XEROS PICCOLO
CONSULTING ENGINEERS

SERVICE FEASIBILITY REPORT
PROPOSED SUBDIVISION
LOT 3 DP740219 & LOT 51 DP1106511
77 OLD NARRANDERA ROAD & 9 RIVER ROAD
GOBBAGOMBALIN NSW 2650

Client:	SALVESTRO PLANNING
Project No.:	170685
Issue:	B
Date:	10TH September 2019
Office:	WAGGA WAGGA NSW

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1 INTRODUCTION

1.1 BACKGROUND

Xeros Piccolo were engaged by Salvestro Planning to undertake a service provision feasibility study for a proposed subdivision at Gobbagombalin NSW, to determine the service provisioning requirements and to determine potential implications for the subdivision in regards to services.

1.2 SCOPE OF REPORT

The aim of this report is to outline the existing services in the area of the proposed subdivision and to investigate and discuss how the proposed subdivision can be serviced by the relevant services, including water, gas, electricity, telecommunications, sewer, stormwater and roads.

Additionally, comment on potential traffic impacts and requirements has been provided addressing aspects such as intersection treatments and alignments, and possible traffic volumes generated by the development.

Opportunities in regards to stormwater management are also discussed.

The information provided in this report is subject to detailed investigation and design of the subdivision and services to meet the service authority requirements. This detailed investigation and design has not been undertaken in preparation of this report.

1.3 CONTACTS

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2 SUBDIVISION DETAILS

2.1 LOCALITY

The proposed subdivision is located at Lot 3 DP740219 and Lot 51 DP1106511, 77 Old Narrandera Road and 9 River Road, Gobbagombalin NSW, north-west of the Wagga Wagga CBD. These lots are currently utilised for cropping, and there are three existing houses and a number of sheds on the lots.

The subdivision is within the Wagga Wagga City Council (WWCC) jurisdiction.

2.2 PROPOSED SUBDIVISION AREA AND NUMBER OF LOTS

The development land is proposed to be rezoned for residential use. The subject area is approximately 58 ha.

A conceptual subdivision layout has been developed, as shown in Figure 1 below. Lot yield analysis has been undertaken by others, with potential lot yield of approximately 750 lots possible. A subdivision of this size would be expected to be staged, with an estimated 60-80 lots per stage.

Whilst the layout below is conceptual only and subject to change in detailed design, key aspects to note are that a new intersection to access the subdivision is proposed near the current intersection of Pine Gully Road and Old Narrandera Road, and that the existing intersection of River Road and Old Narrandera Road may be closed. Further discussion regarding traffic, access roads and intersections is provided in Section 4.

It is also noted that an ecotourism and recreational area is proposed around the Gobbagombalin Lagoon, on the southern side of the development.

Figure 1: Conceptual subdivision layout

2.3 SURROUNDING AREA

The area north of the proposed subdivision and west of Pine Gully Road is residential area which is continuing to be developed and expanded. East of Pine Gully Road is generally undeveloped.

East of the subdivision is Colin Knott Drive (Olympic Highway).

South of the proposed subdivision is farmland and the flood plain for the Murrumbidgee River. The northern extremities of the flood zone effectively define the southern edge of the proposed rezoning and residential subdivision.

3 SERVICE PROVISION REQUIREMENTS

Investigation into the servicing requirements included obtaining Dial Before You Dig (DBYD) plans and information of the existing services, direct discussions held with the relevant service authorities, information and plans provided by the service authorities, and a site investigation.

All service authorities were given the current available information relating to the subdivision, including proposed rezoning, approximate subdivision area, approximate total number of lots and possible subdivision construction staging, as outlined in Section 2.2 above.

3.1 WATER

Riverina Water County Council (RWCC) is the water supply authority in this area.

3.1.1 Existing Water Infrastructure

There is no water supply infrastructure located on Old Narrandera Road or River Road. The DBYD plans, RWCC online mapping and conversations held with RWCC staff confirmed that the nearest trunk watermain is located on Pine Gully Road, approximately 1km from the intersection of Old Narrandera Road. This main is a 375mm dia. DICL main.

The water infrastructure located within the Estella Rise subdivision extends down as far as Barmedan Avenue, just north of Old Narrandera Road. RWCC indicated that this infrastructure is not adequate to supply the proposed subdivision.

3.1.2 Water Provision for the Proposed Subdivision

Based on the information provided, RWCC indicated that water supply infrastructure to the proposed subdivision likely to be possible with no significant impediments expected, except for costs associated with the extension works. Detailed subdivision plans and investigation by RWCC would be required to confirm this.

3.1.2.1 Main Extension

To supply the proposed subdivision, the 375mm dia. main located on Pine Gully Road would be required to be extended from its current location, at the intersection of Cootamundra Boulevard and Pine Gully Road, to Old Narrandera Road, a distance of approximately 1 km. The line will need to be extended further to enter the proposed subdivision, which will involve crossing Old Narrandera Road. Figure 2 shows the possible extension route.

