an obligation on owners and developers to ensure future lots and developments have modern telecommunication infrastructure in place prior to selling or leasing a property.

8.2 Existing infrastructure

GHD initiated a DBYD enquiry for the NIA and received responses from nbn^{TM}, Optus, Telstra and TPG, all who have minor communications infrastructure in the area.

There does not appear to be a coordinated existing telecommunications network for the NIA. Existing telecommunication infrastructure is scattered within each road reserve. The infrastructure does not appear to adhere to standard service corridors, with the exception of development through Meridian Park which has been provided with nbn^{TM} infrastructure throughout.

8.3 Proposed infrastructure

Nbn^{TM} was established in 2009 to design, build and operate Australia's wholesale broadband access network. The default infrastructure provider for broadband Australia wide is nbn^{TM}.

Nbn^{TM} provides services on its local access network on equivalent terms to retail phone and internet providers, to provision for end-user needs. Owners and developers are therefore able to select a telecommunications service provider that is active within the NIA area. At the time of writing, over 40 phone and internet providers were active in the NIA area with regard to provide nbn^{TM} / fibre services[1], meaning that the NIA is 'fibre ready'.

This means that a developer in the area can apply to nbn^{TM} to provide infrastructure to their development, and there is a standard process for this. Should nbn^{TM} be the chosen fibre provider, the developer is required to install and fund a pit and pipe system to nbn^{TM} requirements (if not already existing) and then transfer ownership of this infrastructure to nbn^{TM} via the execution of a Developer's Agreement in exchange for provision of data infrastructure within that pit and pipe.

Alternatively, individual developers can make arrangements with other providers, such as Opticomm, to provide similar infrastructure.

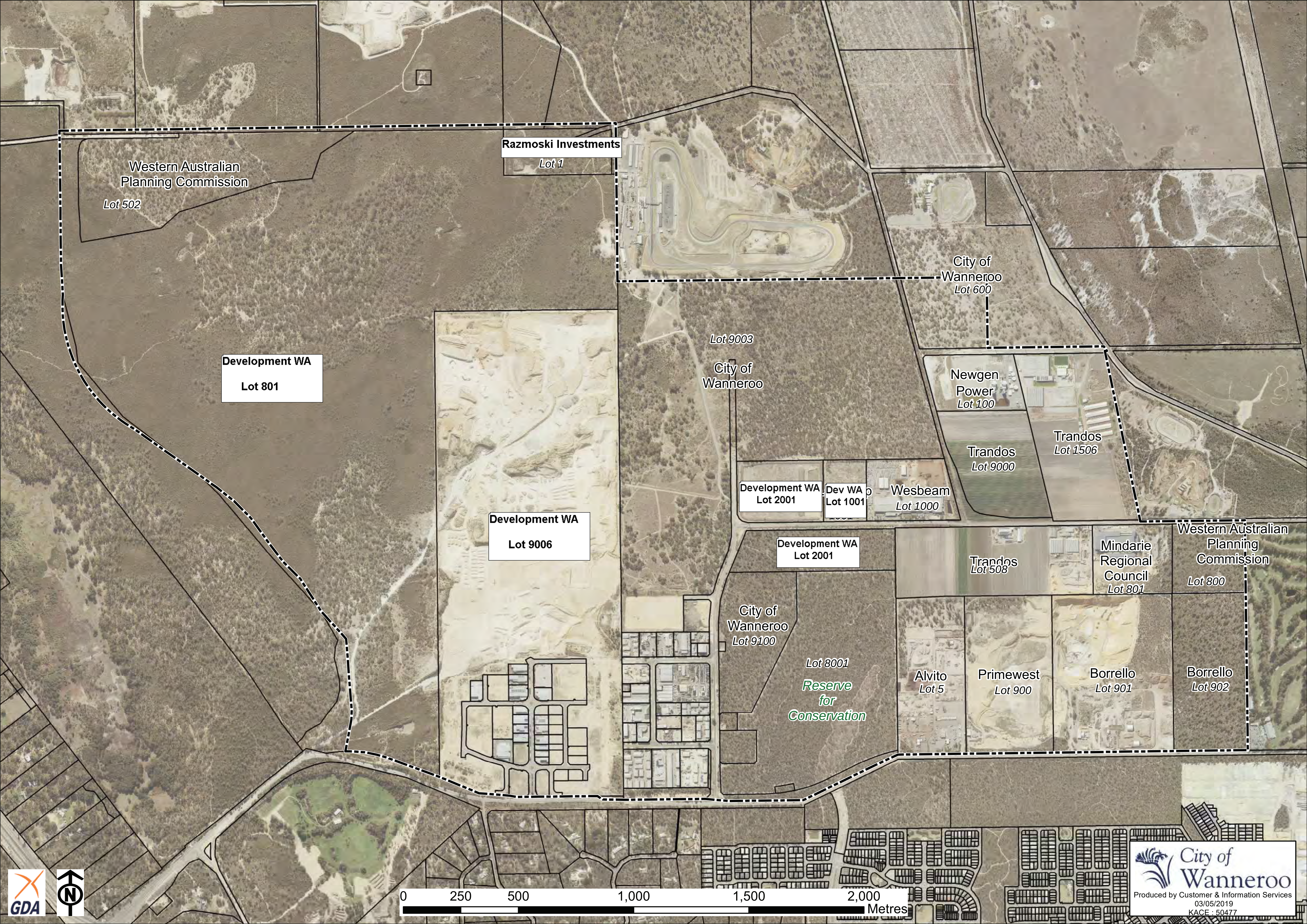
Proposed telecommunications infrastructure through the NIA will be designed by a chosen carrier to the extent requested by each developer, and as such cannot described at this stage.

---

[1] Proponents can search nbn^{TM} providers in the area through nbnco.com.au [https://www.nbnco.com.au/connect-home-or-business/check-your-address/choose-a-provider]

Appendices

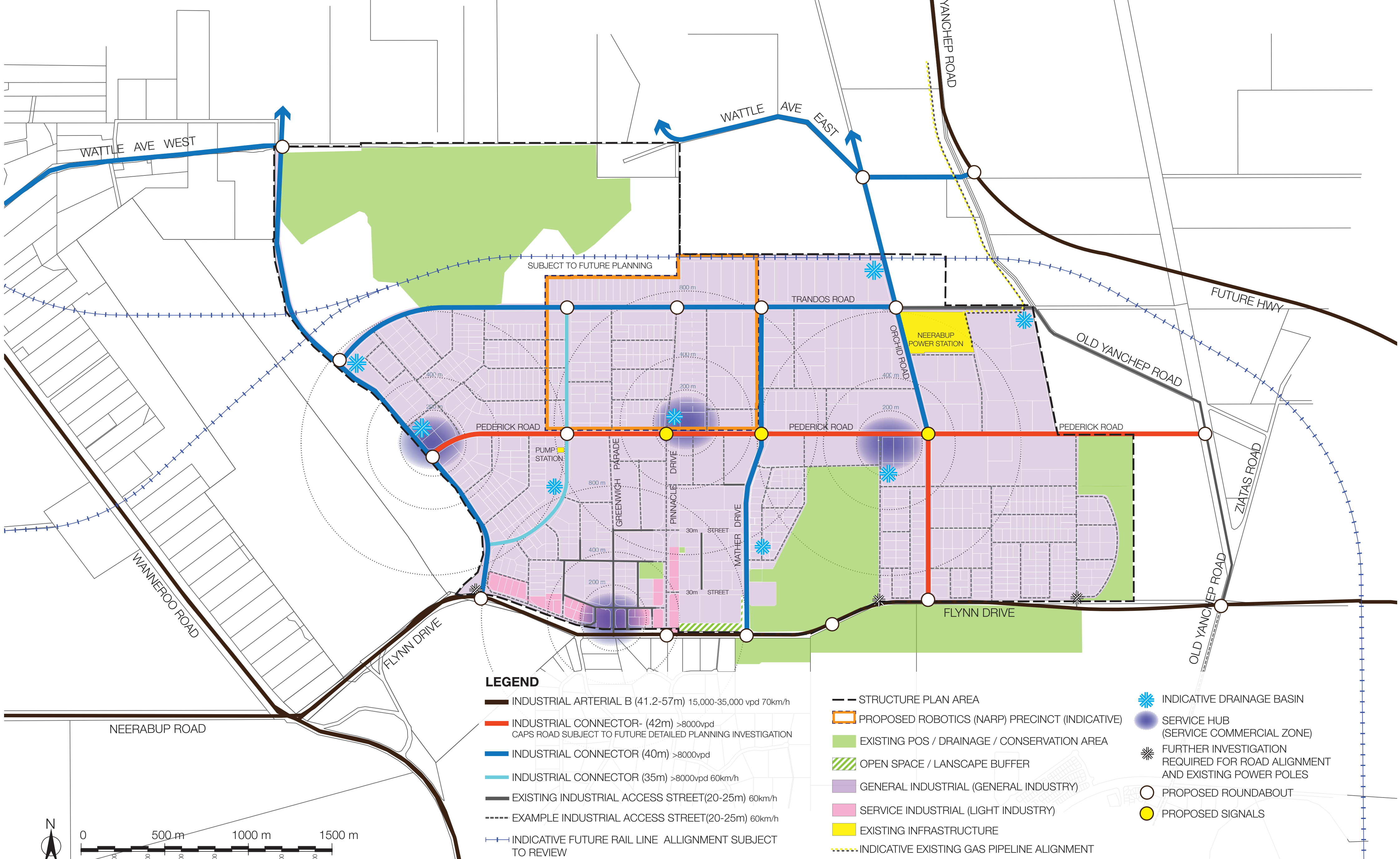
Appendix A – Land Ownership Plan



Razmoski Investments
Lot 1
Western Australian
Planning Commission
Lot 502
City of
Wanneroo
Lot 600
Lot 9003
City of
Wanneroo
Development WA
Lot 801
Newgen
Power
Lot 100
Trandos
Lot 1506
Trandos
Lot 9000
Development WA
Lot 2001
Dev WA
Lot 1001
Wesbeam
Lot 1000
Development WA
Lot 9006
Development WA
Lot 2001
Western Australian
Planning
Commission
Lot 800
Trandos
Lot 508
Mindarie
Regional
Council
Lot 801
City of
Wanneroo
Lot 9100
Lot 8001
Reserve
for
Conservation
Alvito
Lot 5
Primewest
Lot 900
Borrello
Lot 901
Borrello
Lot 902
GDA
N
0
250
500
1,000
1,500
2,000
Metres
City of
Wanneroo
Produced by Customer & Information Services
03/05/2019
KACE : 50477

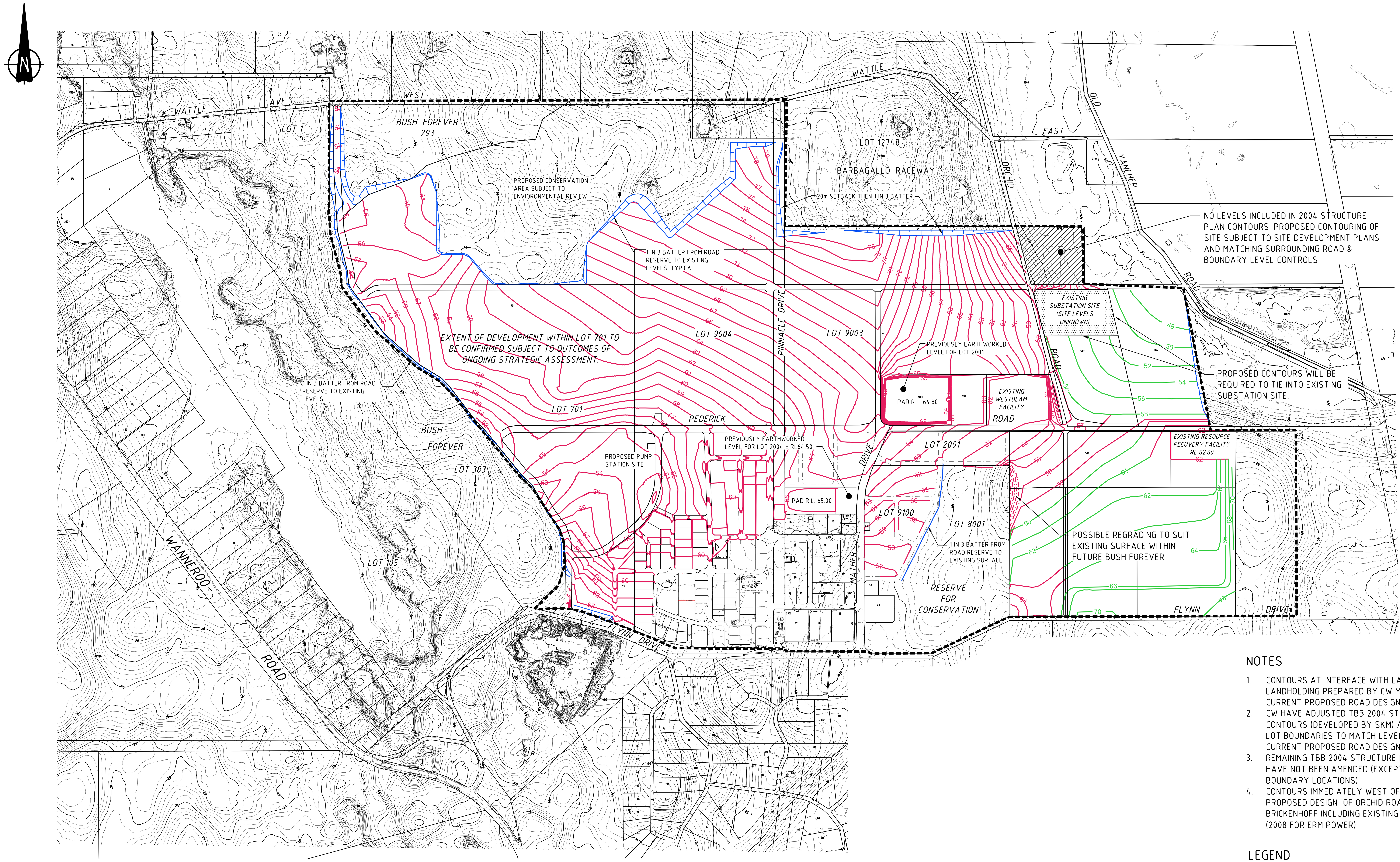
Appendix B – Neerabup Industrial Area Master Plan

DRAFT MASTERPLAN
NEERABUP INDUSTRIAL AREA



NOTES: 1- PTA WILL CONSTRUCT AND FUND ANY GRADE SEPARATIONS OVER RAIL LINES WHERE A ROAD IS IN-SITU. WHERE THE ROAD IS CONSTRUCTED AFTER THE RAIL LINE, DEVELOPER IS REQUIRED TO FUND.
2- INDUSTRIAL ARTERIAL AND CONNECTOR ROADS TO FACILITATE MINIMUM RAV4 ACCESS.

Appendix C – Final Surface Contour Plan (Cossill & Webley, 2017)



NOTES

1. CONTOURS AT INTERFACE WITH LANDCORP & CoW LANDHOLDING PREPARED BY CW MATCH EXISTING OR CURRENT PROPOSED ROAD DESIGN LEVELS.
2. CW HAVE ADJUSTED TBB 2004 STRUCTURE PLAN CONTOURS (DEVELOPED BY SKM) AT ROAD INTERFACE & LOT BOUNDARIES TO MATCH LEVELS ALONG EXISTING & CURRENT PROPOSED ROAD DESIGN LEVELS
3. REMAINING TBB 2004 STRUCTURE PLAN CONTOURS HAVE NOT BEEN AMENDED (EXCEPT AT SELECTED BOUNDARY LOCATIONS).
4. CONTOURS IMMEDIATELY WEST OF ORCHID RD TIE INTO PROPOSED DESIGN OF ORCHID ROAD BY PARSON BRICKENHOFF INCLUDING EXISTING O/H POWERLINES (2008 FOR ERM POWER)

LEGEND

AMENDED 2015 STRUCTURE PLAN CONTOURS
ORIGINAL 2004 STRUCTURE PLAN CONTOURS
STRUCTURE PLAN BOUNDARY

0m 200 400 600m
1:10000

REV	DATE	DRN	CKD	APP	AMENDMENT
F	07.06.17	JBA	RP	R. Staniforth	LOT 8001 RESERVE FOR CONSERVATION ADDED
E	14.12.15	JBA	RP	R. STANIFORTH	ROAD LAYOUT REMOVED FOR CLARITY
D	09.11.15	JBA	RP	R. STANIFORTH	BATTER AMENDED TO COLOUR WHEN PLOTTED
C	20.08.15	JBA	RGS	R. STANIFORTH	CONTOURS REVISED TO SUIT EXISTING SUBSTATION & RESOURCE RECOVERY FACILITY
B	12.08.15	JV	RP	R. STANIFORTH	CONTOURS REVISED ADJACENT TO LOT 1001 AND EXISTING WESTBEAM FACILITY
A	07.08.15	JBA	R.P.	R. STANIFORTH	ISSUED FOR INFORMATION

This plan is not to be used for construction unless issued as revision 0 or higher

Cossill & Webley CONSULTING ENGINEERS
Mailing Address
PO Box 680
Subiaco WA 6904
Street Address
B12 (Level 2) 431 Roberts Road
Subiaco WA 6008
T (08) 9422 5800 F (08) 9422 5801 E admin@cosweb.com.au

CLIENT: LANDCORP
APPROVED: ROLAND STANIFORTH
DESIGNED: JBA
SCALE: 1:10000
PROJECT: LOT 22 FLYNN DRIVE, NEERABUP
TITLE: PROPOSED AMENDED STRUCTURE PLAN CONTOURS 2015
WAPC No.
DRAWING No. 5920-00-SK128
REVISION: F
ORIGINAL SIZE: A1

P:\5920 Lot 22 Flynn Drive\5920-00\Acadwork\5920-00-SK128.dwg, 7/06/2017 9:50:26 AM, jeffa, Digital Signing PDF.pc3, 1:1, - CW Reference

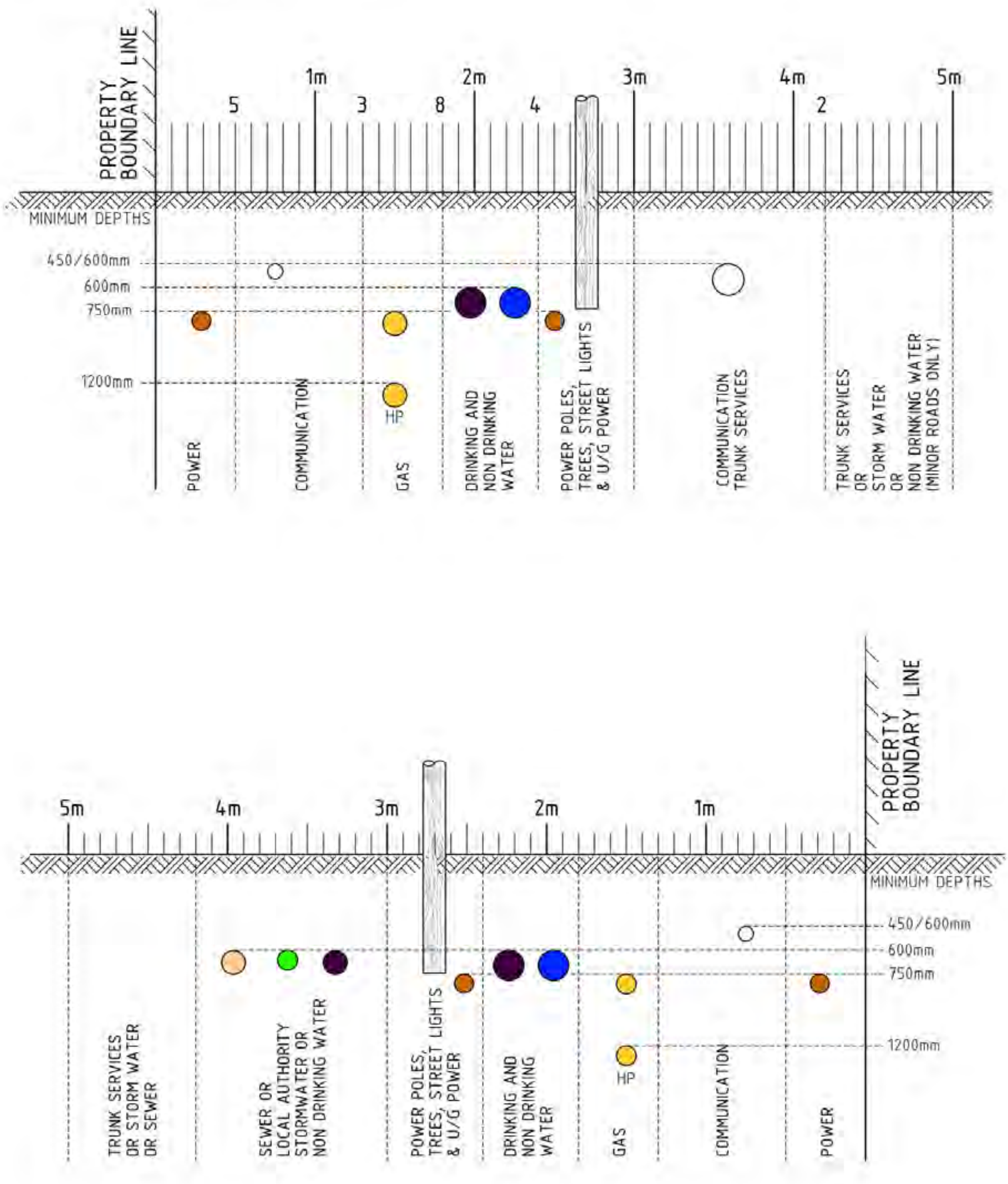
Appendix D – Extract from UPSC Code of Practice – Road Reserve Allocation

ROAD RESERVE ALLOCATION FOR UTILITY SERVICE PROVIDERS IN NEW 'GREEN FIELD' DEVELOPMENTS

(Applicable AFTER May 2001) and supersedes **ALL** allocations shown in previous codes

FIGURE B3

ROAD RESERVE ALLOCATION FOR UTILITY SERVICES *AFTER* MAY 2001



Notes:

1 All measurements relate to distance from the Property Line on each side of the road reserve unless otherwise specified.

2 Although the diagrams show a single utility service within each corridor, these may be multiple services of similar utilities.

3 Junction pits and access chambers may extend into the 2.4 - 3.0 metre corridor by agreement with the electricity network provider.

4 Alignments in the 4.2 - 5.0 metre corridor may be used by arrangement between utility providers.

5 Traffic light installation cables for synchronising systems to be located in the verge by arrangement with utility providers. Similarly under established footpaths some variations may be necessary to electrical and telecommunication cable alignments following negotiation and approval from other affected utility providers.

6 In new developments Power and Communications distribution cables are to be laid in locations shown. Under established footpaths some variations may be necessary following negotiation and approval from other affected utility providers and the road authority.

7 In general, no underground utility service shall exceed a nominal 300mm diameter within the 0 - 3.0 metre corridor. Larger utility services may be located within this corridor following negotiation and approval of other utility providers.

8 Local Government reticulation, rising irrigation or non-drinking water mains location options indicated as non potable water pipes in Figure B3. Agreement must be obtained from relevant water utility prior to works commencing.

9 The planting of street trees should be of a type and variety to cause minimal interference to utility services. (Refer to the applicable Local Government for policy and specification).

10 Utility services may be located beneath the carriageway where verge space is insufficient. Consultation must be made and agreements obtained with all relevant utility providers and road authorities.

11 Verge widths may vary. Refer to the current version of the Liveable Neighbourhoods produced by the Western Australian Planning Commission for acceptable verge widths, particularly if trees are to be planted in the verge. Also consult appropriate Local Government.

12 Electricity cables and conduits to pass under gas and water.

13 Gas to pass under water at reticulation crossings.

14 Gas services (lead ins) connecting to the property shall pass under communications and over underground power cables and water mains.

15 A minimum clearance of 300mm is required between gas and other utility services. If 300mm clearance cannot be achieved, approval of the gas provider shall be obtained.

16 A minimum clearance of 150mm is required between sewer main and other utility services and between water main and other utility services. (Note clearance of reticulation services may vary from this value). Refer also to Table B1, Clearance Zones Guide regarding minimum clearances between utility services when undertaking works within the road reserve.

17 Cover, bedding and backfill are to be in accordance with utility provider's requirements (e.g. water reticulation in accordance with Water Corporation's Drawing BD62-1-1) and road authority's reinstatement specification requirements.

18 All reticulation to be laid within +/-100mm wherever practicable of the indicated centre line and secured against movement with initial backfill. Some utility practices may vary from this requirement particularly for multiple utility services.

19 Low voltage cables used by non-network provider for street lighting shall be installed in the 2.4 - 3.0 metre service allocation. Cabling outside of the alignment including streetlight and unmetered supply consumers mains cabling shall be run at right angles to the services corridors including road crossings. Streetlight cabling in median strips shall be installed directly between poles but installation under road ways shall be avoided. Refer also to Section 8.1.2 of this Code.

20 Different alignment corridors may apply to green field developments in Narrow Road Reserves with widths of 14.0 - 16.0 metres. **Refer to Figure B4**.

21 Where there are problems with the 0 - 0.5 metre alignment, power may be installed on the 2.4 – 3.0 metre alignment subject to approval by Western Power or Horizon Power.

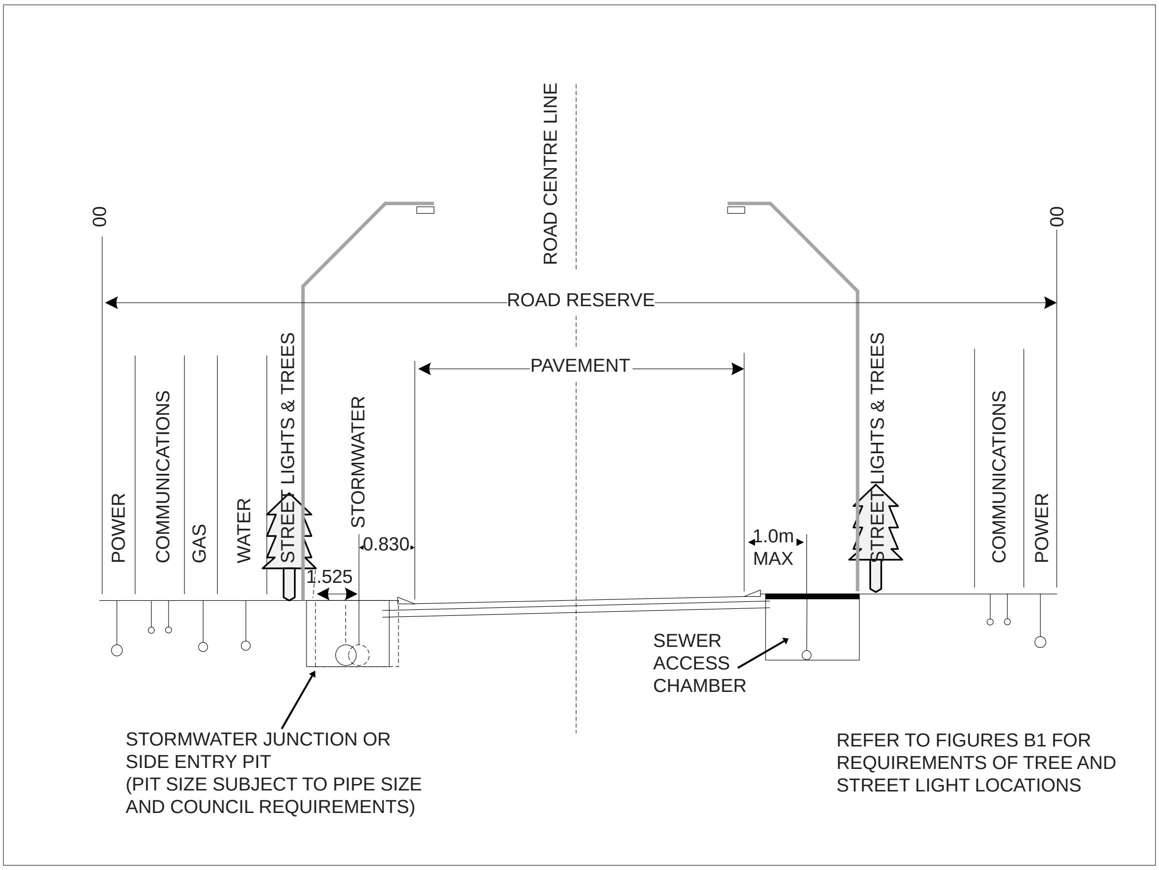
22 Services allocation in the 3.0 – 4.2 metre alignment shall be by agreement with nominated utility providers.

ROAD RESERVE ALLOCATION FOR UTILITY SERVICE PROVIDERS IN NARROW ROAD RESERVES (NOMINALLY 14.0 – 16.0 METRES)

These allocated alignments apply to all new developments after October 2002 and supersedes all allocations shown in previous Codes of Practice, including Standard and Common Trenching. All affected utility service providers must agree to proposed variations to these allocations.

All previous utility services allocation notes apply except where varied below.

<u>Figure B4 Narrow road typical services installation arrangement.</u>



Notes:

1 The designers of narrow road reserves are obliged to consider the relationship of all utility services, surfaces and furniture with each other. The corridors shown in this diagram can only be varied with approval from all affected utility service providers.

2 All measurements generally relate to the distance from the property line on each side of the road reserve unless otherwise specified.

3 Access chambers may extend into the trees and lights corridor.

Appendix E – Water Corporation Existing Water Reticulation Network (May 2021) - annotated

LEGEND

- = Service/meter
- = DN100 PVC
- = DN150 PVC
- = DN200 PVC
- = DN250 PVC
- = DN375 PVC
- = DN400 Steel

Appendix E - Water Corporation Existing Water Network May 2021 (annotated)

**information from ESInet portal dated 20/05/2021*

Appendix F – Water Corporation Long Term Wastewater Scheme Planning

DESIGN FILE:

THE INFORMATION ON THIS PLAN IS BASED ON THE BEST DATA AVAILABLE AT DATE OF PRINTING AND IS SUBJECT TO ONGOING REVIEW AND AMENDMENT. NO RESPONSIBILITY IS ACCEPTED BY THE WATER CORPORATION FOR ACCURACY OF DATA SUPPLIED BY EXTERNAL AGENCIES.

LEGEND

- EXISTING PUMPING STATION
- EXISTING PRESSURE MAIN
- EXISTING GRAVITY SEWER
- PROPOSED PUMPING STATION
- PROPOSED PRESSURE MAIN
- PROPOSED GRAVITY SEWER
- PARKS AND PUBLIC OPEN SPACE
- EXISTING SEWERED AREAS
- SEWERED BY PRIVATE PS
- NODE CATCHMENT
- PS AND SEWER CATCHMENTS
- SEWER DISTRICT CATCHMENT
- WWTP CATCHMENT

NOTATION

CATCHMENT NODE
SEWER DISTRICT NUMBER
'7001 - 121'
SDF = 1.5 x AVERAGE DAILY FLOW RATE

DATE	REVISION DESCRIPTION	DRN	APPD
NOV 2020	UPDATED QUINNS MS FROM NODE 'S2096-503' TO NODE 'S2100-503'	F. MALEKI	T. ZHENG
JUN 2020	UPDATED LANDUSE, UPDATED EXISTING PIPES, CHANGED DISCHARGE POINT OF PROPOSED GRAVITY SEWER FROM N1783 TO N2092	F. MALEKI	T. ZHENG
FEB 2018	ADDED YANCHEP RD TEMP PS, UPDATED PS Q CATCHMENT AND LOCATION	L. GABRIEL	
MAY 2017	Updated the invert levels for DN450 GS from AC N1793 to AC N1801 as per drawing L028-2-1	D. GAMAGE	T. ZHENG

SHEET INDEX

AQUA NO. 13425358

AQUA VERSION V5

WATER CORPORATION

ISSUED WITH THE AUTHORITY OF THE MANAGER INFRASTRUCTURE PLANNING BRANCH
629 NEWCASTLE STREET, LEEDERVILLE 6007
WESTERN AUSTRALIA.
TELEPHONE (08) 9420 2420, FAX (08) 9420 3179

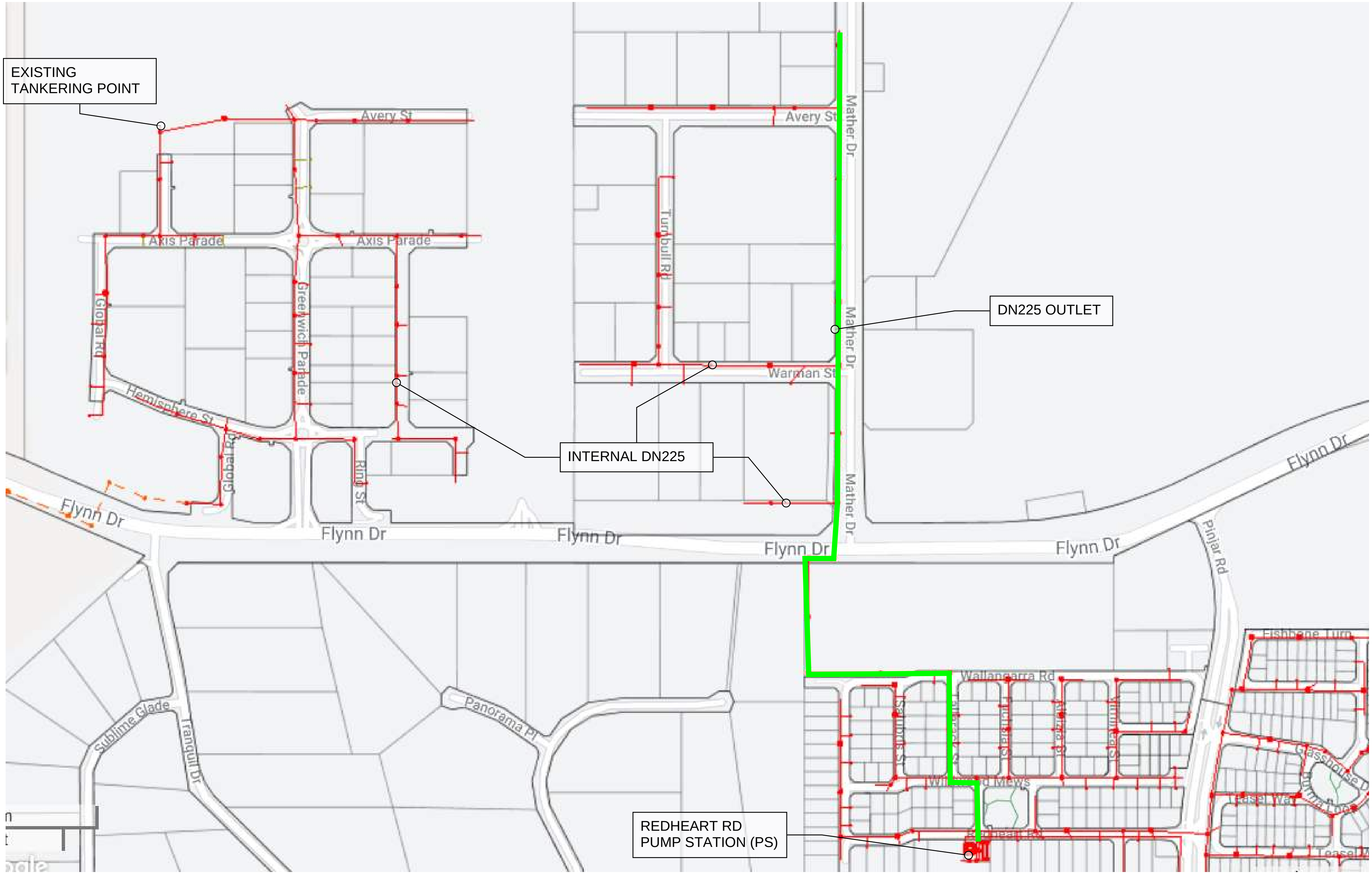
WASTEWATER SCHEME PLANNING SERIES

NEERABUP SD160

CONCEPTUAL PLANNING LONG TERM SCHEME

PLANNING BY	COMPILED BY	ACCEPTED BY
AIPM PLANNERS	W. CALLANAN	C. DELPORT
SCALE 1:15,000	FULL REVIEW 7 JULY 2015	FILE NO. JT1 2010 07892 V01 A0

Appendix G – Water Corporation Existing Wastewater Network (May 2021) - annotated



Appendix G - Water Corporation Existing Wastewater Network May 2021 (annotated)

information from ESInet portal dated 20/05/2021

Appendix H – GHD Renewables Report

Neerabup Renewables Report

June 2021

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Table index

Figure index

Appendices

1. Introduction

1.1 Purpose

GHD have prepared this report as a technical and commercial assessment of opportunities to utilise renewable energy sources for industrial development in the Neerabup Industrial Area. This screening study incorporates considerations of the available renewable energy sources together with a battery storage facility to complement the generation capacity, and the various possible operational and governance arrangements for such a scheme.

It is acknowledged that the City has commissioned a separate study involving:

> "A financial assessment of the estimated costs to the City associated with themselves or a third party constructing, owning, managing, operating, maintaining and retailing ….. the most feasible renewable energy supply option."

The final report for this study has not been made available to GHD and so this report can be considered a separate and comparable set of assessments and recommendations.

This study has been significantly informed by Development WA's microgrid project for the Nambeelup Industrial Area (also known as the Peel Business Park).

1.2 Scope and Limitations

This report: has been prepared by GHD for City Of Wanneroo and may only be used and relied on by City Of Wanneroo for the purpose agreed between GHD and the City Of Wanneroo as set out in the contract for the overall commission.

GHD otherwise disclaims responsibility to any person other than City Of Wanneroo arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared the preliminary cost estimates and prices set out in Section 8 of this report ("Financial Performance") using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by GHD derived from previous projects.

The section has been prepared for the purpose of assessing the likely feasibility of an onsite renewable energy project and must not be used for any other purpose.

Any estimates are preliminary only. Actual prices, costs and other variables may be different to those used to prepare the estimates and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the project can or will be undertaken at a cost which is the same or less than the Cost Estimate.

Where estimates of potential costs are provided with an indicated level of confidence, notwithstanding the conservatism of the level of confidence selected as the planning level, there remains a chance that the cost will be greater than the planning estimate, and any funding would not be adequate. The confidence level considered to be most appropriate for planning purposes will vary depending on the conservatism of the user and the nature of the project. The user should therefore select appropriate confidence levels to suit their particular risk profile.

2. Yield and Demand

An approximate yield has been derived from the previous September 2017 Structure Plan and the Market Positioning and Viability Assessment report.

The following indicative disaggregation of the site has been derived from the Landgate cadastral information and the Structure Plan (Table 1) in order to derive the likely final developable land area.

Table 1: Developable Land Calculation

Un-subdivided lots	910
Subdivided lots	45
Road reserves	30
	955
Bush Forever	152
Reserves	52
Conservation	455
	204
Developable land	
Industrial lots	563
Road reserves	188
	751

Based on the proposed split between different industrial activity an approximate yield has been developed (Table 2).

Table 2: Assumed Yield

		Area		Lot size (ha)	Ave lot size (ha)	No. lots
Large scale industry	10%	56		5-10	6.5	9
General industry	60%	338		2-5	2	169
Service	20%	113		0.5-1	0.75	150
Commercial/retail	10%	56		0.5	0.5	113
Total	**100%**	**563**				**441**

Some 45 ha of the southern part of the site have already been subdivided. These lots are presently serviced conventionally via the Western Power distribution network. For the purposes of this study it has been assumed that they would be integrated into a site wide power scheme.

3. Demand Assumptions

It is extremely difficult to predict the future energy demand of industrial development because the land uses vary from low energy uses such as logistics to very high energy use in intensive industrial processes. For this study, unit energy demands have been developed from those used in a range of previous industrial land development projects, and are derived from actual load profiles. The assessment does not include any future load from electric vehicles.

Each industrial use has been assumed to comprise small, medium and large users with the individual characteristics and total load demand set out in Tables 3 and 4.

Table 3: Assumed Power Characteristics

							per premise				
		ha	ha	Ave	No.		Peak (kVA)	Ave (kVA)	LF	Annual (MWh)	kVA/ha
Large scale industry	10%	56	5-10	5	11	11	363	230	0.63	2,019	73
General industry		338	2-5	2	169						
Large 7d	10%					28	363	230	0.63	2,019	181
Med 5d	10%					28	86	34	0.40	300	43
Med 7d	40%					113	72	46	0.63	401	36
Service		113	0.5-1	0.5	225						
Med 7d	10%					113	86	34	0.40	300	172
Med 5d	10%					113	29	11	0.40	100	57
Commercial/retail		56	0.5	0.5	113						
Small 7d	2.5%					28	10	3	0.30	26	20
Small 5d	7.5%					85	8	2	0.22	15	16
	100%	563			518	519					
					0.78	Ha/lot					

*d= activity days

A half hourly annual demand assessment has been made for each user to derive an overall load for the industrial area at full buildout (Table 4) which is also based on profiles used in a range of previous industrial land development projects.

Table 4: Assumed Loads

Peak load	36,800 kVA (65 kVA/ha)
Average load	20,455 kVA
Load factor	0.56
Annual demand	179,675 MWh (319 MWh / ha

Typical weekday profiles for each month are depicted in Figure 1.

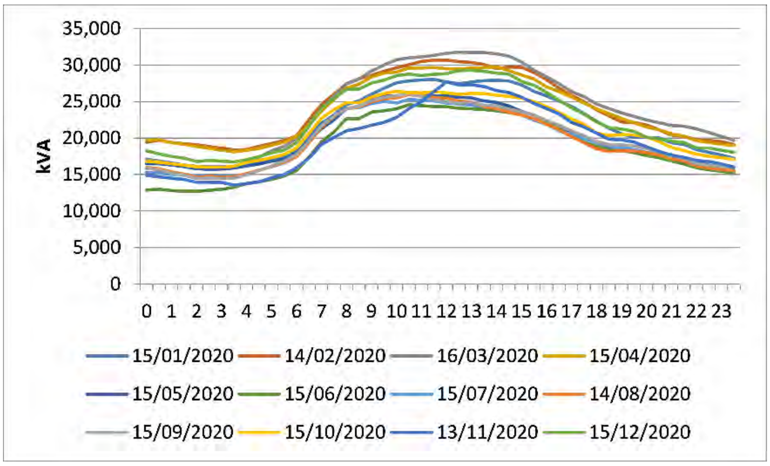

Figure 1: Typical Weekday Load Profile

The assumed loads include businesses with both 5 day and 7 day activities with various load factors and so loads vary from weekedays to weekends. Assuming the existing Synergy time of use periods for business contracts (R1 and R3 tariffs) the peak and off-peak loads are represented below.

Table 5 Peak & Off-peak Loads

	Weekends	Weekdays
Peak (8am – 10pm)		46%
Offpeak (10pm – 8am)	25%	29%

4. Energy Performance Model

The renewable energy options considered below have been simulated using a bespoke systems model. The model inputs are the load and generation profiles for a typical 24 hour period in each month, and the model simulates (inter alia):

- Energy demand met directly by onsite generation;
- Energy stored and discharged from onsite batteries;
- Energy required to be imported from the South West Interconnected System (SWIS) when onsite generation / storage discharges are insufficient to meet demand (in whole or part);
- Energy exported to the SWIS when onsite generation exceeds that necessary to meet demand and storages are full; and
- The load on the SWIS network arising from both import and export.

The model assumes battery storage has 10% losses and maximum discharge of 80%.

5. Renewable Energy Options

5.1 Viability

The viable renewable energy generation options for the development are solar PV and wind energy. Solar PV could comprise of either or both of a ground mounted tracking array and rooftop solar systems.

A simple evaluation of the suitability of these generation types can be illustrated by estimating the capacity of each to match the total annual electricity load from the development on an average day The generation profiles for each energy source have been derived from analysis of renewable energy generators on the SWIS, and analysis of rooftop solar performance in Perth.

At full buildout Figure 2 illustrates the generation required with assumed values of capacity factor as set out below. These values have been derived from a combination of sources including previous relevant studies and, for simplicity, assume an AC/DC ratio of one.

Table 6 Capacity Factors

	Capacity factor
Wind energy	0.3
Ground mounted single axis solar PV (SA solar PV)	0.26
Rooftop solar PV (RT solar PV)	0.18

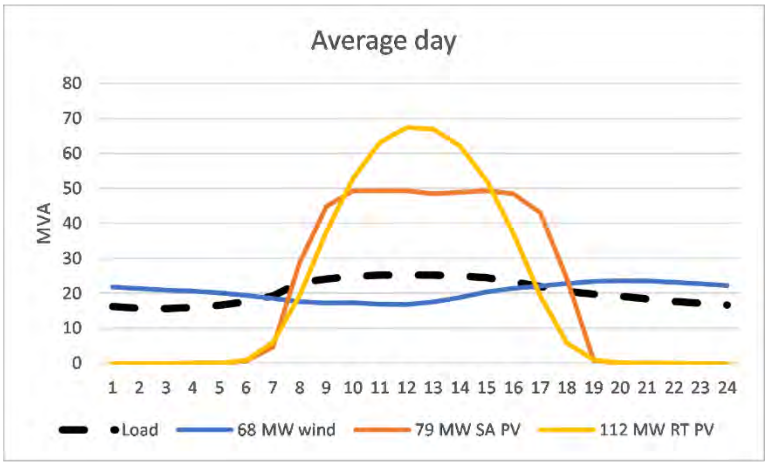

Figure 2: Average Day Energy Demand and Generation

Figure 2 illustrates the relative compatibility of demand with wind generation compared to solar, and identifies that significant storage is required to capture excess solar energy generated during the day for use overnight and next morning.

Wind energy

A meaningful assessment of viability for wind energy would require wind speed measurements from the site. However, by observation it is clear that a wind farm with a capacity of 68 MW is not feasible as the land take (approximately 25 ha/MW) would be larger than the entire industrial area. Wind energy alone is therefore not a viable solution for the Neerabup Industrial area.

Solar PV

The generation performance of single axis tracking ground mounted solar arrays has been derived from an analysis of the solar farms connected to the SWIS. These, on average, have a capacity factor of 0.26 and require ground space of approximately 20 m^2 per kilowatt of capacity. For the 79 MW capacity required for a single technology solution, the area required would be approximately 160 ha, which is too large to be considered feasible on the site. A smaller ground mounted array has therefore been considered as one component of the solution.

The capacity factor for conventional rooftop (i.e. fixed) solar PV is around 0.183, meaning that a 1 kW system will produce on average 1,600 kWh pa and require approximately 5m2 of roof space. For the site to be serviced entirely with rooftop solar PV (112 MW) an area of 560,000 m2 would be required. This represents around 10% of the developable land and 30% of available space, assuming that around one third of the site area of developable land (563 ha) is roof or suitable for PV panels. Accordingly, it is assumed there is sufficient roof space / available land to accommodate rooftop solar PV.

Battery storage

As demonstrated in Figure 2, significant storage is required to fully utilise the energy generated by solar PV during the day. Accordingly, battery storage has been assumed to be required to more fully utilise solar energy generation. The land take implications for battery storage are addressed in Section 6.

Land availability

It is understood that the City has allocated land for solar power generation within their land holdings. This land is depicted in Figure 3. This area is in two parcels of approximately 3.8 and 7.5 ha respectively.

Figure 3: Land Availability

5.2 System Optimisation

Because of the relative shape of the solar PV generation profile compared to the demand profile there are steeply diminishing financial returns in increasing the generation capacity without energy storage. Figure 4 illustrates the annual savings at notional average electricity tariffs (Synergy L1 and L3) and solar capital costs over a 30-year period for the annual load profile in Figure 1. It is only possible to realise savings of around 50% of annual costs for a system that generates the equivalent of the annual demand, assuming that no revenue is obtained from exporting excess energy.

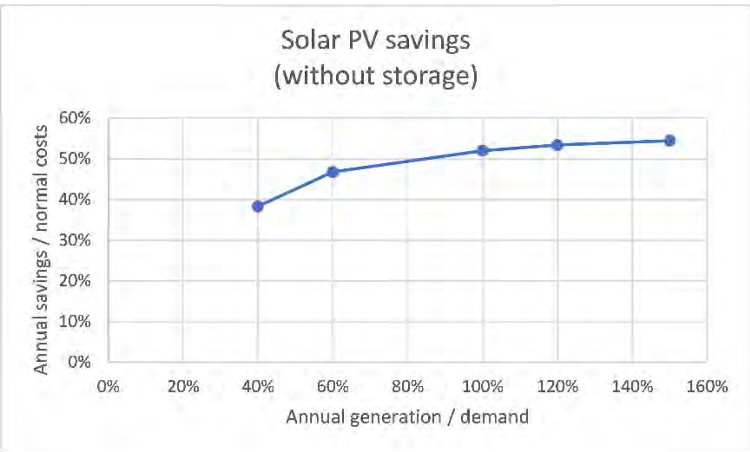

Figure 4: Savings From Solar PV

By adding energy storage to the generation, it is possible to realise additional savings, but again there are diminishing returns. Figure 5 illustrates the additional savings realised from adding 1, 2 ,4 and 6 hours of storage (at nameplated capacity) to a system that generates the equivalent of the annual demand. It can be seen that there is sharply diminishing benefit in increasing the amount of storage beyond 3 hours.

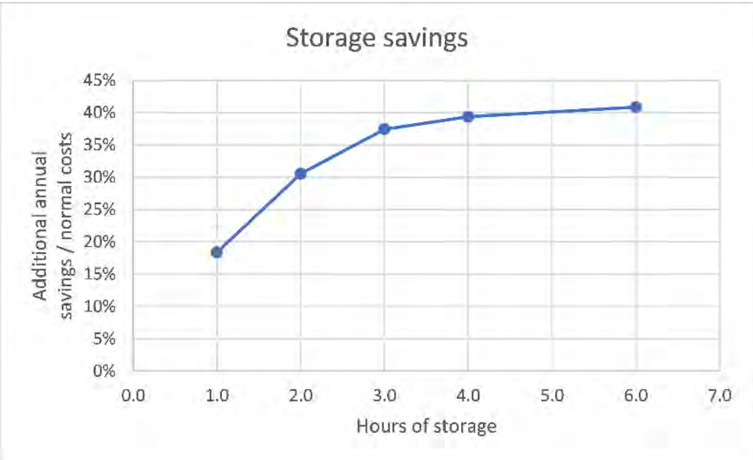

Figure 5: Savings From Energy Storage

5.3 Western Power Network

If the site is serviced by on-site generation beyond around 30% of demand, there will be periods when the site demand is less that the energy generated, meaning the system can export energy to the broader SWIS network. Western Power will evaluate whether this export will have technical implications for their network (i.e. the feeder(s) connecting the site to the substation and / or the substation itself). If they believe that there would be technical implications arising, they would likely require either a) a restriction of exports, or b) the network to be reinforced at the project's cost. Their advice is that export from an embedded network solution would be limited to <1.5 MVA at the present time. The implications of this restriction are discussed in Section 10.

5.4 Modelled Scenarios

Based on the conclusions drawn in the preceding sections, two scenarios have been modelled:

Case A objective is to maximise generation consistent with limiting the need to export or store energy when generation exceeds demand. This option involves lower capital costs and utilises only one of the two of the City's land parcels.

Case B objective is to provide sufficient generation and storage to both minimise imports, thereby maximising the renewable energy fraction, and exports (or curtailment if exports are restricted). This option involves higher capital costs and utilises both land parcels.

As the cost of both solar PV generation and battery storage will reduce significantly over time it is possible that the project could transition from Case A to Case B over time.

The assumptions for each case are set out below.

Case A

- The project commences with the construction of a 1.9 MW single axis ground mounted PV array and 1.9 MWh of large scale battery storage on the larger land parcel (7.5 ha).
- Additional generation is obtained by utilising the same land parcel for a second single axis ground mounted PV array with a capacity of 1.9 MW in Year 5.
- Rooftop solar installations proceed as development occurs, leading to some 62 MW of installed rooftop capacity at full buildout.
- Battery storage is added incrementally as the site develops with a final capacity of 66 MWh (i.e. approximately 1 hour of capacity).

Case B

- The project commences with the construction of a 3.15 MW single axis ground mounted PV array and 6.3 MWh of large scale battery storage on the larger land parcel (7.5 ha).
- Additional generation is obtained by utilising the second land parcel (3.8 ha) for a second single axis ground mounted PV array with a capacity of 1.9 MW in Year 5.
- Rooftop solar installations proceed as development occurs, leading to some 108 MW of installed rooftop capacity at full buildout.
- Battery storage is added incrementally as the site develops with a final capacity of 225 MWh (i.e. approximately 2 hours of capacity).

Case A will generate sufficient energy to meet approximately 60% of the total site demand on an annual basis, while Case B generates the equivalent amount of energy to meet 100% of the site demand. Table 5 identifies the capacity of each option at full buildout.

Table 7: Energy Generation Scenario

	Single axis solar PV (MW)	Rooftop solar PV (MW)	Battery storage (MWh)
Case A	3.8	61.95	65.75

Case B	5.05	107.5	225.1

In all cases a connection to the SWIS will be required in order to ensure continuity of supply (without relying on diesel generators onsite) and to avoid very large energy storage capacity. A master meter will be located at the boundary of the site, and all electrical equipment including the distribution network would be 'behind-the-meter'.

The scenario is depicted in Figure 6 and would operate as follows:

- Power will be supplied directly to customers from the solar plant when generation is less than demand;
- Surplus power thereafter will charge the battery storage;
- Power will be supplied from the battery when generation is insufficient to meet demand;
- Power will be imported from the SWIS when the battery is fully discharged and demand exceeds generation; and
- Power will be exported from the site (subject to Western Power constraints) or curtailed when the battery is fully charged and generation exceeds demand.

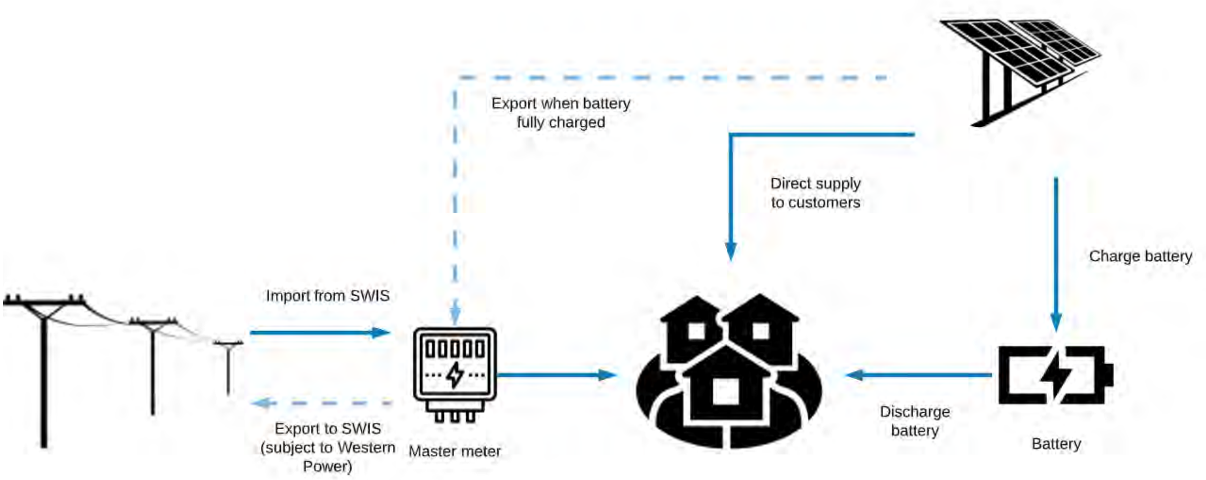

Figure 6: Energy Supply Configuration

6. Site Implications

For Case A the first of the ground mounted 1.9 MW solar PV arrays would require around 3.8 ha of land and would be housed on the 7.5 ha land parcel. The 66 MWh battery storage could be accommodated within 40 foot containers, each requiring only around 30 m² of land[1]. All this equipment could be potentially accommodated on the larger of the two lots that the City has allocated for solar energy (see Figure 3) which is approximately 7.5 ha in size. Inverters and controls could also be accommodated within this land parcel. The second 1.9 MW array would be housed on the second (3.8ha) land parcel.

For Case B, the first 3.15 MW ground mounted array and battery storage would occupy the 7.5 ha site and the other 3.8 ha land parcel could be used for second single axis array of 1.9 MW.

7. Energy Performance Simulations

The two options have been simulated using the systems model described in Section 4.

The results of the simulation for Case A are illustrated graphically in Figures 7-10 which show supply and demand for an average day at full buildout in each season.

[1] The Hornsdale battery is presently the largest in the world at 129 MWh and occupies around 1 ha land. https://hornsdalepowerreserve.com.au/

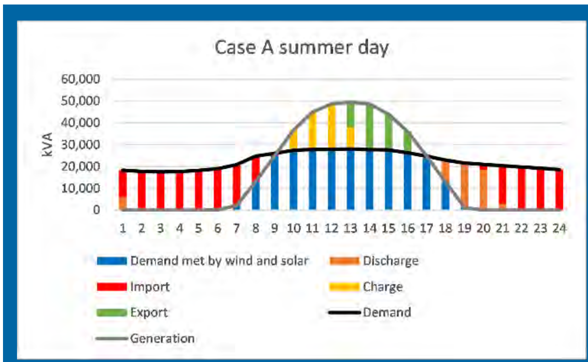

Figure 7: Case A - Typical Summer Day

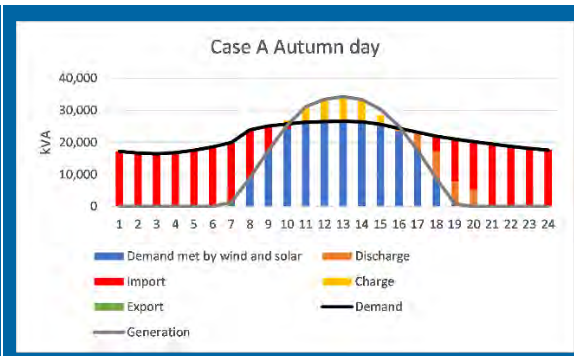

Figure 8: Case A - Typical Autumn Day

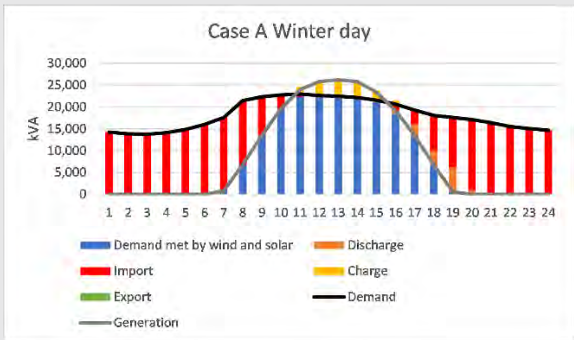

Figure 9: Case A - Typical Winter Day

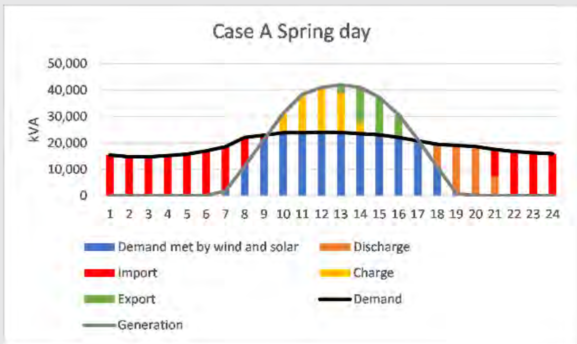

Figure 10: Case A - Typical Spring Day

It can be seen from these figures that demand is directly met partially or totally by solar PV during the day throughout the year. Energy needs to be imported in the mornings, evenings and overnight, supplemented by battery discharge in the evenings (most notably in the summer and spring). Small amounts of excess energy charge the battery during the middle of the day. Once the battery is fully charged additional generation is exported to the SWIS, or if this is restricted, is curtailed.

The results of the simulation for Case B is set out in Figures 11-14.

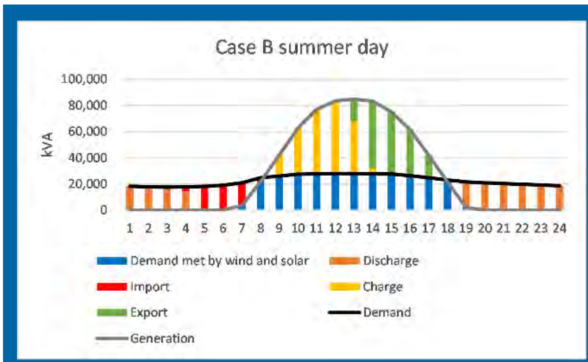

Figure 11: Case B - Typical Summer Day

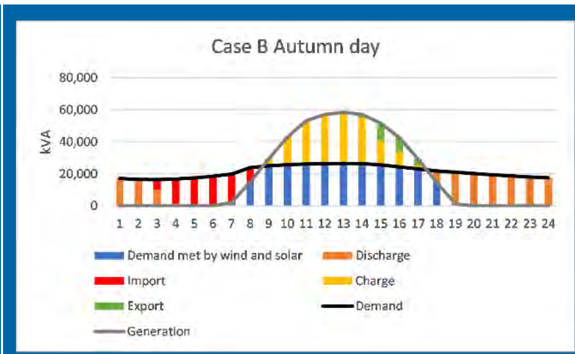

Figure 12: Case B - Typical Autumn Day

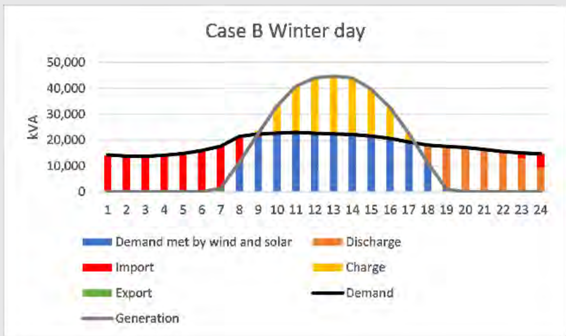

Figure 13: Case B - Typical Winter Day

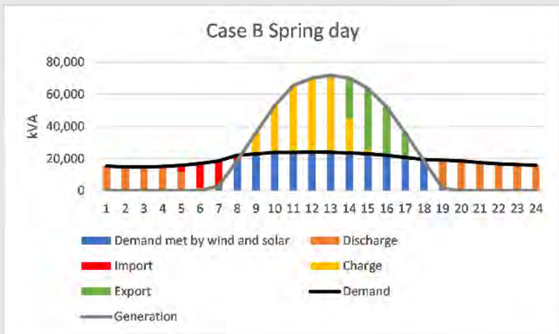

Figure 14: Case B- Typical Spring Day

The simulation for Case B demonstrates the same basic pattern as Case A but the additional generation and storage significantly reduces the amount of energy imported from the SWIS by utilising the larger battery storage to offset demand more effectively in the evenings and mornings. The amount of energy either exported or curtailed is slightly higher than Case A.

Figures 15 and 16 depict the state of charge during a typical day in each month. In Case B (Figure 16) the energy storage system is close to fully utilised. The battery is fully charged and maximally discharged in all except the winter months. In Case A the storage is effective for less of the year (Figure 15).

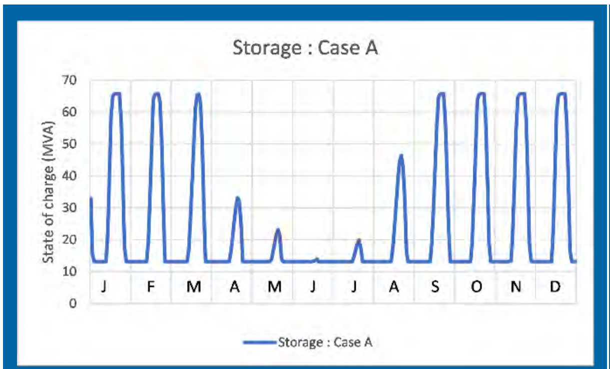

Figure 15: Case A Battery performance

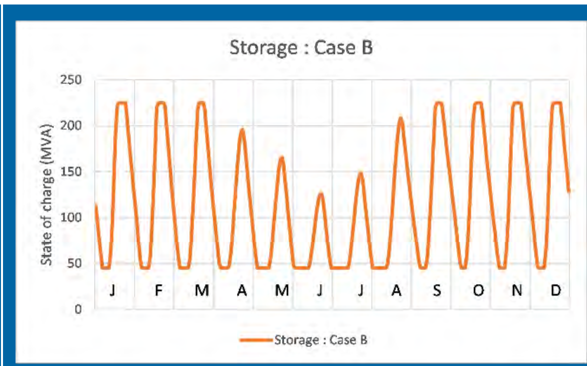

Figure 16: Case B Battery performance

8. Financial Performance

A 30 year financial analysis of the options has been carried out with a view to estimating a customer charging regime that produces a commercial rate of return for a service provider while delivering significant discounts for customers. A number of assumptions have been made, including:

- the capital cost of renewable energy and battery storage systems as set out in Figure 17[2];
- solar systems have a design life of 15 years, and battery systems of 10 years;
- operating costs for this equipment are in the range of 1 to 3.5% of capital costs per annum, escalated at 2% pa;
- that small customers would normally pay the charges associated with the Synergy business flat (L1) tariff, both escalated at 1.5% per annum;
- that large customers would normally pay the charges associated with the Synergy business flat (L3) tariff, both escalated at 1.5% per annum;
- the service provider would pay approximately $0.37 per kilowatt hour (total charges) for imported energy from the Wholesale Energy Market (WEM) (escalated at 1.5% pa); and
- Western Power would restrict the export of energy from the site and the service provider would therefore obtain no income from exported energy (this is discussed further in Section 10)

[2] Capital cost reductions derived from: Graham, P.W., Hayward, J, Foster, J., Story, O. and Havas, L. 2018, GenCost 2018. CSIRO, Australia

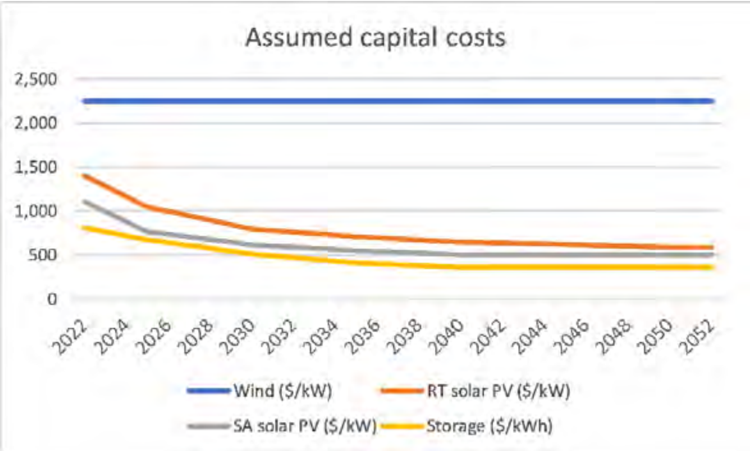

Figure 17: Assumed Capital Cost of Technologies

The results of the financial analysis are summarised in Table 6 which reflect annual figures at full buildout. A more detailed summary is provided in Appendix A.

Table 8: Summary of Simulation Results (Annual)

	Case A	**Case B**
Ultimate power demand (MWh pa)	179,675	179,675
Ultimate capacity		
Rooftop solar capacity (MW)	62.0	107.6
SA array (MW)	3.8	3.2
Storage (MWh)	65.8	225.2
Cumulative capital costs ($k)		
RT solar capex	80,591	140,524
SA solar capex	5,328	7,330
Storage capex	57,761	197,738
	143,680	345,592
LCOE @ 10% ($/kWh)	0.312	0.272
Customer charges discount	25%	30%
Initial customer charges ($/kWh)	0.279	0.261
Year 30 energy imported (MWh pa)	81,573	15,883
Net 30 year cash flow ($k)	256,919	490,438
NPV@10% nominal	25,800	38,920
IRR	17%	15%
Energy self-sufficiency	55%	91%
CO2-e emissions avoided (Year 30 TCO2-e)	68,672	114,655

Case B is a significantly bigger project, both in terms of the generation and storage capacity, and funds required for investment in the system. Case B has a much higher level of self-sufficiency (91% cf 55%) and therefore emission reductions.

Both cases appear able to deliver both customer savings (25-30%) and a commercial rate of return for an investor (15-17%). This analysis assumes that energy is imported at the same tariff as paid by individual businesses on the SWIS. In reality the service provider would be purchasing energy from the wholesale market at lower rates and this would improve the financial viability for both cases.

The cash flows of each case are depicted in Figures 18 and 19. The simple payback is around 12-13 years for both options.

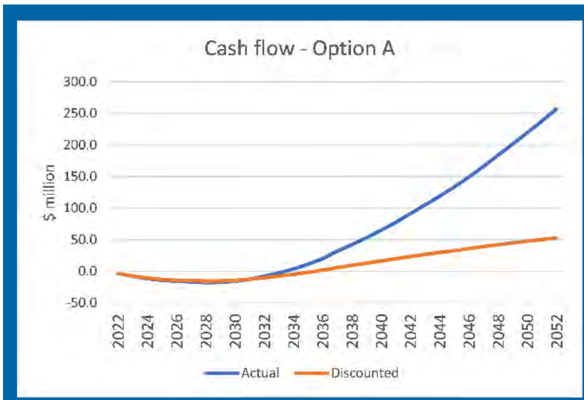

Figure 18: Case A Cash Flow

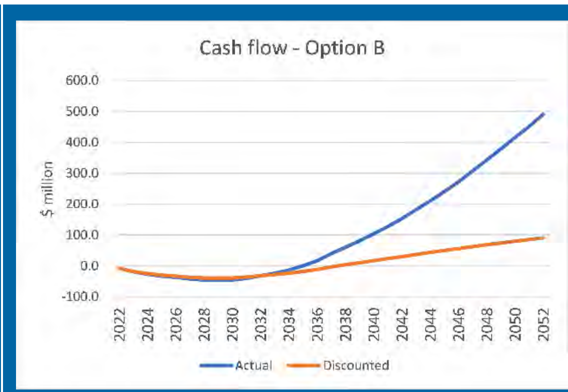

Figure 19: Case B Cash Flow

Although the financial analysis identifies that the project would be commercially viable for a private firm, the main risk for a service provider is the rate at which development would proceed, i.e. when revenues will be available to offset investment costs. This problem has been ameliorated in the Peel Business Park microgrid project by DevelopmentWA making a financial contribution to the initial generation and storage infrastructure. This effectively de-risks the project by improving initial cash flows. A similar contribution could be considered in the case of Neerabup Industrial Area if funds are available.

9. Net Zero Carbon Considerations

Case B generates sufficient renewable energy to meet total electricity demand, although some of this energy is exported from the site (subject to Western Power restrictions), and the same quantity (approximately) is imported from the South West Interconnected System (SWIS). In principle this arrangement allows the project to claim net zero carbon emissions from electricity, although there are some important issues of detail to be considered to ensure this is the case.

Under the Commonwealth Government's Renewable Energy Target (RET) scheme, each megawatt hour of on-site renewable generation will create one large-scale certificate (LGC). LGC's have a financial value, which is used under the RET to effectively subsidise large-scale renewable energy projects. In this case however it will be necessary for the project to retain and retire all of the LGC's created in the project in order to ensure the renewable energy is attributed to the project and be able to claim the full benefit of net zero carbon status. Accordingly, the financial analysis presented here assumes no income from the sale of LGCs. The RET scheme will remain in place until 2030, and thereafter it is likely that LGCs will be retained in the Australian carbon market as offsets, so this approach should be durable.

The export of energy from the site is subject to Western Power approval (see section 10 below). If for some reason Western Power will not accept export in whole or part, LGC's will not be created for that quantity of energy, leaving a shortfall in the net zero carbon equation. This shortfall would need to be made up by the purchase of LGC's from the market to offset the carbon content of imported energy[3]. Beyond 2020, there is considerable uncertainty about the price of LGC's which are currently trading at around $30. Under some scenarios this figure may reduce to 0, but under others it may remain as several tens of dollars. This cost is excluded from the financial analysis.

[3] The greenhouse intensity of SWIS energy is currently around 0.7 kg CO_2-e/kWh.

10. Western Power Network Implications

Under conventional servicing arrangements and with the electricity demand assumptions included here, the site would draw a maximum of around 30 MVA from the Western Power network. The network upgrade assumptions made in the servicing report would facilitate this load on the network. However, if the site is serviced by on-site generation, there will be periods when the site generates excess energy, which could be exported to the SWIS. Western Power will evaluate whether this export will have technical implications for their network (i.e. the feeder(s) connecting the site to the substation and / or the substation itself). These implications might involve capacity, voltage or frequency considerations. If they believe that there would be technical implications, they would likely require either a) a restriction of exports, or b) the local network to be reinforced at the project's cost. Their advice is that export from an embedded network solution would be limited to <1.5 MVA at the present time.

Figure 20 sets out the modelled network loads arising from each of the options considered, for a typical day in each month, assuming exports are not restricted. For comparison purposes the assumed total demand that would need to be accommodated under conventional servicing is also shown. Under Case A network loads arising from exports peak in summer at around 20 MVA. Under Case B, network loads arising from exports are much greater than conventional import loads (over 50 MVA). Western Power have advised that at this stage exports would be restricted to 1.5 MVA. Although the load growth will occur over a very long period of time during which the entire energy landscape will have changed in Western Australia, it is prudent at this stage to assume that Western Power (at their sole discretion) would impose export restrictions.

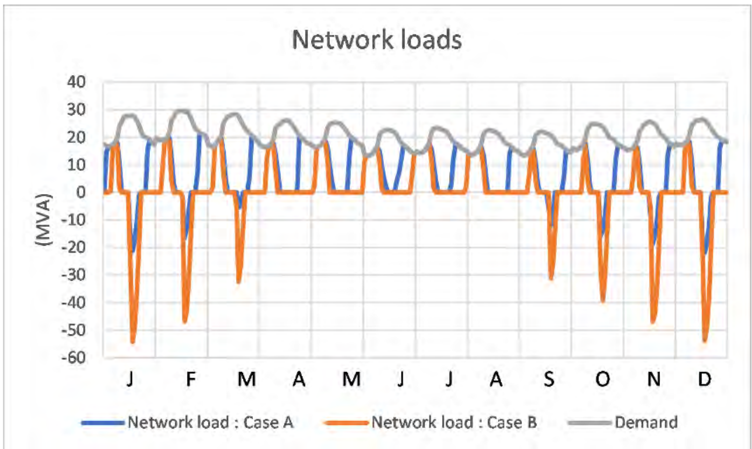

Figure 20: Modelled Network Loads

It is therefore assumed in the financial analysis that there will be no financial implications for the project from reinforcing the Western Power network beyond that already assumed by conventional servicing. However, it is also assumed that there will be no export of energy from the site. Accordingly, the generator will not be part of the Wholesale Electricity Market (WEM) and therefore not receive any payments from the Reserve Capacity Mechanism[4].

Under conventional arrangements the site would eventually require a zone substation to be constructed at a cost of around $25m. As is apparent from Figure 11, the capacity required to import

[4] https://aemo.com.au/energy-systems/electricity/wholesale-electricity-market-wem/wa-reserve-capacity-mechanism

peak energy from the SWIS is only marginally less than under conventional arrangements (20 MVA cf 30 MVA). Accordingly, it is still likely that a zone substation will eventually be required and so no capital savings to Western Power have been assumed. It is noted that Lot 40 has been allocated for a future substation.

11. Governance and Regulatory Issues

The energy system modelled here is a grid-connected microgrid, which can be described as an embedded network that has distributed energy resources within it, i.e. generation and / or energy storage, and is electrically connected to the broader Western Power network. The operator of such a microgrid is therefore not just on-selling and reticulating power from a retailer to a customer, it is also generating power for consumption onsite and potentially exporting power to the broader network.

The metropolitan region is part of the South West Interconnected System (SWIS) which is operated by the Australian Energy Market Operator (AEMO). Following disaggregation of the electricity industry in Western Australia in 2006, the system has three separate service elements:

- generation;
- transmission and distribution; and
- retailing.

Providers of all three services are (normally) required to obtain licences to operate from the Economic Regulation Authority (ERA). It is possible for an embedded network to apply to the Public Utilities Office (PUO) to obtain exemptions from holding licences, which is conventionally the case for apartment blocks, retirement villages, caravan parks and shopping centres. However, these examples do not involve the operation of generation or storage equipment. Customers who are serviced by an exempt retailer also do not have the benefit of the range of protections offered by the requirements under which retailers hold licences issued by the ERA in the SWIS. Complaints or disputes cannot be referred to PUO, nor do customers have access to the Energy Ombudsman scheme. In Development WA's landmark Peel Business Park microgrid project, the contract requires the microgrid operator to hold retail and network licences as it has been determined that this is in the best interests of both Development WA and customers. It is recommended that this approach is also taken for Neerabup should this initiative proceed.

Under the present arrangements that apply in the SWIS, only Synergy can supply customers with an annual demand of no more than 50 MWh per annum, which includes small commercial customers. It is assumed here that the whole development would be 'behind-the-meter' and hence the microgrid would be treated as an aggregated load, and accordingly the supply would be 'contestable', i.e. Synergy would not have to be the retailer for small customers.

It is assumed here that landowners would build a conventional local subdivision electrical network as it would for any normal project. Sub-division networks are conventionally constructed in accordance with Western Power's Underground Distribution Schemes (UDS) Manual under their network licence. In the case of Neerabup, either a licenced service provider would need to be in place at the time of construction, or cooperation sought from Western Power to construct under their licence, with a later handover to the selected service provider.

As per current requirements, Western Power can disconnect inverter connected generation for system security and stability reasons. By the time any generation assets associated with this project would be in service, they would also be required to comply with AS4777.2 2020 requirements which has additional feed in management requirements.

The government's Energy Transformation Taskforce released the Distributed Energy Resources roadmap in December 2019. Under the recommendations included in the roadmap, the operator of a scheme at Neerabup could potentially participate in the wholesale energy market (WEM) via an ‘aggregator’ (which will probably be a retailer). Under these arrangements, and dependent on Western Power’s management of the local network, it may be possible for the scheme to obtain financial benefits from the revised arrangements for exported energy, storage or other services.

12. Recommendations

It is recommended that the concept of a grid-connected microgrid at Neerabup Industrial Area is progressed under a similar model to the Peel Business Park project, i.e. Expressions of Interest are sought from consortia to build and operate the microgrid, followed by a Request for Proposal from shortlisted firms. Under this approach, the landowners led by the City facilitate the development of the microgrid and have several options:

- to finance and operate the scheme as a 'utility' via a special purpose vehicle (SPV);
- to participate directly in the scheme as a shareholder in the SPV;
- to facilitate the involvement of incoming landowners to purchase shares in the SPV; or
- have no ongoing regulatory responsibility for its operation.

Under any of those options the City could also purchase power from the scheme under a Power Purchase Agreement (PPA).

If the development proceeds prior to a decision being made by the City relating to a microgrid solution, then it is recommended that the initial stages are serviced via a standard Western Power arrangement in accordance with the Underground Distribution Schemes manual. Western Power's Network Capacity Mapping Tool currently shows there is <5MVA capacity available in the vicinity of the existing lots already serviced to the south of the development near Flynn Drive but Western Power would be able to confirm any capacity constraints on the distribution network when a Design Information Package (DIP) application is lodged.

Appendices

Appendix A- Financial analysis summary

			Case A	Case B
Ultimate power demand (MWh pa)			179,675	179,675
Ultimate capacity				
Rooftop solar capacity (MW)			62.0	107.6
SA array (MW)			3.8	3.2
Storage (MWh)			65.8	225.2
Cumulative capital costs ($k)				
RT solar capex			80,591	140,524
SA solar capex			5,328	7,330
Storage capex			57,761	197,738
			143,680	345,592
Ultimate energy generated (MWh pa)	CF			
RT solar	0.183		99,311	172,411
SA solar	0.26		8,655	11,502
			107,966	183,913
Ultimate energy imported / exported				
Energy imported (% of demand)			45%	9%
Year 30 energy imported (MWh pa)			81,573	15,883
Energy exported/curtailed (% of demand)			5%	7%
Energy exported/curtailed (% of generation)			8%	7%
Year 30 energy exported (MWh pa)			8,984	12,667
Cumulative operating costs ($k)				
Wind opex	3.5%		0	0
RT solar opex	1.0%		26,044	45,446
SA solar opex	1.0%		1,665	2,249
Storage opex	2.0%		56,537	193,963
			84,245	241,658
Cumulative capex and opex ($k)				
Wind			0	0
RT solar			106,634	185,970
SA solar			6,993	9,579
Storage			114,298	391,701
			227,925	587,250
Import costs	0.37	$/kWh	843,091	164,161
Other costs @ 2.5%			53,551	37,571
Land lease costs			7,946	7,946
Rooftop lease			11,627	20,289
Export income			0	0
Cumulative annual costs ($k pa)			1,144,140	817,217
Discounted cumulative costs ($k)			244,735	213,580
Discounted energy (MWh)			785,348	785,348
LCOE @ 10% ($/kWh)			0.312	0.272
Customer charges discount			25%	30%
Initial customer charges ($/kWh)			0.28	0.26
Cumulative customer charges ($k)			1,401,060	1,307,656
Net 30 year cash flow ($k)			256,919	490,438

Discounted cash flow ($k)		NPV@10%	25,800	38,920
		Nominal IRR	17%	15%
Cumulative normal annual charges ($k)	0.37	$/kWh	1,868,080	1,868,080
Normal emissions @	0.7	TCO2-e/MWh	125,773	125,773
Imported energy			57,101	11,118
Emissions savings			68,672	114,655
			55%	91%

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	B. Grace	Claude Morris		Claude Morris		23/02/21
1	B. Grace	Claude Morris		Steve Barlow		16/06/21

Appendix I – ATCO Gas Existing Network Information (DBYD, May 2021)

ATCO GAS AUSTRALIA UNDERGROUND ASSET DETAILS ASSETS AFFECTED HIGH PRESSURE PIPELINES

GAS DIVISION

ASSETS AFFECTED – see accompanying plan

WARNING – HIGH PRESSURE GAS PIPELINE IN THE VICINITY

Mr Anthony Dang
GHD
999 Hay Street
Perth
WA, 6000

Job No:	**21659326**
Sequence No:	**109936455**
Date of Issue:	20/05/2021
Phone:	0862228412
Mobile:	0413467081
Fax:	0894636012

DBYD Utility Registration Name:	**70852 - ATCO Gas Australia**
DBYD Location:	**Flynn Drive, Neerabup, WA, 6031**

ATTENTION: This response to your inquiry has been interpreted from details in your requested DBYD picture location request only (not any street address you gave). It is your duty to ensure the accompanying plan/s match your geographical area of works.

IF YOU SEE, HEAR, SMELL OR OTHERWISE DETECT GAS, LEAVE THE IMMEDIATE AREA AND THEN CALL 13 13 52

Our records indicate that ATCO Gas Australia Pty Ltd gas infrastructure IS PRESENT in the vicinity of and/or surrounding area of the above enquiry. This response relates only to ATCO Gas Australia assets. Your Duty of Care requires that personnel must at all times comply with, and have on site, this information sheet and the accompanying plan(s). All plans are subject to this information sheet. You should also refer to the "Questionnaire for works near ATCO Gas infrastructure" on page [5] of this document, which must be read and all questions answered. If you answer **"yes"** to any of the questions you must contact ATCO Gas Australia during business hours on 1300 926 755.

All information provided is to be used as a guide only (see Disclaimer item 5). It does not absolve you or third parties from your Duty of Care obligations, including to take additional precautions where work has the potential to impact on gas assets, public safety or the environment, or from your duties at law (including Reg 3.21 of the Occupational Safety and Health Regulations 1996).

WARNINGS

- No works of any type within 15 metres of any **HIGH PRESSURE** gas infrastructure without prior approval from ATCO Gas Australia.
- **NO HOT WORK** within 15 metres of any gas infrastructure except in compliance with applicable laws & Australian Standard 1674. DO NOT let heat sources or hot works impact on gas infrastructure and take into consideration that the ground or adjacent structures may also be capable of transmitting heat so as to circumvent protection afforded by a heat shield or barrier.
- **DANGER** Gas can cause asphyxiation and is flammable. Keep all ignition sources well away (eg flames, matches/lighters, sparks, electrical devices, vehicles or engines, mobile phones, cameras)
- Gas pipes must not be unsupported or left without adequate cover or protection without prior approval from ATCO Gas Australia.
- Damage to the pipe coating or pipe itself can be very dangerous if not given immediate attention. Report any damage to ATCO Gas Australia immediately on 13 13 52. Do not attempt to repair any damaged gas infrastructure.
- No alteration or removal of live or abandoned gas infrastructure without prior written approval from ATCO Gas Australia.
- Any abandoned or proposed gas infrastructure indicated on the gas plans must be treated as live.
- Never assume the location or depth of any gas infrastructure. Pipes may not follow straight lines or maintain a constant depth. Always check carefully (e.g., careful hand digging of potholes).
- Unauthorised repairs or tampering with gas infrastructure may result in prosecution under the Energy Operators (Powers) Act 1979. ATCO Gas Australia reserves all rights to recover compensation for loss or damage to its gas infrastructure or other property including for indirect or consequential losses.

PLANS:

Plans provided are current for **30 days only** from date of request. You must use current plans at all times.

Plans do not show all gas service lines (which connect gas mains to individual meter positions). See condition 3(c) below.

If plan shows **additional detail** symbols (*) or ( ) in the area of proposed works it is **your duty** to obtain that further detail from the number below.

Plans (including the location of pipes, services, infrastructure and boundaries) are **approximate only**. You must use safe and proper procedures – including **potholing** (see condition 4 below).

Plans are not a guide as to gas availability for connection purposes.

To call ATCO Gas Australia: **Weekdays from 8am to 4pm, call – 1300 926 755**
After hours, weekends and emergencies, call – 13 13 52

<u>**CONDITIONS FOR WORKS IN THE VICINITY OF ATCO GAS AUSTRALIA ASSETS**</u>

1. Compliance with Warnings

You must comply with the Warnings contained in this information sheet and the accompanying plan(s).

2. Compliance with 'Additional Information for Working around Gas Pipelines' (AGA-O&M-PR24), applicable laws and duty of care

All work (including but not limited to using Excavator's Augers, Directional, drilling machines, 'Ditch Witch' type trenching machine, Loader, Dozer, Skid Steer (Bob Cat)) must comply with all applicable requirements in the 'Additional Information for Working around Gas Pipelines' (AGA-O&M-PR24) and with all applicable laws and Australian Standards. All due care must be exercised to locate any gas infrastructure in the vicinity and when conducting any works near them.

3. All Gas Infrastructure

All work that may have any impact upon any gas infrastructure (see 3(a), (b) and (c) below for examples) should be carefully planned with notification to ATCO Gas Australia well in advance of commencement. Contact ATCO Gas Australia Engineering Services on (08) 1300 926 755 or email <u>engineering.services@atcogas.com.au</u>. Amongst other things, this includes excavation of or near gas pipelines, boring/drilling, crossings of pipelines (including by other underground infrastructure e.g. drains, power cables, etc.), road works and structural installations. In addition:

a) High Pressure Pipelines (HP, PEHP > 110, CHP)

No works of any type are permitted within 15 metres of these pipelines without prior approval from ATCO Gas Australia. For approvals contact ATCO Gas Australia on 1300 926 755.

You must ascertain the location of any high pressure pipeline, in relation to your proposed work by:

– Locating a straight line between two high pressure warning signs, and

– Assessing the distance from this line to your proposed work area.

ATCO Gas Australia may require stand-by supervision during your works and will advise of attendance requirements.

b) Medium (MP), Medium-Low (MLP), Low (LP) and other Pipeline Pressures

These pipelines are installed in most streets throughout the Perth metro area and several country centres. Main valves, regulator sets and test points also exist at intervals along these pipelines. Where work may impact upon these pipelines or assets then ATCO Gas Australia must be contacted as per item 3 above.

c) Gas Services and Meters

If a gas meter is installed on a property, an underground gas service pipe will run from the meter position to the gas main in the street. Plans do not show all gas service lines, but their presence must be anticipated. Most gas meter boxes installed since 1996 will include a sticker giving approximate guidelines for the gas service line location. All due care must be exercised to locate any gas services in the vicinity and when conducting any works near them.

4. Compliance with Safe Work Practices

It is your responsibility to have and comply with adequate safe work practices and procedures.

Without limiting your obligations:

PLAN The complete Dial Before You Dig documentation and plans must always be on site and referred to for the duration of work. Refer to regulation 3.21 of the *Occupational Safety and Health Regulations 1996* and the Utility Providers "Code of Practice" for further useful information.

POTHOLE Using current Dial Before You Dig plans, all gas pipes should be located (including any deviation in the direction of a gas pipe) by exposing them by careful digging using a HAND SHOVEL. Where the proposed work is parallel to a gas pipeline, pothole every 5 metres along the entire route. Damage to the pipe coating or to the pipe itself can create a very dangerous situation if not given immediate attention. If damage does occur, it must be reported to ATCO Gas Australia immediately on Ph. 13 13 52.

PROTECT Supervise and monitor all excavations near gas infrastructure using a dedicated spotter. Where any gas infrastructure is required to be exposed, adequate protection of the gas infrastructure is required to prevent potential damage. Also implement appropriate controls when conducting 'hot work' (in accordance with AS 1674) in the vicinity of the ATCO Gas Australia GDS such as; isolation; separation distance; the placement of an effective non-combustible barrier of sufficient size and thermal resistance for the intensity, type and duration of heat exposure; gas monitoring; monitoring the environment surrounding the ATCO Gas Australia GDS to ensure it is not being impacted by the work, and other controls as necessary.

5. Disclaimer and Further Terms

a) Nothing in this document, any accompanying plan or the 'Additional Information for Working around Gas Pipelines' (AGA-O&M-PR24) (together called "**Documents**") purports to exclude or modify any term, condition or warranty to the extent that by law it cannot lawfully be excluded or modified by agreement or notice, including but not limited to those contained in Schedule 2 of the *Competition and Consumer Act* 2010 (Cth) and corresponding provisions of state legislation.

b) If any of ATCO Gas Australia Pty Ltd, or their respective related entities, officers, employees, agents, contractors or advisers (together called "**Associates**") is liable for a breach of a term, condition or warranty described in paragraph 5(a) above, its liability is, to the fullest extent permitted by law, limited to any one or more of the following as it determines in its absolute discretion:

   i) in relation to goods supplied by them, replacing or repairing the goods, supplying an equivalent item, paying the cost of replacing or repairing the goods or paying the cost of acquiring or hiring an equivalent item; and

   ii) in relation to services supplied by them, the re-supply of the services or the payment of the cost of having the services re-supplied.

c) Subject to paragraphs 5(a) and (b), but otherwise despite any other provision in the Documents, no representation or warranty is made or given (whether expressly or by implication) by any of ATCO Gas Australia or their respective Associates in respect of any information contained or referred to in any of the Documents or in any other communication from ATCO Gas Australia concerning any of the Documents or the subject matter of any of the Documents ("Information"). In particular, but without limiting the generality of the foregoing limitation, none of ATCO Gas Australia or their respective Associates makes any warranty or representation as to the truth, accuracy, completeness, reliability, currency, timeliness, quality or fitness for any purpose of or the standard of care taken in the preparation of any Document or Information (including, but not limited to, the accuracy of the scale of, or the location of anything or symbol shown on, any plan or diagram).

d) Subject to paragraphs 5(a) and (b), to the maximum extent permitted by law, none of ATCO Gas Australia or their respective Associates is liable to any person or other body ("**Recipient**") who receives or otherwise obtains access to all or any part or parts of the Documents or Information, in any way (including, but not limited to, liability for negligence, breach of statutory duty or lack of care) in respect of any cost, expense, damages, loss or liability, including, but not limited to:

   i) any financial or economic loss, cost, expense or damage, including but not limited to loss of production, loss of profit, loss of revenue, loss of use, loss of contract, loss of goodwill or loss of business opportunity;

   ii) any new or increased costs or expenses, including but not limited to financing or operating costs;

iii) any failure to achieve any actual or anticipated saving in respect of any cost or expense;

iv) any cost, expense, damage or loss resulting from any liability of the Recipient to any other person or body howsoever and whensoever arising, suffered or incurred by the Recipient in relation to, or in connection with, the disclosure to them of, or use of, or reliance on, all or any part or parts of the Documents or Information.

e) By using any Document or Information, each Recipient is taken to represent and warrant to ATCO Gas Australia that the Recipient will comply with the conditions and other terms referred to in the Documents or Information, including but not limited to conditions that:

i) the Recipient must comply with the conditions in numbered paragraphs 1 to 4 above and this paragraph 5;

ii) as between ATCO Gas Australia and each Recipient, ATCO Gas Australia owns the Information and all rights and title in and to the Information are to remain vested in ATCO Gas Australia;

iii) no Recipient has any right, title or interest in the Information or, except as expressly provided for in the Documents, any licence or right to copy, alter, modify, publish or otherwise use or deal with the Information without prior written approval from ATCO Gas Australia;

iv) ATCO Gas Australia makes no representation and gives no warranty as to its right to disclose any Information;

v) the Recipient relies on any Information entirely at its own risk and expense;

vi) the Recipient must undertake its own independent due diligence and investigations in relation to the Information;

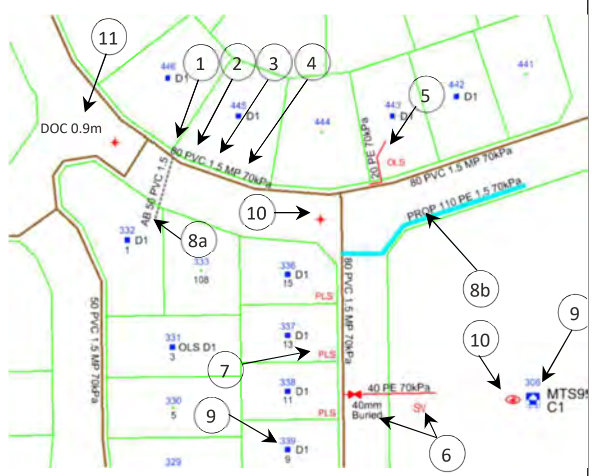
vii) none of ATCO Gas Australia or their respective Associates owes the Recipient any duty of care in respect of the Information; and

viii) none of ATCO Gas Australia or their respective Associates is under any obligation to correct, update or revise any Documents or Information.

GAS MAIN AND SERVICE IDENTIFICATION

LEGEND

1. Pipe Diameter (Millimetre's)
2. Pipe Material
   CI = Cast Iron PE = Polyethylene
   GI = Galvanised Iron PVC = PVC
   ST = Steel
3. Alignment (in metres from property line)
4. Pressure in main (MP 70Kpa = Medium Pressure and MAOP(Maximum Allowable Operating Pressure).
5. Off Line Service – service may not be straight line to meter. (<u>**WARNING**</u> **– OLS may not always be shown on plan**. See item 3c above).
6. Service Valve in the vicinity.
(Note: Service Valve may be **"BURIED"**).
7. Pre-Laid Service laid in Common Trench.
8. Main Status: (See WARNINGS page 1).
8a. AB = Abandoned Mains
8b. PROP = Proposed Mains
9. Customer Connection : Does not indicate actual location of Meter Position.
   D1 = Domestic
   C1 = Commercial
10. **Additional detail available and must be obtained if within area of proposed works – see page 2 above.**
11. Depth of Cover (DOC) in metres.



QUESTIONNAIRE FOR WORKS NEAR ATCO GAS AUSTRALIA GAS INFRASTRUCTURE

The accompanying documentation must be read and the following questions answered and instructions followed when planning and **before commencing any work**.

	Questions	Yes	No
1	Will any works be within 15 metres of any High Pressure gas infrastructure?	☐	☐
If answered ***Yes*** you must contact the ATCO Gas Australia **High Pressure Coordinator** to seek prior approval on ***1300 926 755*** between 08:00 hours – 16:00 hours (Monday – Friday, except public holidays).			
If you answer ***Yes*** to any of the following questions you must contact ATCO Gas Australia **Engineering Services** to seek prior approval on ***1300 926 755*** between the above hours. Plan ahead and allow sufficient time for ATCO Gas Australia Engineering Services to consider your request.			
Question		**Yes**	**No**
2	Will any works require the use of a vibrating roller within 15 metres of any gas mains?	☐	☐
3	Will any works involve boxing the ground out to a depth of 300mm or more for the construction of a road/car park or crossover/driveway over a gas main?	☐	☐
4	Will any works affect water flows or drainage, e.g., surface drainage, within 15 metres of any gas mains?	☐	☐
5	Will any works involve traversing any gas infrastructure with any heavy vehicle or plant (e.g., cranes, agitators or trucks)?	☐	☐
6	Will any works involve stockpiling of spoil, dangerous goods or any other materials over any gas infrastructure?	☐	☐
7	Will any works or structure (e.g., fencing) obstruct access to gas infrastructure?	☐	☐
8	Will any works involve placing infrastructure e.g., cable, pipes etc. that will not comply with the minimum separation distances to the gas infrastructure: 300mm crossing, 500mm parallel?	☐	☐
9	Will any works involve blasting that could affect any gas infrastructure?	☐	☐
10	Will any works involve the installation of electrical infrastructure to operate above 22kV in the vicinity of any steel gas infrastructure?	☐	☐

If unsure, please contact ATCO Gas Australia Engineering Services on ***1300 926 755***.