This pipe would be in either DICL or uPVC, subject to detailed review and investigation by RWCC. The cost of this extension would be payable by the developer. High-level estimates provide by RWCC indicated that the cost of this 375mm extension could be approximated at $350 - 400/m. This would give a total main extension cost for water supply of approximately $350,000 – $400,000.

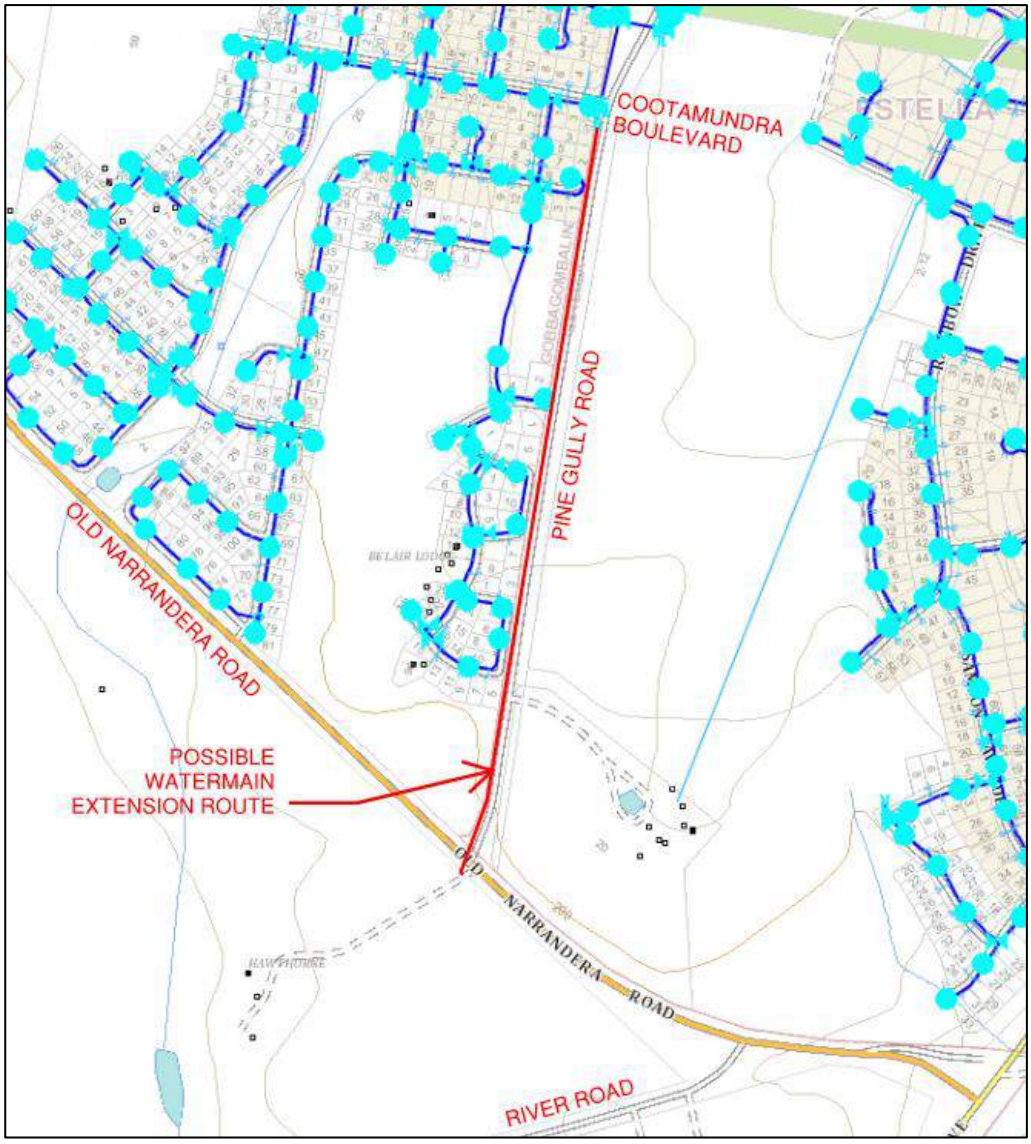


Figure 2: Possible watermain extension route

3.1.2.2 Internal Subdivision Works

The internal subdivision supply would connect to the trunk main extension, and feed into the proposed subdivision street network as per RWCC and Council requirements. The supply would be designed and sized by RWCC according to the subdivision layout and water requirements. These lines are typically oPVC pipes, with road crossings in DICL.

For internal subdivision mains, the developer is required to pay the 100mm dia. equivalent of the water mains installed, and RWCC covers the remainder if larger pipes are required. High-level estimates provided by RWCC indicated that developer costs for the internal watermains can be estimated at approximately $100/m.