IMPORTANT: It is your responsibility to ***TAKE CARE*** to comply with all requirements of ATCO Gas Australia Engineering Services (including their 'Additional Information for Working around Gas Pipelines' (AGA-O&M-PR24)), the ATCO Gas Australia Dial Before You Dig cover sheets and maps and all applicable laws and standards.

IF YOU SEE, HEAR, SMELL OR OTHERWISE DETECT GAS, LEAVE THE IMMEDIATE AREA AND THEN CALL 13 13 52

GIS SYMBOLS SHEET

ATCO

EXISTING GAS NETWORK

- High Pressure
- Polyethylene High Pressure
- City High Pressure
- Medium Pressure
- Albany Medium Pressure
- Medium Low Pressure
- Low Pressure
- Not Gassed
- Service
- High Pressure Service

ASSOCIATED INFRASTRUCTURE

- Associated Asset

PROPOSED GAS NETWORK

- Proposed Main

ABANDONED GAS NETWORK

- Abandoned Gas Main
- Abandoned Gas Main Sold
- Abandoned Valve
- Abandoned Fitting

DUCTS AND SLEEVES

- Duct
- Horizontal Boring
- Sleeve
- Road Crossing
- Concrete Slab

TOPOGRAPHY

- ATCO Easement
- Fence
- Building
- Kerb
- Water Boundary
- Contour Line
- Elevation Point

FEATURE LINES

- Miscellaneous Line
- Reference Line
- Gas Indicator Line
- Gas Pit
- DOC 1.2m — Arrow Pointer with Text

VALVES

- High Pressure
- High Pressure Service
- Main
- Service
- Isolation

GATE STATIONS

- Gate Station
- Pressure Reducing Station
- L.P.G. Tank

REGULATOR SETS

- Distribution Regulator
- Boundary Regulator

TELEMETRY MONITORING DEVICE

- Non Billing Meter
- Pressure Monitoring Device

DELIVERY POINTS

- Service Point
- Meter
- Interval Meter
- Meter Set

FEATURE POINTS

- SC — Side Elevation
- Obstacle
- See Details
- NC — Not Connected
- SV — Gas Service
- Sign
- OLS — Offline Service
- Linked Reference Document
- PLS — Pre-Laid Service
- PLSS — Pre-Laid Service Stairs
- PLST — Pre-Laid Service Tee
- BL — Asset ends on Building / Property Line
- CoD — Asset ends on Direction Peg

PROTECTION DEVICES

- T — Test Point
- PM — Potential Monitoring
- Odorant Test Point
- E — Earthing
- Bond Wire
- Bond Junction
- R — Rectifier
- IJ — Insulation Joint
- A — Anode
- GB — Ground Bed
- EM — Earth with Mitigation
- FS — Foreign Structure Monitoring
- IJM — Insulation Joint with Mitigation

FITTINGS

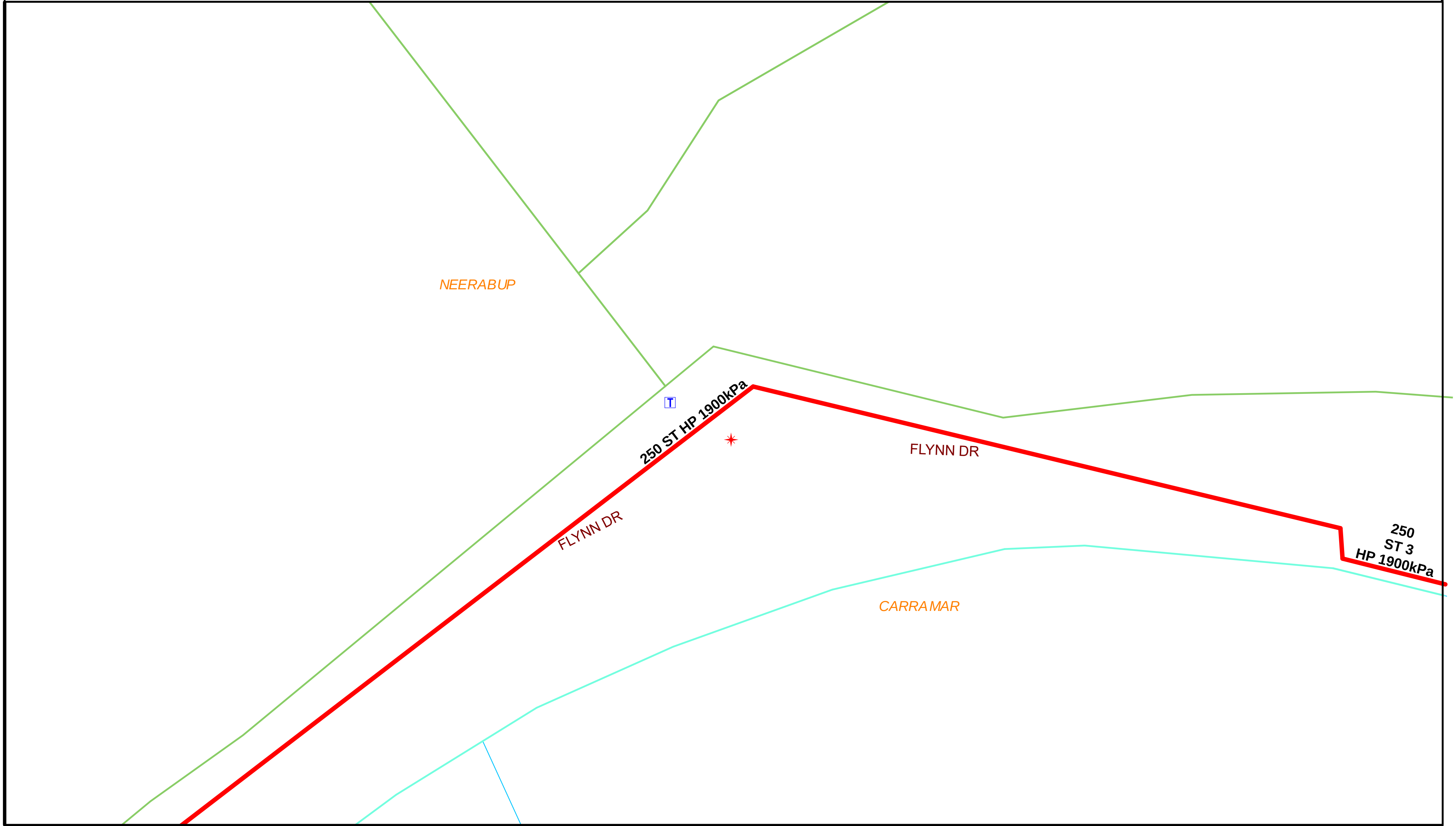
- Syphon
- Coupling
- Expansion Joint
- Main Cross
- Reducer
- Stopple
- Flange
- Change Node
- Thredolet
- Tapping Band
- Bend
- Elbow
- Monolithic Joint
- End Cap
- Tee
- Transition
- Three-Way Tee
- Short Stop
- Weldolet
- Socket
- Spherical Tee
- Tapping Tee
- Barrier
- S.O — Squeeze Off

FEATURE POLYGONS

- Hard Digging
- Licence Area
- Suburb
- Proving Gas Location
- Not Gassed
- Local Government Authority
- Pressure Upgrade

FLYNN DRIVE

WARNING - HIGH PRESSURE PIPELINE IN THE VICINITY.
No works within 15 metres of this asset are permitted without prior approval from ATCO Gas Australia PH 1300 926 755



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Job No: 21659326 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

Please read all **warnings**, conditions and information on the attached "Underground Asset Details" information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the "NO HOT WORKS" warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.

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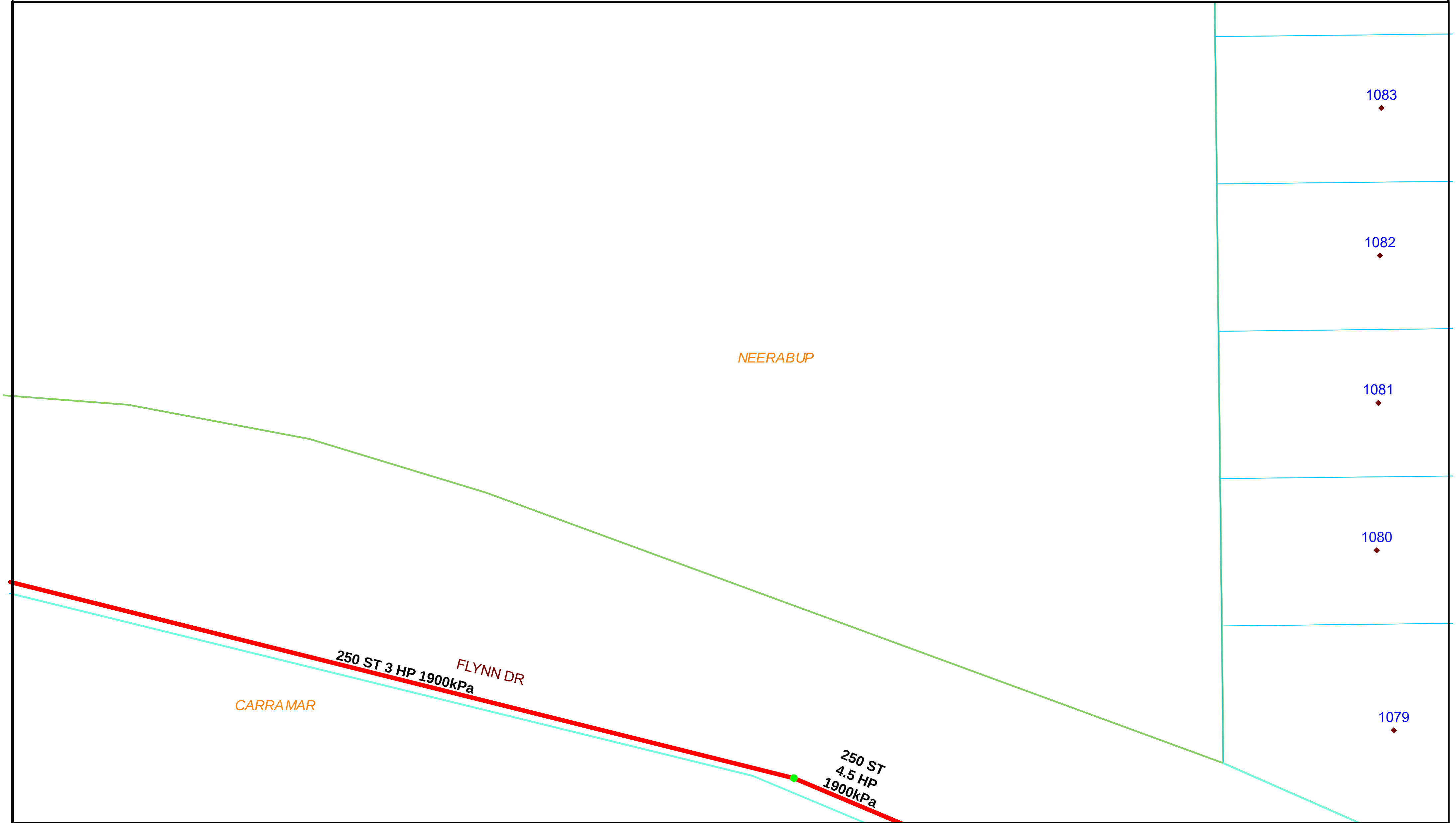

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Scale: 1:1500
Job No: 21659326
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

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N W E S

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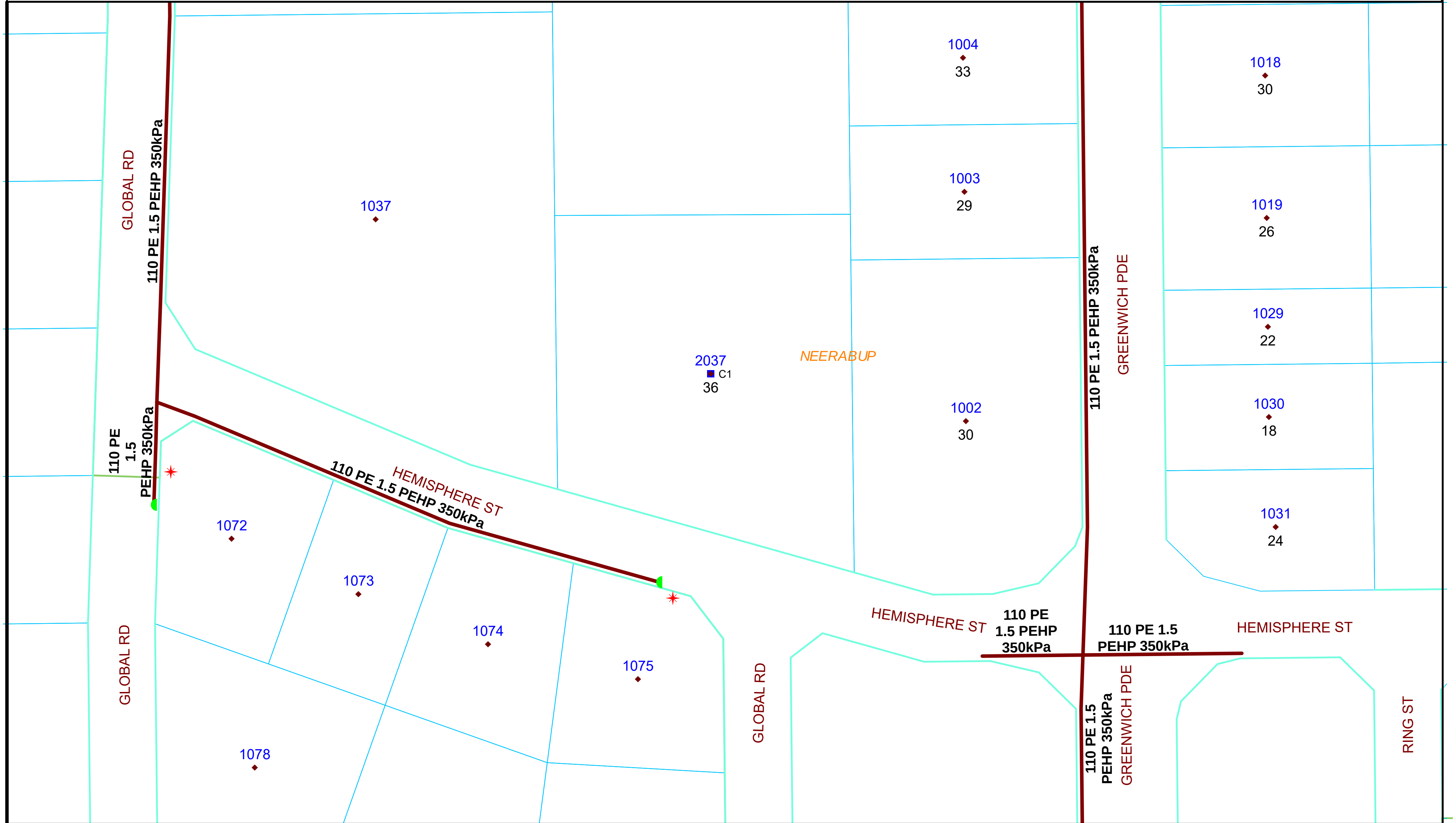

Sequence No: 109936455 Map Tile: 3 Scale: 1:1500

Job No: 21659326 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

N W E S

ATCO

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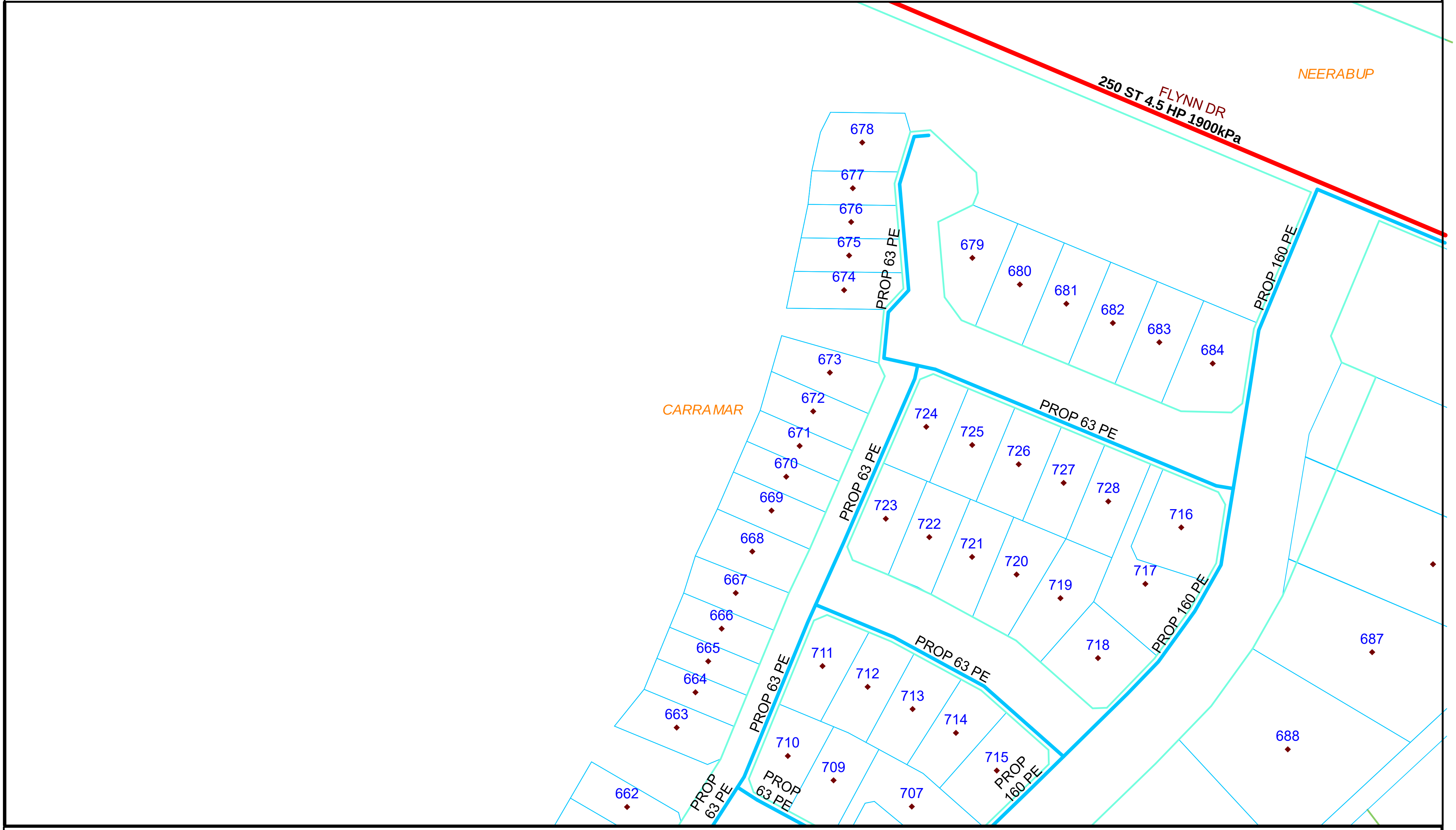

Sequence No: 109936455 | Map Tile: 4 | Scale: 1:1500

Job No: 21659326 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

N W E S

ATCO

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WARNING - HIGH PRESSURE PIPELINE IN THE VICINITY.

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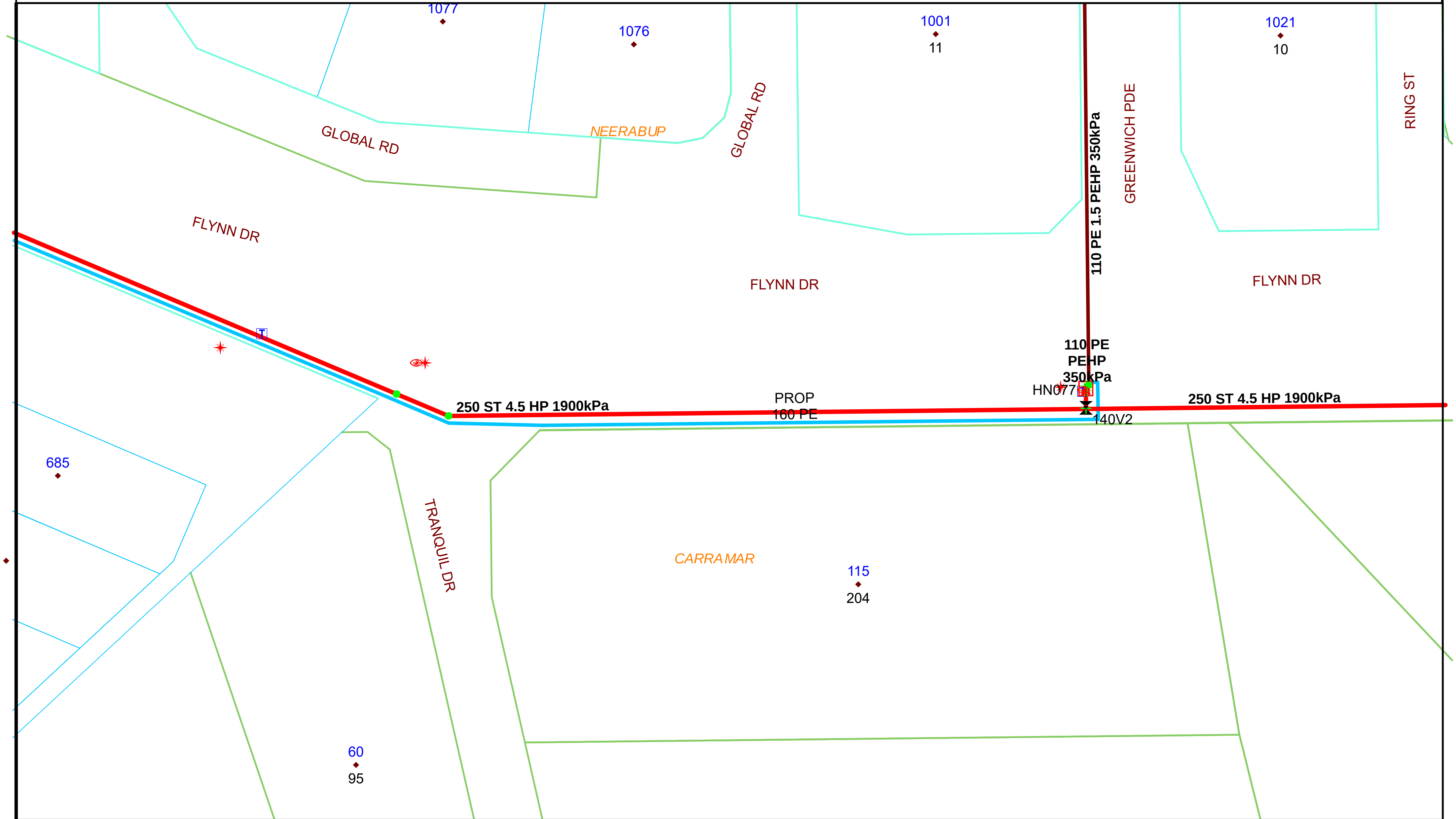

Sequence No: 109936455 Map Tile: 5 Scale: 1:1500

Job No: 21659326 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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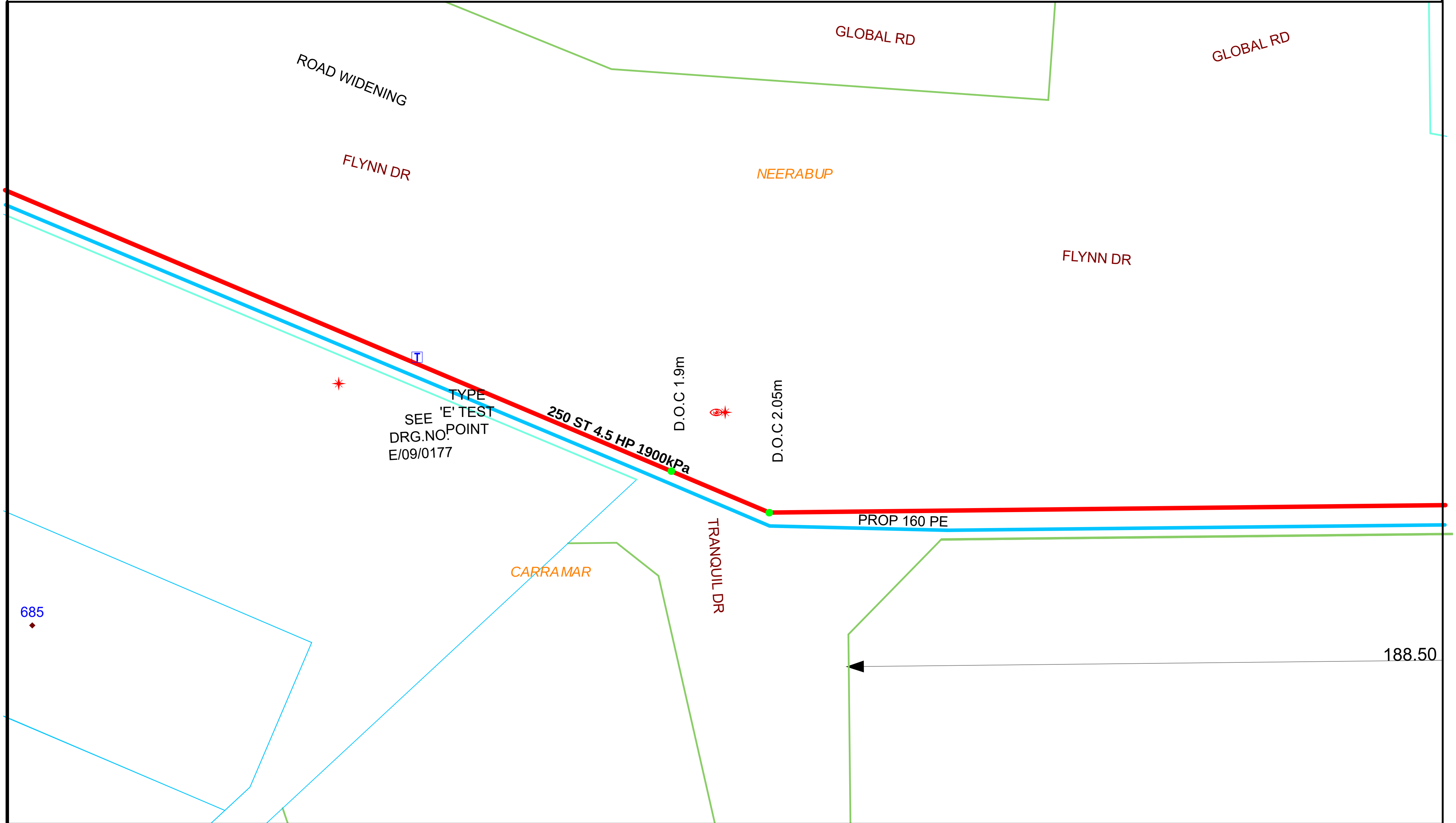

Sequence No: 109936455 Map Tile: 6 Scale: 1:800

Job No: 21659326 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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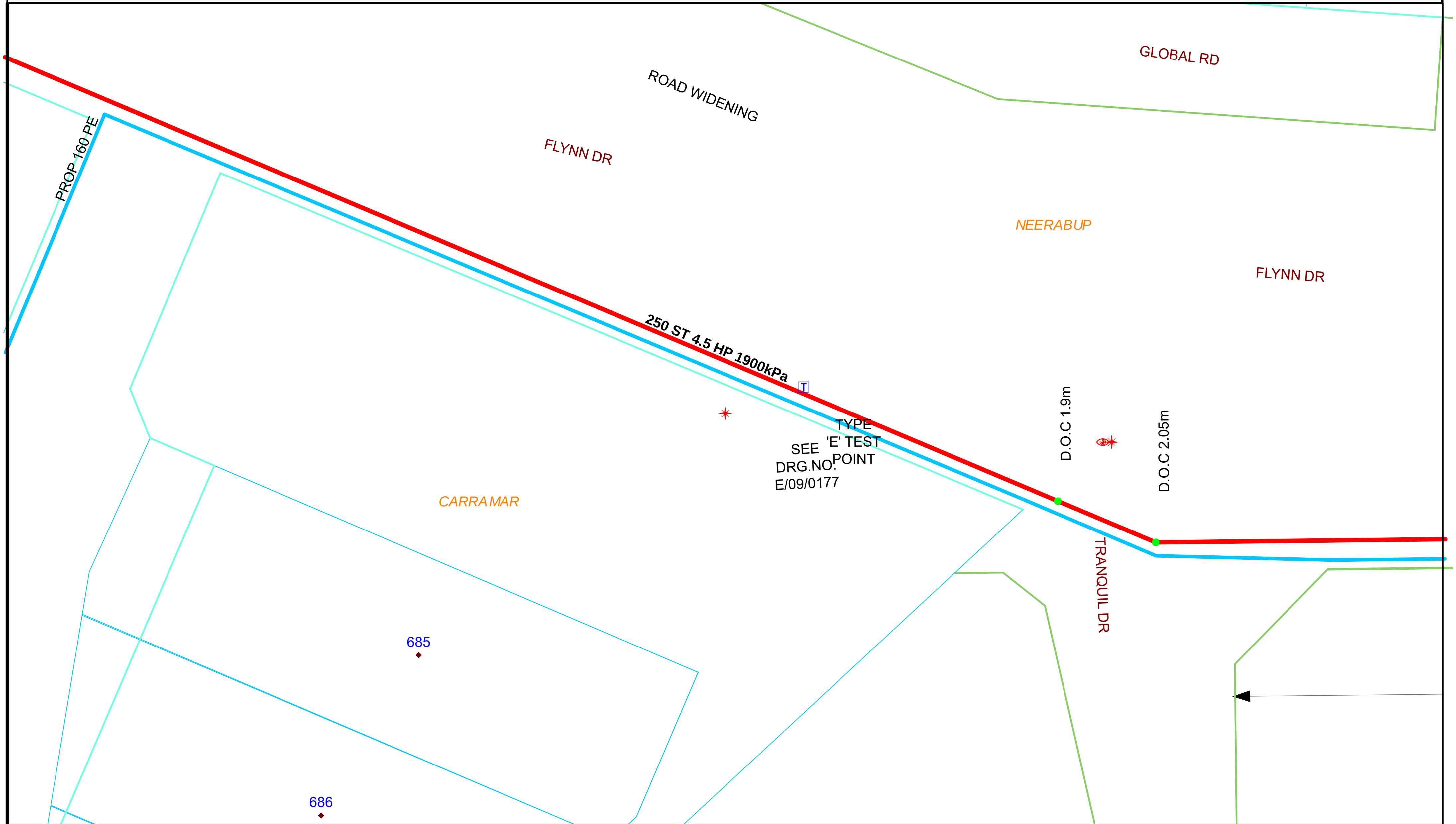

Sequence No: 109936455 | Map Tile: 7 | Scale: 1:800

Job No: 21659326 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

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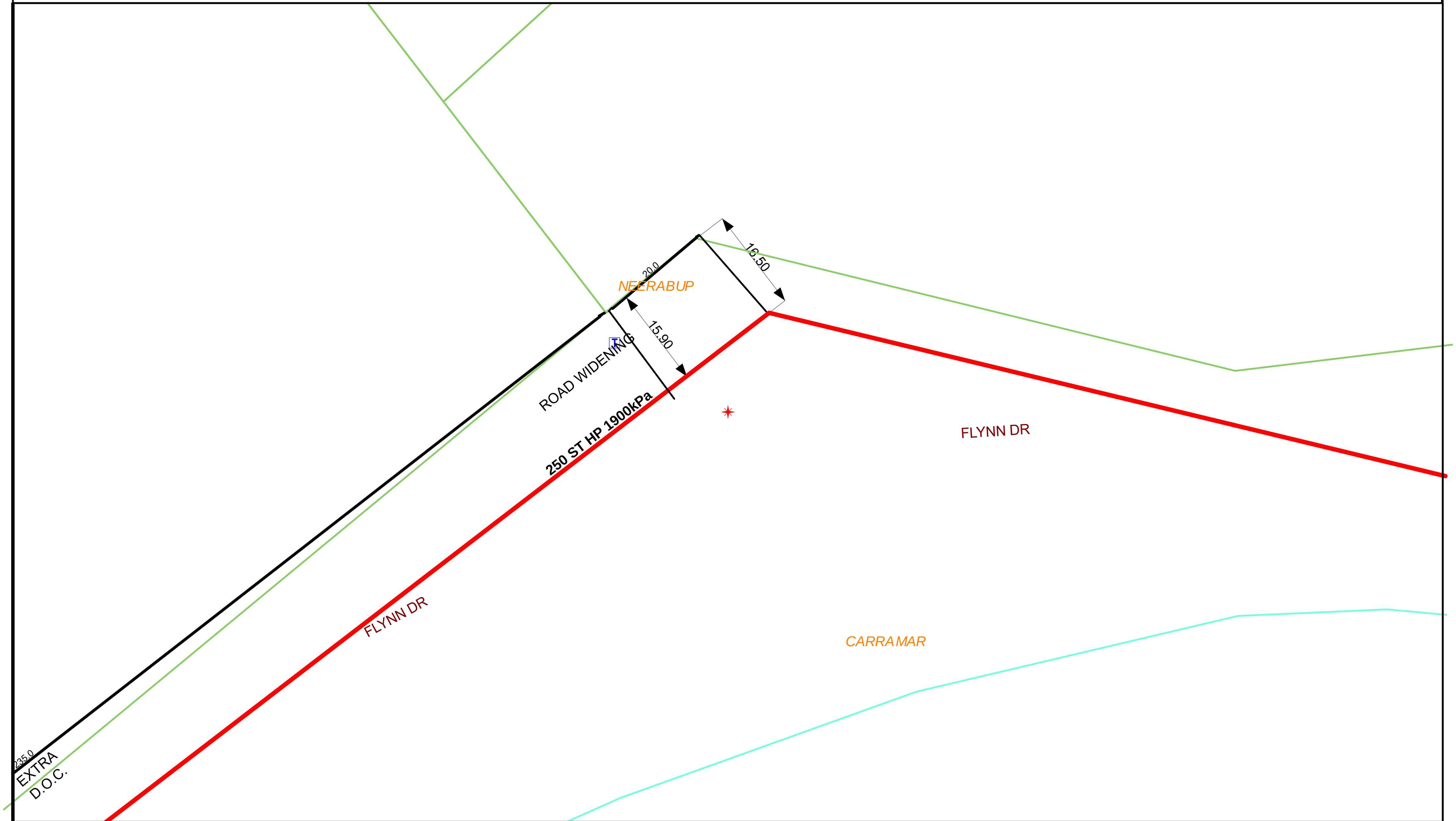

Sequence No: 109936455 Map Tile: 8 Scale: 1:800

Job No: 21659326 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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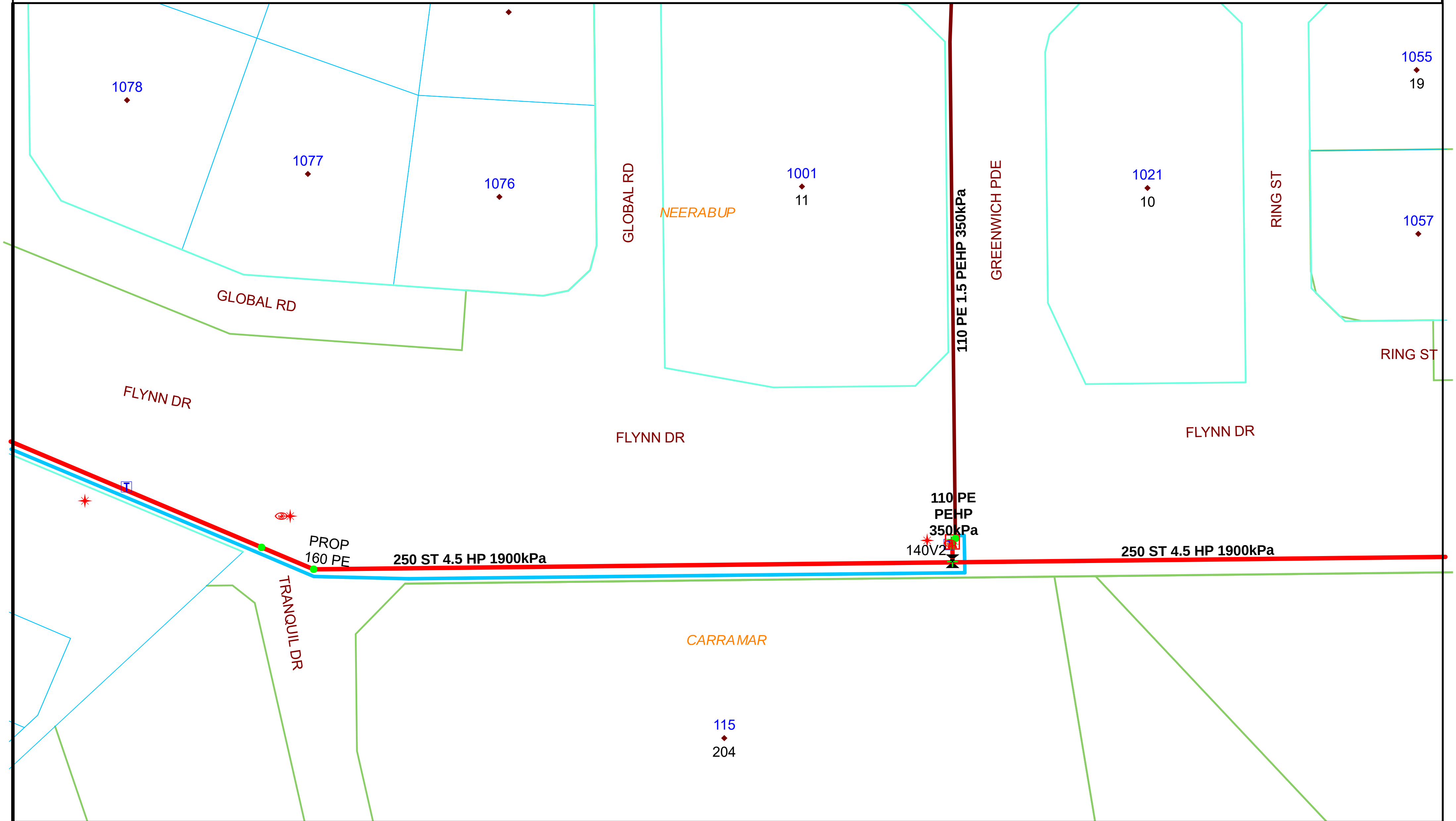

Sequence No: 109936645 Map Tile: 1 Scale: 1:1500

Job No: 21659360 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

N W E S

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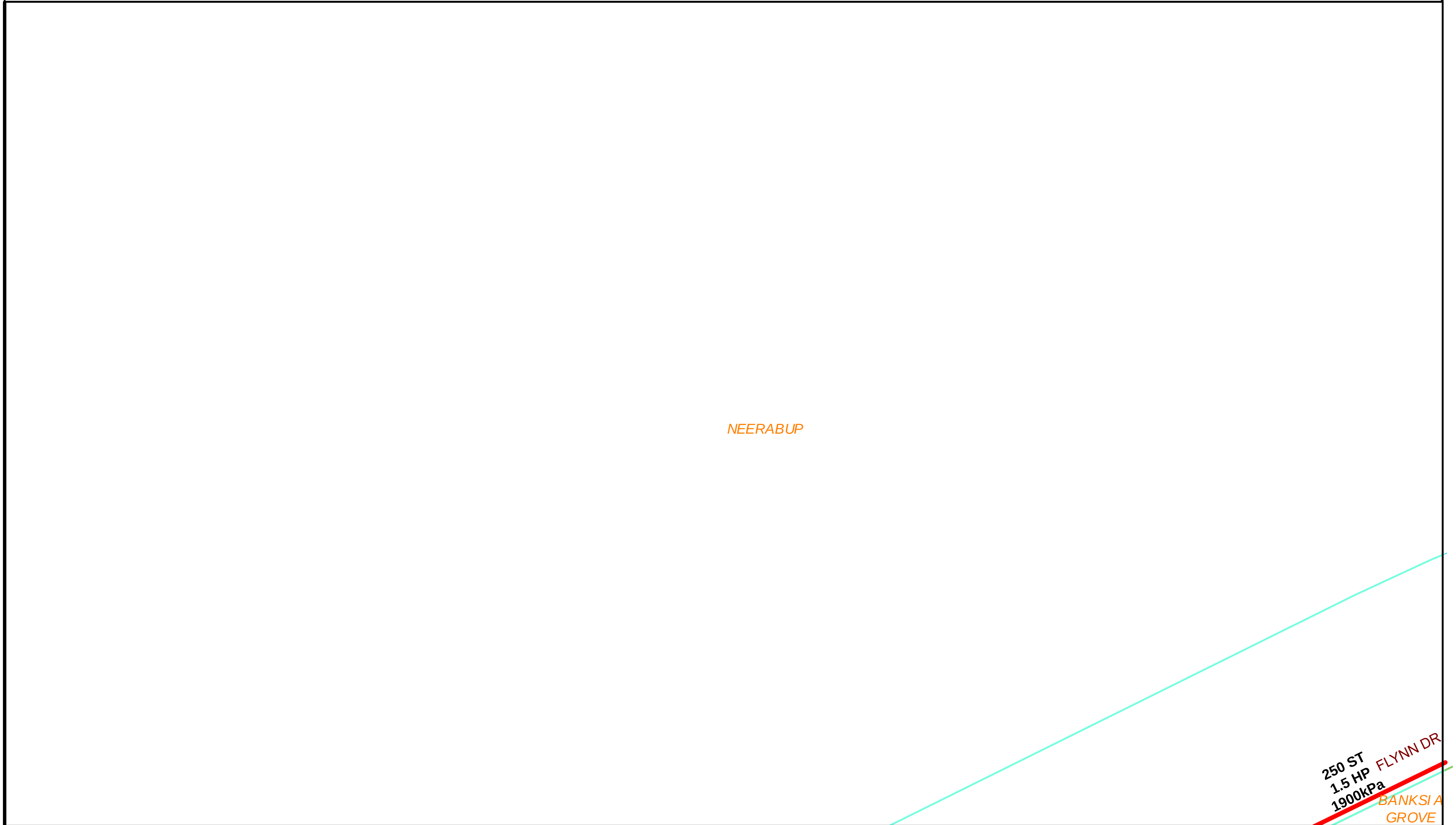

Sequence No: 109938510 | Map Tile: 1 | Scale: 1:1500

Job No: 21659682 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

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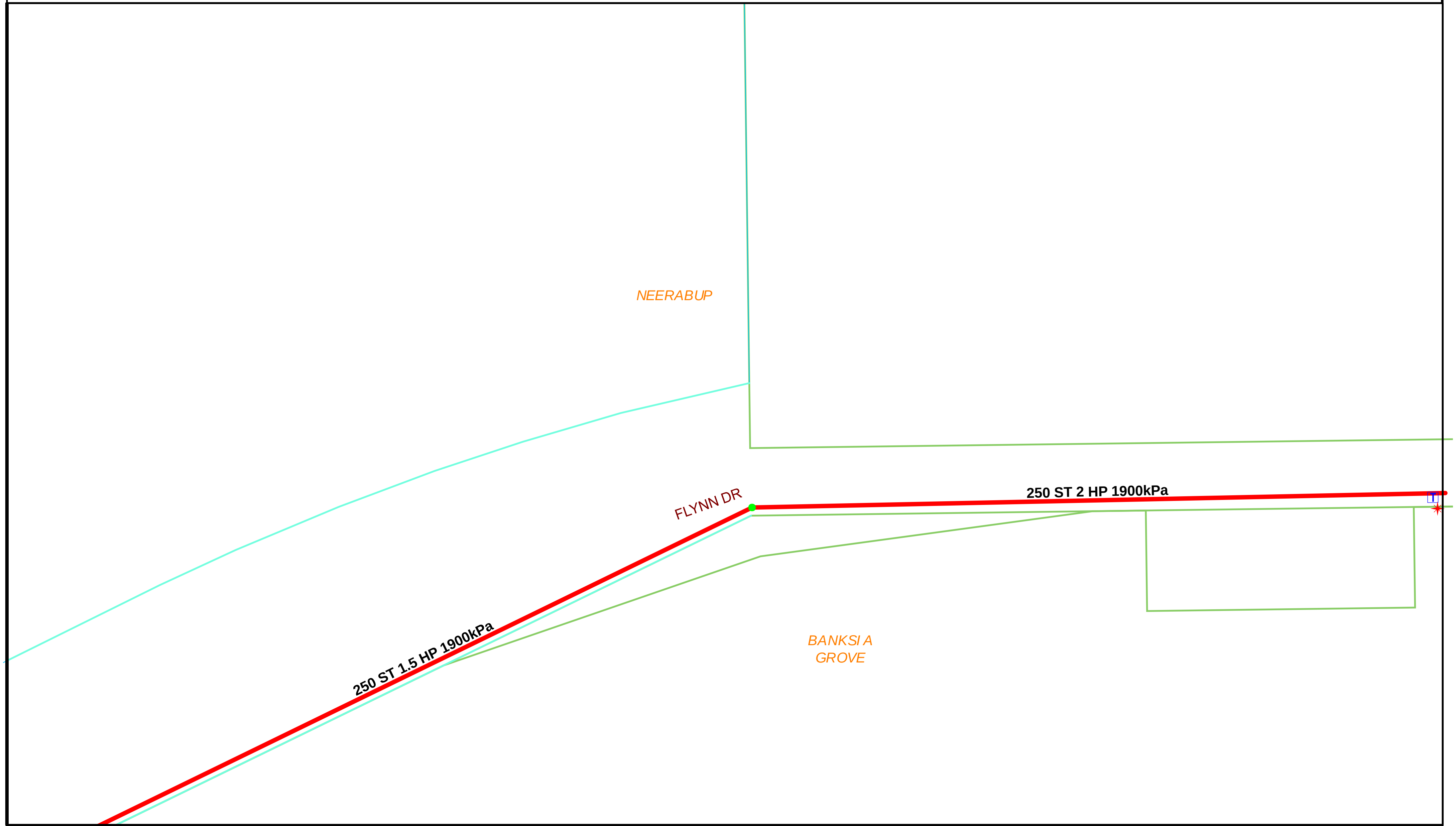

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Job No: 21659703 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

N W E S

ATCO

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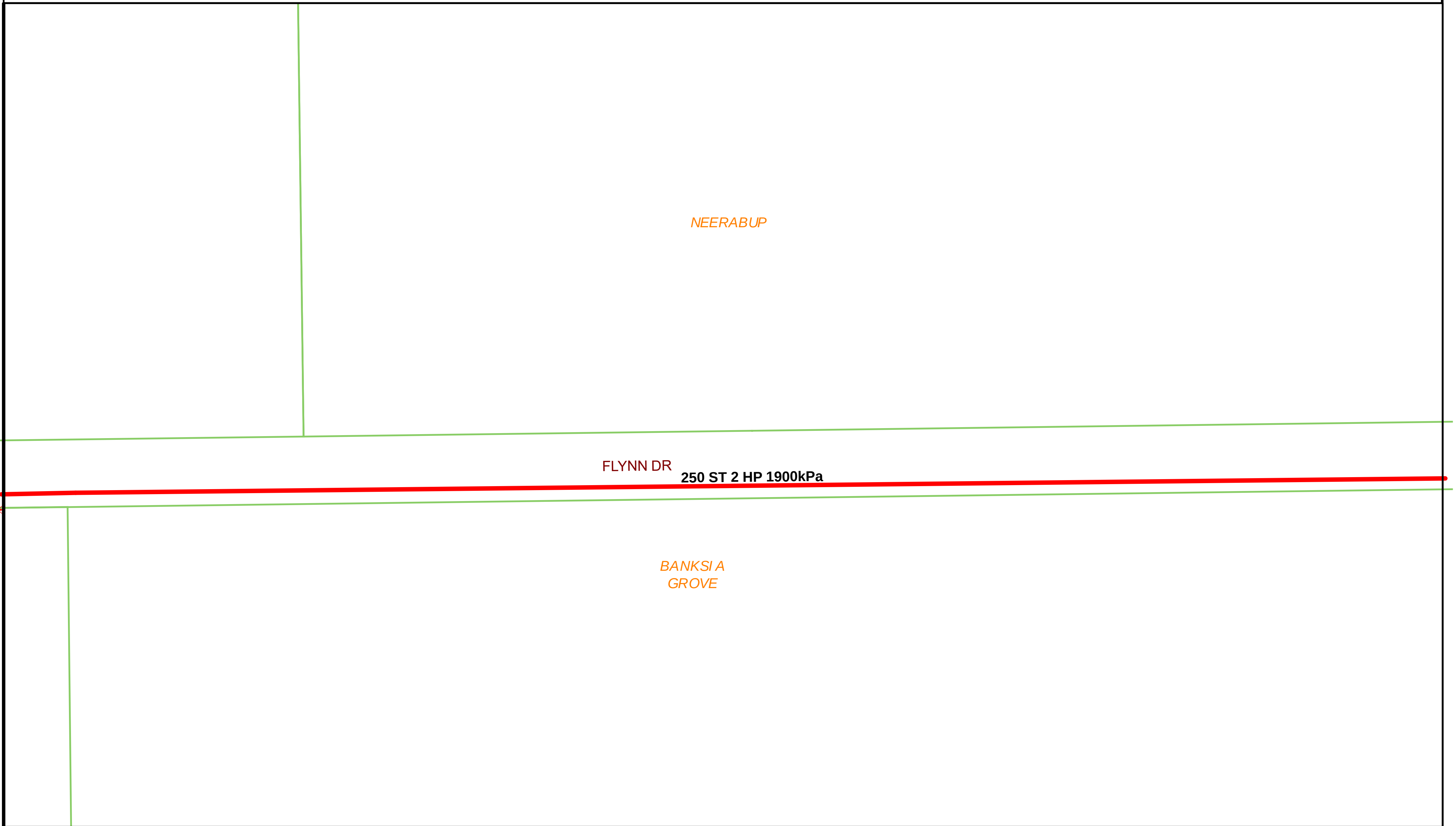

Sequence No: 109938633 Map Tile: 2 Scale: 1:1500
Job No: 21659703 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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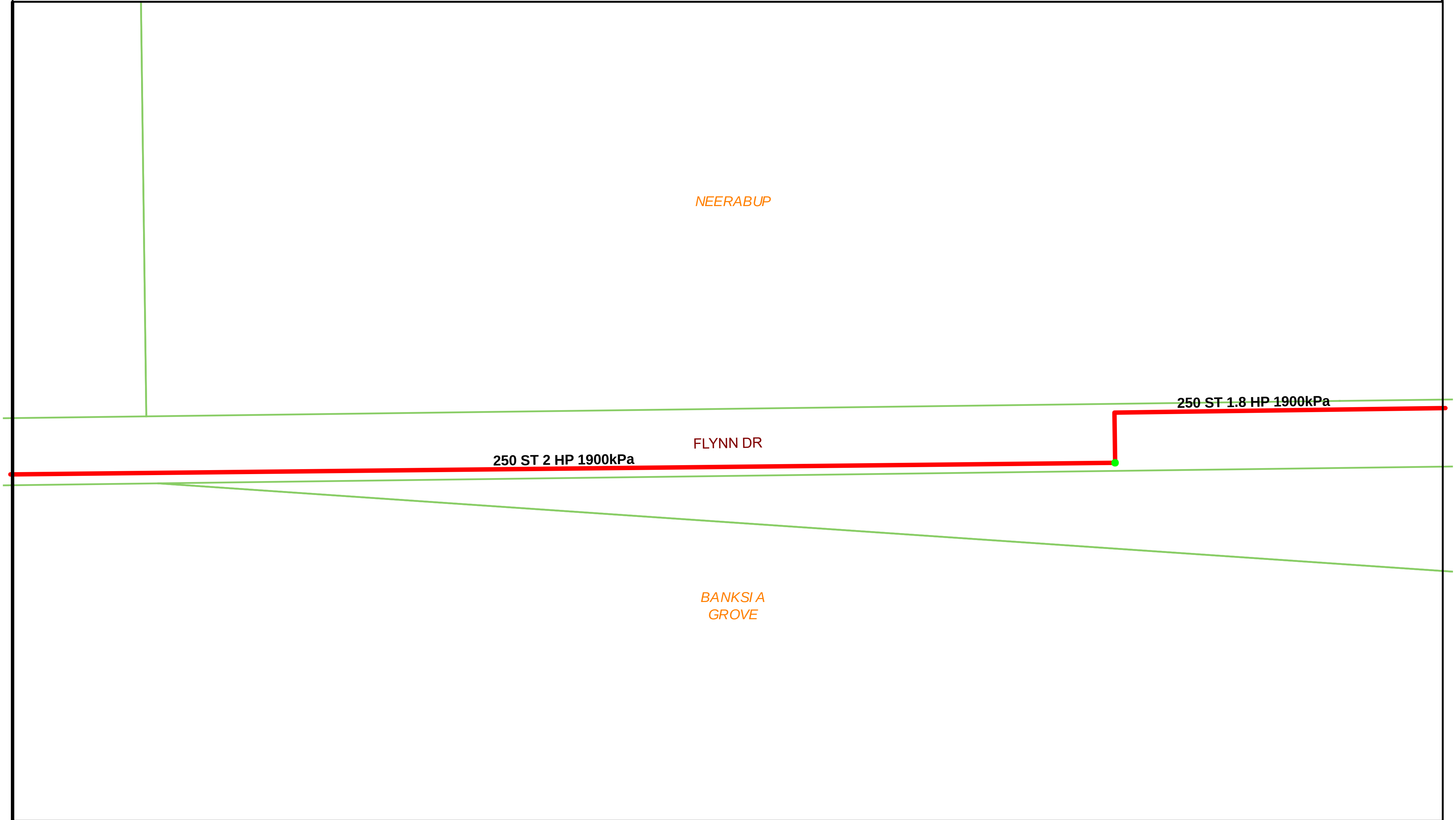

Sequence No: 109938633 Map Tile: 3 Scale: 1:1500

Job No: 21659703 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

N W E S

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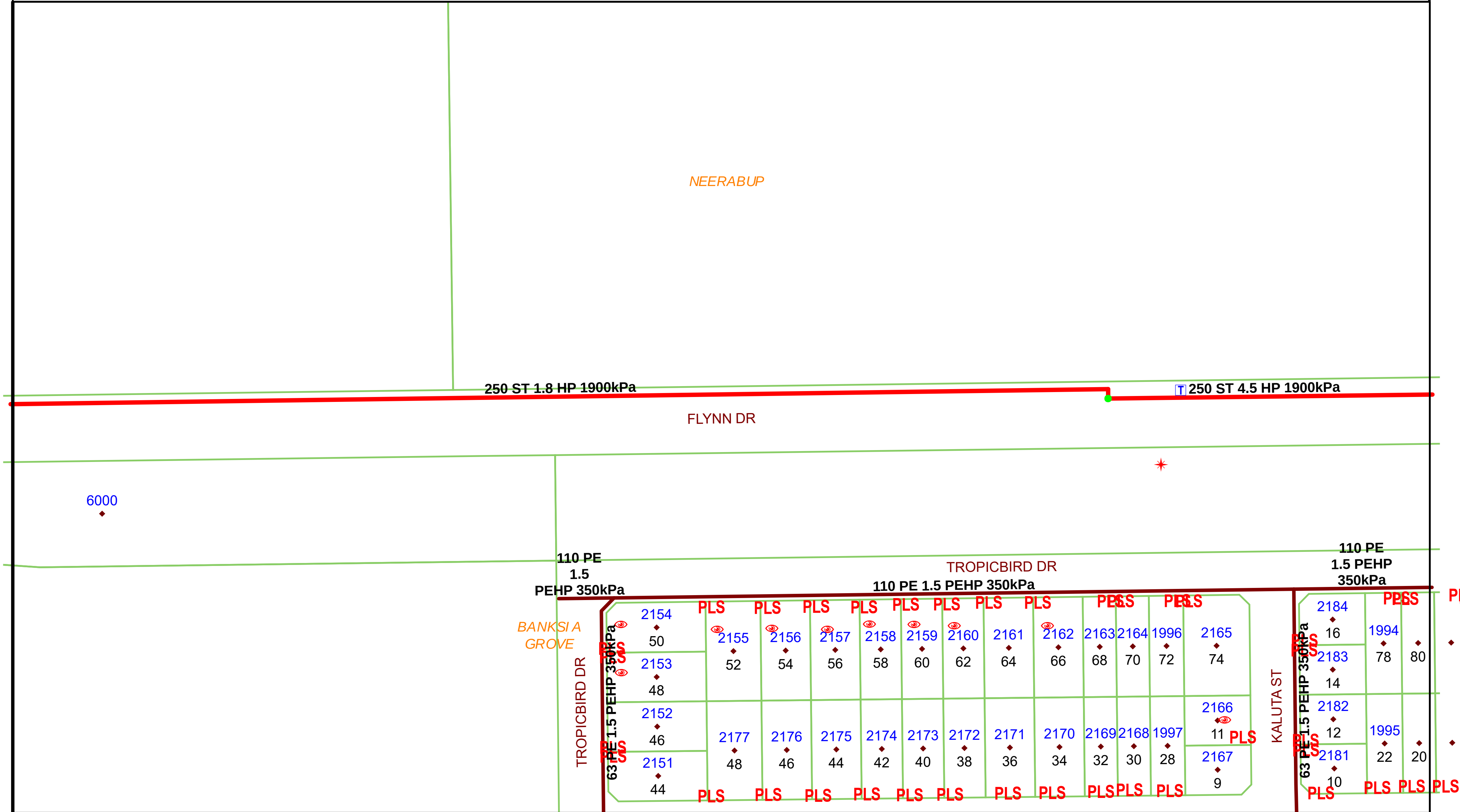

Sequence No: 109938633 Map Tile: 4 Scale: 1:1500

Job No: 21659703 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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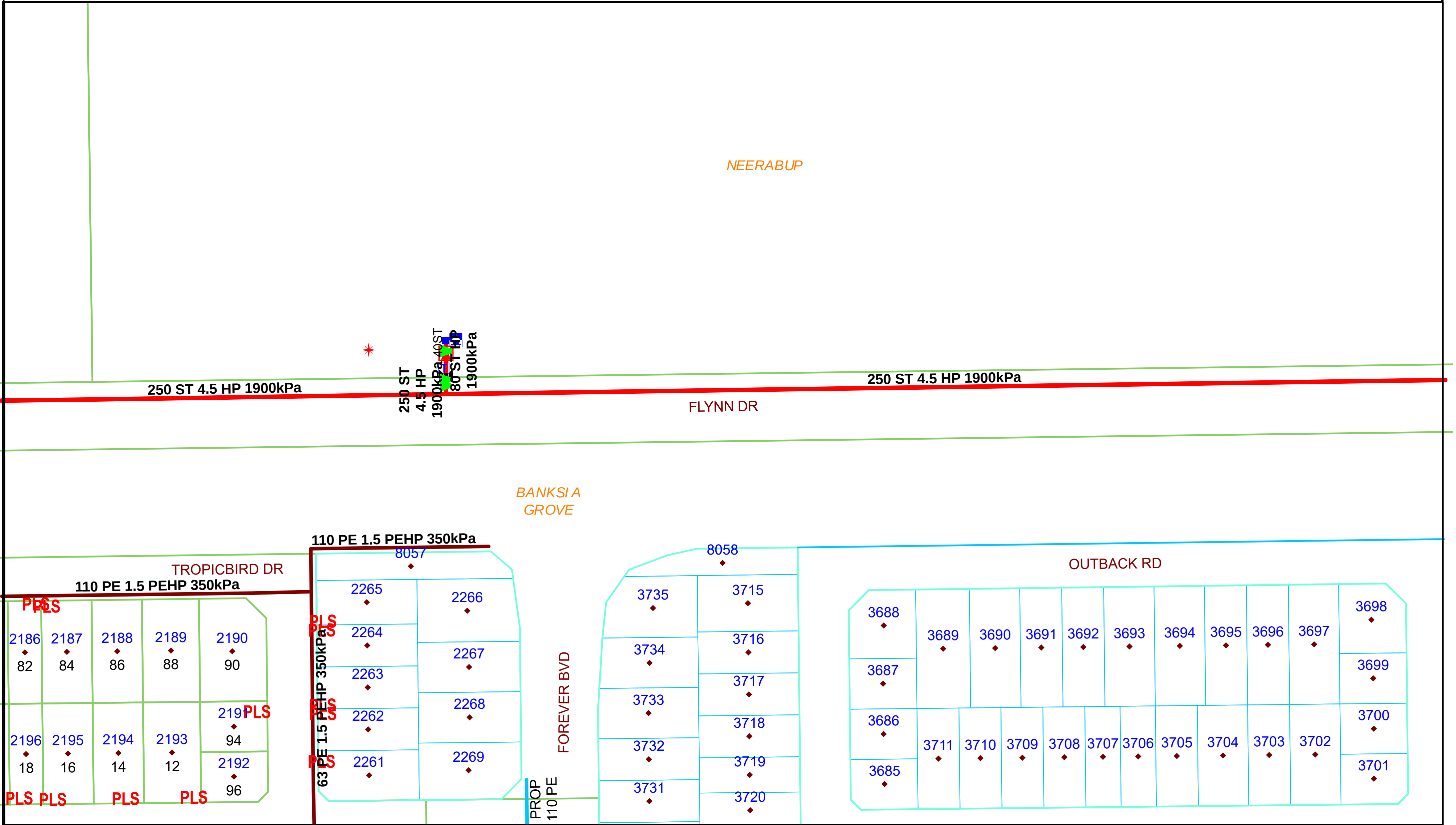

Sequence No: 109938633
Map Tile: 5
Scale: 1:1500
Job No: 21659703
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

ATCO

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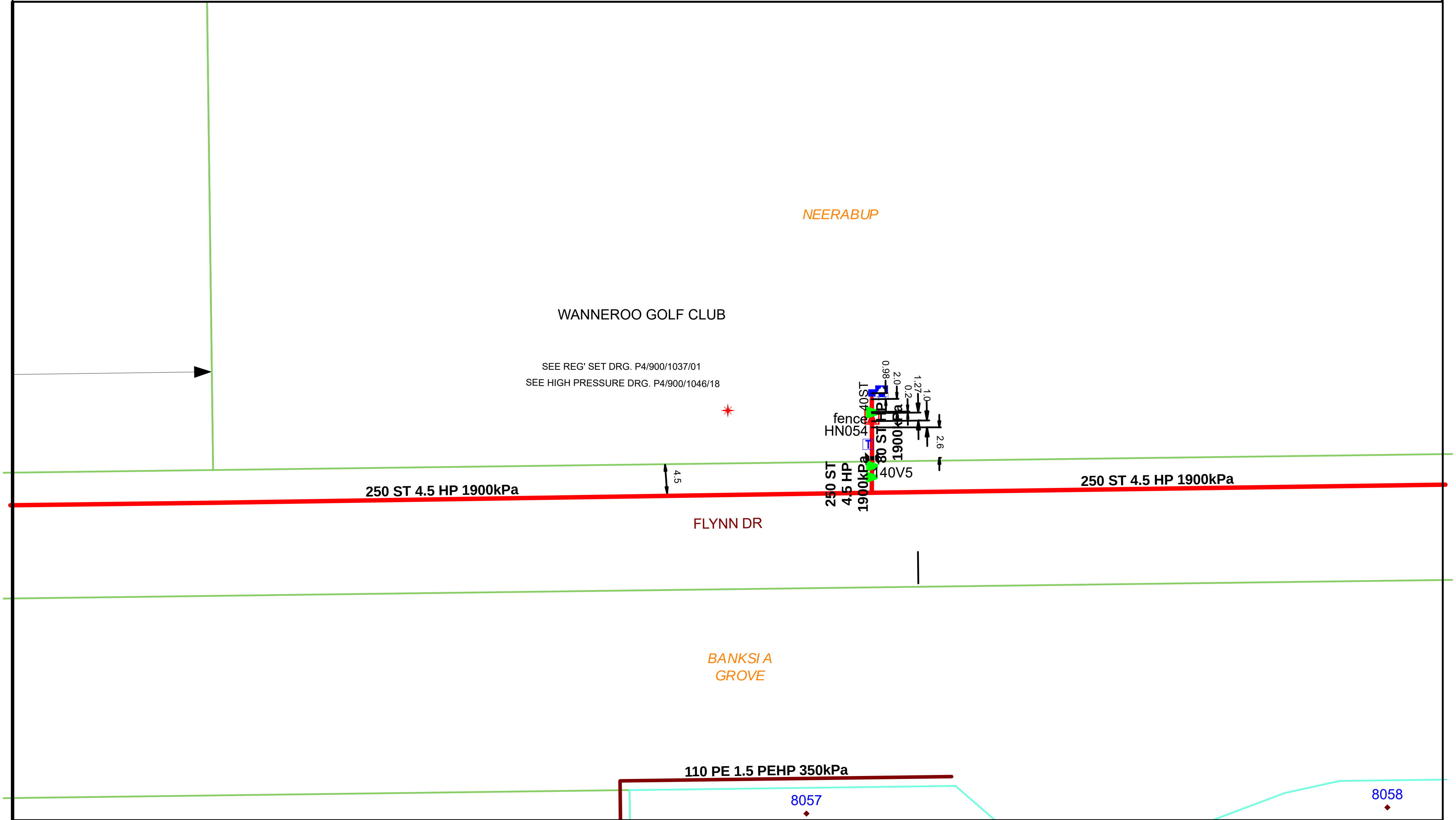

Sequence No: 109938633
Map Tile: 6
Scale: 1:800
Job No: 21659703
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

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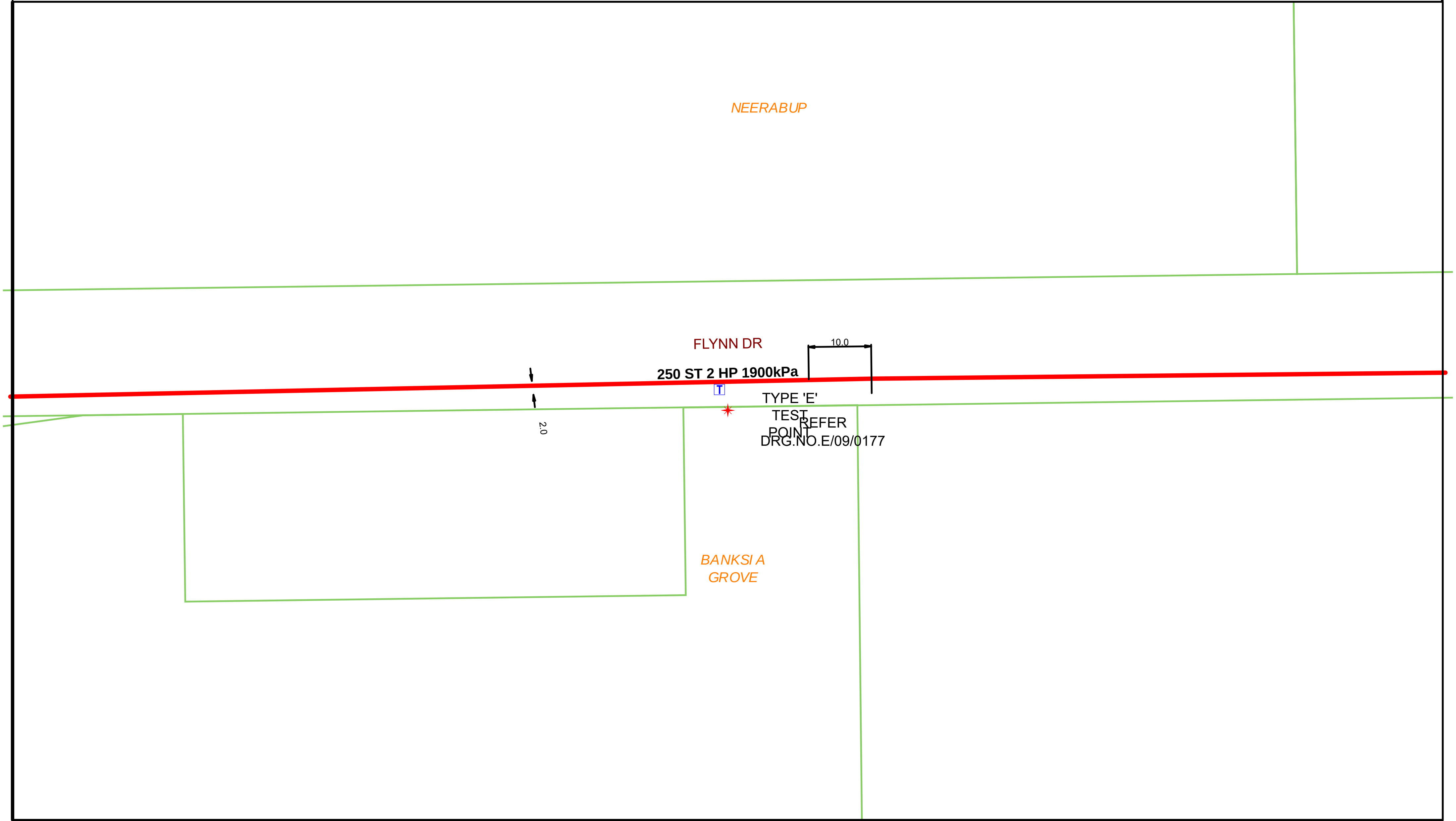

Sequence No: 109938633
Map Tile: 7
Scale: 1:800
Job No: 21659703
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

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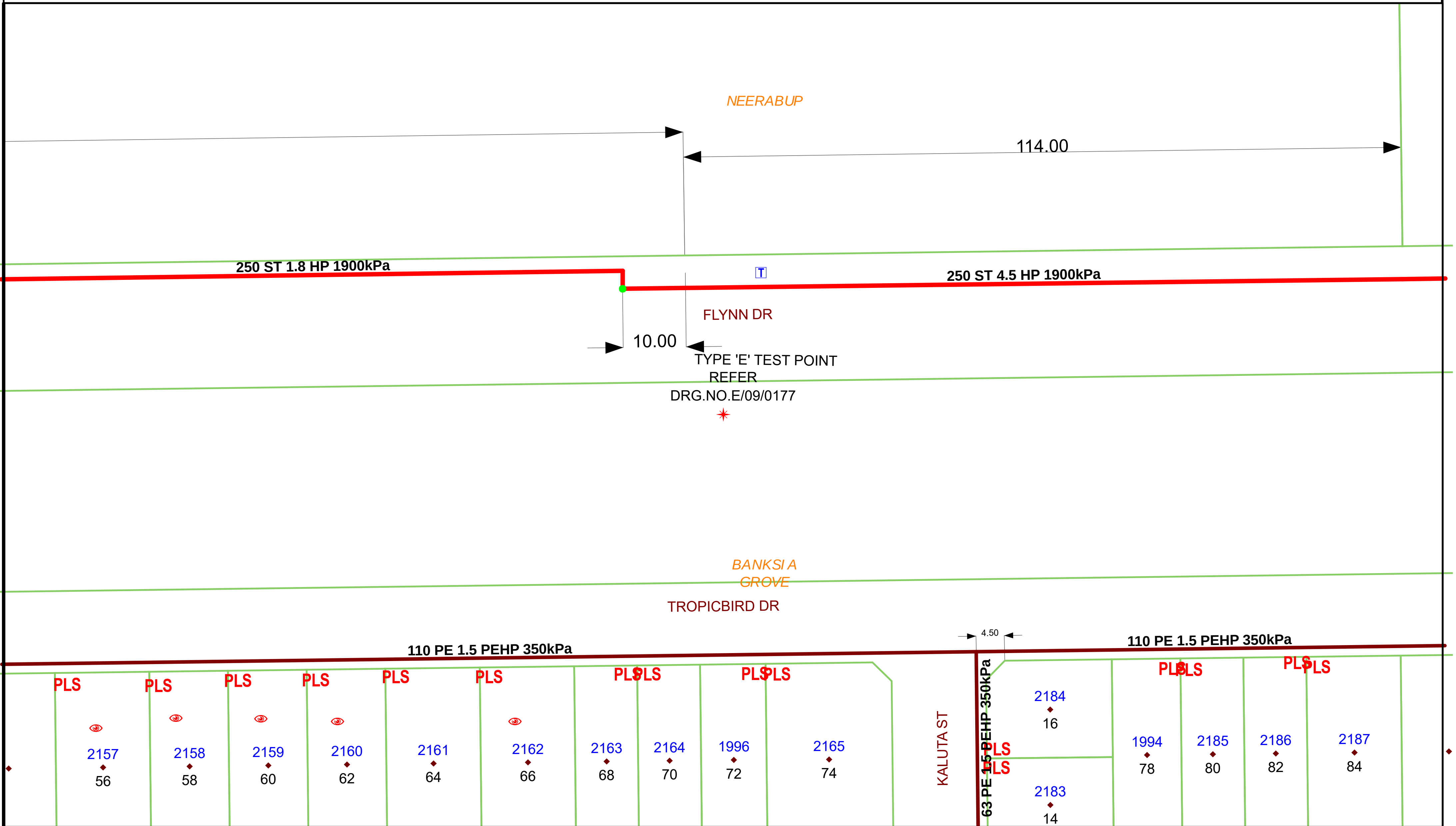

Sequence No: 109938633 Map Tile: 8 Scale: 1:800

Job No: 21659703 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

N W E S

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Sequence No: 109938510 | Map Tile: 2 | Scale: 1:1500

Job No: 21659682 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

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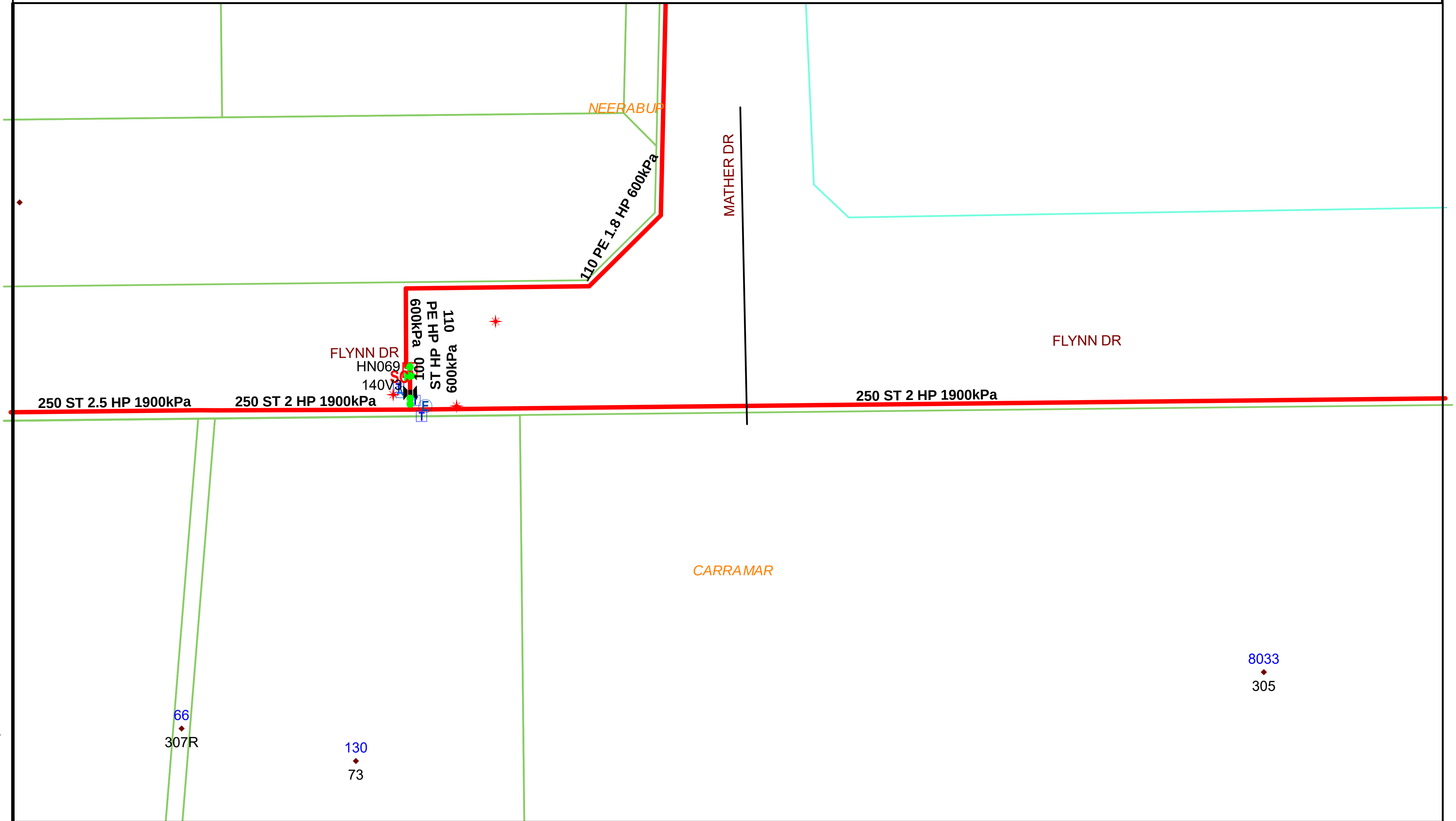

Sequence No: 109938510
Map Tile: 3
Scale: 1:1500
Job No: 21659682
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

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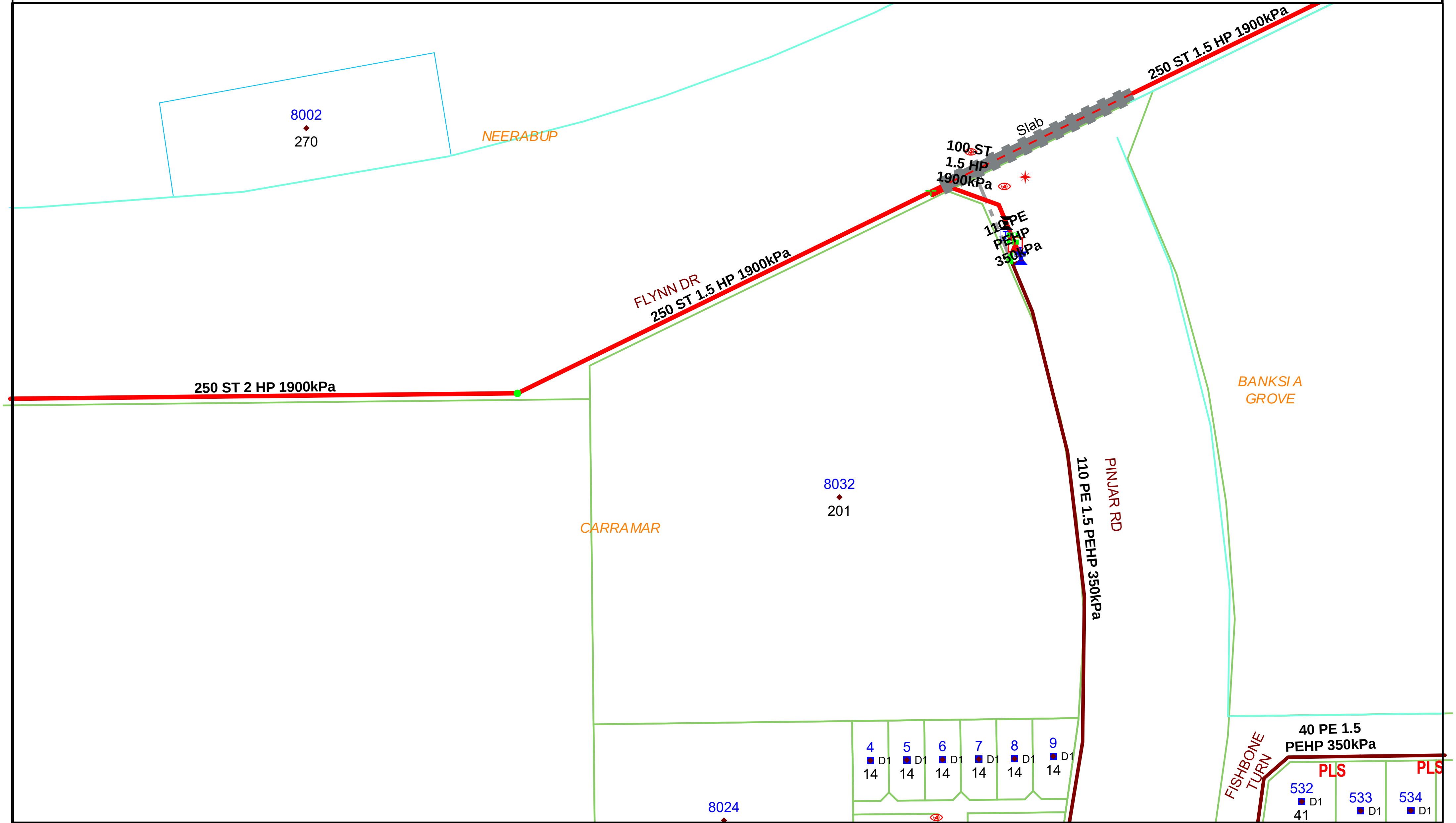

Sequence No: 109938510 | Map Tile: 4 | Scale: 1:1500

Job No: 21659682 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

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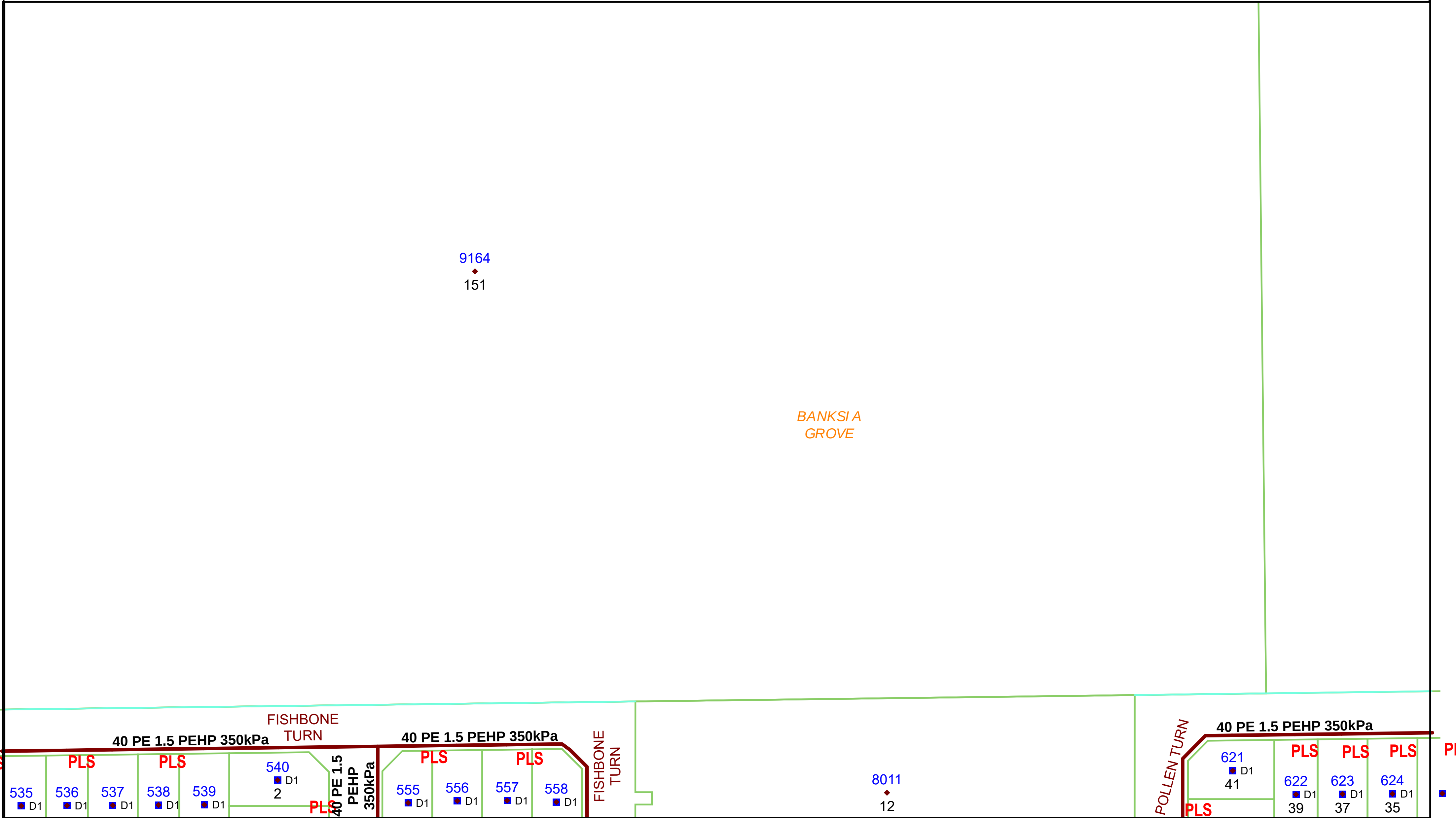

Sequence No: 109938510 Map Tile: 5 Scale: 1:1500

Job No: 21659682 Date:20/05/2021 Location: Flynn Drive, Neerabup 6031

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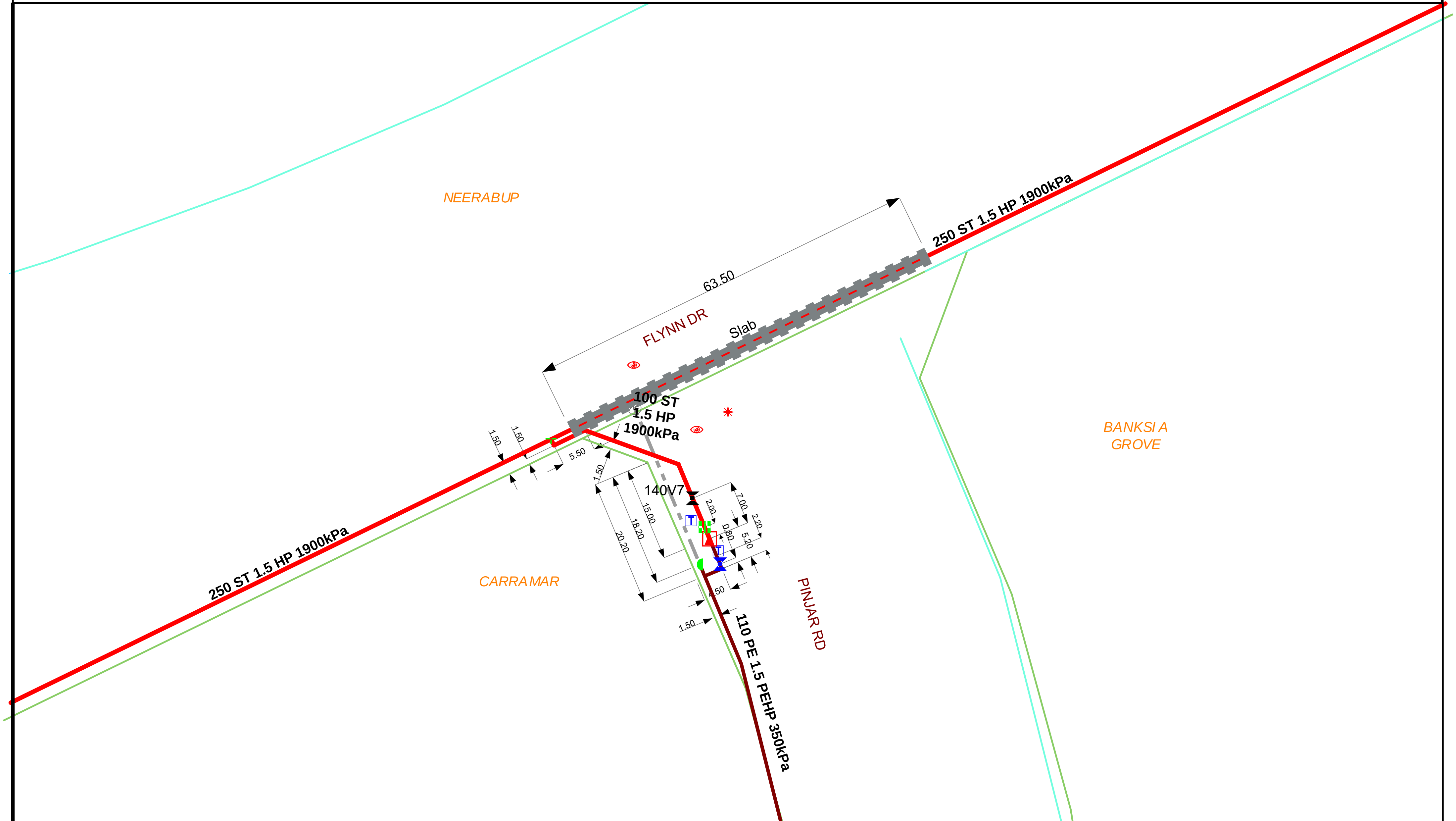

Sequence No: 109938510
Map Tile: 6
Scale: 1:800
Job No: 21659682
Date:20/05/2021
Location: Flynn Drive, Neerabup 6031

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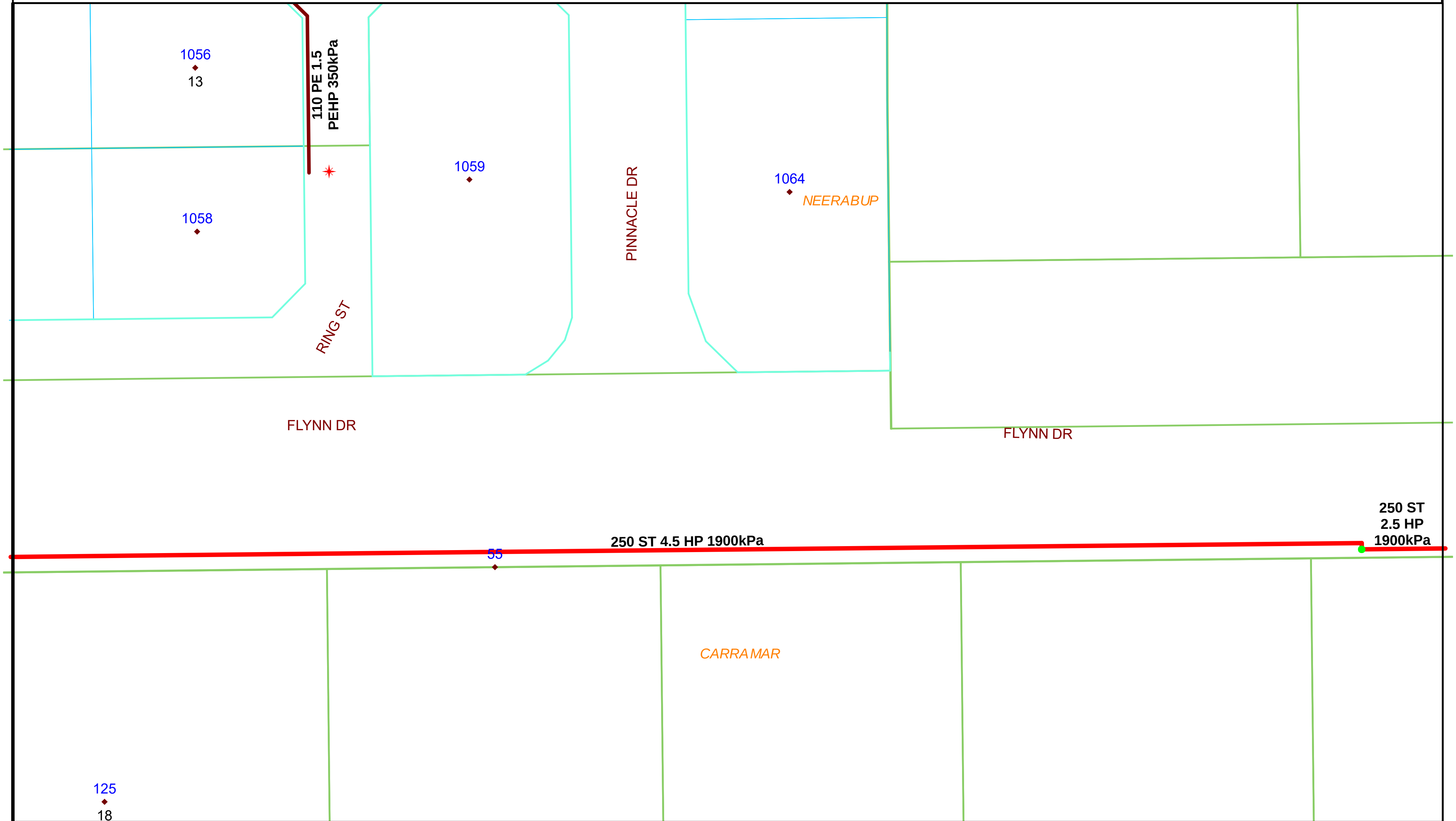

Sequence No: 109936645 | Map Tile: 2 | Scale: 1:1500

Job No: 21659360 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

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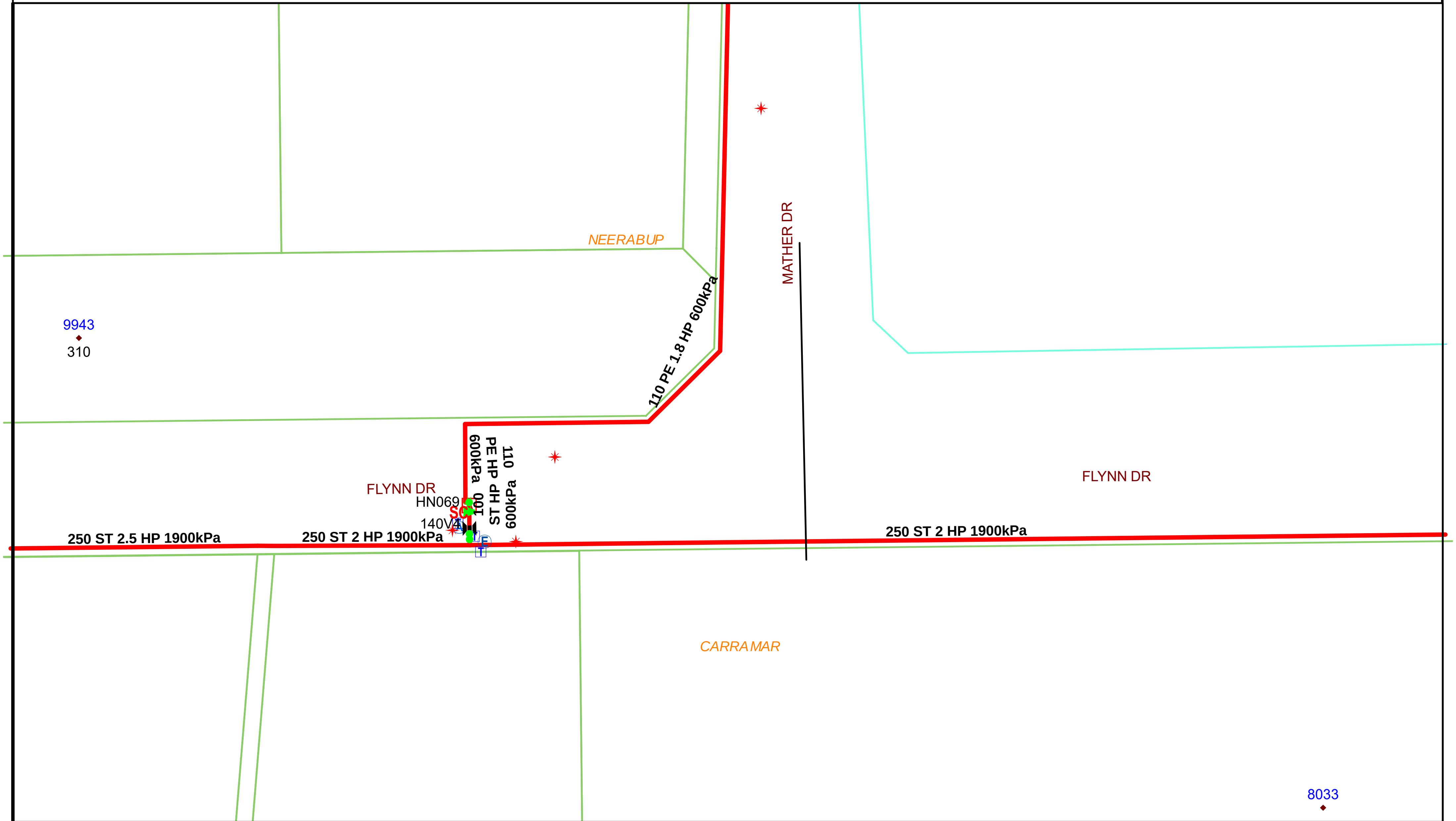