Based on 750 lots with an average road frontage per lot of 20m, the total length of required road can be estimated at 7,500m, with lots on both sides of the roads. This would therefore require approximately 7,500m of water pipe, excluding road crossings. Therefore, the cost of internal subdivision water supply infrastructure can be estimated at $750,000, or about $1,000 per lot.

Additionally, a Development Servicing Charge and Service Connection fee is payable by the developer per lot.

Table 1 below shows a breakdown of the estimated water supply costs for the proposed subdivision

Table 1: Estimated water supply costs, based on 2019-20 financial year rates & estimates from RWCC

DESCRIPTION	QUANTITY	COST	PER LOT	TOTAL
Main Extension (from existing infrastructure to entry into subdivision)	1	$400,000	$533.33 (assuming 750 lots)	$400,000
Development Servicing Charge (single residential lots < 2000m^2)	750 lots	$5,053/lot	$5,053	$3,789,750
Service Connection Fee (20mm service)	750 lots	$1,390/lot	$1,390	$1,042,500
Internal Subdivision Infrastructure	7,500m	$100/m	$1,000	$750,000
	TOTAL ESTIMATED COST:		**$7,976.33**	**$5,586,250**

Note that the above costs are assuming 750 lots are constructed. On the assumption that the subdivision is staged, and the first stage consists of 80 lots, the water supply cost for the first stage would be $995,440 or $12,443 per lot. This includes the $400,000 of main extension.

3.2 ELECTRICITY

Essential Energy is the electricity supply authority in this area.

3.2.1 Existing Electricity Infrastructure

There are existing 11 and 33kV overhead powerlines located on the northern side of Old Narrandera Road for the full length of the proposed subdivision, as shown on the plans provided by Essentially Energy (refer Attachment 1). From the 11kV line, branch lines feed into the Estella Rise development, as well as to the existing buildings on the lots proposed to be developed. There is no electricity line running along River Road.

3.2.2 Electricity Provision for the Proposed Subdivision

Discussions with Essentially Energy indicated that provision of electricity to the proposed subdivision is achievable, through connection to the nearby 11kV electricity lines. The exact location would be determined during detailed design and would depend on the subdivision layout and number of lots being developed in that stage of construction.

There is potential for the existing network to be required to be upgraded, due to the rate of development in the area, with upgrades potentially required in the next 5-10 years.

Discussions with Essential Energy staff indicated that staging of the subdivision would likely be beneficial. If an application is made for Design Information for the entire subdivision (750 lots), the required investment to augment and upgrade the existing infrastructure plus the cost of the internal works would be substantial compared to a staged development. If the development is staged, and other nearby developers also apply for Design Information, there is potential for the

costs to be shared. It is unlikely significant upgrades or extensions would be required for the initial stage of the subdivision.

The internal electrical network will be required to be underground for both high and low voltage lines, with a 'ring main' type configuration being developed to provide reliability. This configuration can likely be achieved as the stages of the subdivision progress.

Whilst more detailed design and investigation are required, at this stage there does not appear to be any significant impediments to the provision of electricity to the proposed subdivision.

3.3 GAS

APA Group is the gas supply authority in this area.

3.3.1 Existing Gas Infrastructure

There is no existing gas supply infrastructure to service the proposed subdivision on Old Narrandera Road or River Road.

There is an existing 450mm dia. high-pressure gas transmission line that crosses from the northern side of Old Narrandera Road to the east of River Road, and continues along River Road toward the south-west. This line is the Wagga Wagga – Culcairn pipeline. See Section 3.3.2 for the implications of this line on the proposed subdivision. Refer to Attachment 2A.

3.3.2 Implications of Existing High-Pressure Transmission Line

Discussions were held with APA Group's NSW Planning department in regards to the existing high-pressure transmission line. This line is partially located within the River Road and Old Narrandera Road corridors, and then within private property along the northern side of River Road, where it is located within a 16m wide easement. It is critical to the supply of gas to communities south of Wagga Wagga, and the costs to relocate this line would be extremely high.

3.3.2.1 Restrictions on Types of Development

To consider the safety of nearby communities in the event the line is impacted and there is a loss of pipeline containment, APA requires a Measurement Length (ML) area be maintained. The ML area is an area around the pipeline in which APA is mandated to consider the safety of the community. The key implication of the ML is the restriction of sensitive developments within the ML area, such as hospitals, child care or seniors living facilities, educational, retail and entertainment facilities, places of public worship, service centres, hotels and motels. Residential development is not restricted. APA indicated that the ML is likely to be in the order of 450m either side of the pipeline.

To determine the ML, a Safety Management Study (SMS) will be required to be undertaken by APA, with an approximate cost of $10,000 - $15,000 payable by the developer. This process can take several months, and is highly recommended to be undertaken early in the subdivision layout development process to allow for APA recommendations and requirements to be accommodated in the design.