Sequence No: 109936645 | Map Tile: 3 | Scale: 1:1500

Job No: 21659360 | Date:20/05/2021 | Location: Flynn Drive, Neerabup 6031

N W E S

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MERIDIAN PARK / LOT 9006

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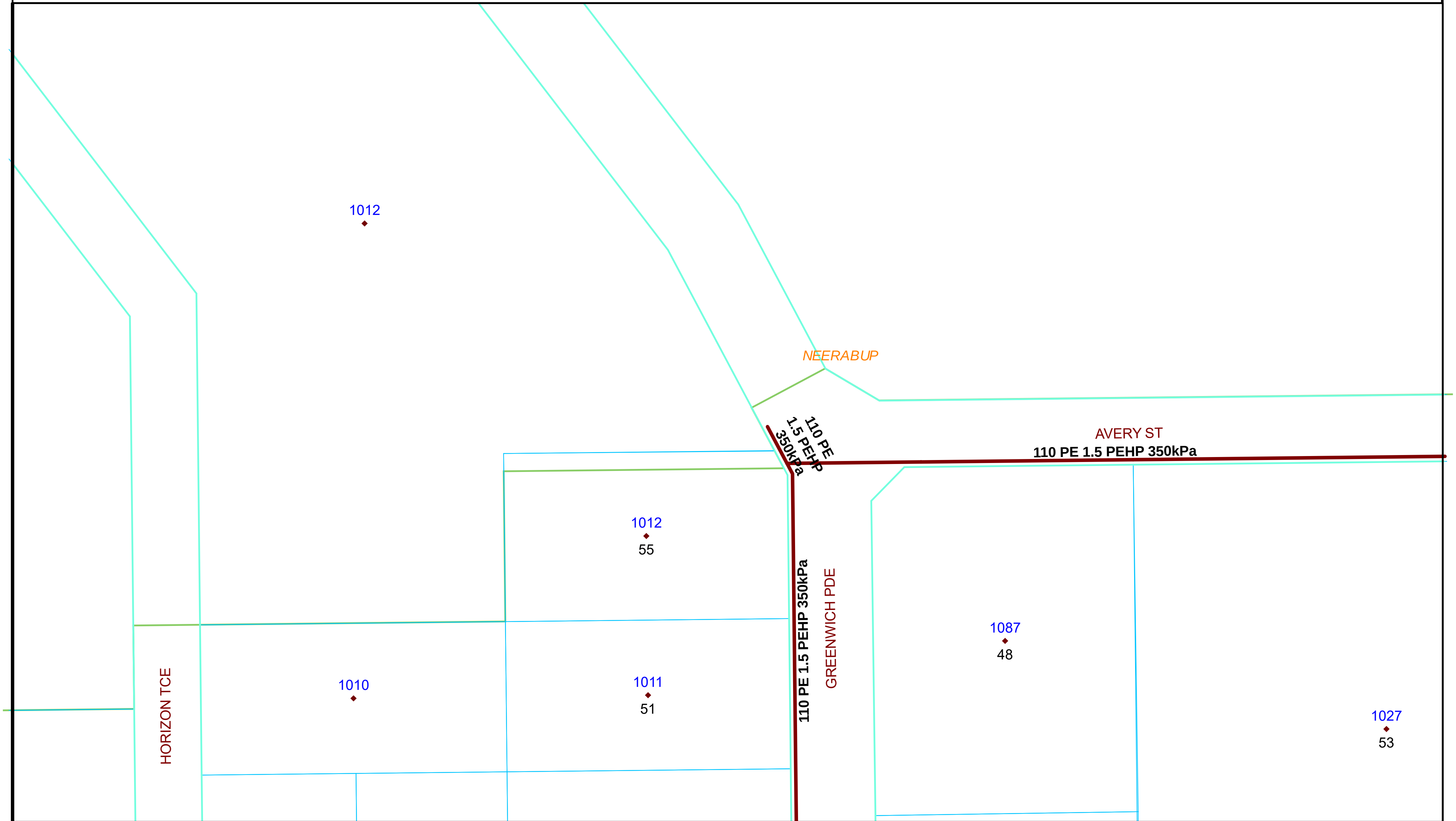

Sequence No: 109955328 Map Tile: 1 Scale: 1:1500

Job No: 21662530 Date:20/05/2021 Location: Avery Street, Neerabup 6031

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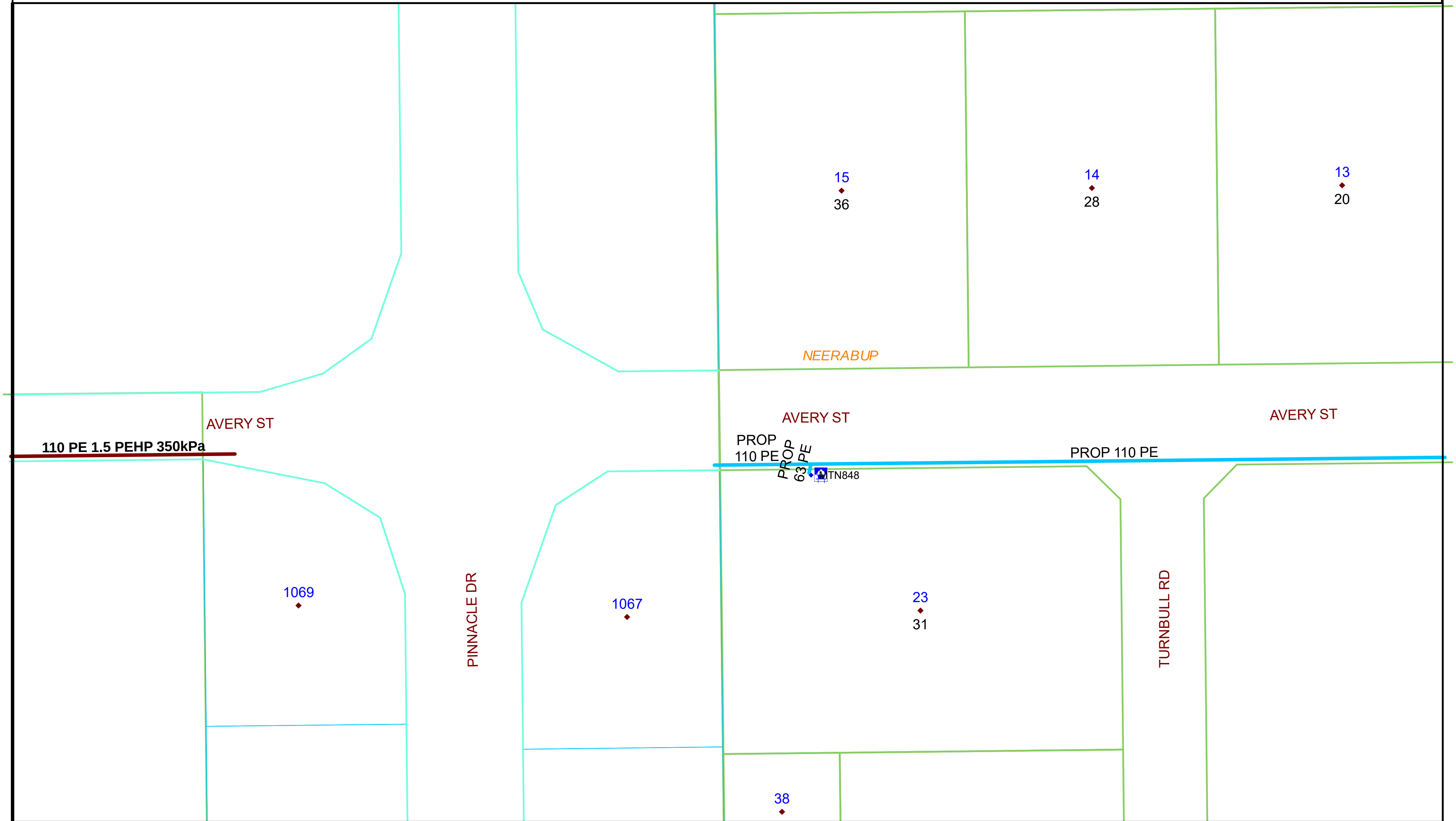

Sequence No: 109955328 Map Tile: 2 Scale: 1:1500

Job No: 21662530 Date:20/05/2021 Location: Avery Street, Neerabup 6031

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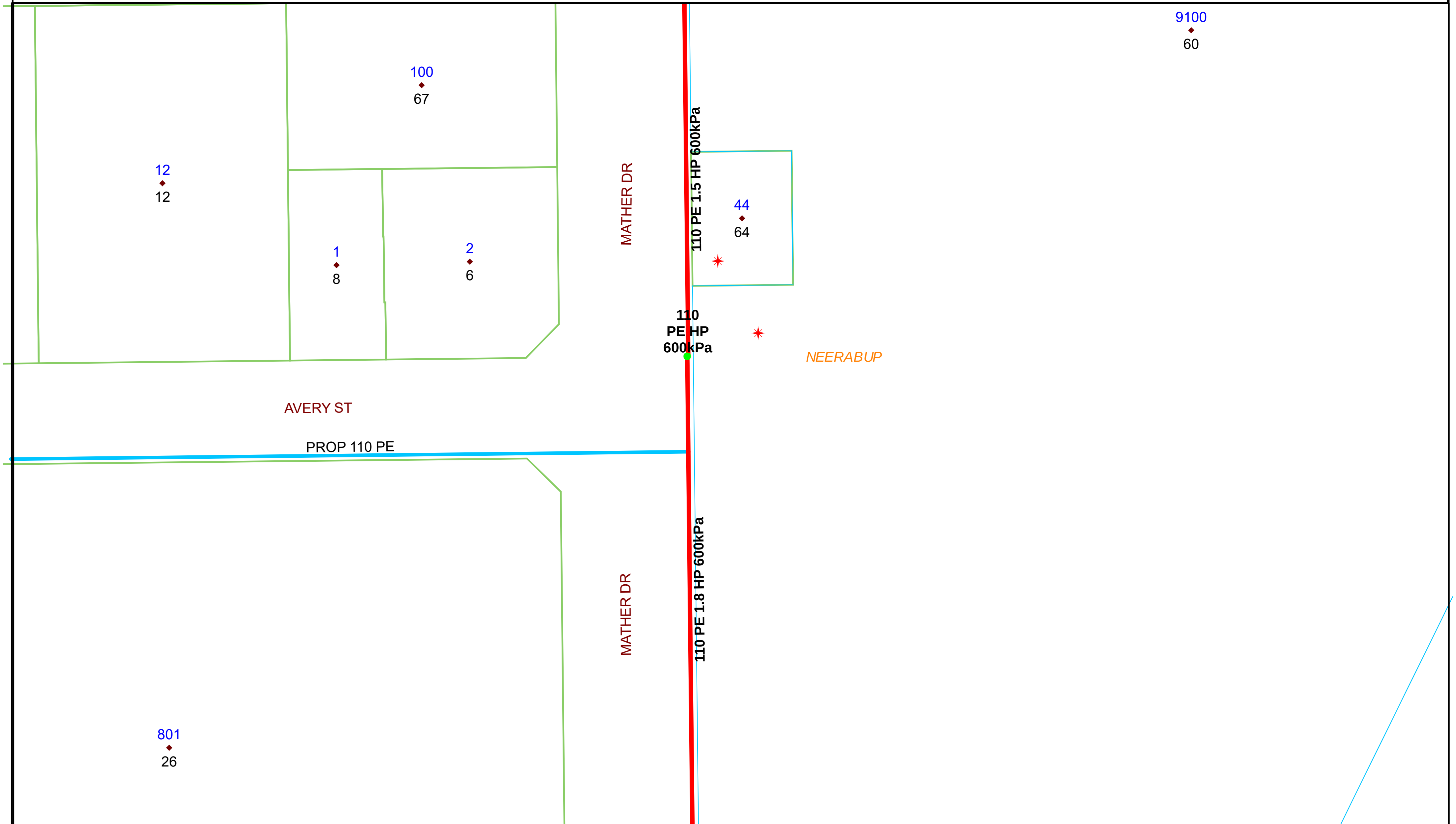

Sequence No: 109955328 | Map Tile: 3 | Scale: 1:1500

Job No: 21662530 | Date:20/05/2021 | Location: Avery Street, Neerabup 6031

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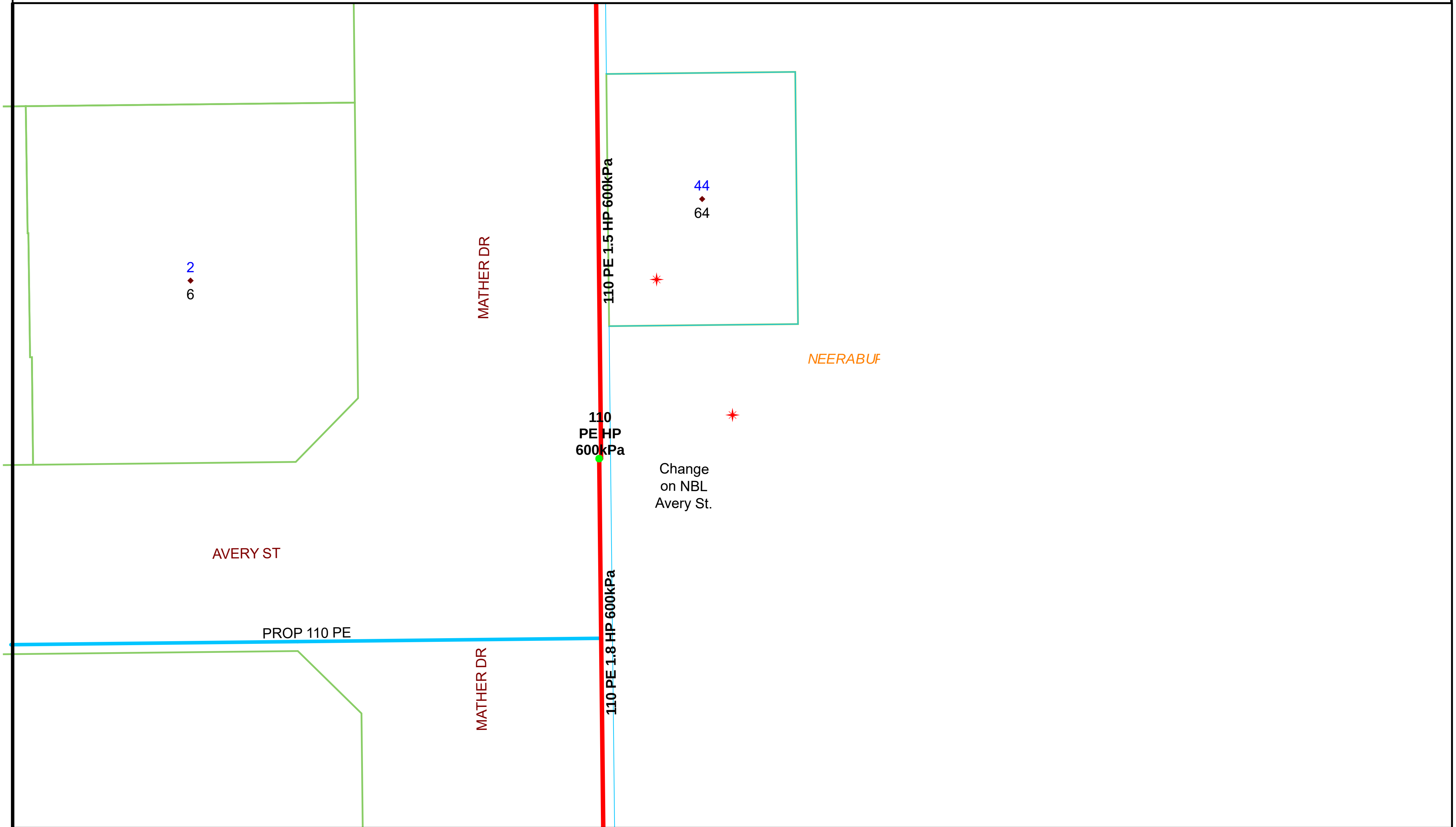

Sequence No: 109955328
Map Tile: 4
Scale: 1:800
Job No: 21662530
Date:20/05/2021
Location: Avery Street, Neerabup 6031

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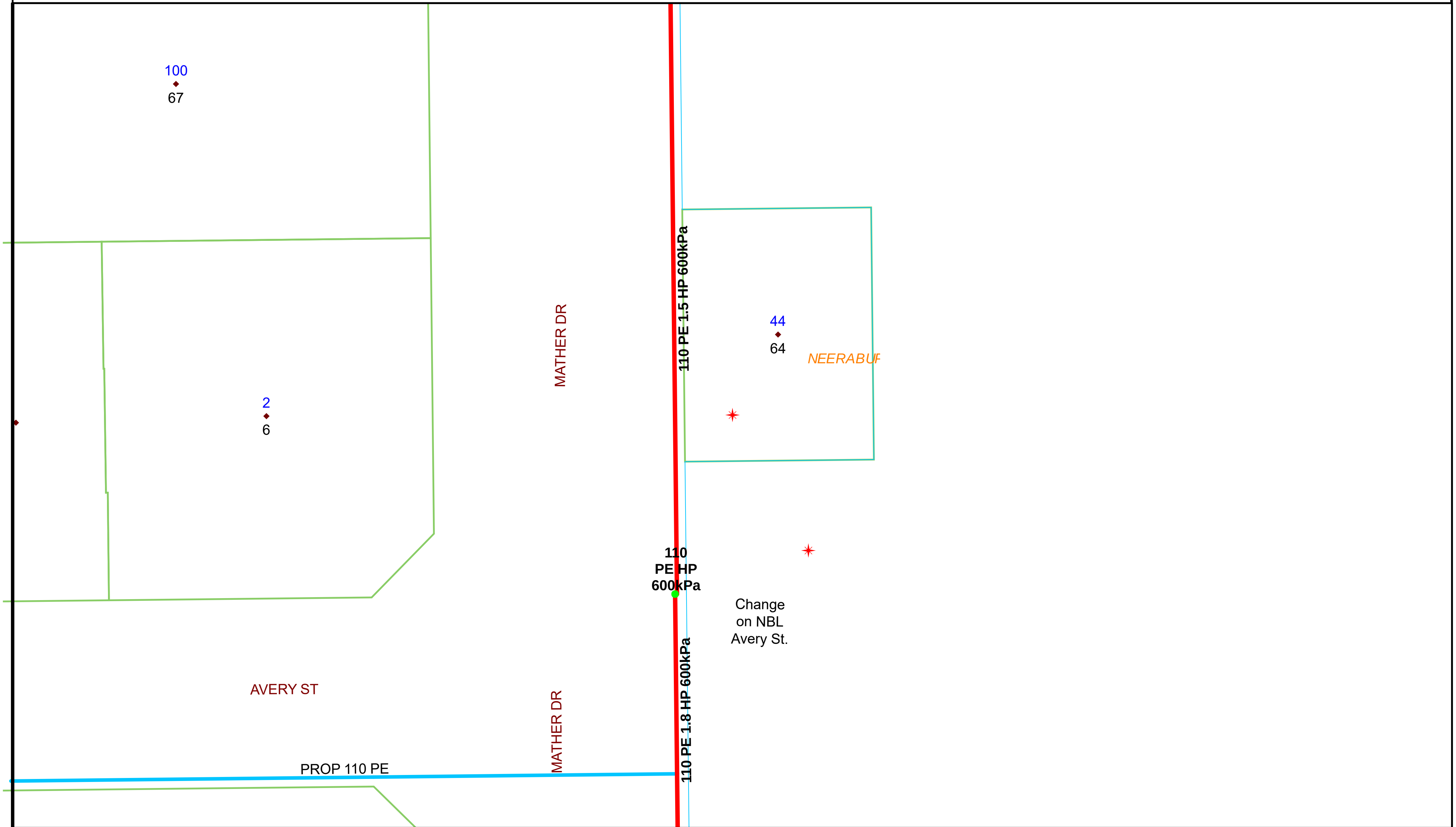

Sequence No: 109955328 Map Tile: 5 Scale: 1:800

Job No: 21662530 Date:20/05/2021 Location: Avery Street, Neerabup 6031

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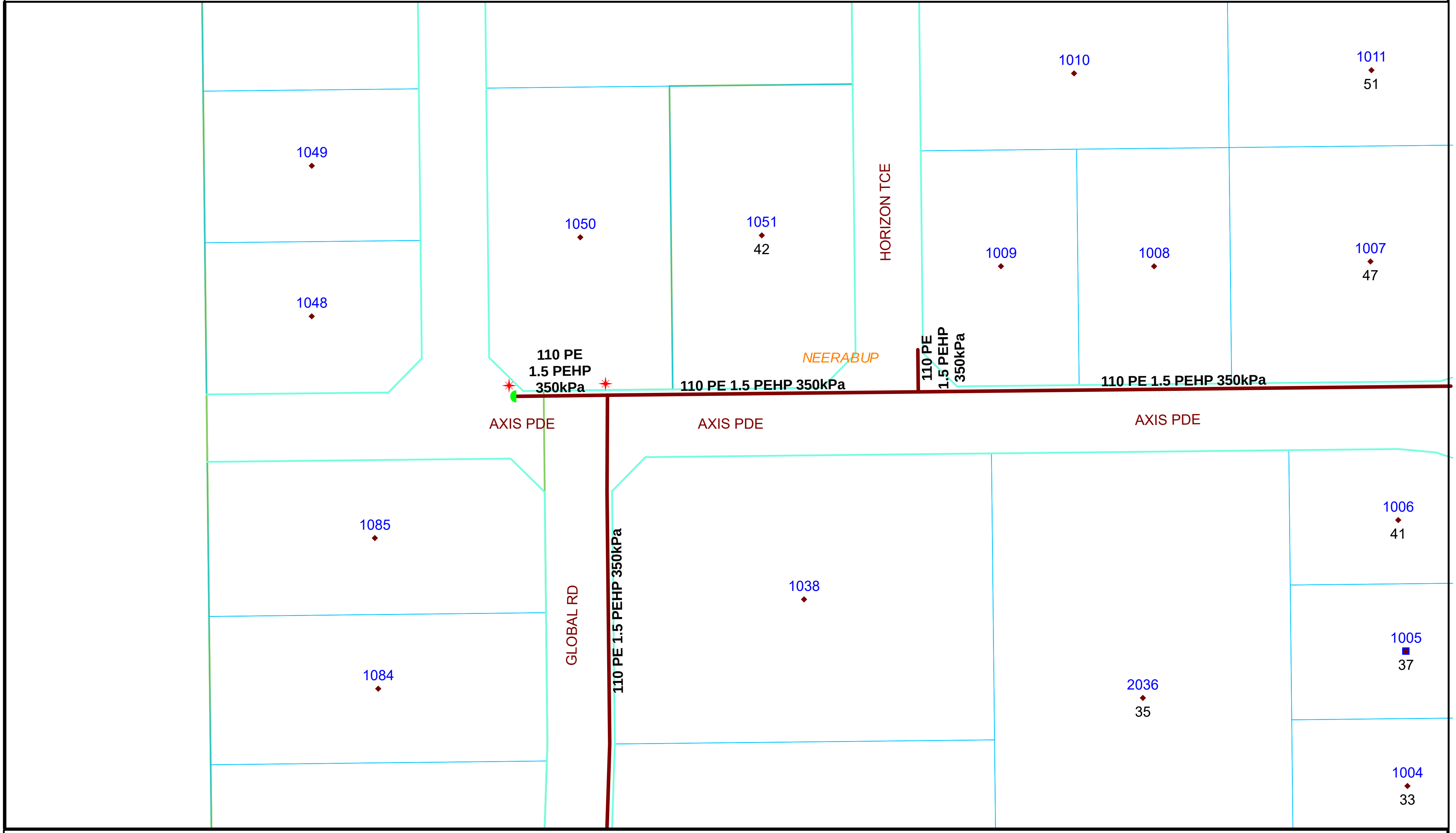

Sequence No: 109955227 Map Tile: 1 Scale: 1:1500

Job No: 21662512 Date:20/05/2021 Location: Axis Parade, Neerabup 6031

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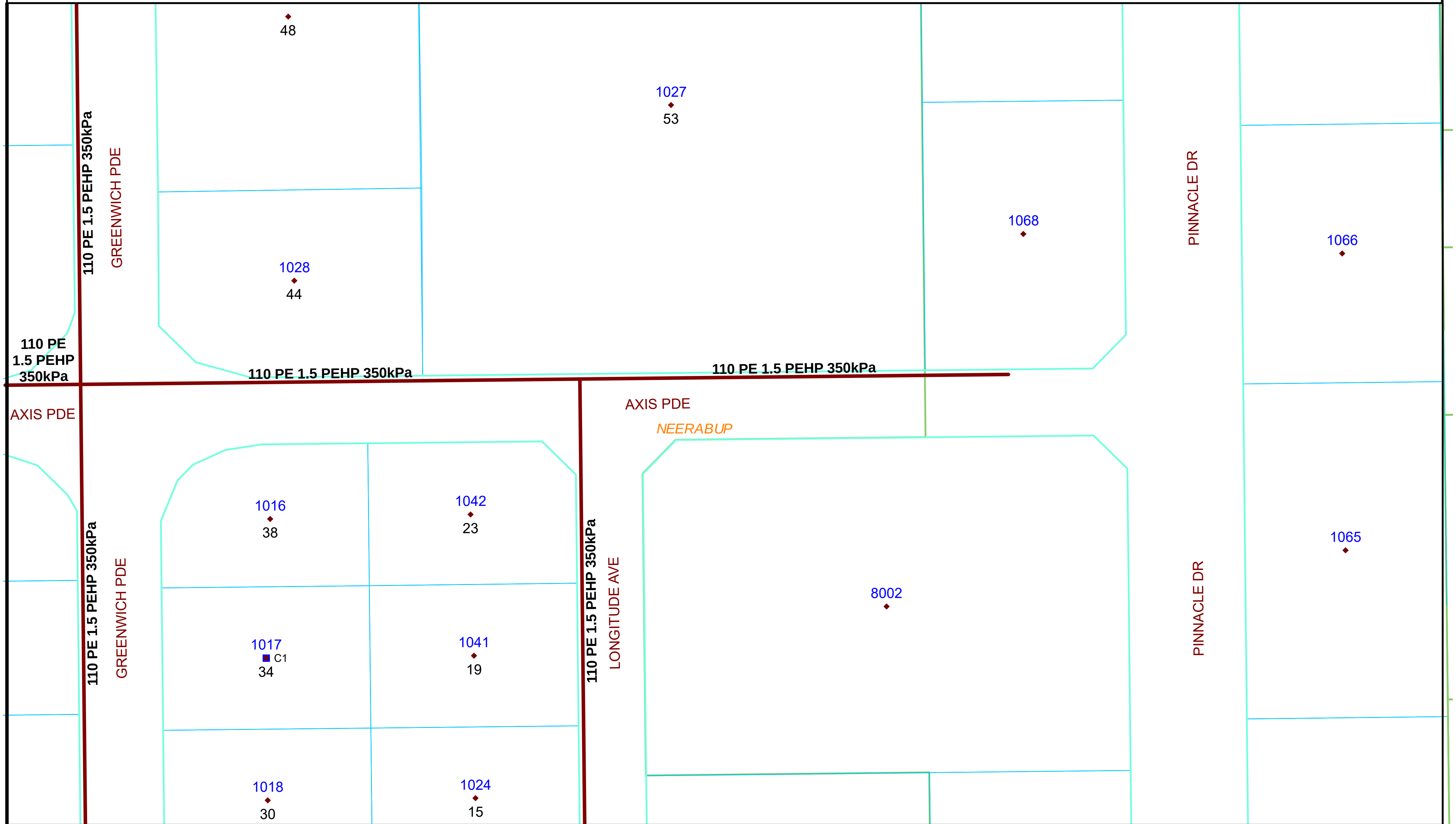

Sequence No: 109955227 Map Tile: 2 Scale: 1:1500

Job No: 21662512 Date:20/05/2021 Location: Axis Parade, Neerabup 6031

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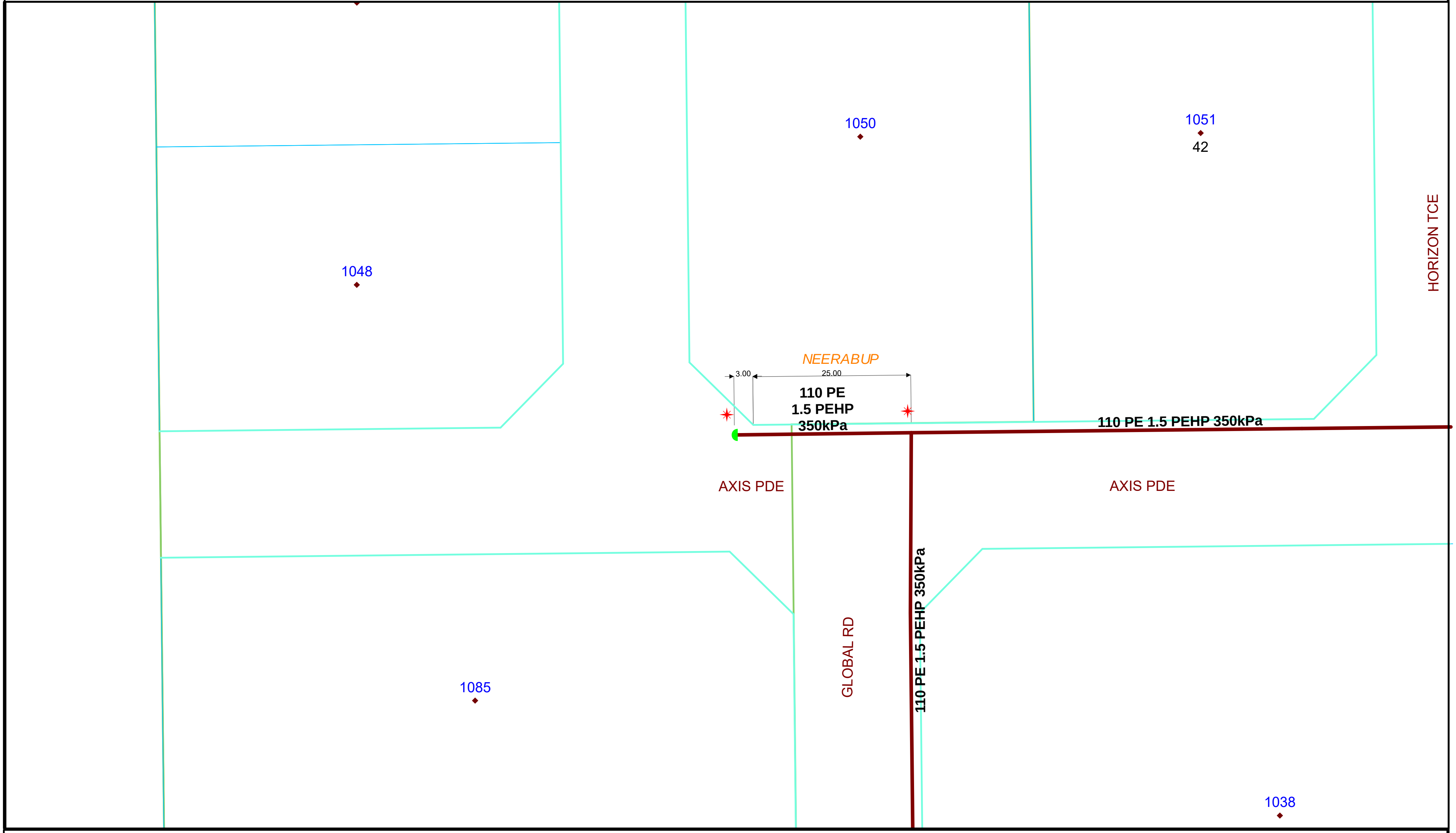

Sequence No: 109955227 Map Tile: 3 Scale: 1:800

Job No: 21662512 Date:20/05/2021 Location: Axis Parade, Neerabup 6031

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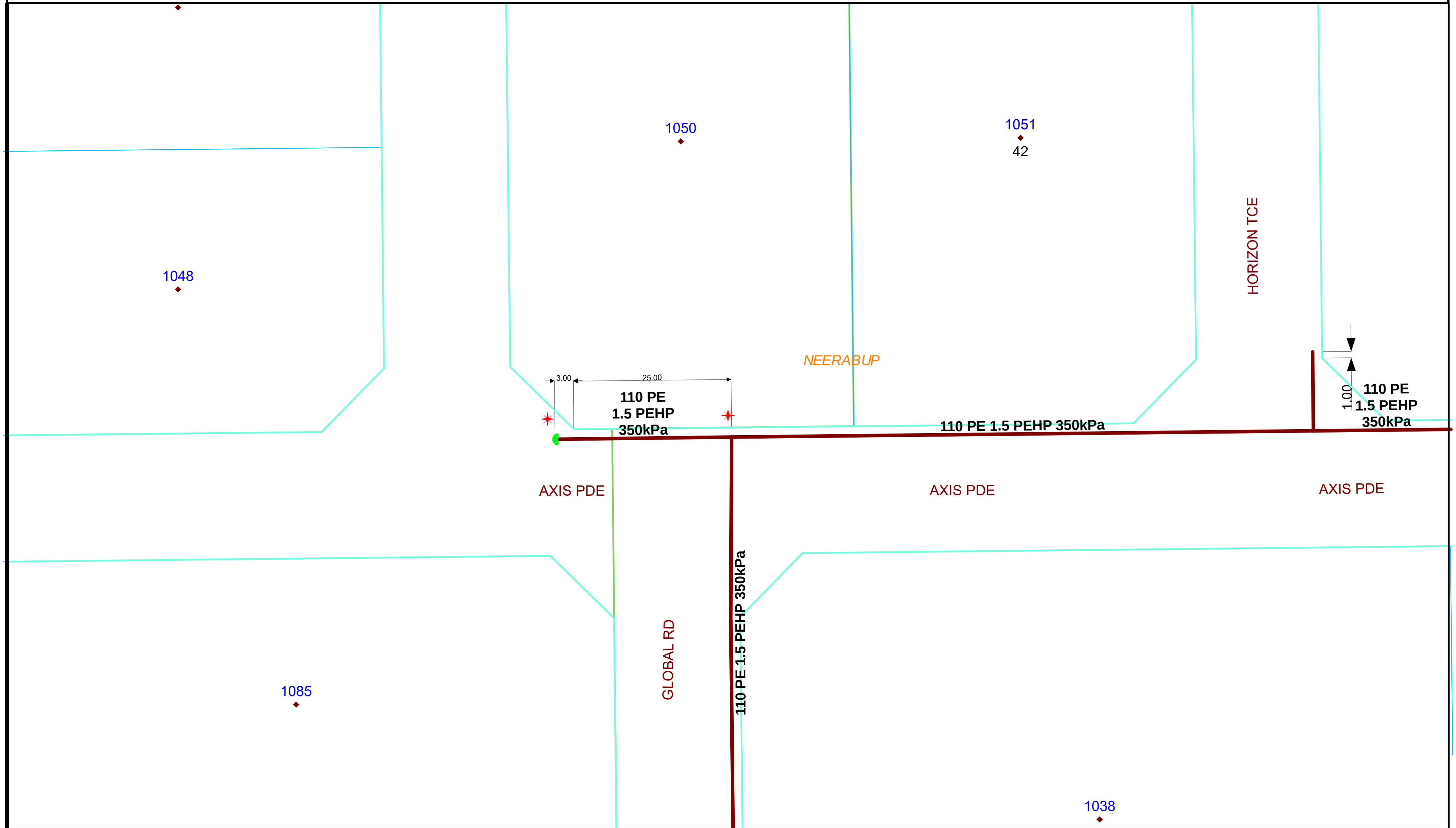

Sequence No: 109955227 Map Tile: 4 Scale: 1:800

Job No: 21662512 Date:20/05/2021 Location: Axis Parade, Neerabup 6031

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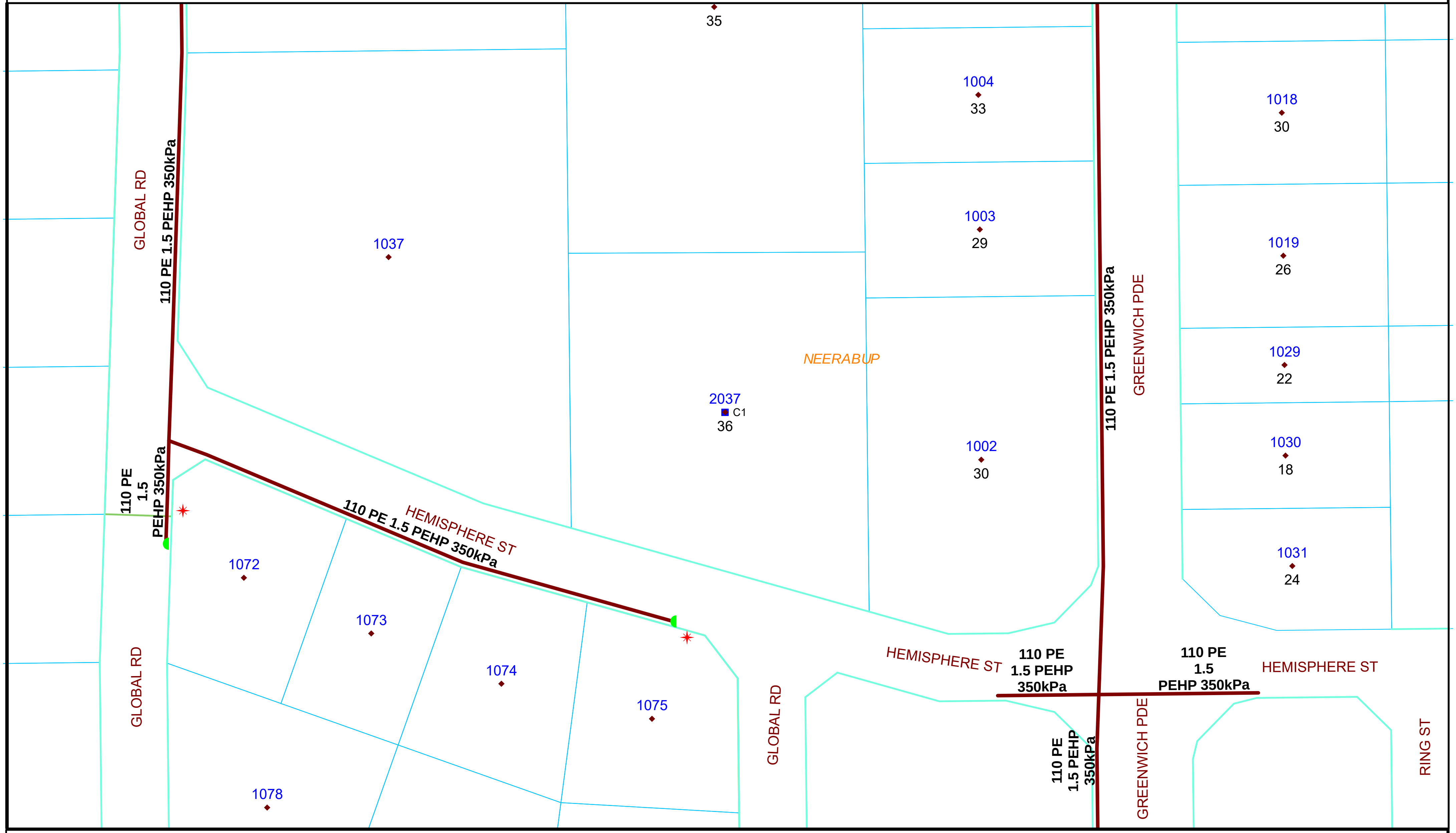

Sequence No: 109955097 Map Tile: 1 Scale: 1:1500
Job No: 21662489 Date:20/05/2021 Location: Global Road, Neerabup 6031

N W E S

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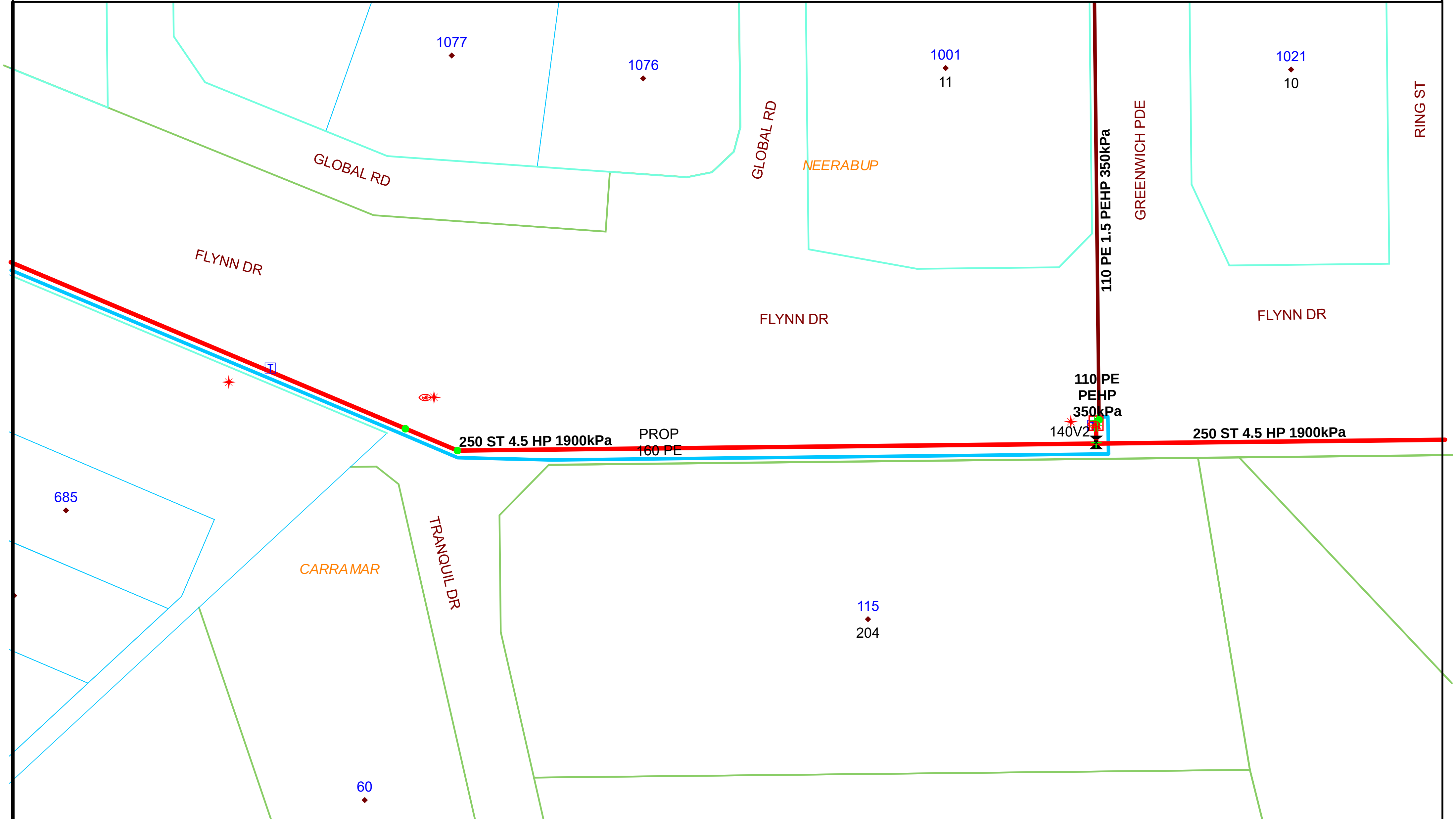

Sequence No: 109955097
Map Tile: 2
Scale: 1:1500
Job No: 21662489
Date:20/05/2021
Location: Global Road, Neerabup 6031

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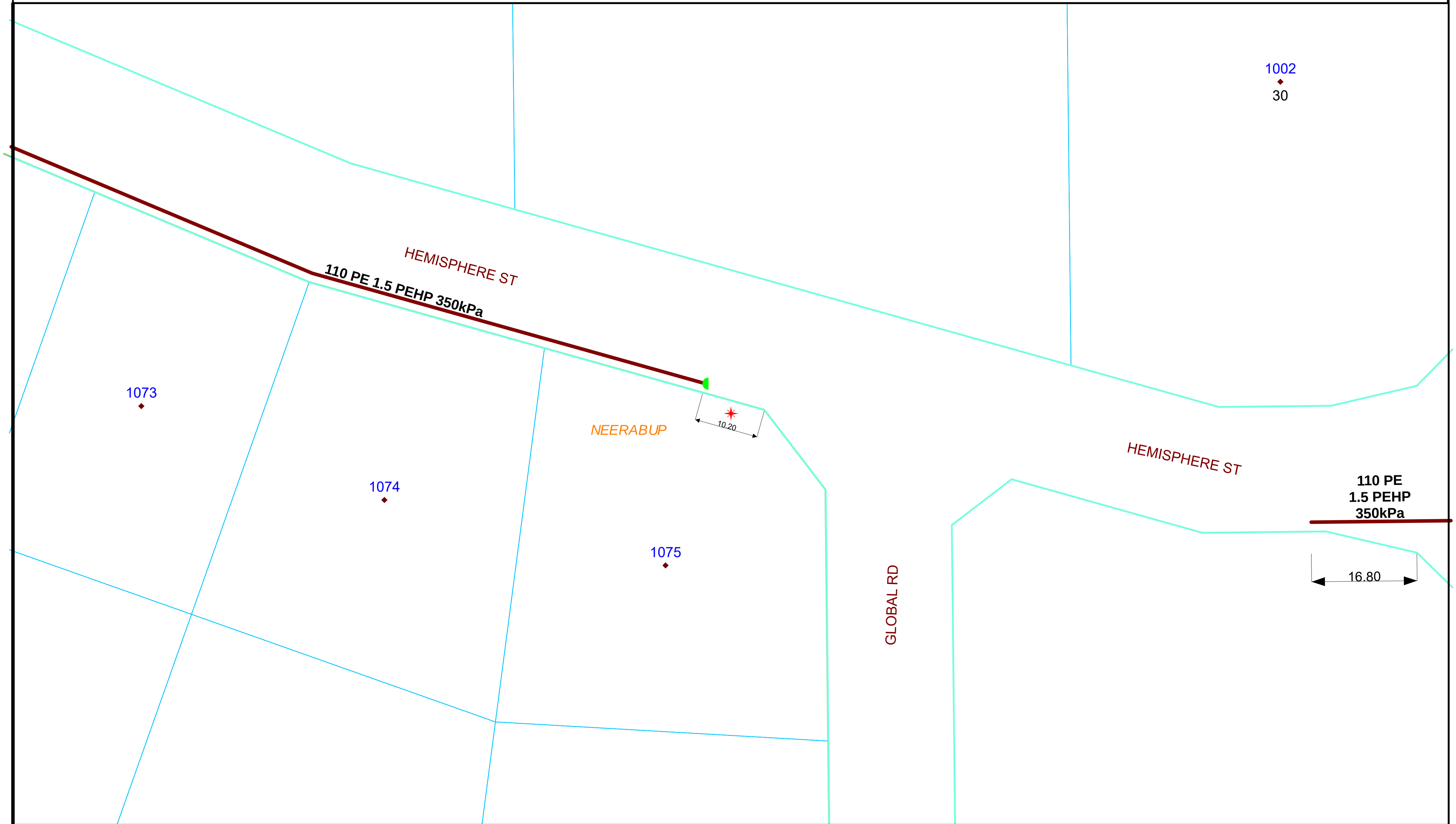

Sequence No: 109955097 | Map Tile: 3 | Scale: 1:800

Job No: 21662489 | Date:20/05/2021 | Location: Global Road, Neerabup 6031

N W E S

ATCO

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WARNING - HIGH PRESSURE PIPELINE IN THE VICINITY.
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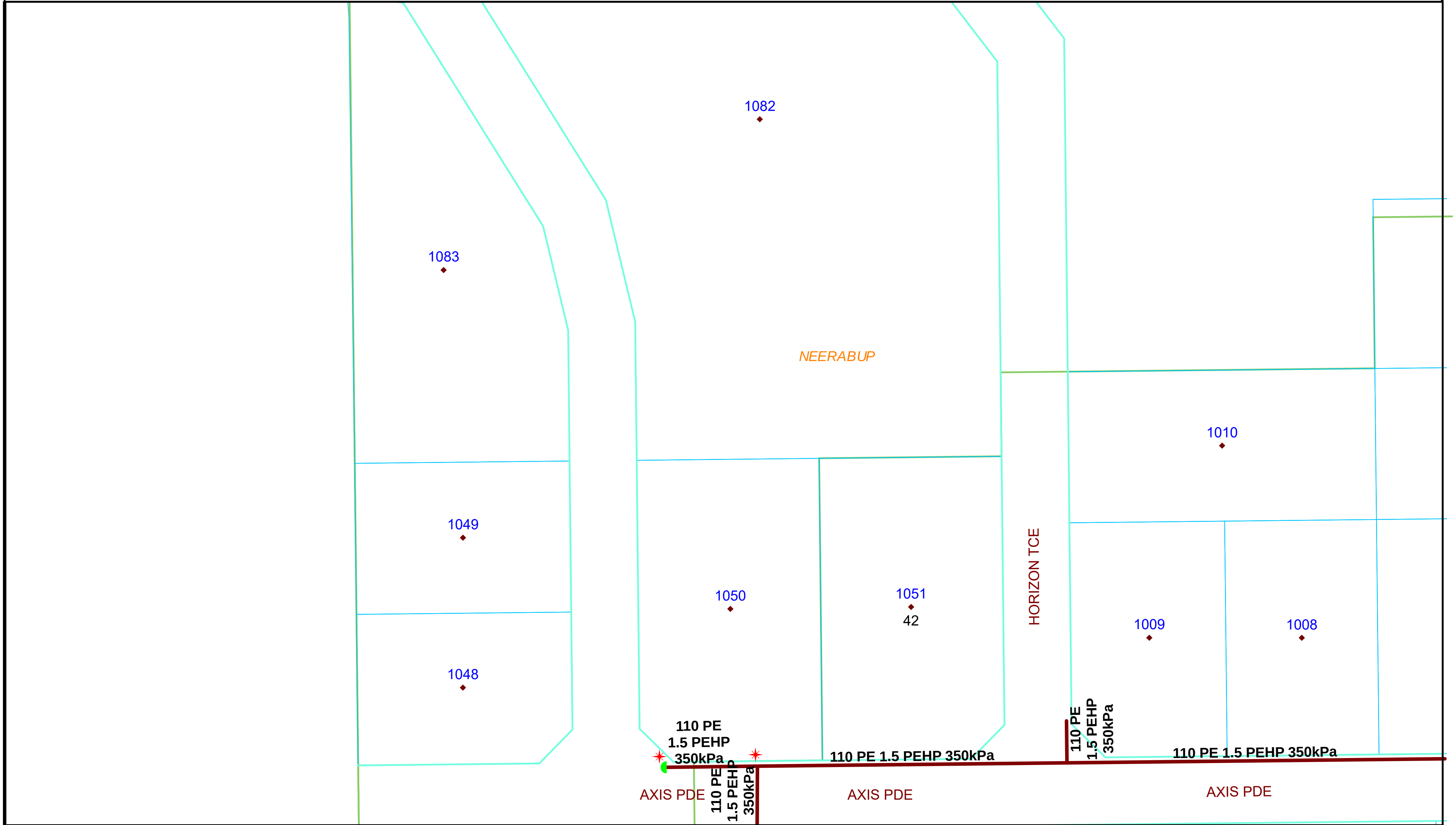

Sequence No: 109955188 Map Tile: 1 Scale: 1:1500

Job No: 21662505 Date:20/05/2021 Location: Global Road, Neerabup 6031

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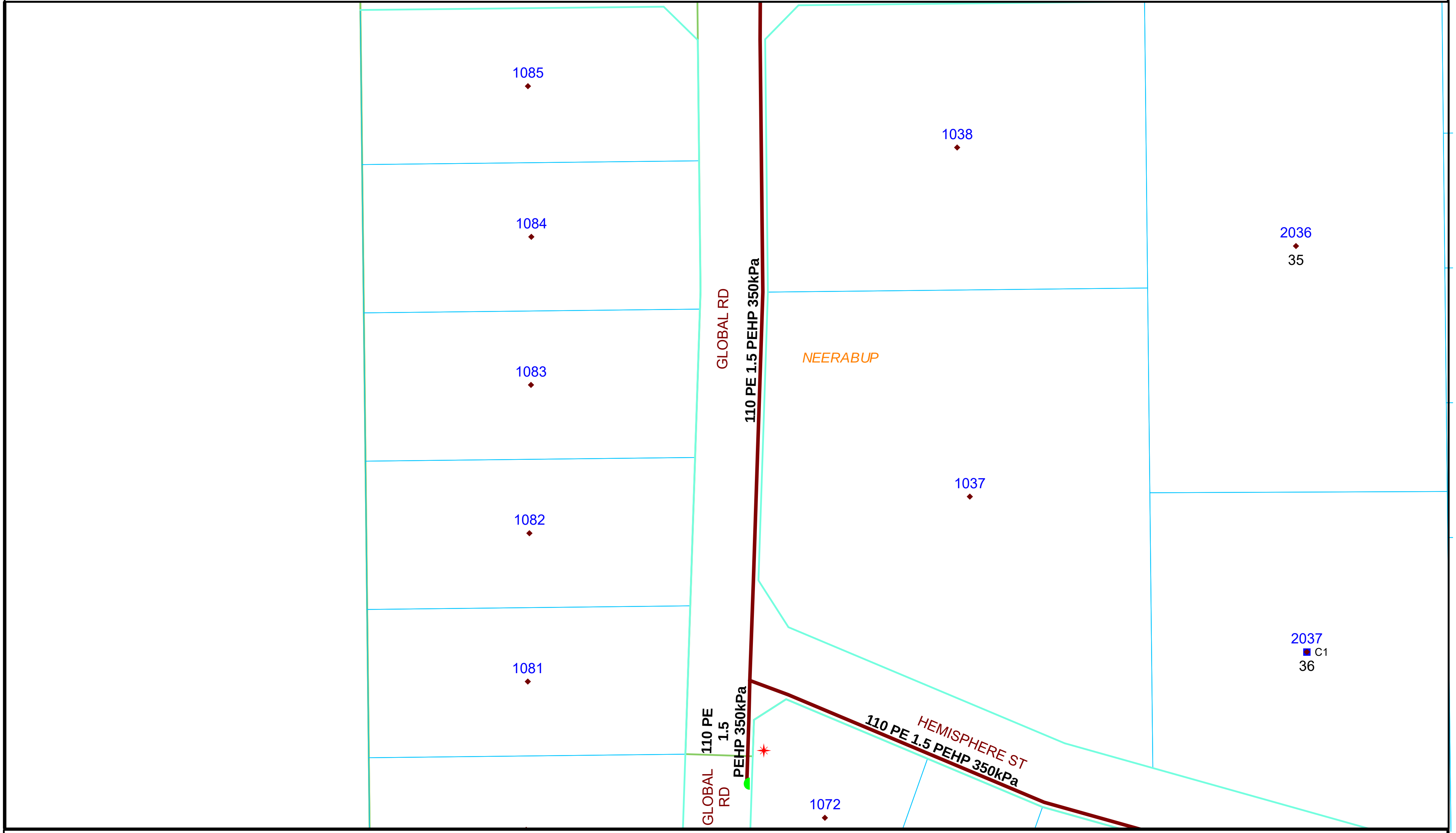

Sequence No: 109955188 | Map Tile: 2 | Scale: 1:1500

Job No: 21662505 | Date:20/05/2021 | Location: Global Road, Neerabup 6031

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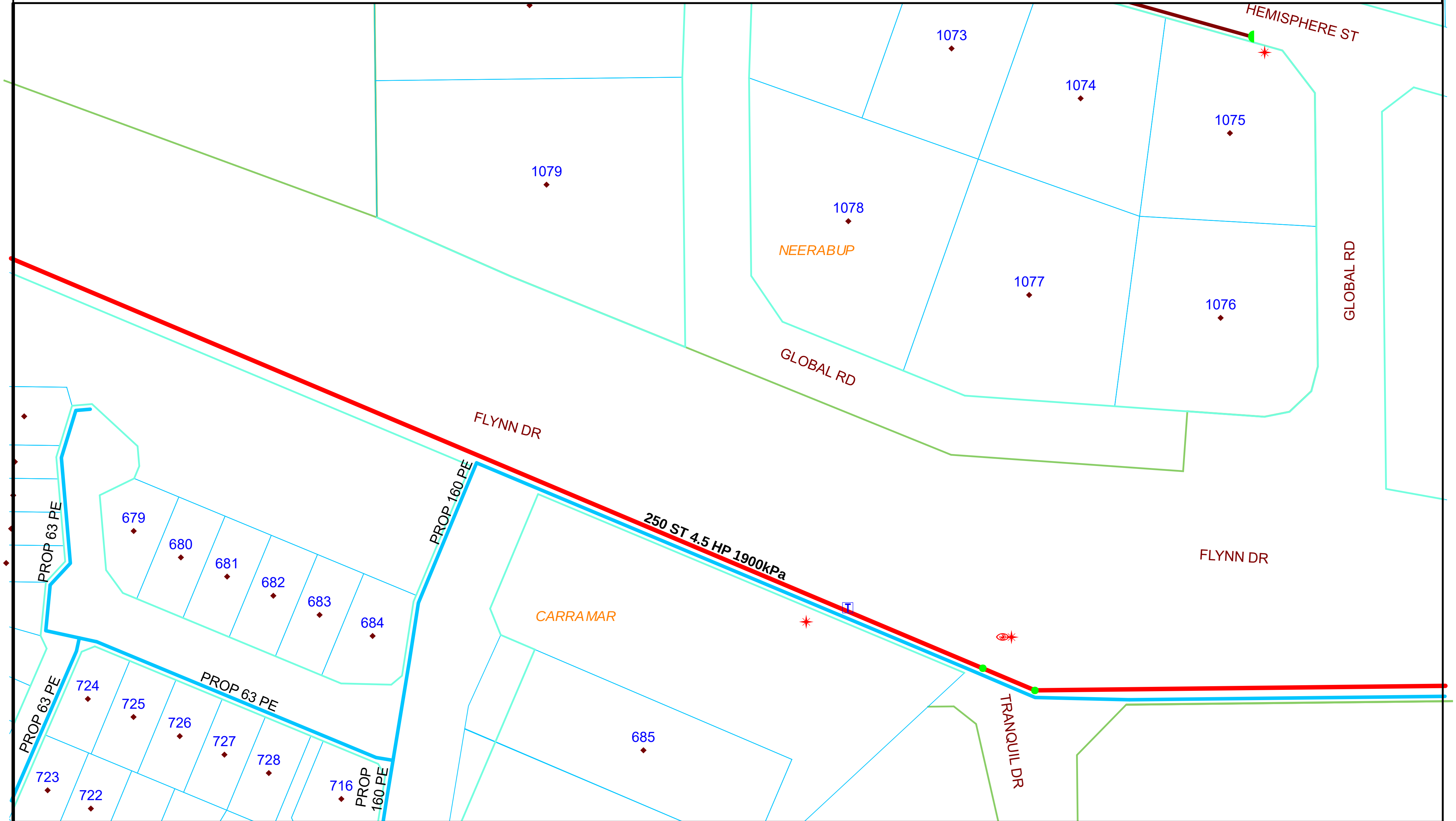

Sequence No: 109955188 | Map Tile: 3 | Scale: 1:1500

Job No: 21662505 | Date:20/05/2021 | Location: Global Road, Neerabup 6031

N W E S

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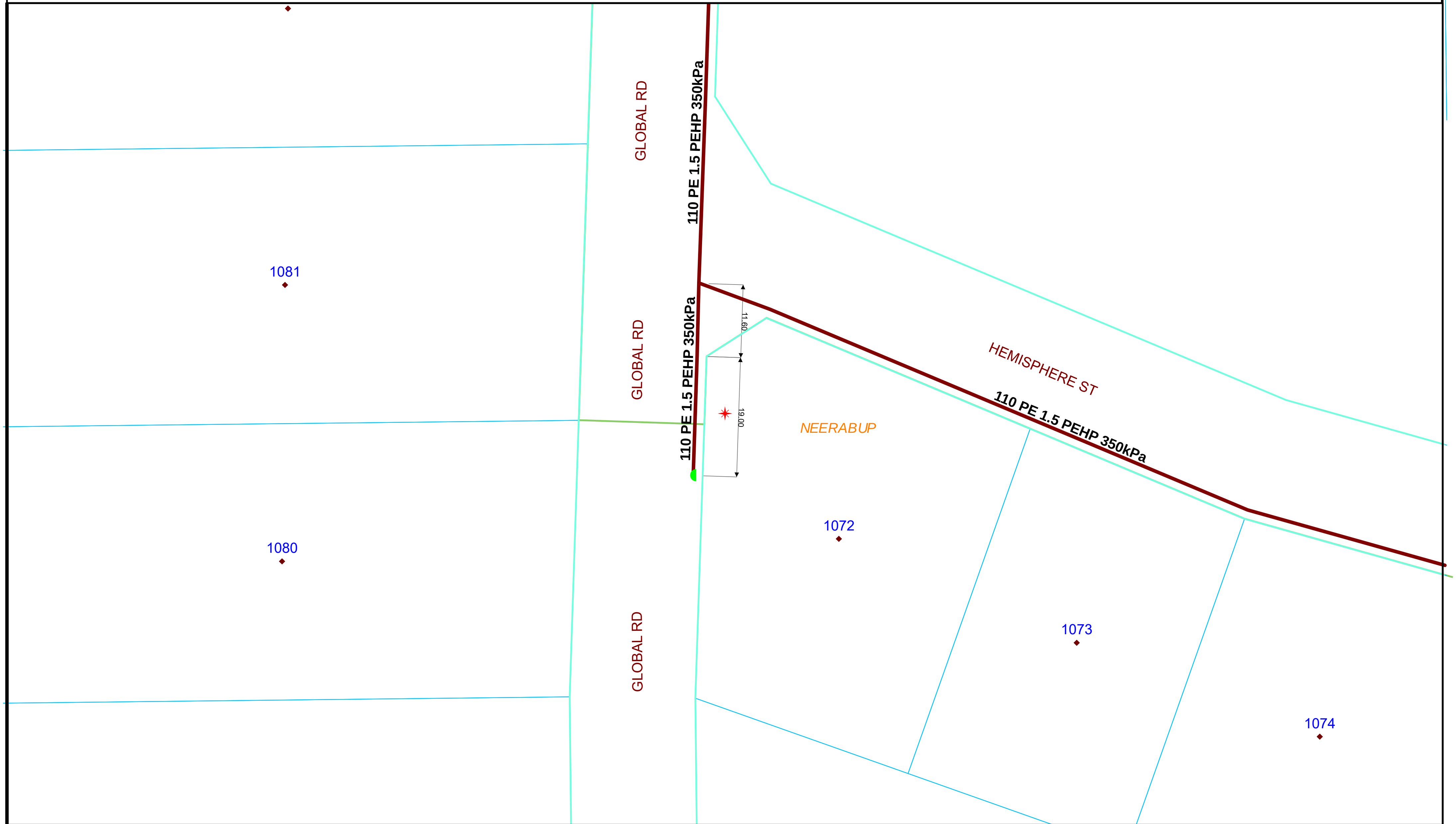

Sequence No: 109955188 | Map Tile: 4 | Scale: 1:800

Job No: 21662505 | Date:20/05/2021 | Location: Global Road, Neerabup 6031

N W E S

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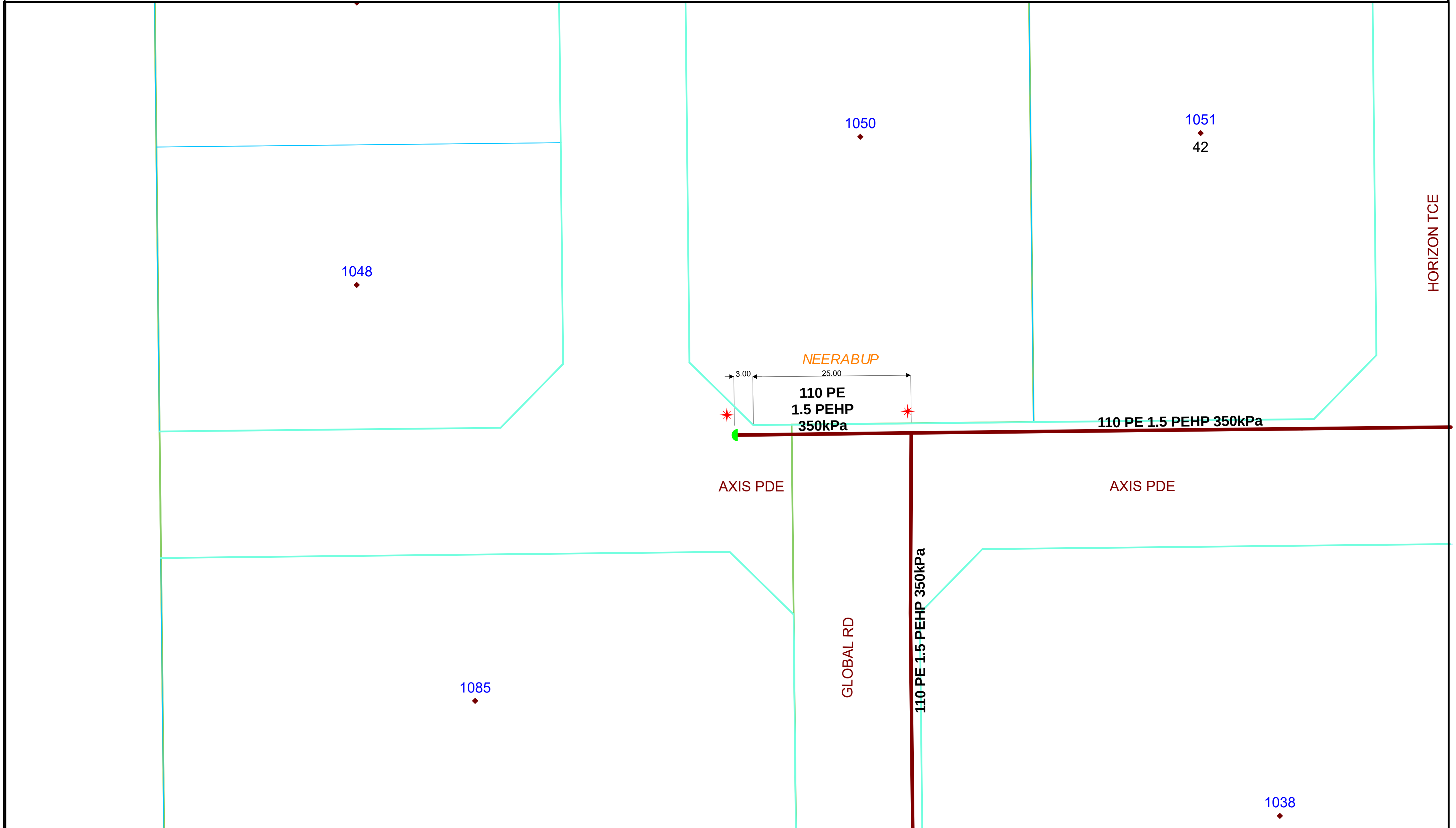

Sequence No: 109955188 | Map Tile: 5 | Scale: 1:800
Job No: 21662505 | Date:20/05/2021 | Location: Global Road, Neerabup 6031

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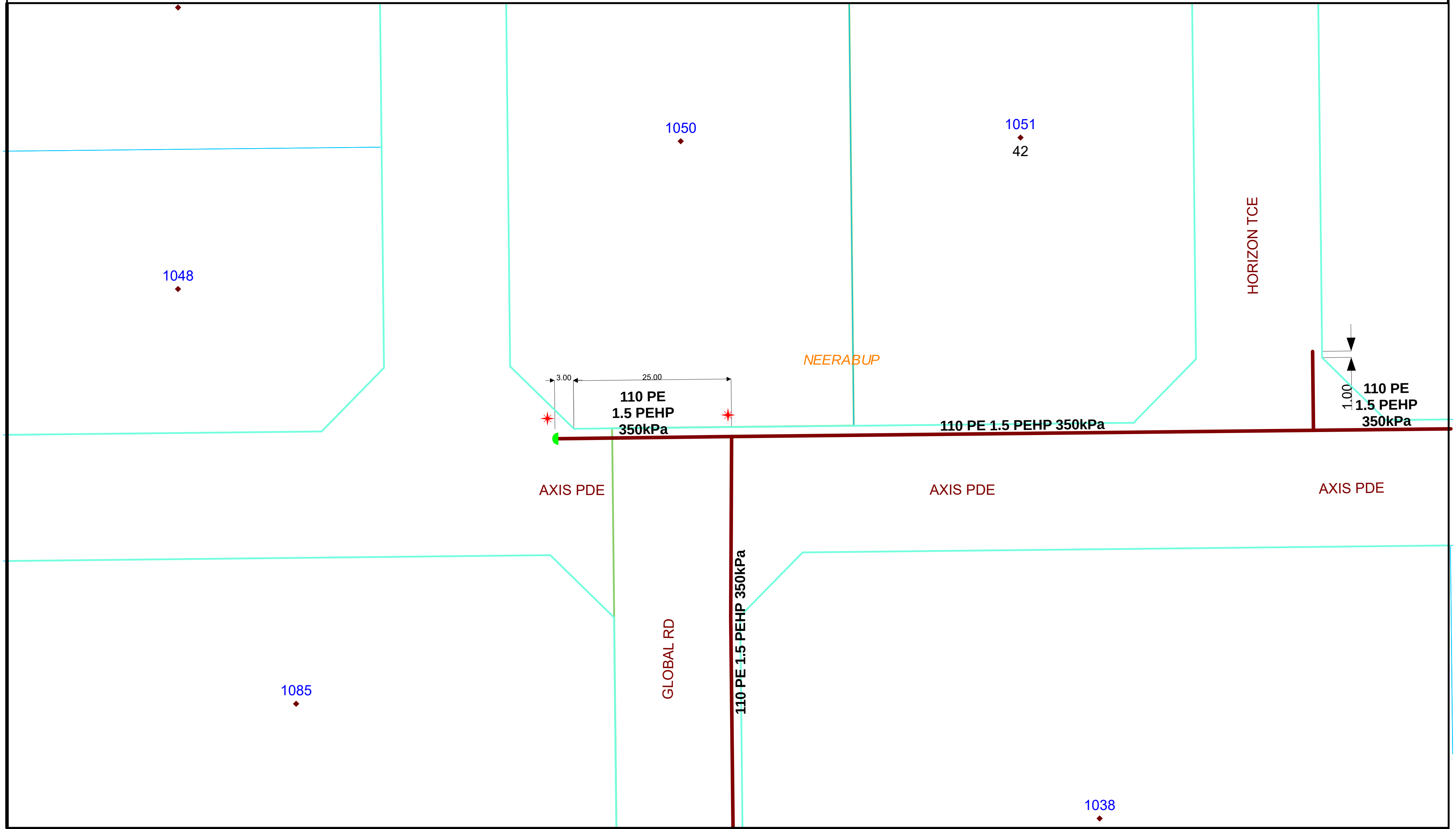

Sequence No: 109955188 Map Tile: 6 Scale: 1:800

Job No: 21662505 Date:20/05/2021 Location: Global Road, Neerabup 6031

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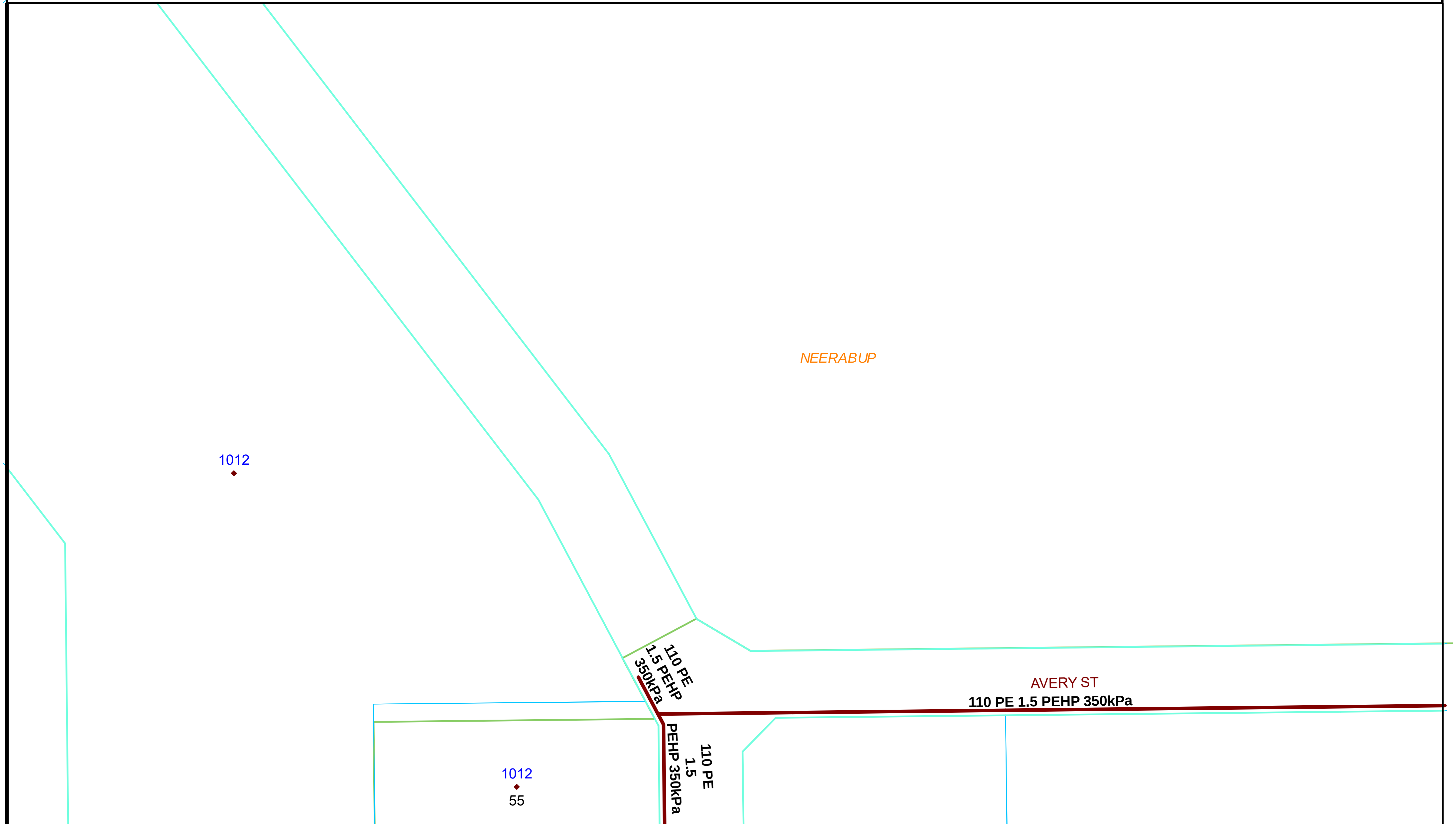

Sequence No: 109955060
Job No: 21662481
Map Tile: 1
Date:20/05/2021
Scale: 1:1500
Location: Greenwich Parade, Neerabup 6031

N W E S

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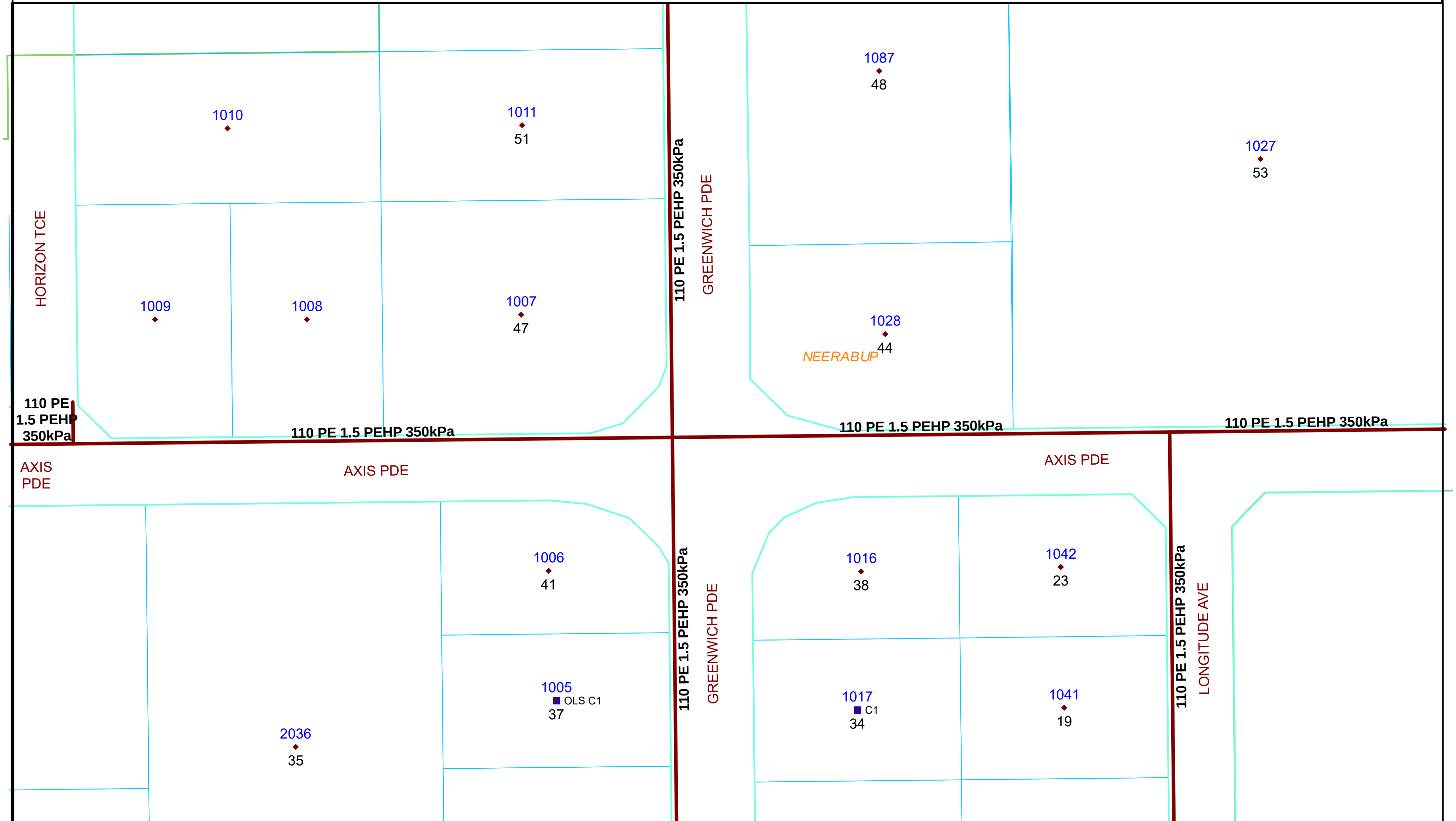

Sequence No: 109955060 Map Tile: 2 Scale: 1:1500

Job No: 21662481 Date:20/05/2021 Location: Greenwich Parade, Neerabup 6031

N W E S

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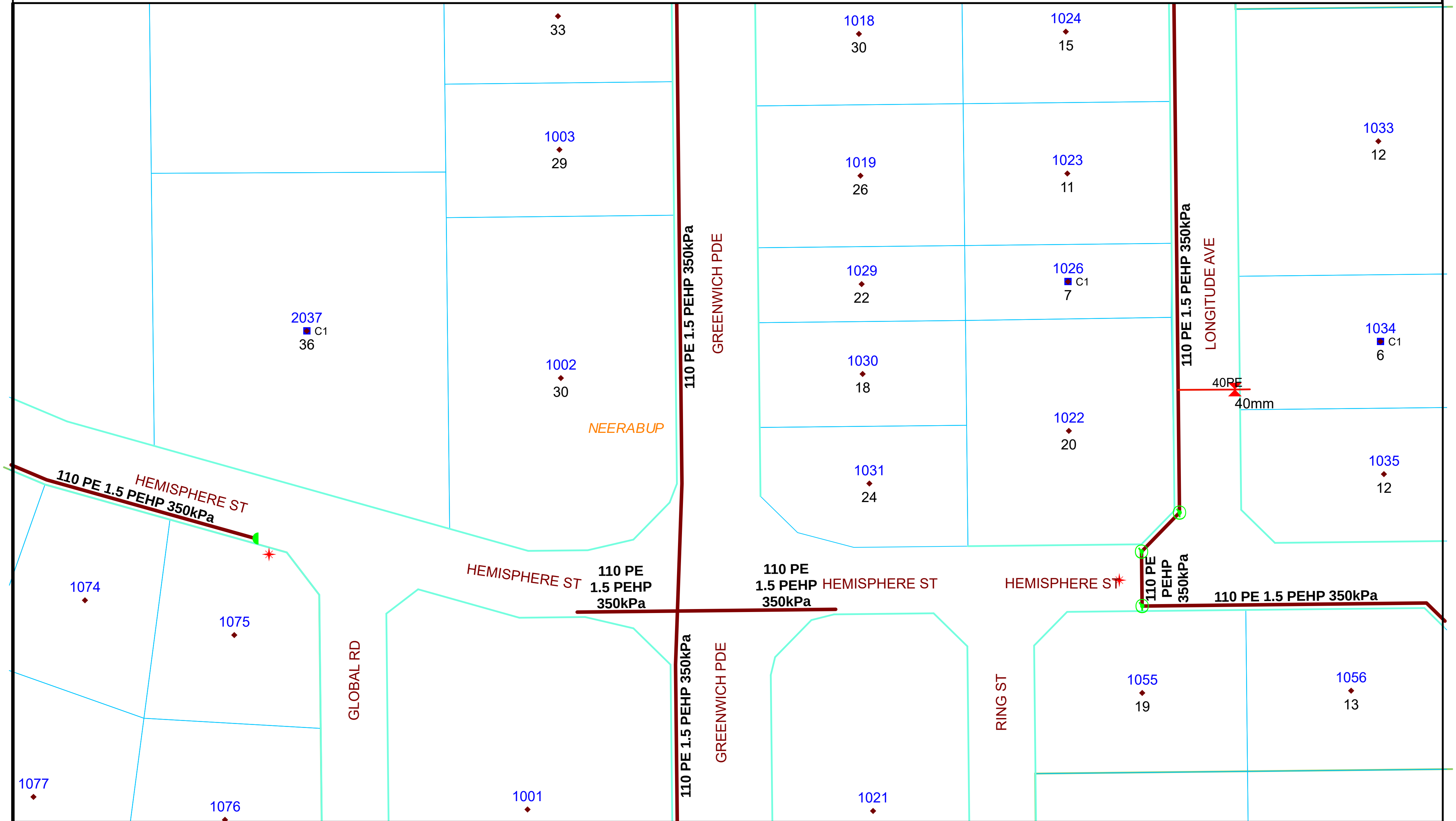

Sequence No: 109955060 Map Tile: 3 Scale: 1:1500

Job No: 21662481 Date:20/05/2021 Location: Greenwich Parade, Neerabup 6031

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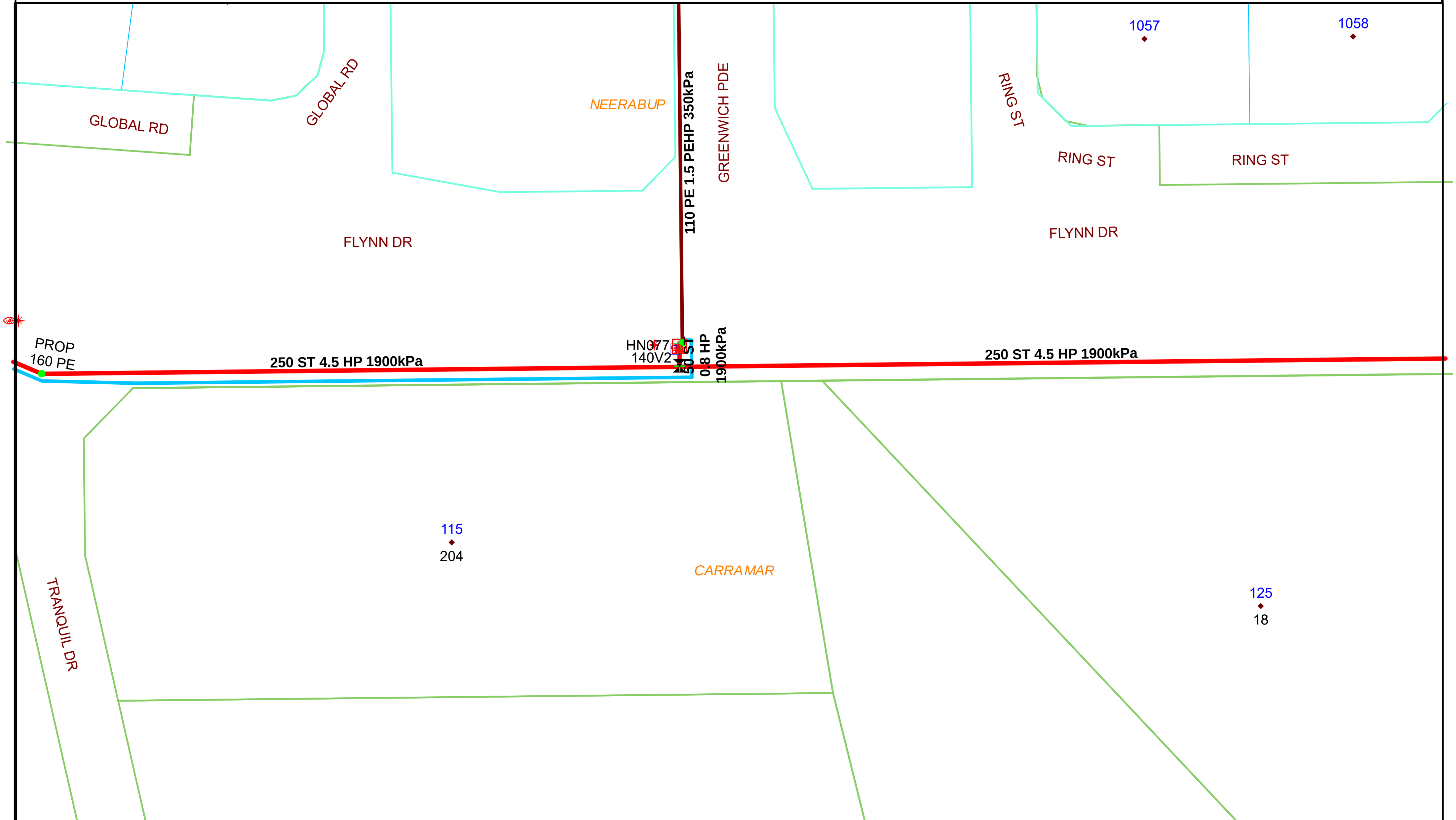

Sequence No: 109955060 Map Tile: 4 Scale: 1:1500

Job No: 21662481 Date:20/05/2021 Location: Greenwich Parade, Neerabup 6031

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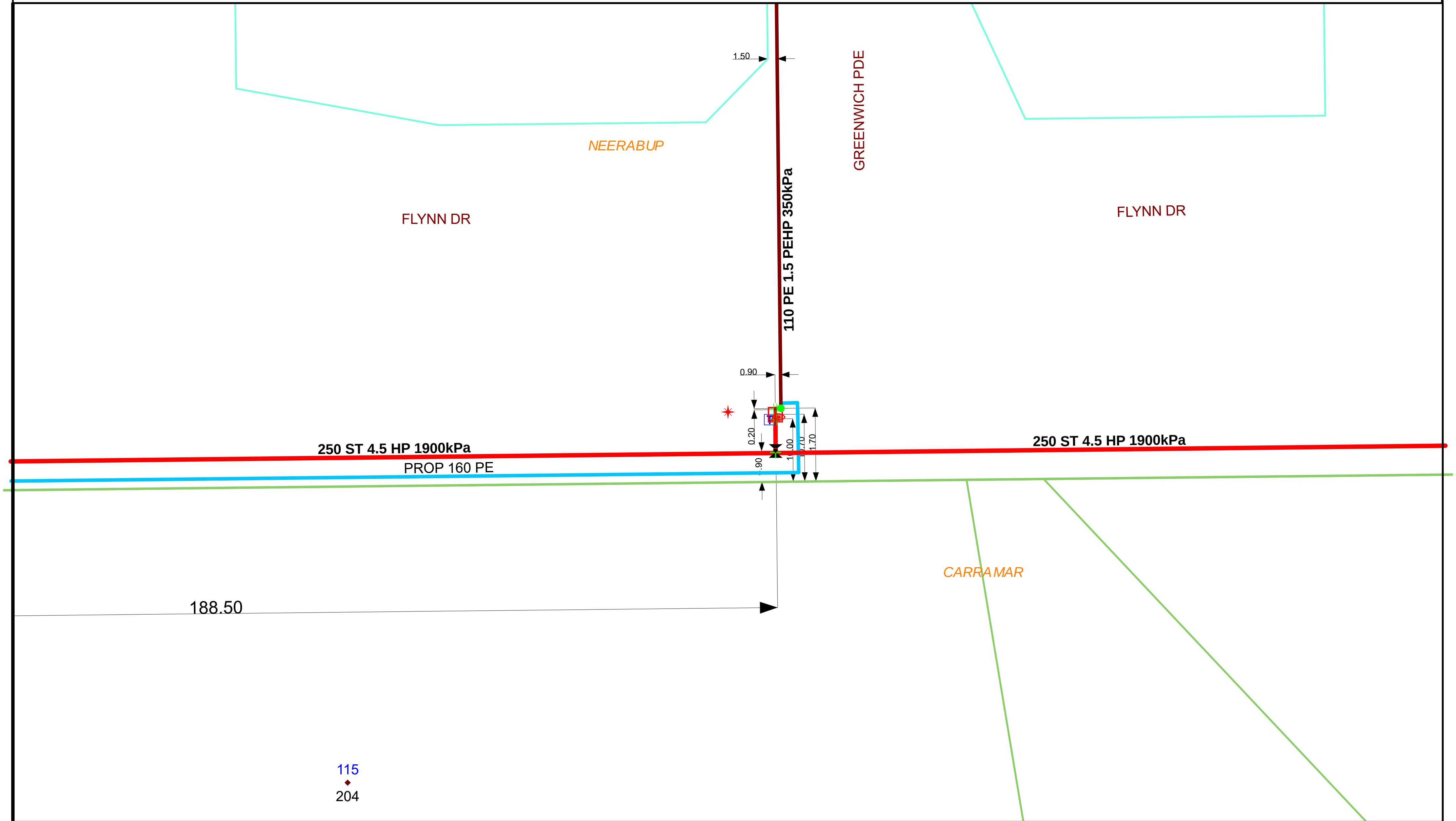

Sequence No: 109955060 | Map Tile: 5 | Scale: 1:800

Job No: 21662481 | Date:20/05/2021 | Location: Greenwich Parade, Neerabup 6031

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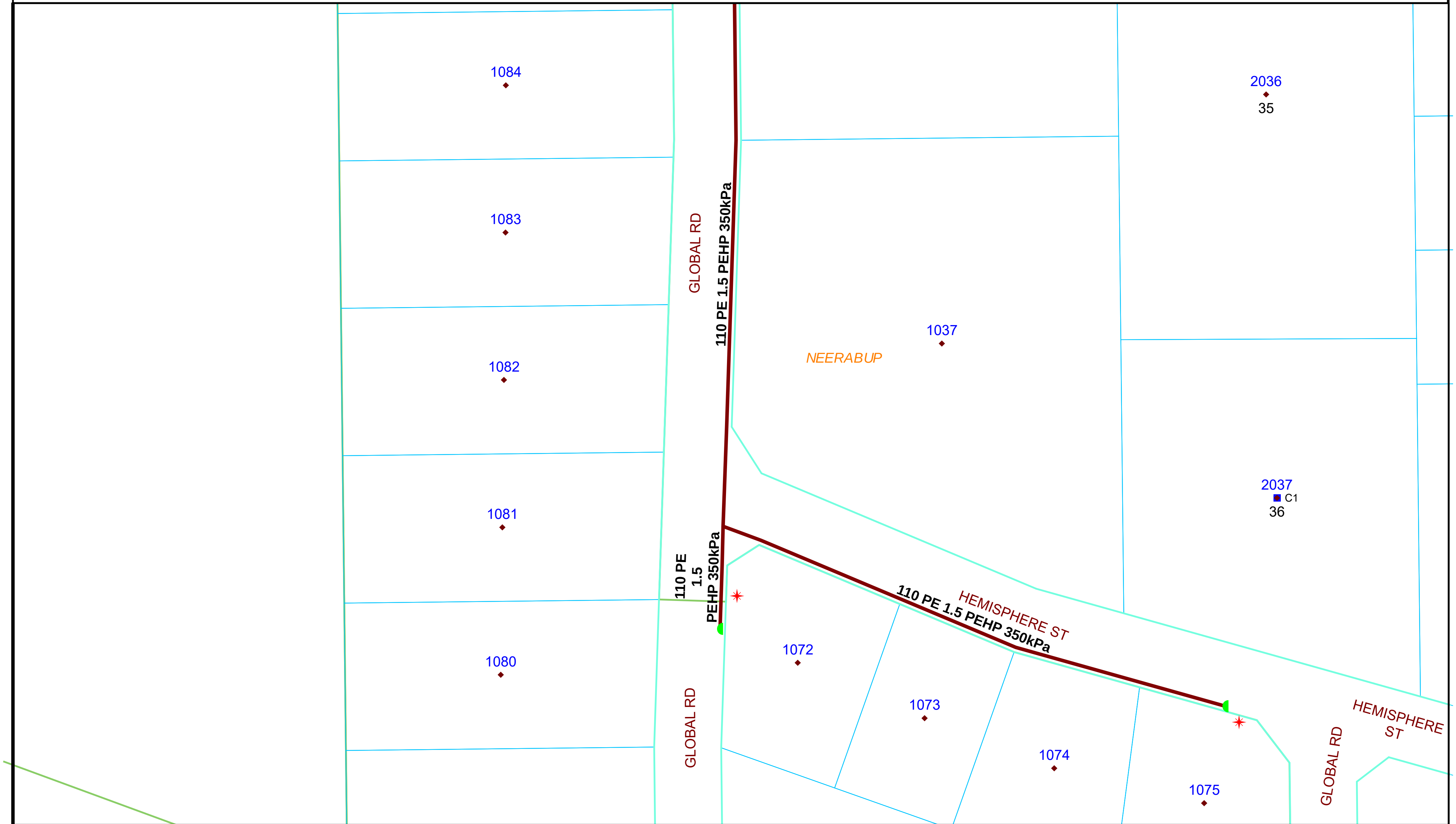

Sequence No: 109955155 | Map Tile: 1 | Scale: 1:1500

Job No: 21662499 | Date:20/05/2021 | Location: Hemisphere Street, Neerabup 6031

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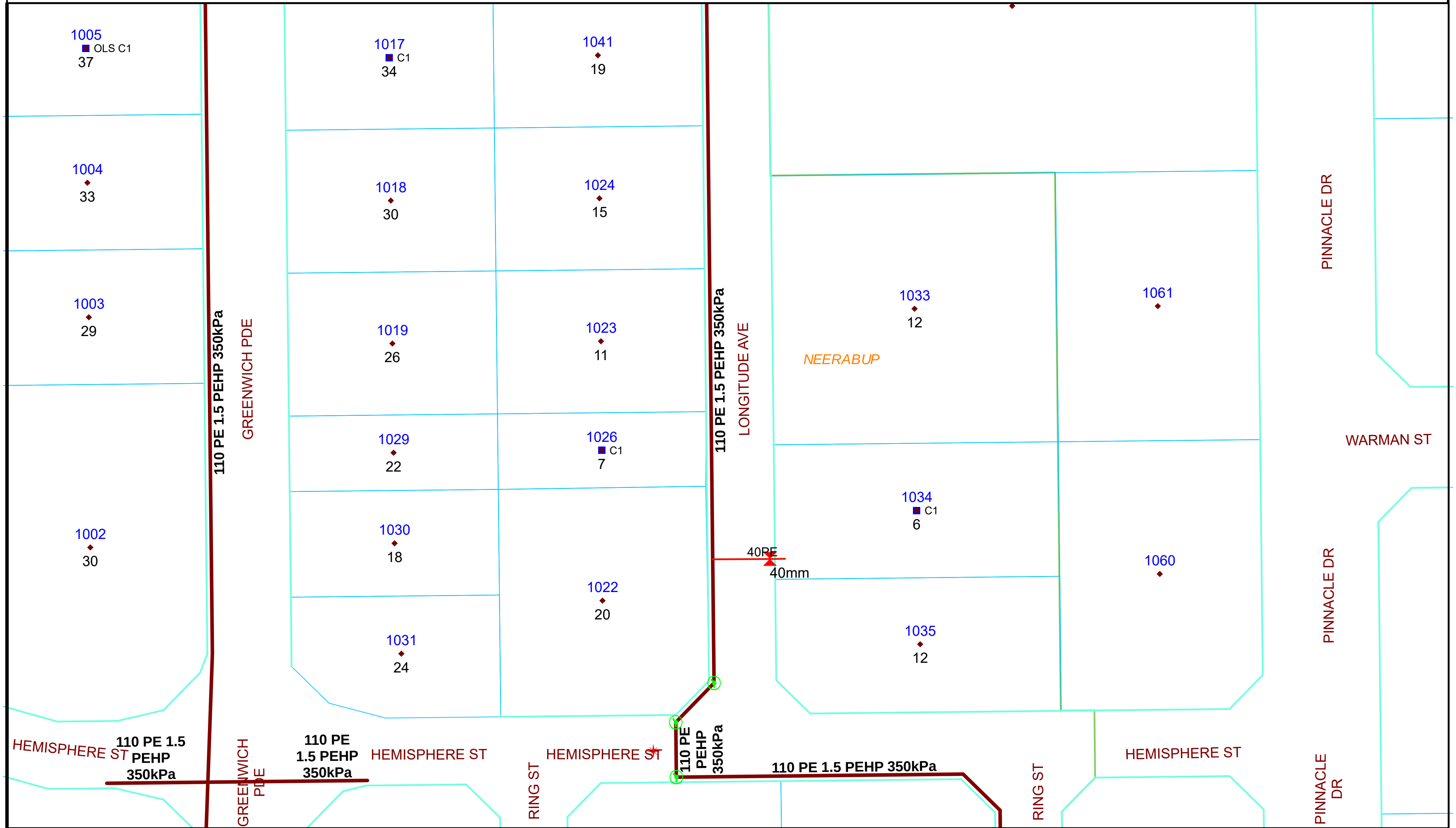