3.3.2.2 Other Requirements

APA indicated the following requirements in relation to this transmission line:

- The line will require a minimum 16m wide easement to be provided, with the easement to be maintained as open space. This open space can potentially include concrete paths, which act as a protective barrier for the pipe
- The line will not be allowed to be located within any proposed lots

- Vegetation with a mature height of greater than 0.5m is not permissible within 3m of the line
- The line should not be built over with inappropriate infrastructure
- Road and service crossings of the line are permissible but should be minimised and where possible be at 90° to the line. Each crossing will require approval from APA and must be constructed to APA requirements. This may include slabbing over the pipe or other protection measures, depending on the depth of the pipe and proposed development over it.
- It is preferable that the line is not located within road reserves due to the risk of impact by contractors working on other services, either during construction or for ongoing maintenance
- Particular controls during construction works, increased signage and warning tape will be required
- Prior to any works near the line, vacuum pump locating will be required to obtain a positive location and depth of the pipeline, under an APA permit
- As outlined above, a SMS will be required and a ML determined which will restrict types of development permissible within nearby properties

Whilst this transmission does restrict the proposed development to some degree, the implications do not inhibit the development of the majority of the subject land.

3.3.3 Gas Provision for the Proposed Subdivision

APA indicated that there are no significant impediments to the servicing of this development with respect to gas. Note that the high-pressure transmission line cannot be connected to for supply to this subdivision.

To service this subdivision, augmentation of the existing gas network would be required. This would consist of approximately 650m of 125mm main along Estella Road from Boorooma Street to Gunn Drive. This would be undertaken at no cost to the developer, based on an evaluation undertaken by APA.

Additionally, approximately 330m of 125mm main extension from the proposed 110mm line on Edgar Place to the entry point into the new subdivision would be required. This would also be undertaken at no cost to the developer.

Attachment 2B provides a basic plan showing the required gas augmentation and extension works.

Internal subdivision gas network infrastructure is to be constructed as per design information provided by APA once subdivision plans have been developed. The cost of construction of these internal works is payable by the developer. The costs will depend on the required pipe size, length of pipe, valves, road crossings and so forth. These can be determined once design information is available.

3.4 TELECOMMUNICATIONS

As per Federal Government telecommunications policy for new developments, NBN Co are the Infrastructure Provider of Last Resort for developments with 100 lots or more, and will therefore be the telecommunications provider for this proposed subdivision.

This was confirmed through contact with both NBN and Telstra.

3.4.1 Existing NBN Telecommunications Infrastructure

The DBYD information obtained indicated that there is some telecommunications infrastructure within the vicinity of this development, which likely provides service to existing lots along River Road.

A Feasibility Assessment Request was made via NBN's online system, based on the proposed 750 lot subdivision. Through this application NBN indicated that service to the proposed subdivision will not be obtained via the existing network, although it is not known if some of the existing pit and pipe infrastructure on River Road may be able to be re-utilised.

3.4.2 NBN Provision for Proposed Subdivision

Based on conversations held with and information provided by NBN, there are no significant implications for the provision of NBN infrastructure for the proposed subdivision, with some backhaul required.

3.4.2.1 NBN Backhaul (Extension)

Information provided by NBN indicated that to service the proposed subdivision, approximately 2.2km of backhaul of a new cable would be required, from a point to the east on Gardiner Street, across Colin Knott Drive, along Old Narrandera Road, and into the subdivision, as shown in Figure 3 below. This is required as the subdivision requires a major distribution cable, and there is insufficient capacity in the existing ducts in Estella Rise to supply this subdivision.