Sequence No: 109955155 Map Tile: 2 Scale: 1:1500

Job No: 21662499 Date:20/05/2021 Location: Hemisphere Street, Neerabup 6031

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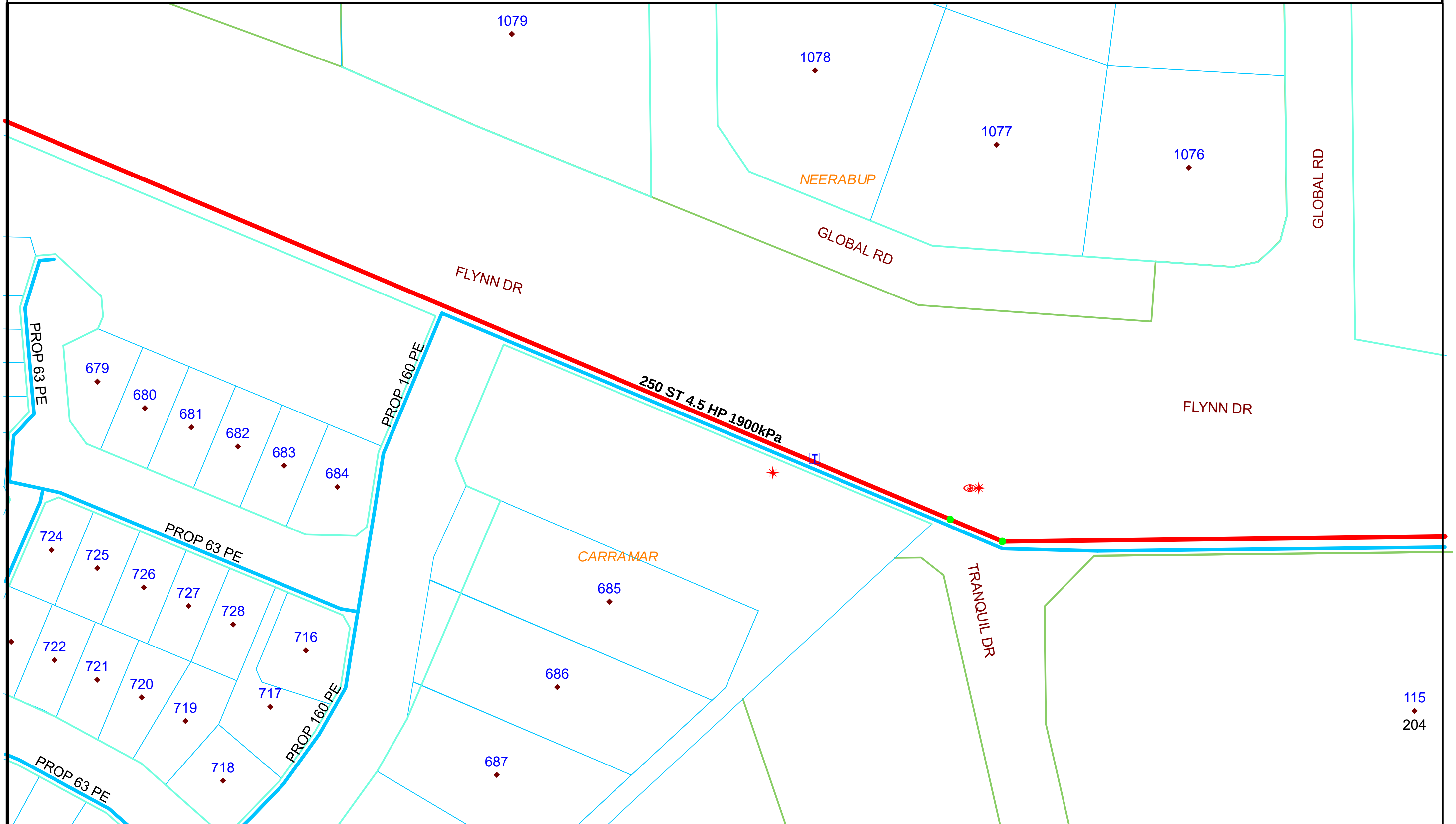

Sequence No: 109955155 Map Tile: 3 Scale: 1:1500

Job No: 21662499 Date:20/05/2021 Location: Hemisphere Street, Neerabup 6031

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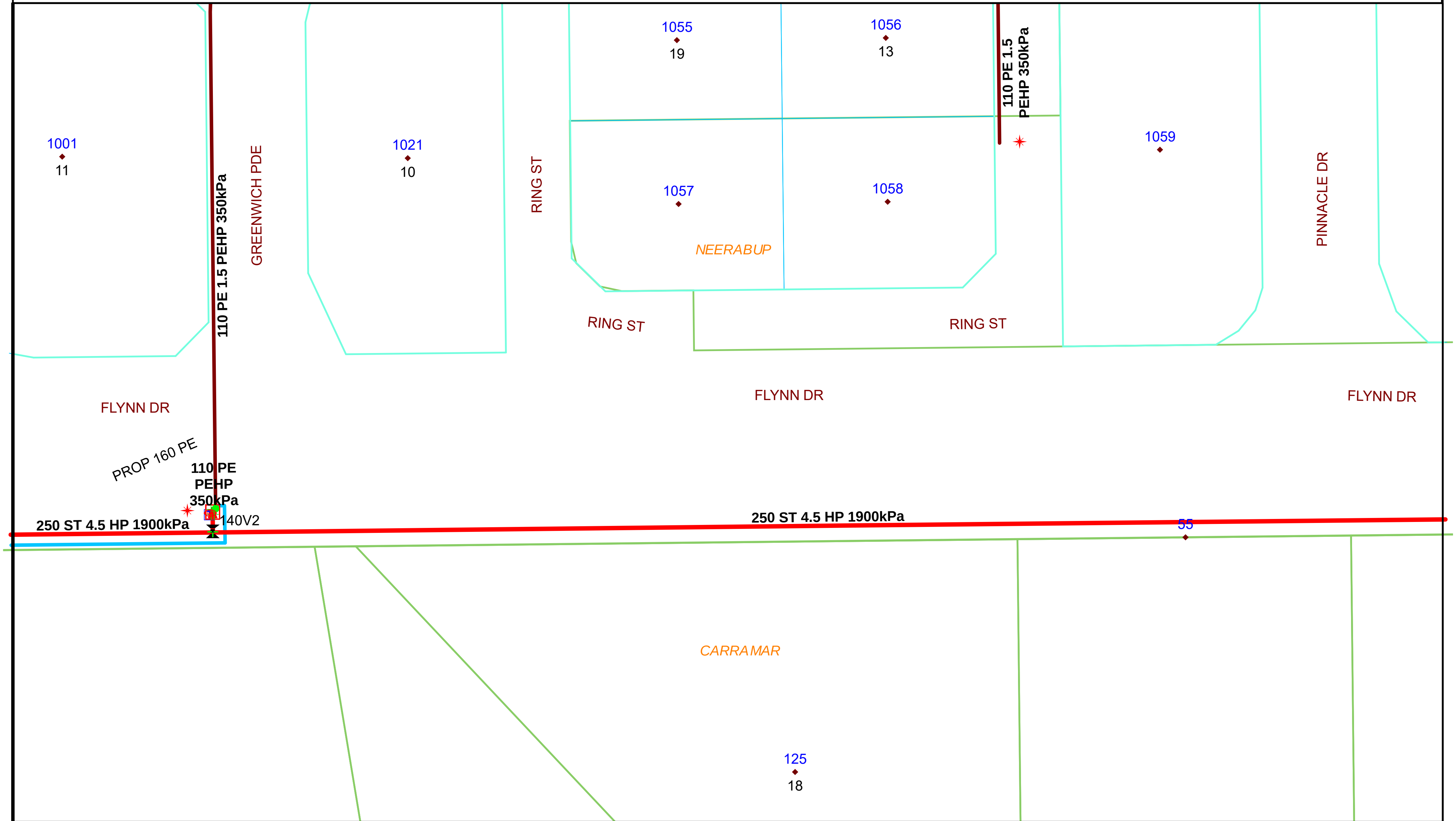

Sequence No: 109955155 | Map Tile: 4 | Scale: 1:1500

Job No: 21662499 | Date: 20/05/2021 | Location: Hemisphere Street, Neerabup 6031

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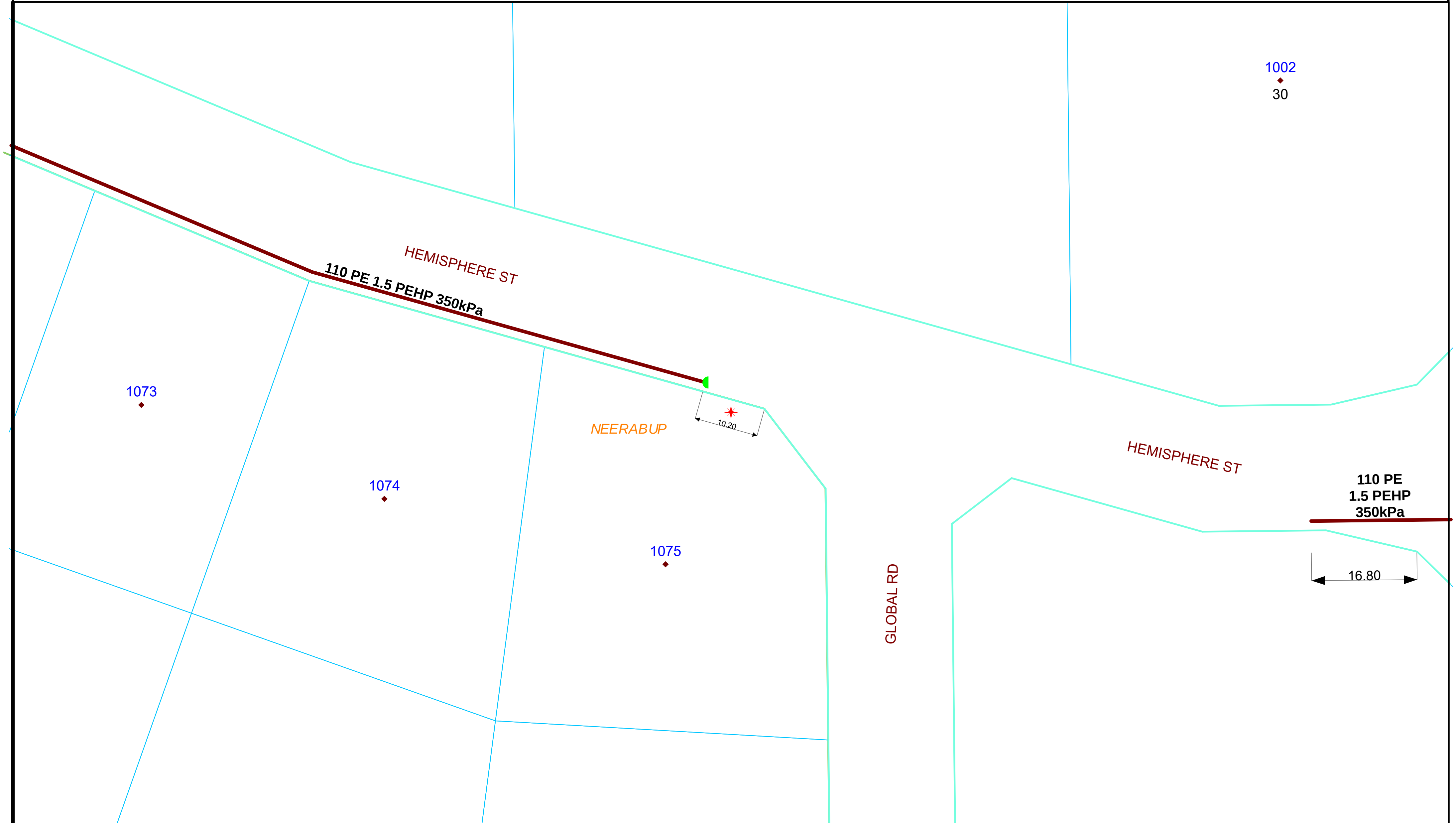

Sequence No: 109955155 Map Tile: 5 Scale: 1:800

Job No: 21662499 Date:20/05/2021 Location: Hemisphere Street, Neerabup 6031

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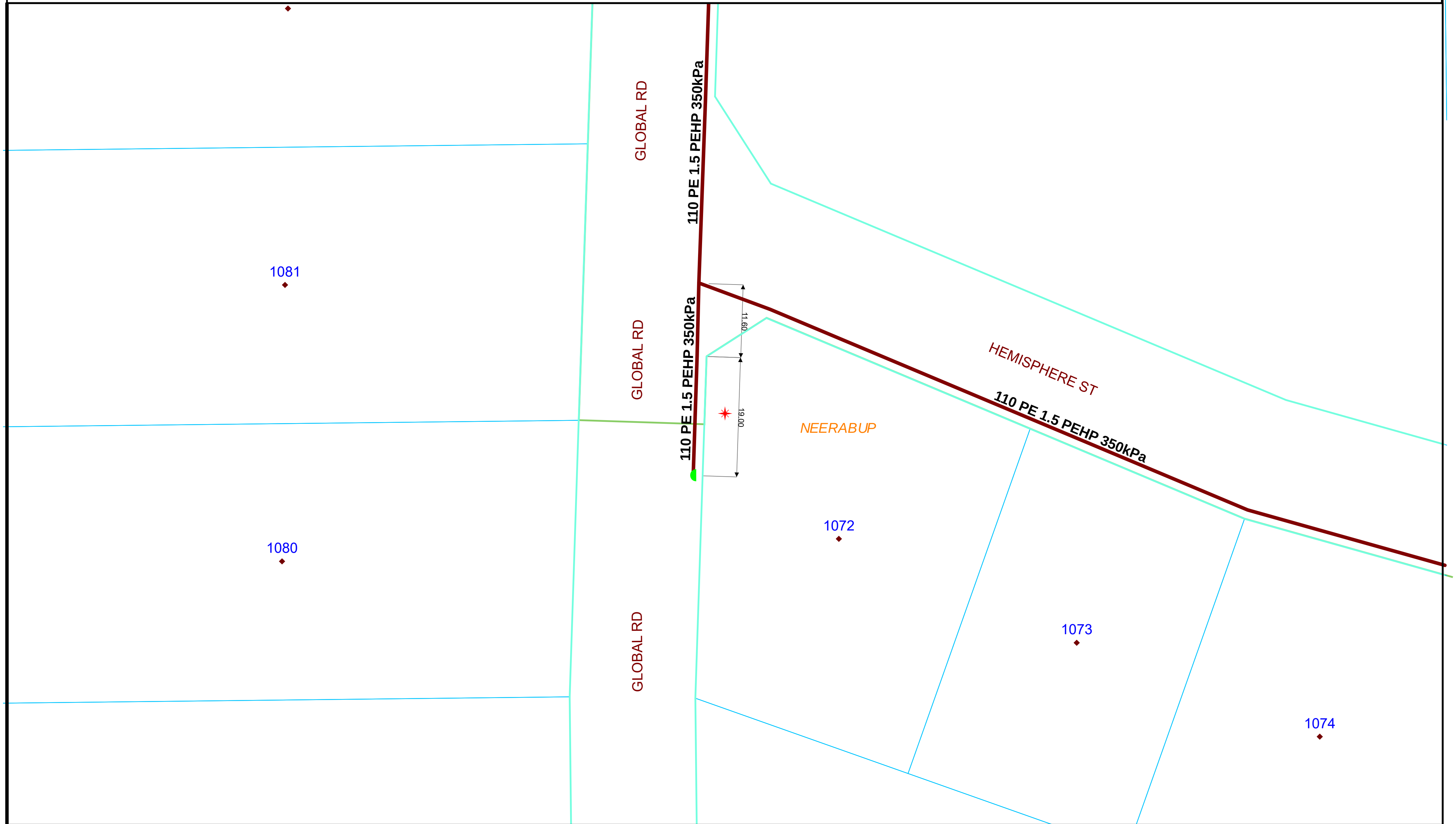

Sequence No: 109955155
Map Tile: 6
Scale: 1:800
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Job No: 21662499
Date:20/05/2021
Location: Hemisphere Street, Neerabup 6031

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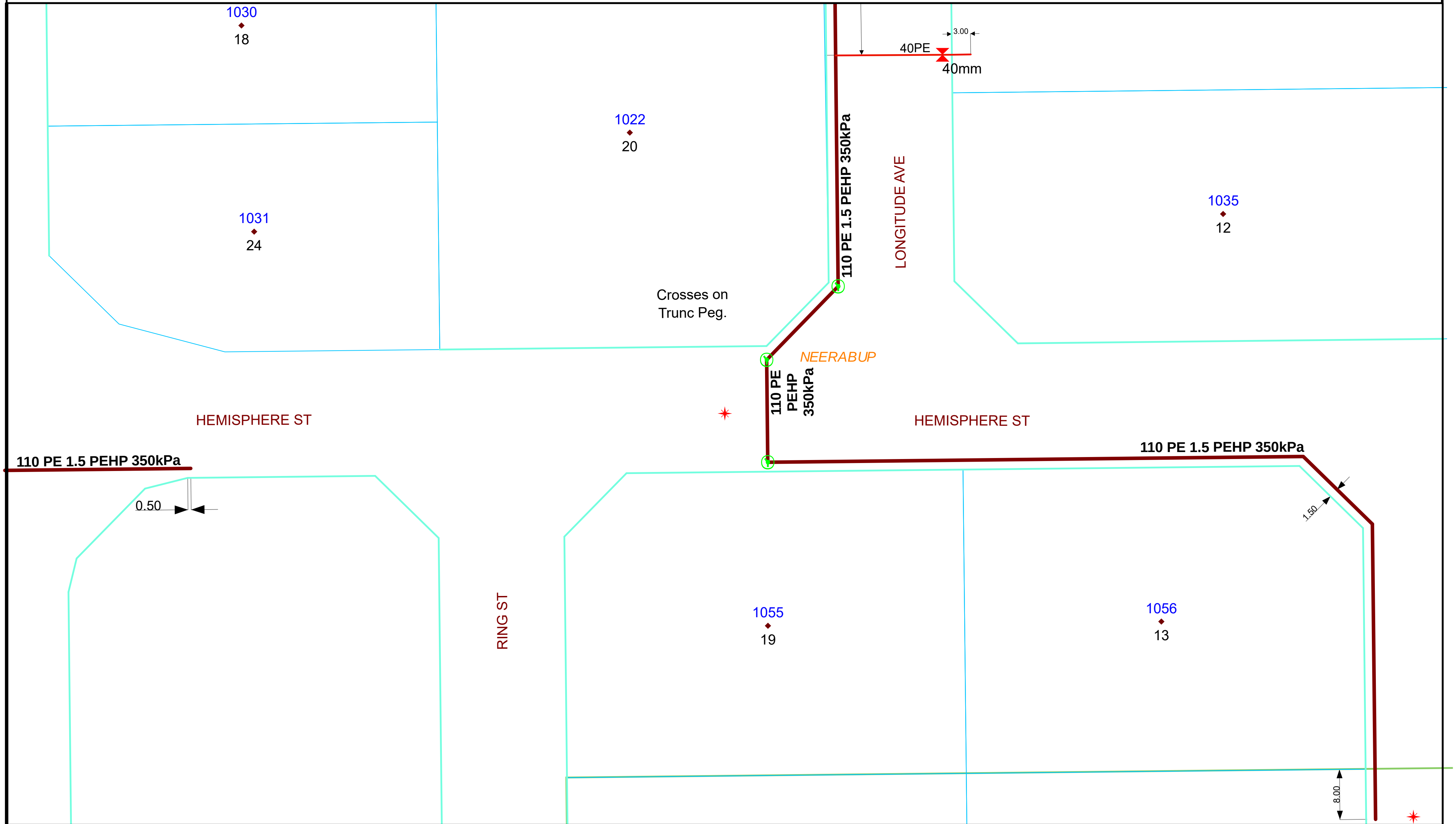

Sequence No: 109955155 | Map Tile: 7 | Scale: 1:800

Job No: 21662499 | Date: 20/05/2021 | Location: Hemisphere Street, Neerabup 6031

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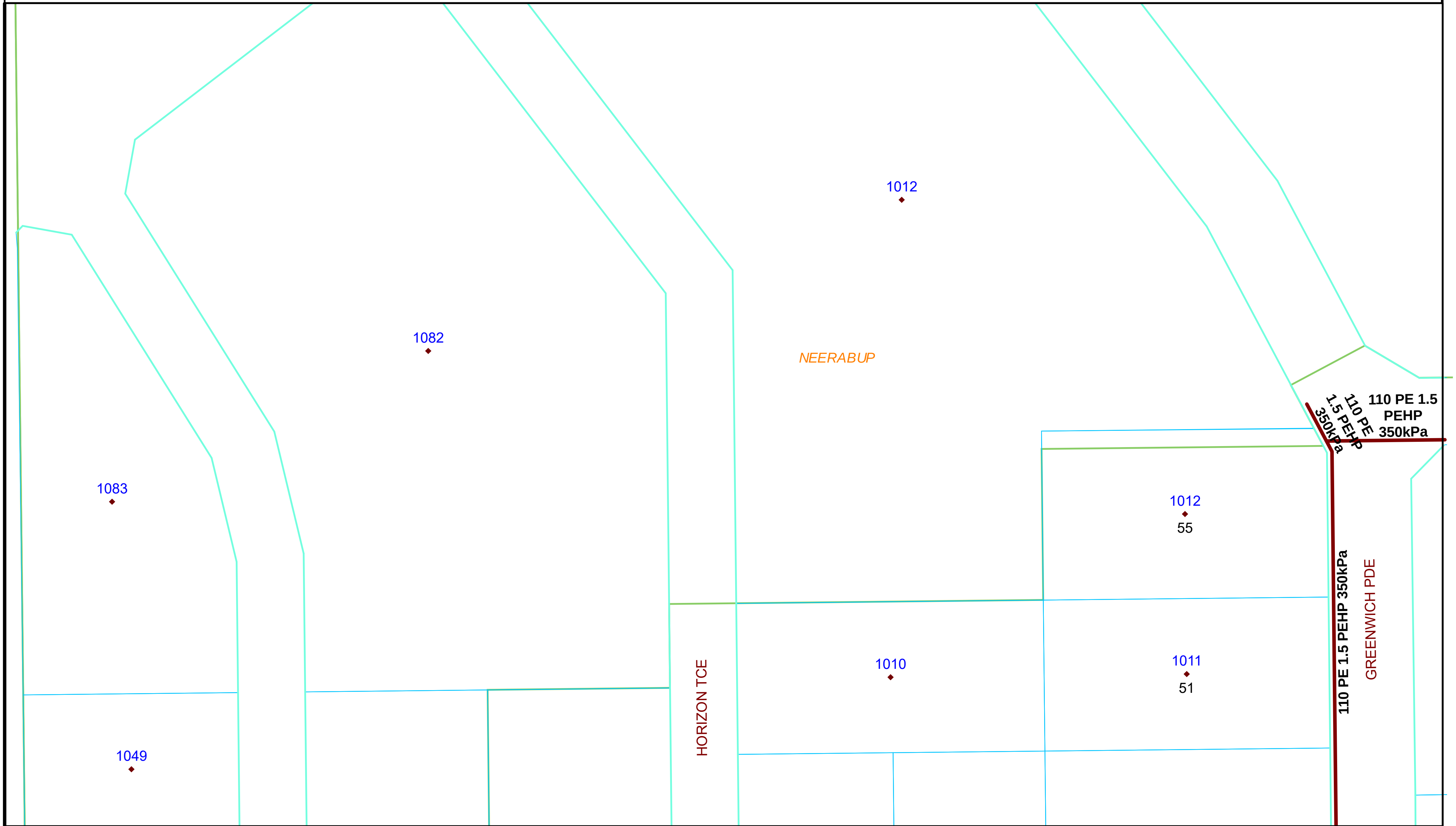

Sequence No: 109955297 Map Tile: 1 Scale: 1:1500

Job No: 21662524 Date:20/05/2021 Location: Horizon Terrace, Neerabup 6031

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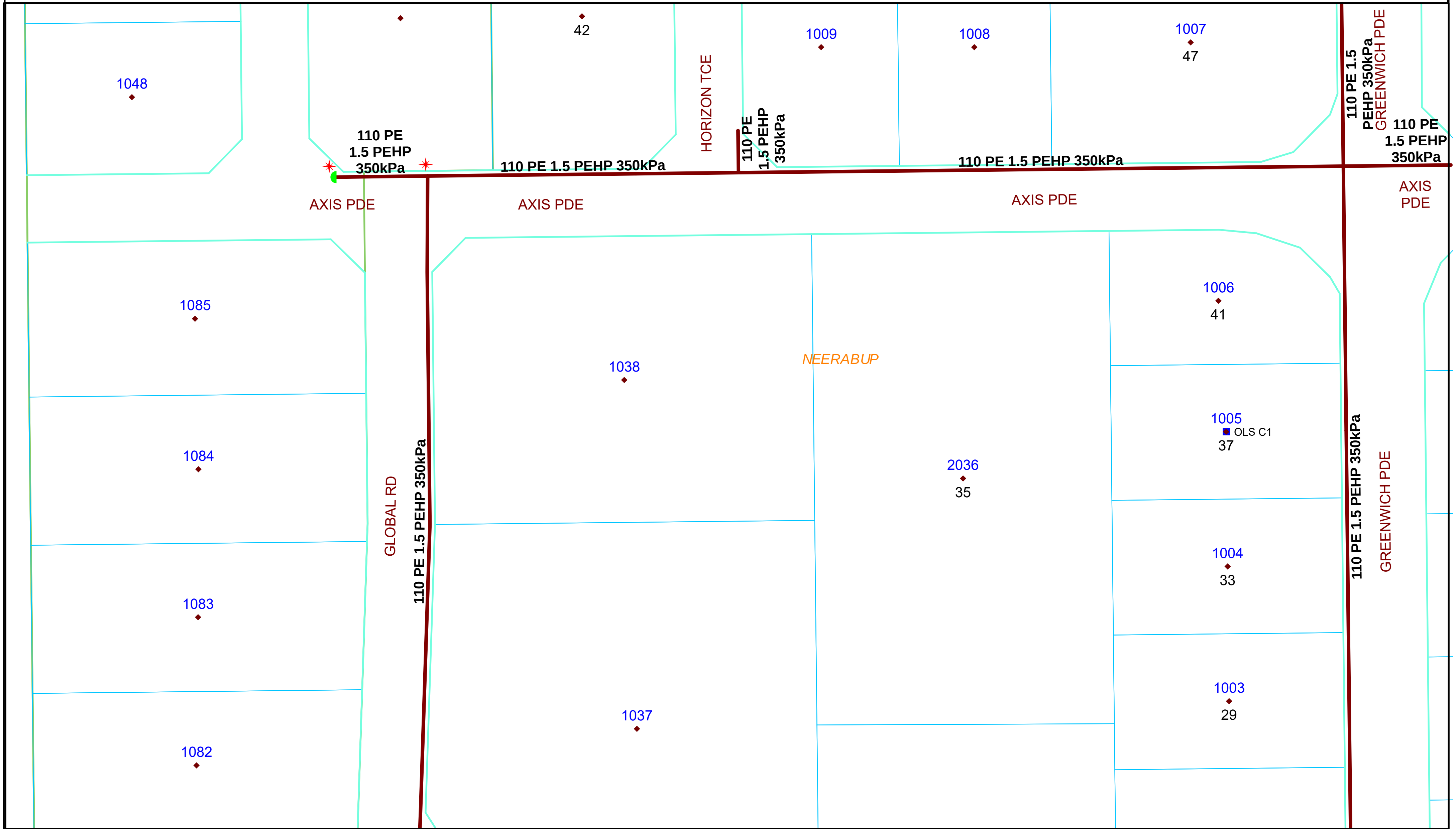

Sequence No: 109955297 Map Tile: 2 Scale: 1:1500

Job No: 21662524 Date:20/05/2021 Location: Horizon Terrace, Neerabup 6031

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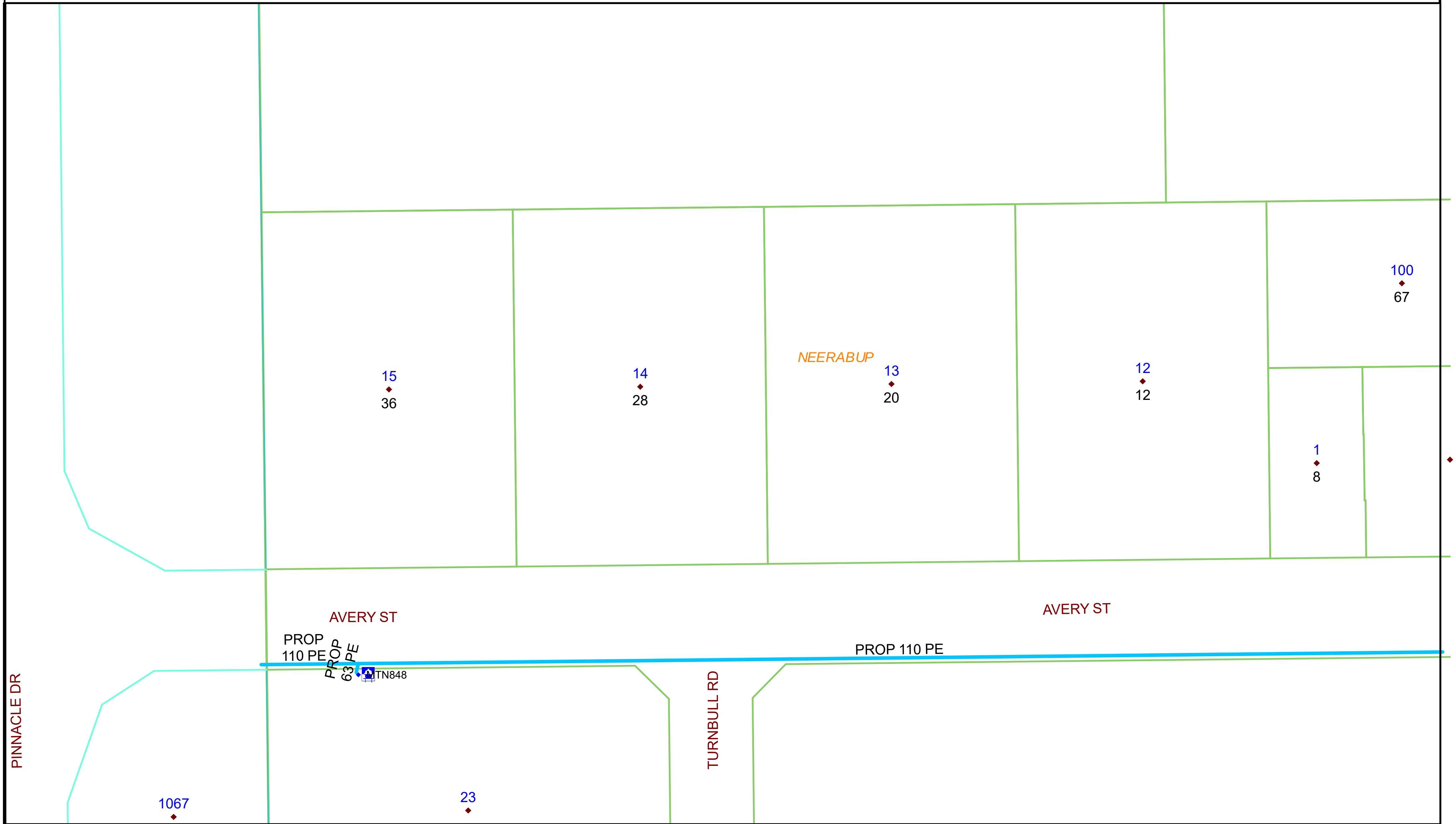

Sequence No: 109955446
Job No: 21662550

Map Tile: 1
Date:20/05/2021

Scale: 1:1500
Location: Turnbull Road, Neerabup 6031

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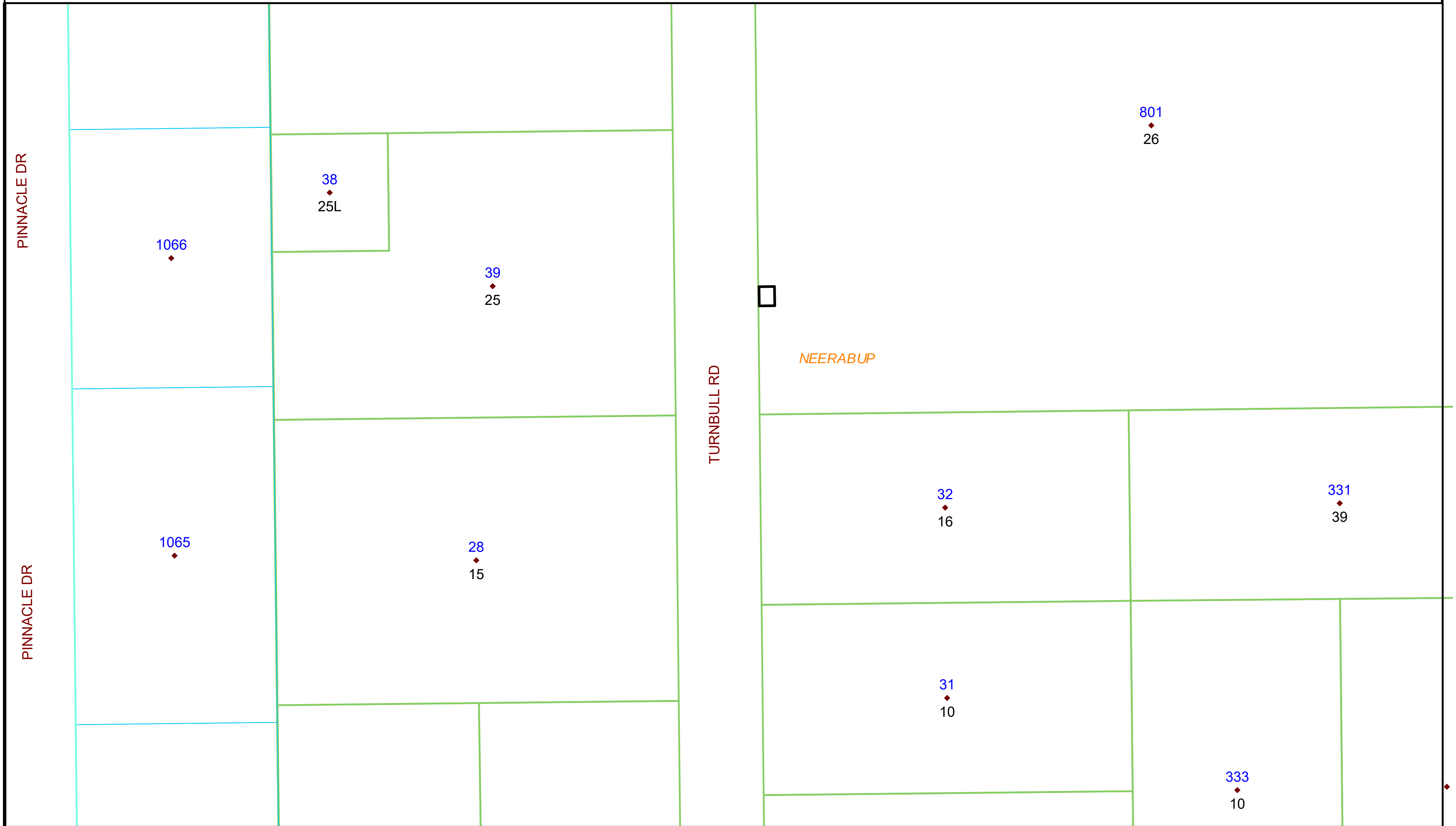

Sequence No: 109955446 | Map Tile: 2 | Scale: 1:1500

Job No: 21662550 | Date:20/05/2021 | Location: Turnbull Road, Neerabup 6031

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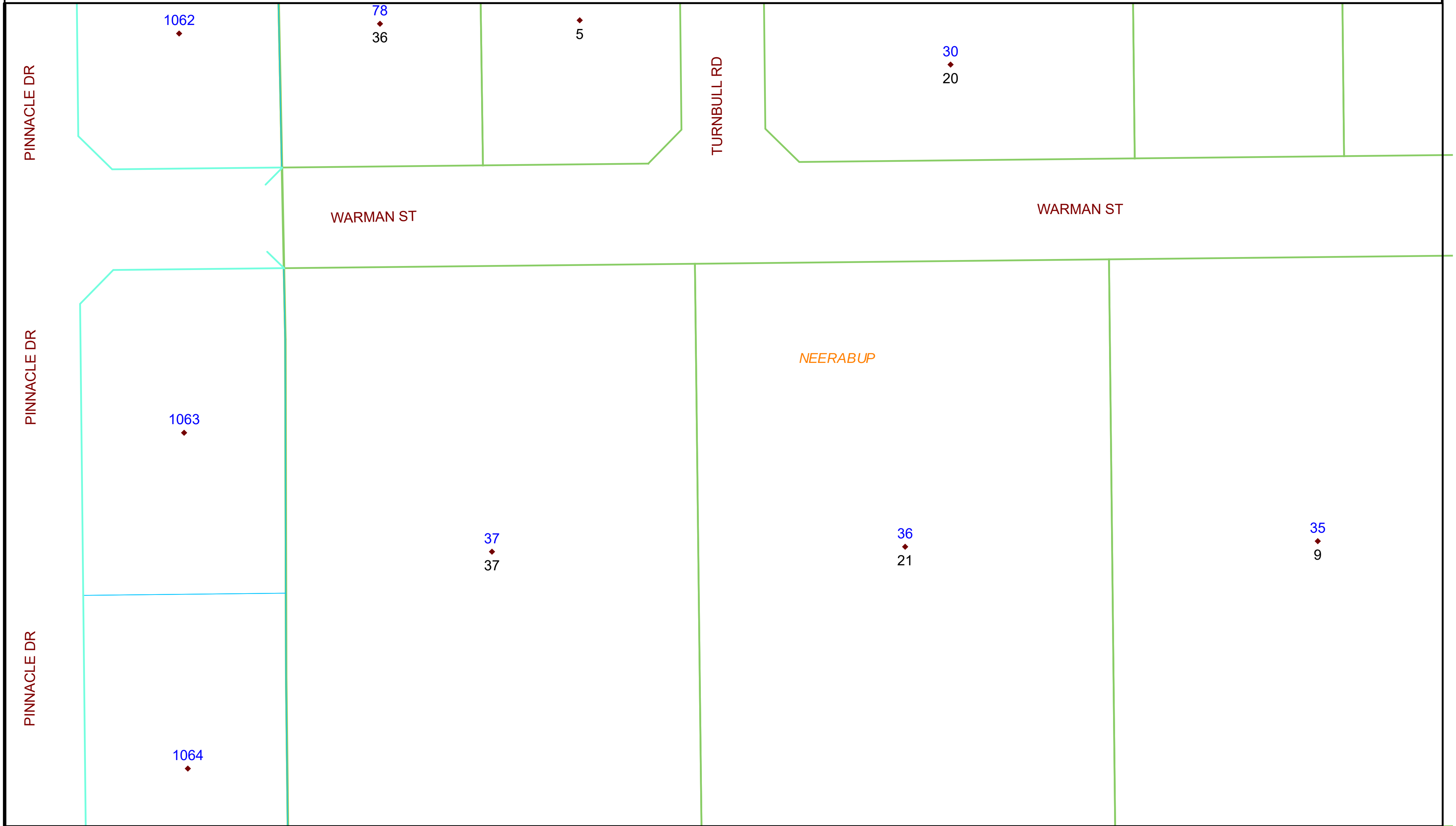

Sequence No: 109955446 | Map Tile: 3 | Scale: 1:1500

Job No: 21662550 | Date:20/05/2021 | Location: Turnbull Road, Neerabup 6031

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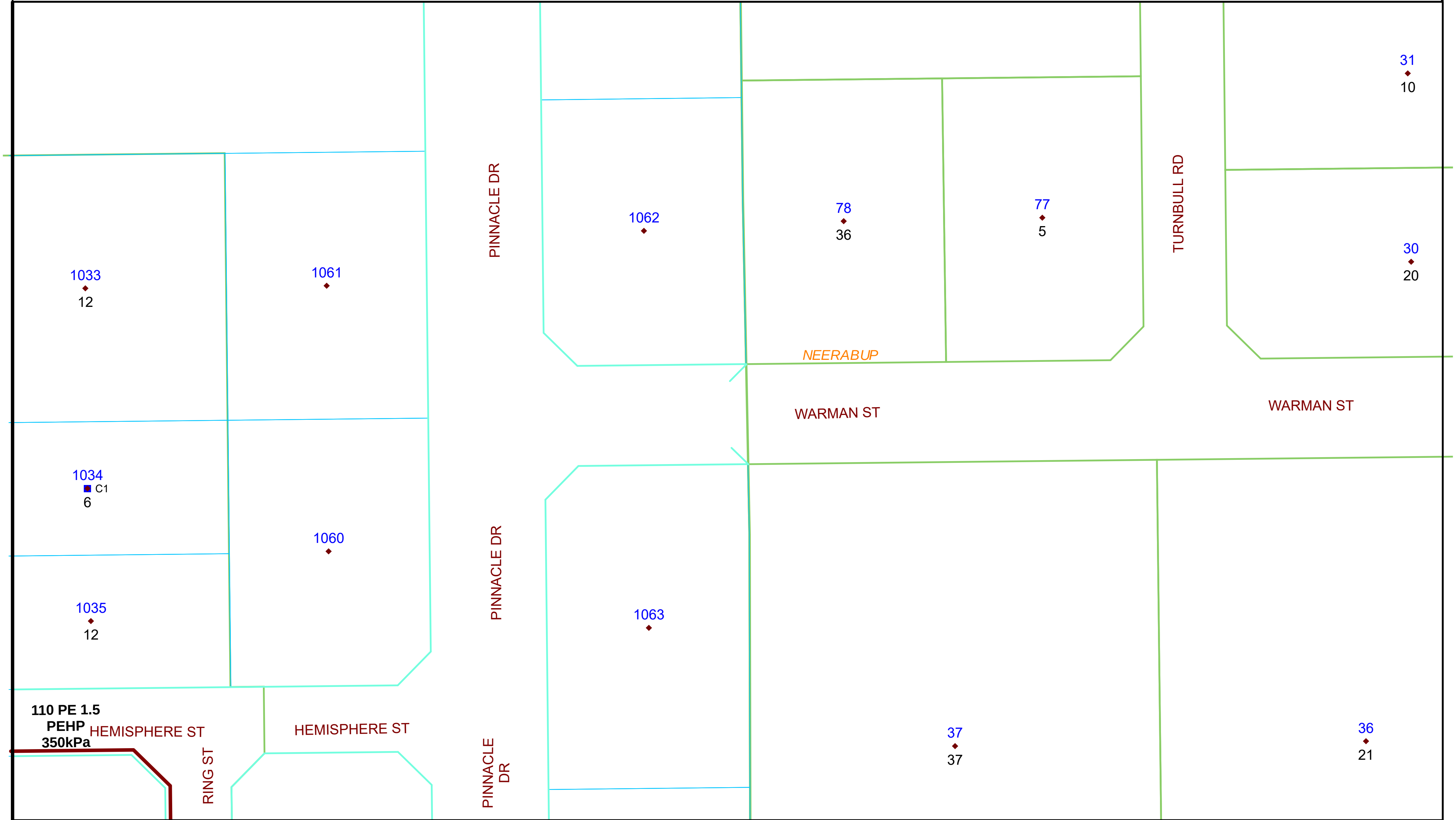

Sequence No: 109955425 | Map Tile: 1 | Scale: 1:1500

Job No: 21662547 | Date:20/05/2021 | Location: Warman Street, Neerabup 6031

N W E S

ATCO

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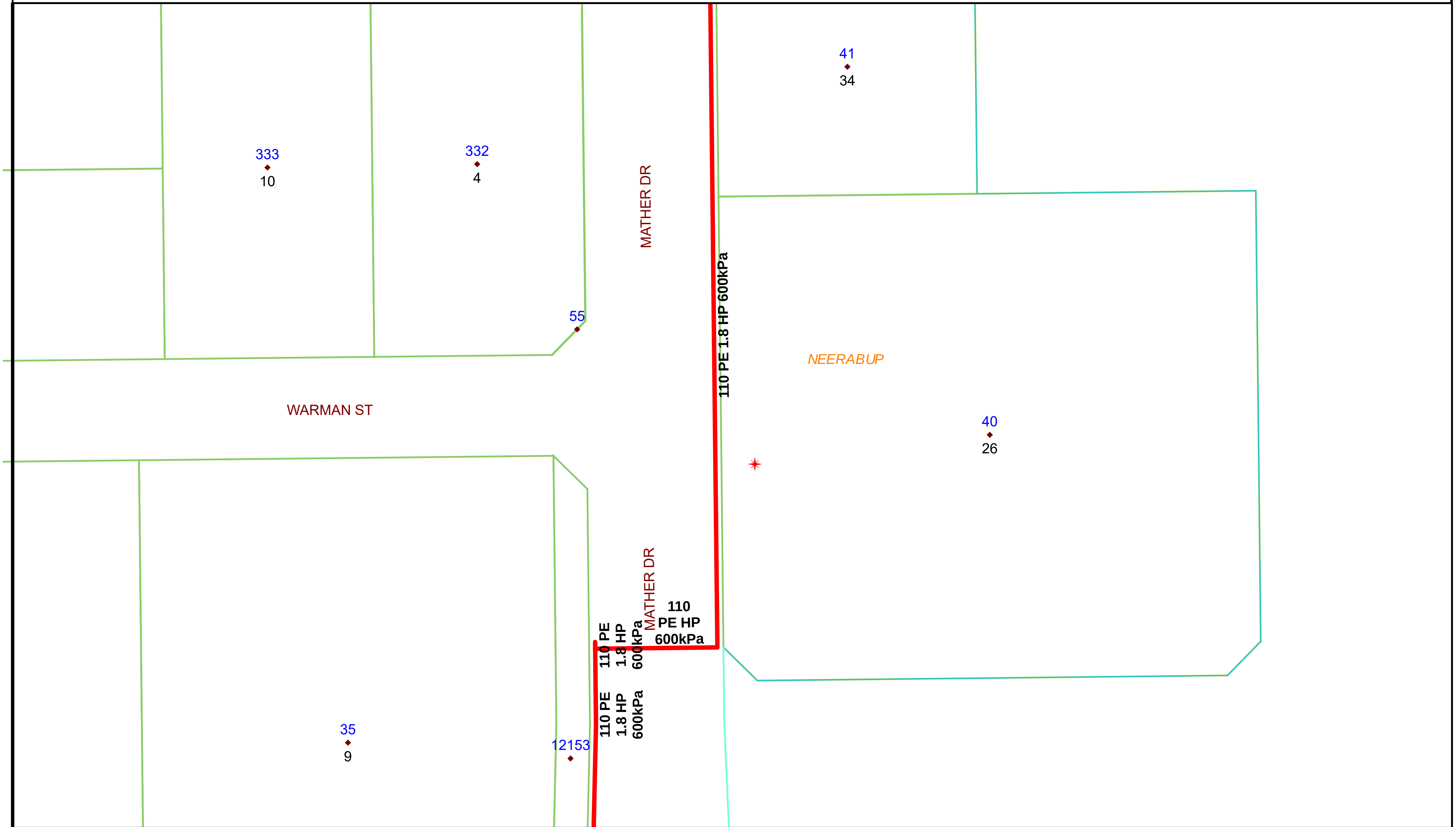