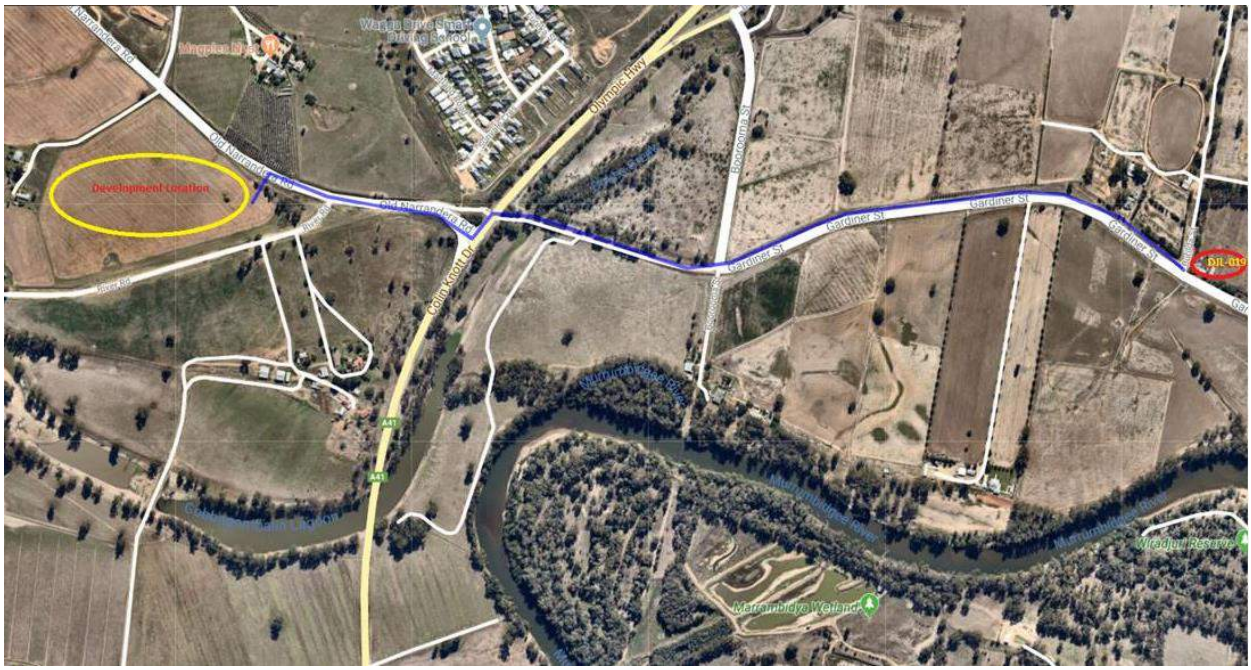


Figure 3: NBN backhaul required

The Federal Government policy outlines the backhaul charges payable by the developer. NBN provided an estimate of $13,000 as the developer's contribution for the above outlined backhaul. Information provided by NBN in relation to this is provided as Attachment 3.

3.4.2.2 Internal Subdivision Works

The internal subdivision telecommunications network will be subject to NBN requirements, and typically a third-party contractor will install pit and pipe infrastructure at full cost to the developer. The pit and pipe infrastructure needs to be designed and installed to comply with NBN's specifications.

In addition to these costs, NBN charges $600 (including GST) per lot for Single Dwelling Units (SDU's), payable by the developer.

Table 2 below shows approximate NBN charges for the proposed subdivision assuming all lots are SDU's and excluding the cost of pit and pipe infrastructure.

Table 2: NBN charges for the proposed subdivision excluding pit and pipe infrastructure

DESCRIPTION	QUANTITY	COST	PER LOT	TOTAL
Backhaul	1	$13,000	$17.34 (assuming 750 lots)	$13,000
Estate Charge	750 lots	$600/lot	$600	$450,000
TOTAL ESTIMATED COST:			**$617.34**	**$463,000**

3.5 SEWER

Wagga Wagga City Council has jurisdiction over the sewer drainage requirements for this subdivision.

Extensive discussions were held with Council staff regarding potential connection points for the subdivision and the capacity of the existing infrastructure. There are other significant developments proposed within the vicinity of this proposed subdivision, and as such consideration of capacity with respect to these other developments is required.

3.5.1 Existing Sewer Infrastructure and Capacity

An existing sewer pump station (SPS) is located within the subject land, toward the western end of the site. This is designated SPS29 by Council and is owned and maintained by Council.

SPS29 pumps to a 250mm line running along Old Narrandera Road and connects to a 315mm pipe near the intersection of Old Narrandera Road and Colin Knott Drive, downstream of SPS19.

Council advised that SPS29 was designed to service developments north of Old Narrandera Road, as well as development on this land. Council have advised that SPS29 has capacity for up to 400 Equivalent Tenements (ETs), or 400 residential blocks from this proposed development (south of Old Narrandera Road).

SPS19, located near the intersection of Old Narrandera Road and Colin Knott Drive, currently services a portion of Estella, north of Old Narrandera Road. SPS19 pumps to the same 315mm line as does SPS29. Council advised that SPS19 has a capacity for approximately 100-150 ETs from this proposed development.

The existing 315mm line drains toward the east and Council have indicated that is has a large capacity and will be able to service this proposed development.

Drawings showing the above-mentioned sewer infrastructure are provided as Attachment 4.

3.5.2 Sewer Infrastructure Requirements for the Proposed Subdivision

Discussions with Council indicated that there are no significant impediments to the provision of sewer drainage for the proposed subdivision.

3.5.2.1 Connection to Existing Council Infrastructure

As outlined above, SPS29 has capacity for an additional 400 ETs. As such, a large portion of the proposed development will likely drain to SPS29. Depending on the depth of the existing system and the site topography it may or may not be possible to send as many as 400 lots to SPS29. This would need to be determined in detailed design.

A further 100-150 lots may be directed to SPS19. To reduce the number of new pump stations being installed, it is preferable this is achieved via a gravity system. Again, the number of lots that can be drained to SPS19 will depend on the lot layouts and topography and is subject to detailed design.

Any remaining lots will drain via a gravity main system to a new pump station(s). This new pump station will be required to drain to the same existing 315mm line, and will not be able to connect to the 250mm line running parallel to Old Narrandera Road.

To reduce the number of new pump stations, it is preferable that only one new pump station is installed, however this may be subject to the topography of the site. The new pump station will be required to be above flood levels.

3.6 STORMWATER

Wagga Wagga City Council has jurisdiction over the stormwater drainage requirements for this subdivision.

3.6.1 Existing Stormwater Infrastructure, Watercourses and Flow Paths

The existing site is undeveloped and as such there is no significant stormwater infrastructure within the subject area including along River Road. The land generally falls toward the flood zone as shown in Figure 4 below. The proposed subdivision would be located outside of the flood zone.

There a number of road culverts under Old Narrandera Road draining upstream catchments into the subject land. One is located approximately 150m west of the intersection of Pine Gully Road, and the other further west near the western end of Barmedman Avenue. Council indicated the flows from these culverts have been restricted to pre-developed flow rates.

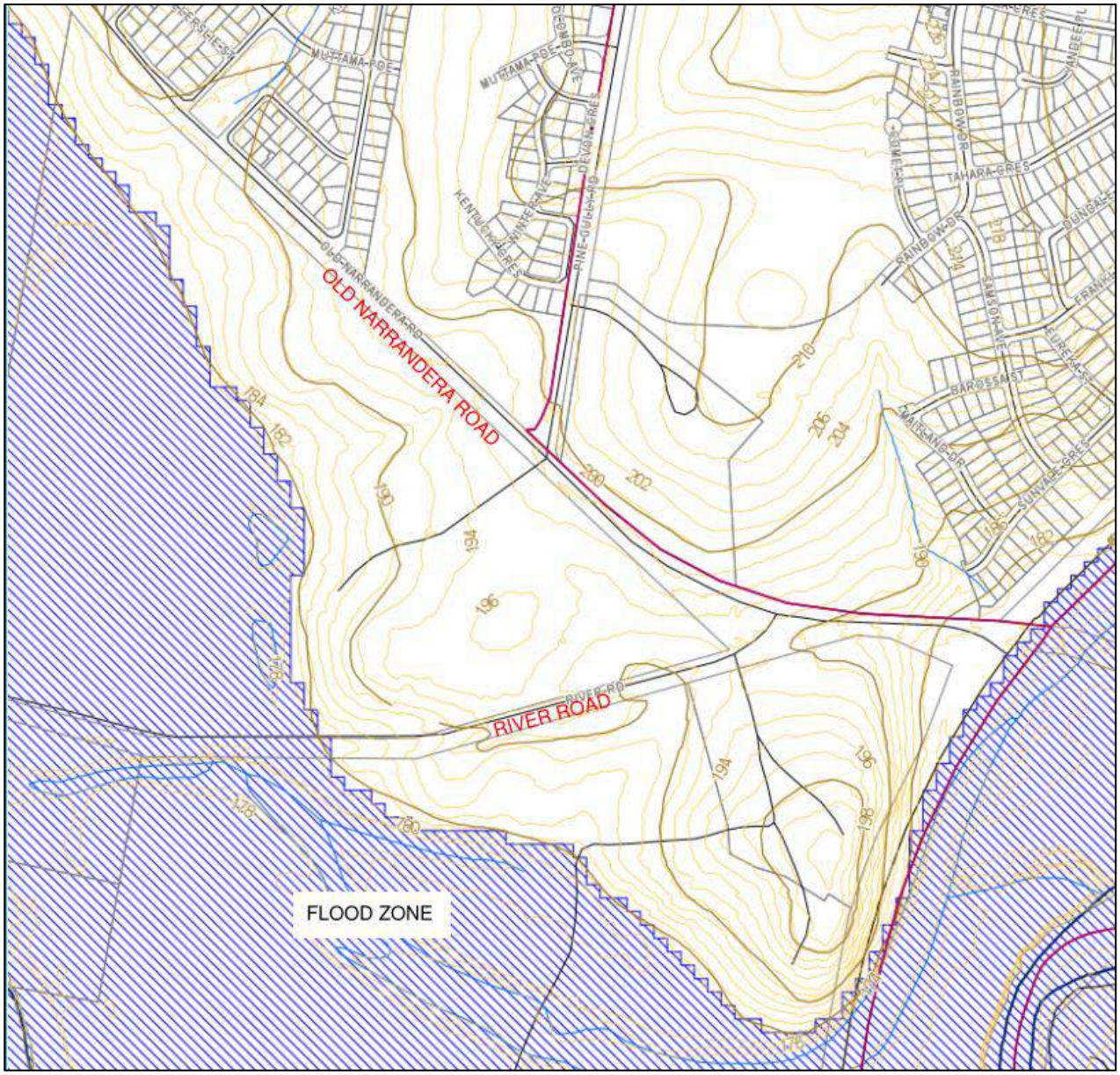


Figure 4: Site topography and flooding extents

The Gobbagombalin Lagoon extends from the southern side of the proposed development, under Colin Knott Drive and around to the east. The total catchment area draining to the Lagoon is substantial, and includes significant portions of the residential areas north of Old Narrandera Road, including areas of Estella.