Sequence No: 109955425	Map Tile: 2	Scale: 1:1500	© ATCO Gas Australia Pty Ltd ABN 90 089 531 975
Job No: 21662547	Date:20/05/2021	Location: Warman Street, Neerabup 6031	

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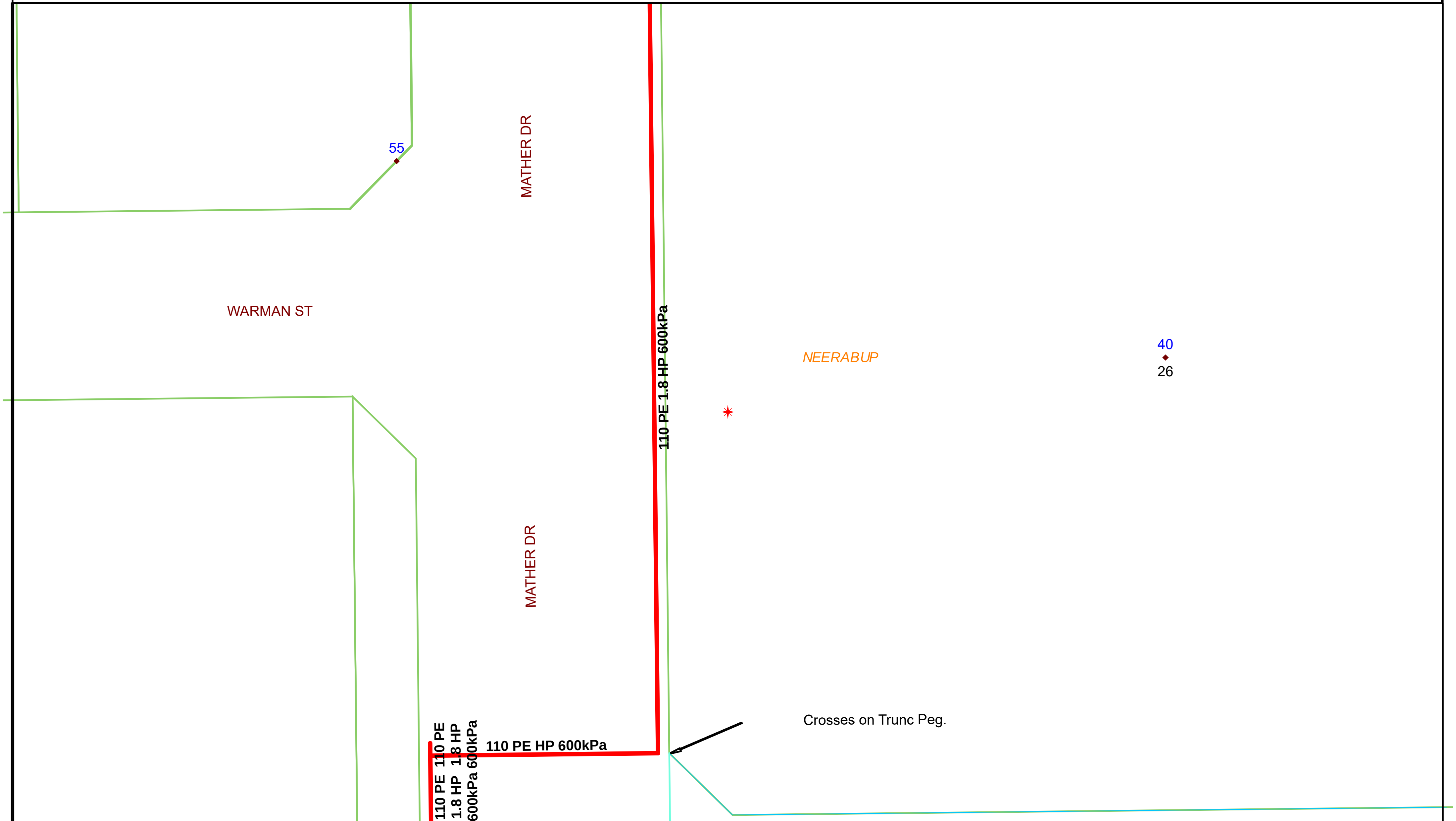

Sequence No: 109955425 | Map Tile: 3 | Scale: 1:800

Job No: 21662547 | Date:20/05/2021 | Location: Warman Street, Neerabup 6031

N W E S

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MATHER DRIVE

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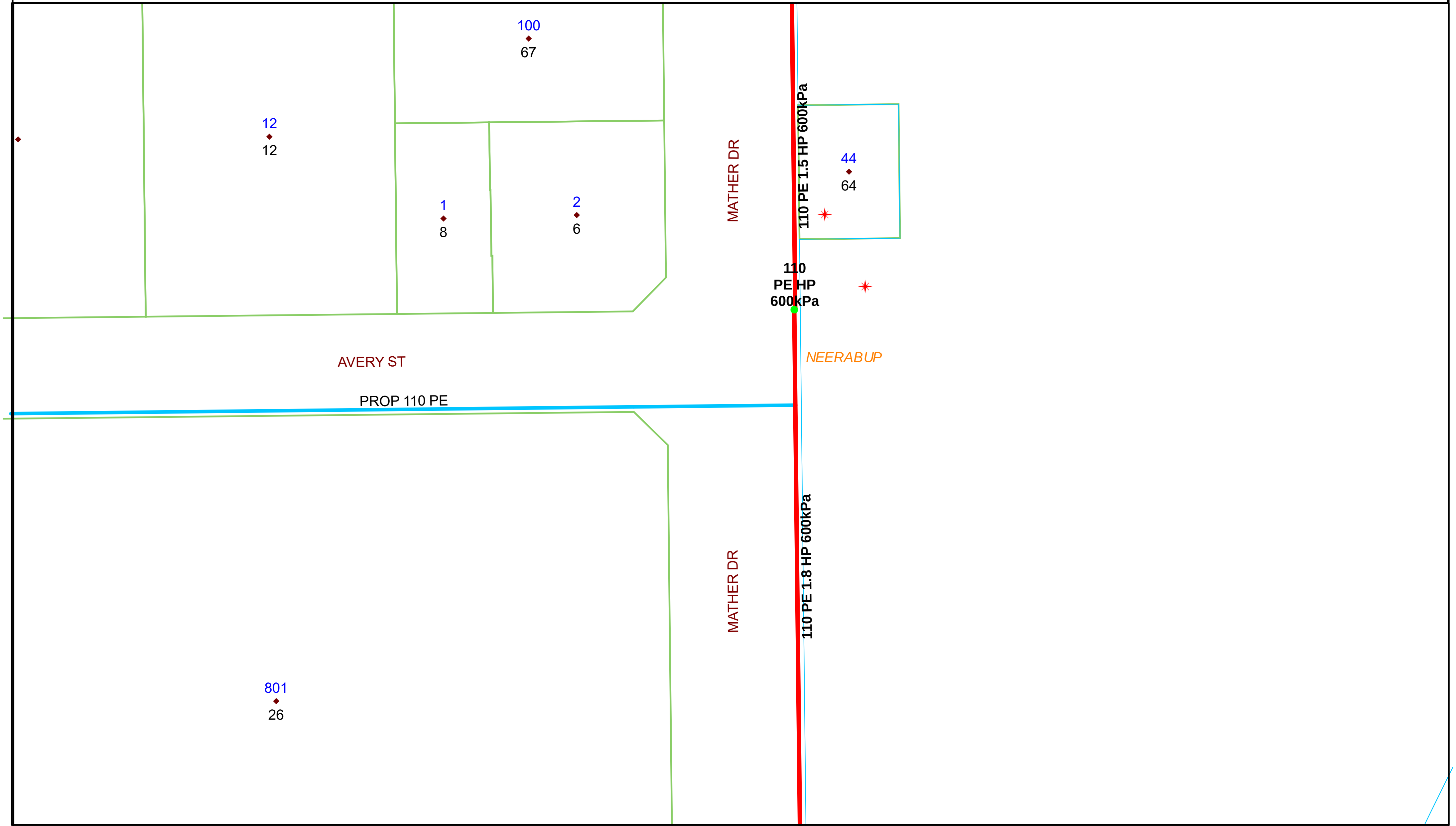

Sequence No: 109950478 Map Tile: 1 Scale: 1:1500

Job No: 21661703 Date:20/05/2021 Location: Mather Drive, Neerabup 6031

Please read all **warnings**, conditions and information on the attached “Underground Asset Details” information sheet. This plan is issued subject to that information and those conditions and **warnings** (including, but not limited to, the “NO HOT WORKS” warning). Plans are current for only **30 days** from date of request, indicative only and not warranted to be accurate. It is your responsibility to carefully locate underground assets and follow safe work practises and procedures (eg pot-holing). ATCO Gas Australia will seek compensation for damage caused to assets.

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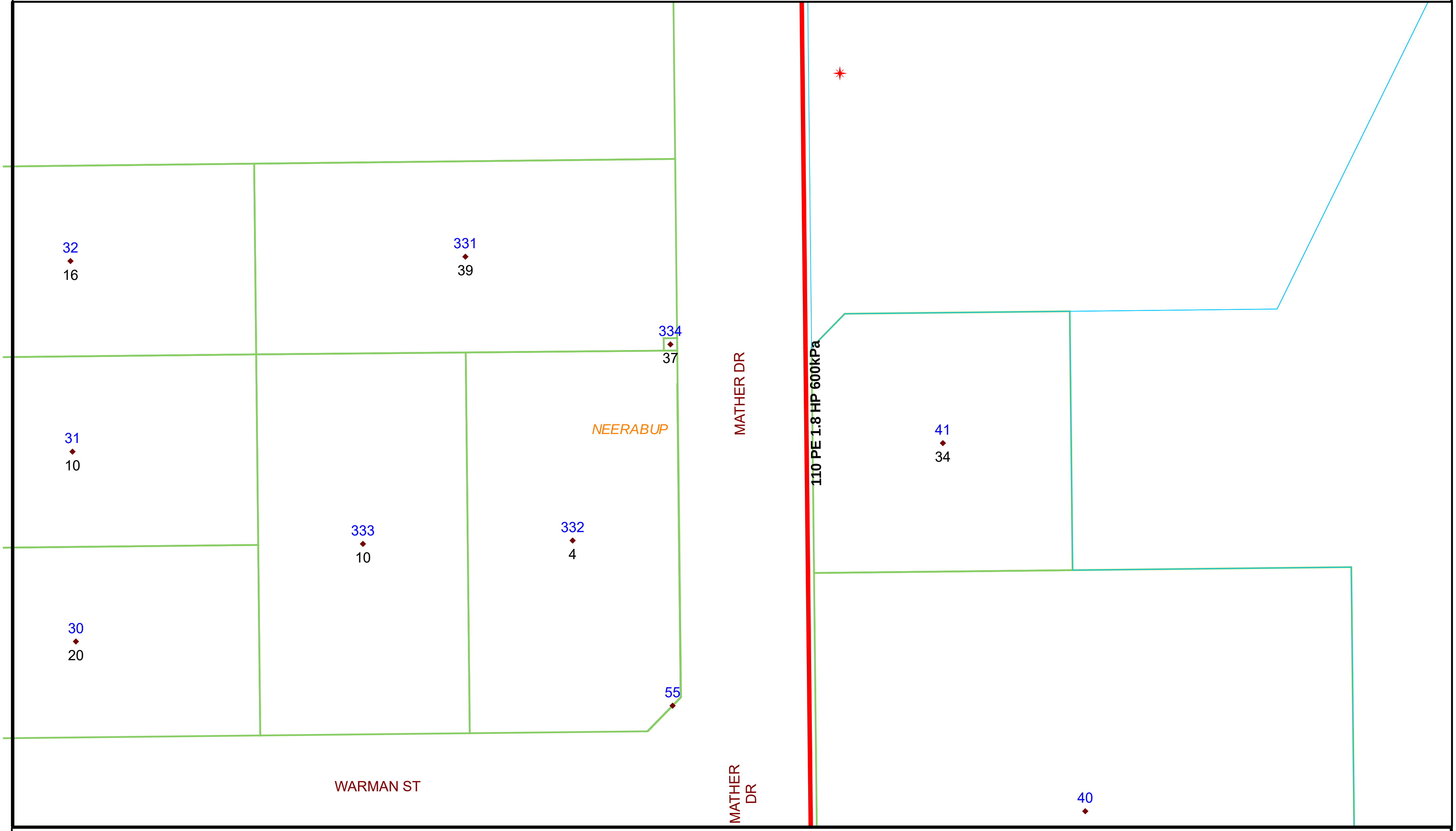

Sequence No: 109950478 | Map Tile: 2 | Scale: 1:1500

Job No: 21661703 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

N W E S

ATCO

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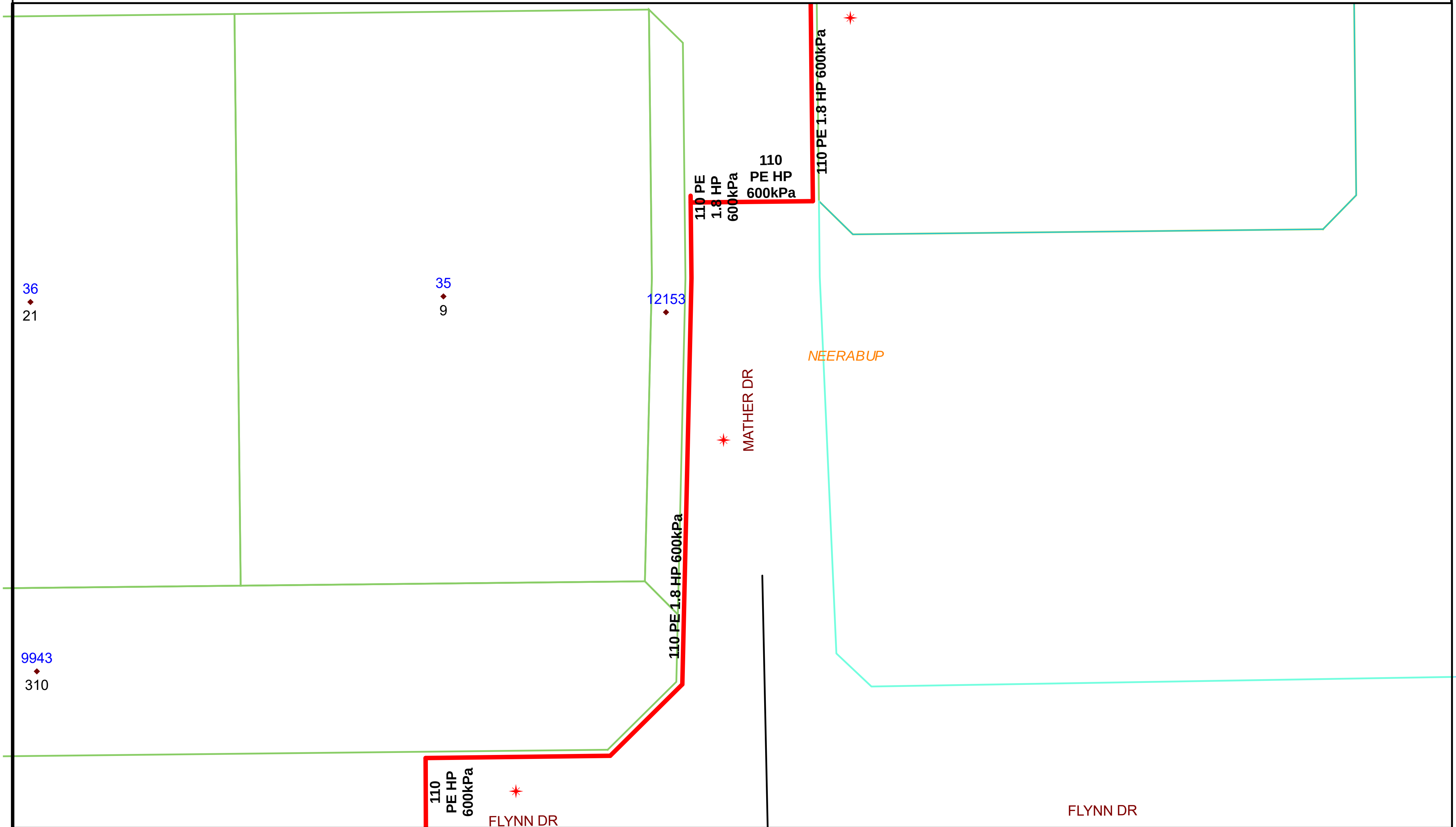

Sequence No: 109950478 Map Tile: 3 Scale: 1:1500

Job No: 21661703 Date:20/05/2021 Location: Mather Drive, Neerabup 6031

N W E S

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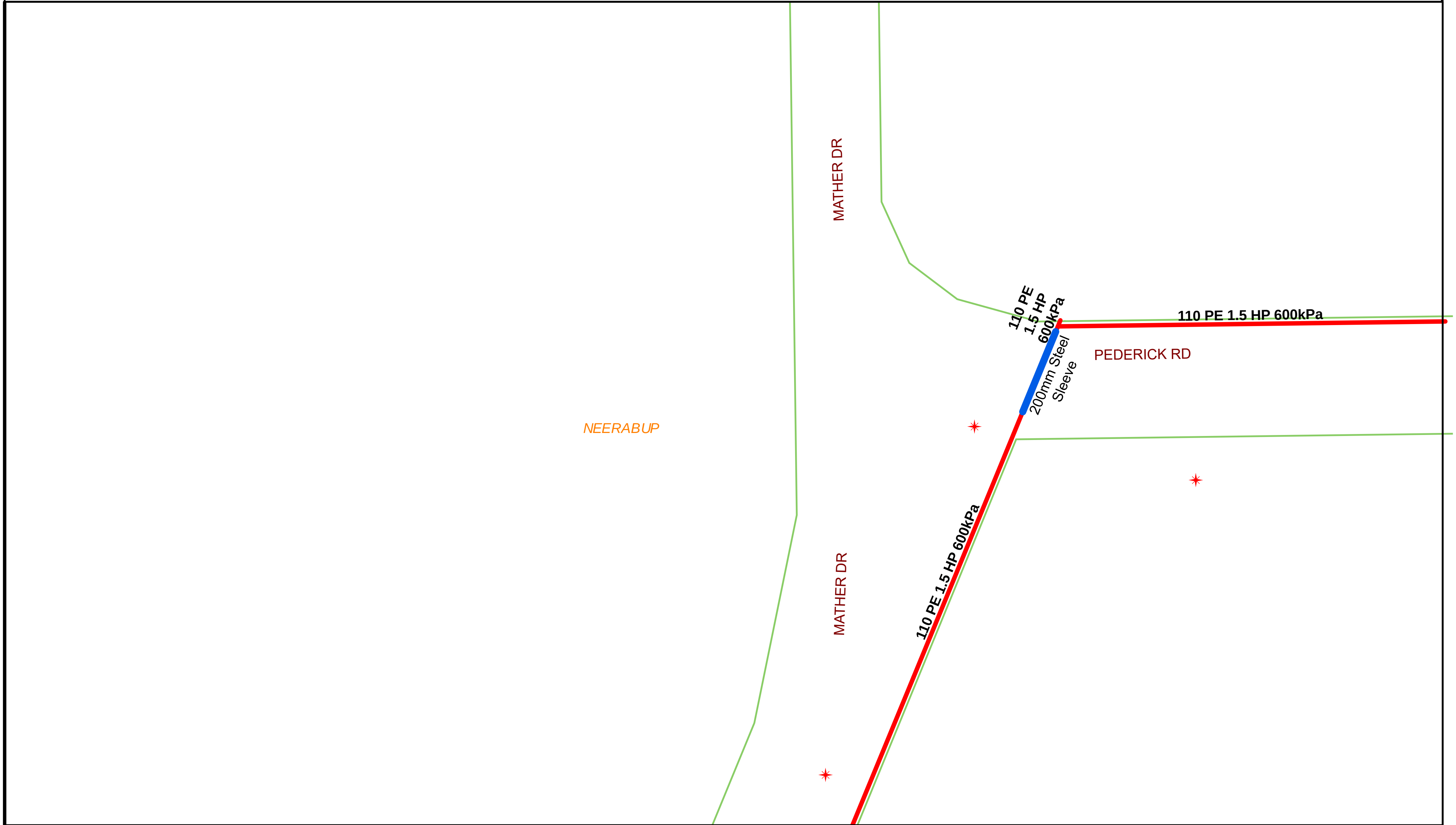

Sequence No: 109950599 | Map Tile: 1 | Scale: 1:1500

Job No: 21661720 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

N W E S

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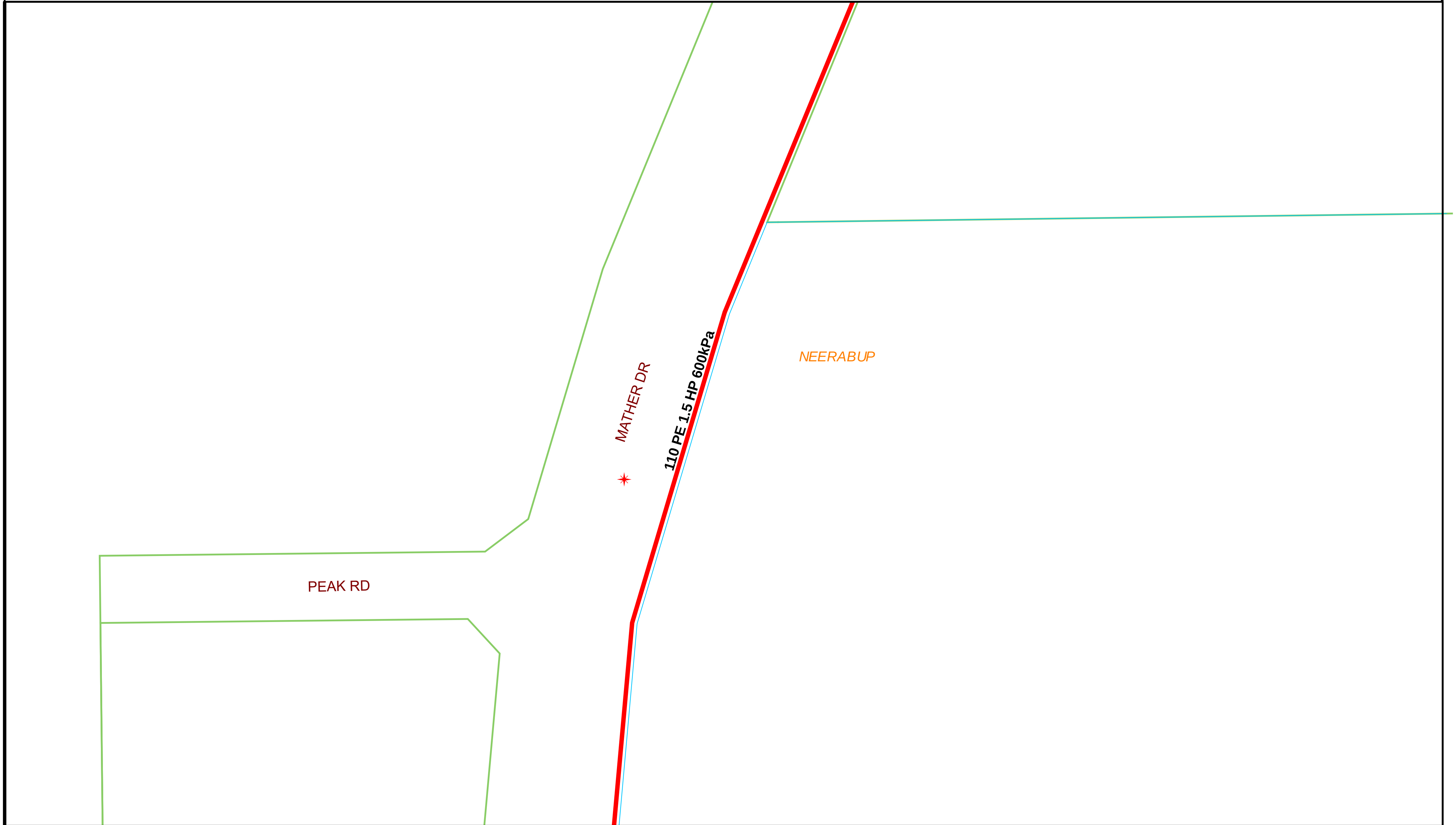

Sequence No: 109950599 | Map Tile: 2 | Scale: 1:1500

Job No: 21661720 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

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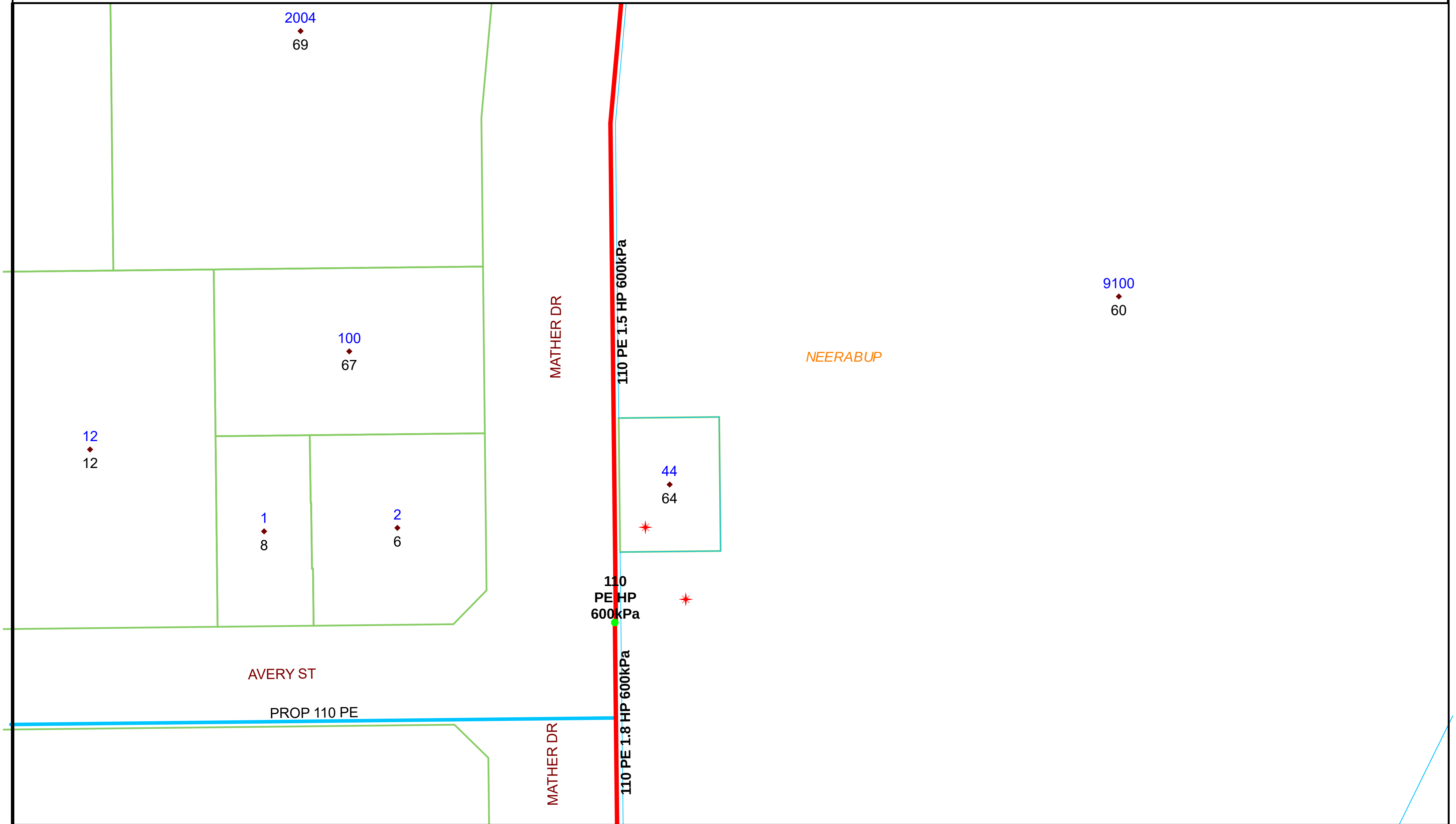

Sequence No: 109950599 Map Tile: 3 Scale: 1:1500

Job No: 21661720 Date:20/05/2021 Location: Mather Drive, Neerabup 6031

N W E S

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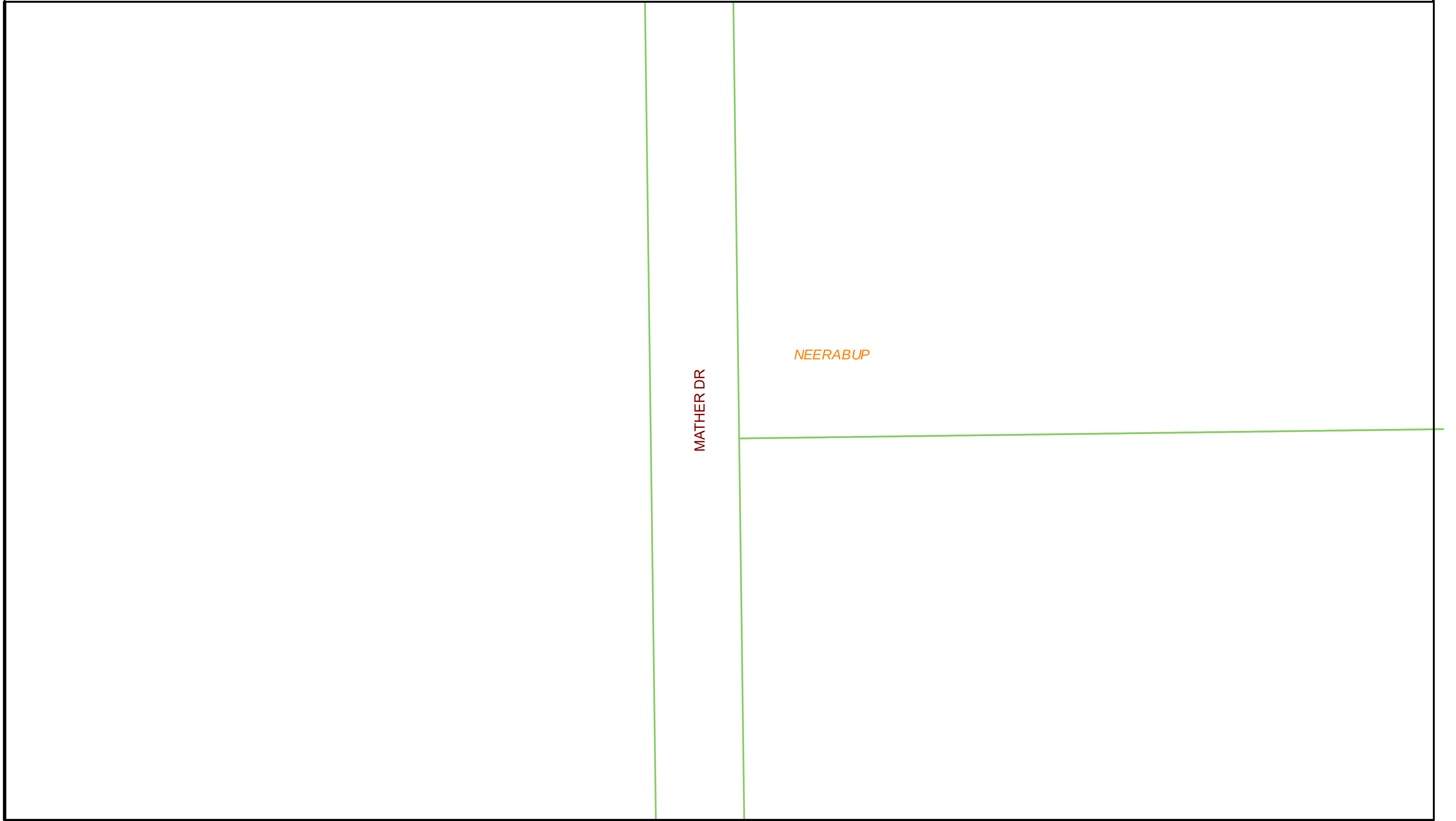

Sequence No: 109950684 | Map Tile: 1 | Scale: 1:1500

Job No: 21661736 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

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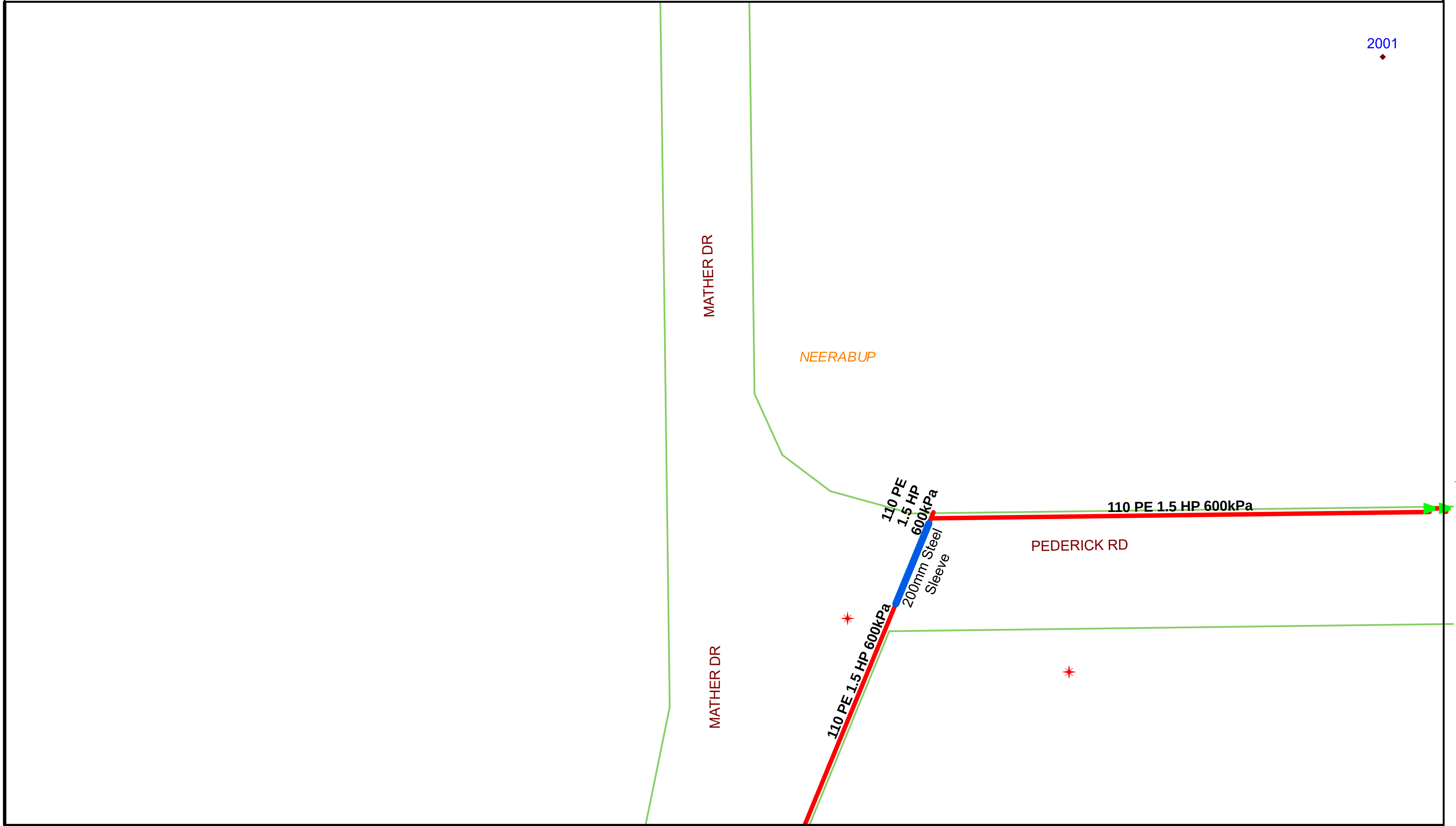

Sequence No: 109950684 | Map Tile: 2 | Scale: 1:1500

Job No: 21661736 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

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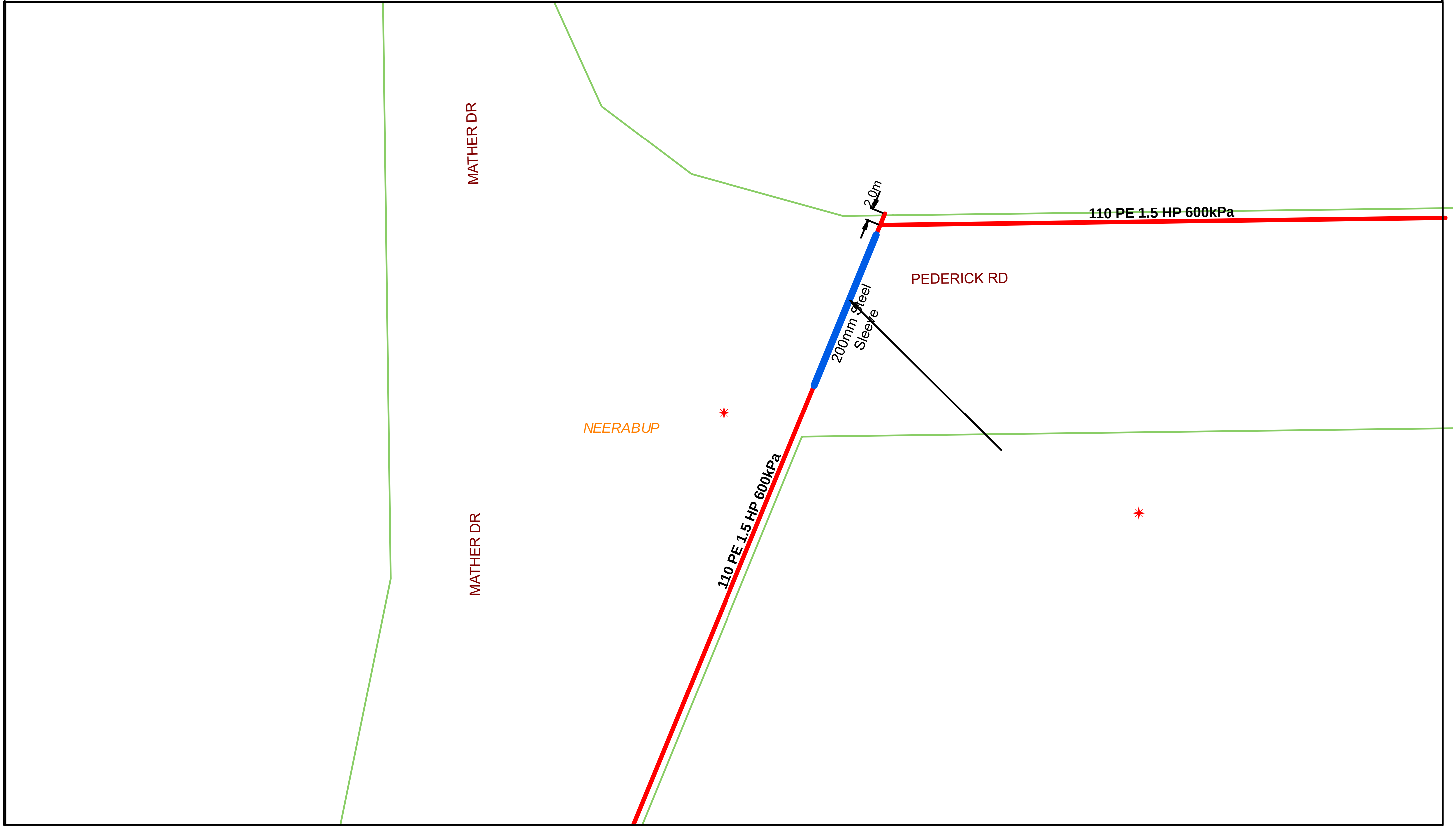

Sequence No: 109950684 | Map Tile: 3 | Scale: 1:800

Job No: 21661736 | Date:20/05/2021 | Location: Mather Drive, Neerabup 6031

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N W E S

PEDERICK ROAD

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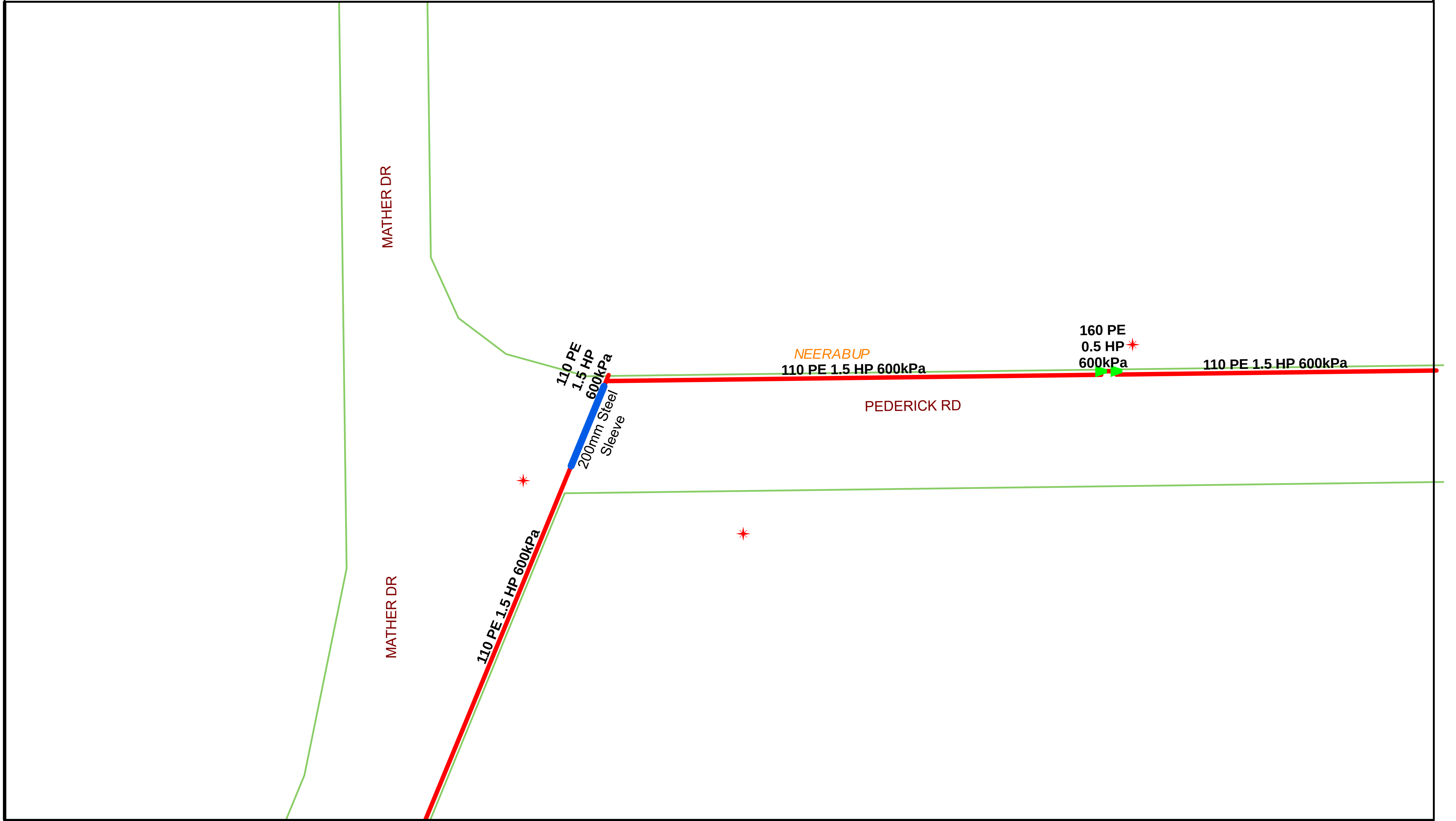

Sequence No: 109950978 Map Tile: 1 Scale: 1:1500

Job No: 21661787 Date:20/05/2021 Location: Pederick Road, Neerabup 6031

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Sequence No: 109950978 | Map Tile: 2 | Scale: 1:1500

Job No: 21661787 | Date:20/05/2021 | Location: Pederick Road, Neerabup 6031

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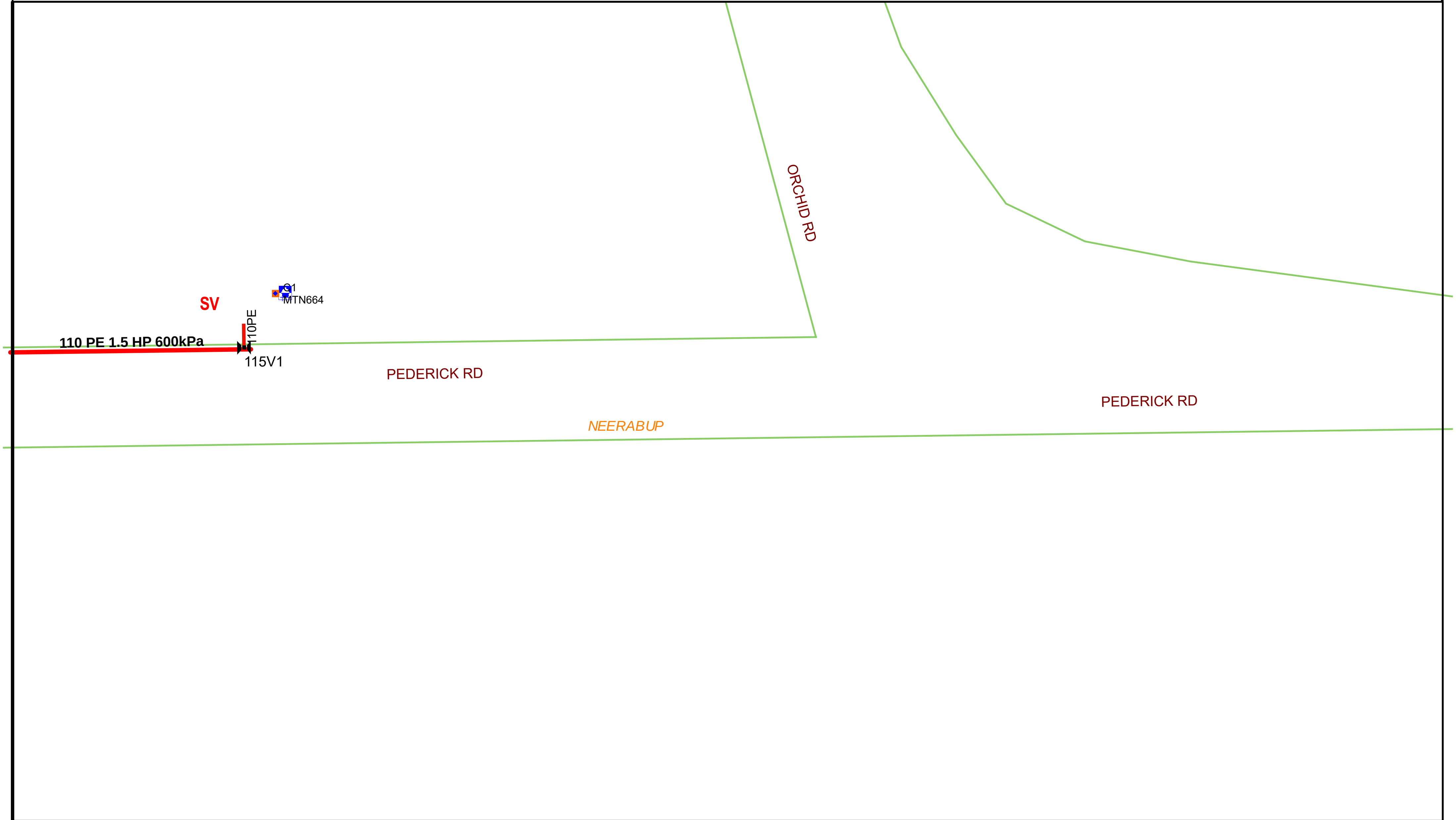

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Job No: 21661787 Date:20/05/2021 Location: Pederick Road, Neerabup 6031

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	L.Johnson C. Moore	G.Hendrie		S. Barlow		16.6.2021
1	L.Johnson	H.Shigeyoshi		S. Barlow		15.9.2021