3.6.2 Stormwater Management Requirements for the Proposed Subdivision

Direct discussions were held with Council with respect to the likely stormwater management requirements for this subdivision.

3.6.2.1 Council Requirements

Council will require that stormwater be managed and designed to cater for both upstream flows from culverts under Old Narrandera Road as well as flows generated within the subdivision itself.

From conversations held with Council's engineering department and as per Council's Engineering Guidelines, piped stormwater drainage will be required to be designed to cater for the 1 in 10-

year ARI (10% AEP) events. Overland flow paths will be required to be designed for the 1 in 100-year ARI (1% AEP) events.

To cater for the large flows, including flows from catchments north of Old Narrandera Road, trunk drainage lines and drainage corridors will need to be provided. These will consist of drainage lines running along road corridors, but potentially also through open space drainage corridors.

Council indicated that as this subdivision will discharge into natural watercourses and into the flood zone, no on-site detention is expected to be required. Gross Pollutant Traps (GPTs) will be required prior to discharging into the watercourses to meet water quality requirements. All discharge points will be required to be designed to minimize erosion and to discharge suitably into the watercourses.

3.6.2.2 Stormwater Management Opportunities

Within the design and implementation of stormwater management for this subdivision there are opportunities for Water Sensitive Urban Design (WSUD) and similar management strategies which provide environmental benefits as well as opportunities for visual embellishment and improvement in an urban environment.

Key objectives of WSUD include:

- Improving and protecting waterways and associated aquatic ecosystems
- Establishment of native vegetation in and around waterways
- Controlling erosion
- Reduce pollutant load from catchments
- Improve visual amenity
- Reduce maintenance costs
- Minimise risk of flooding to properties and other infrastructure
- Optimise service life of infrastructure

This particular subdivision offers opportunities for the implementation of some of these strategies through the potential utilisation of the Gobbagombalin Lagoon area, as well as within open space drainage corridors. Potential strategies that could be incorporated into these areas include the construction of vegetated swale drains and wetlands, design of bio-retention systems, detention basins and the like. These strategies would provide both environmental and visual benefits.

The Lagoon itself offers a unique opportunity for the establishment of an ecotourism area that incorporates elements of the WSUD strategies and establishment of native vegetation, as well as providing an area for recreational use. Due to the large catchment area draining to the Lagoon, and through the use of an existing water license attached to this land, the water level within the Lagoon can be controlled and managed to help achieve these objectives.

4 TRAFFIC IMPACTS AND REQUIREMENTS

Wagga Wagga City Council has jurisdiction over the road requirements for this subdivision.

4.1 EXISTING ROADS

The proposed subdivision is bordered by Old Narrandera Road along the northern side, and is split by River Road. Both roads are located within 30m wide corridors. Old Narrandera Road is the main road servicing areas west of Colin Knott Drive, including Pine Gully Road and Estella Rise, and also leads to Ganmain and Matong. The speed limit on Old Narrandera Road adjacent to the proposed development is 70-100km/h. Old Narrandera Road is a sealed, two-lane, two-way road, and River Road is an unsealed road.

4.1.1 Existing Traffic Data

Council provided traffic data from a 2017 count on each leg of the Pine Gully Road – Old Narrandera Road intersection (see Attachment 5). This data indicates that the majority of traffic comes from and heads toward the east on Old Narrandera Road and turns onto or leaves Pine Gully Road. A smaller proportion comes from or heads toward the west on Old Narrandera Road; therefore, the amount of through traffic on the major road (Old Narrandera Road) is small compared to the amount of turning traffic

No breakdown of peak hour movements was available, however estimates of about 10% during peak periods are reasonable

It is noted that the percent heavy vehicles on Old Narrandera Road is about 10% to the east of the intersection, 15% to the west, and about 9% along Pine Gully Road. These values are not insignificant and would need to be considered in the selection and design of intersection treatments.

It is also noted that further residential subdivisions are under development in the areas north of Old Narrandera Road, and increases in traffic movements can be expected.

4.2 POTENTIAL ROAD AND INTERSECTION REQUIREMENTS

4.2.1 Location of Proposed Access Road Intersection

Due to the inherent safety risks associated with all types of intersections, Council have indicated that access from the proposed subdivision is likely to be limited to one intersection. It should be noted that Estella Rise, the nearest subdivision north of Pine Gully Road, currently has no direct connection to Old Narrandera Road, with all access coming via Pine Gully Road.

In the existing state, River Road intersects Old Narrandera Road to the east of Pine Gully Road. As shown in Figure 1, current concept layouts propose that this intersection be closed, and a new intersection be provided near the Pine Gully Road intersection.

Moving this intersection away from Colin Knott Drive likely improves safety and performance of both intersections, and is considered beneficial in this regard. The interaction between the subdivision access road and Pine Gully Road and the intersection treatment required still needs to be considered.

4.2.2 Traffic Generation from Subdivision

Preliminary estimates on the traffic volumes generated from the proposed development can be made based on the number of lots and expected use of the land.

The Roads and Maritimes Services (RMS) *Guide to Traffic Generating Developments (version 2.2)* (2002) outlines possible generation rates for a variety of development types, and is

commonly used for estimating traffic volume generation for new developments. The document also highlights that there are a number of variables that can impact the amount of traffic generated by a development, including available public transport, and the proximity of shops, businesses and recreational areas, amongst other factors. The RMS released a Technical Direction in 2013 (TDT 2013/04a) which provides updated generation rates.

The proposed development is a residential subdivision of approximately 750 lots. At this stage, it is unlikely that shops and businesses will be located within the subdivision. As such, the majority of traffic generated is expected to leave the subdivision and will therefore be entering onto Old Narrandera Road. It is also noted that a recreational area around the Gobbagombalin Lagoon is proposed, which may attract some additional traffic.

For standard residential dwellings in a regional area, daily traffic volumes are estimated at about 7.4 vehicles per day per dwelling, with approximately 10% occurring in the commuter peak periods.

For 750 lots, this would result in a total of 5,550 movements per day, and about 555 vehicles per hour in peak periods. This would be a substantial increase in the amount of traffic accessing Old Narrandera Road. It is noted that all traffic associated with this subdivision will be utilising the proposed access road intersection.

4.2.3 Possible Intersection Treatments

Due to the high number of vehicles turning at this intersection, either into this subdivision or onto Pine Gully Road, the selection of intersection treatment cannot simply be based on typical treatment warrants or traffic volumes. Rather, a performance and safety analysis will need to be undertaken in the detailed design phase. Below is a high-level discussion on potential treatments.

As outlined in Section 2.3 of Austroads *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings,* the selection of intersection treatments must take into consideration a variety of factors. Key considerations for the intersection selection are;

- It must be safe for all road users
- It must provide adequate capacity and level of service (LOS) for the volume of vehicles utilising it; that is, it should not cause excessive delays and queue lengths, and have capacity to cope with peak hour volumes, and
- It must be practically and financially feasible in the available space, both in terms of road reserve space, topography, impacts on existing services, amongst other factors.

The treatment selected must accommodate traffic movements associated with the subdivision itself, as well as existing traffic on Pine Gully and Old Narrandera Roads, including heavy and articulated vehicles.

Placing the subdivision access road near to the Pine Gully Road intersection will likely require one of two potential intersection treatments; a staggered (or offset) T-intersection, or a roundabout.

4.2.3.1 Roundabout

In terms of safety, a roundabout is generally preferred to a T-intersection as it forces a reduction in speed, reduces angles of impact, and priority between vehicles is clearer. However, roundabouts can be costly to install, may require additional land acquisition, can be difficult to negotiate for cyclists and pedestrians, and can result in higher delays if there is a large imbalance in the volume of traffic movements. Due to the fact the majority of traffic during peak morning periods will be turning right on to Pine Gully Road, a roundabout could result in long delays for vehicles trying to exit the proposed subdivision and turn right onto Old Narrandera Road, as vehicles will tend to give way to their right. This is discussed further in Section 4.2.3.3.

4.2.3.2 Staggered T-intersections

There are two-configurations for staggered T-intersections:

- Left-right, where vehicles turn left onto the main road and then turn right onto opposite leg of the intersection (the new access road would be located to the east of Pine Gully Road), and
- Right-left, where vehicles turn right onto the main road and then turn left onto the opposite leg of the intersection (the new access road would be located to the west of Pine Gully Road).

The separation between the intersecting minor road legs needs to be large enough to essentially allow the traffic movements to occur independently of each other.

Staggered T-intersections are generally preferred to a four-leg cross intersection as they prevent vehicles crossing the main road at higher speeds, which frequently results in accidents. However, they do not generally provide the same levels of safety as a roundabout because vehicles are still required to cross or merge with traffic travelling at higher speeds, and long delays can result if there is little break in the main road traffic. They are not necessarily appropriate if the majority of traffic from the minor roads is attempting to enter the main road, rather than attempting to cross the main road onto the opposing minor road leg.

Staggered T-intersections often require lower installation costs and are possibly more likely to fit within existing road reserves when compared to roundabouts, although this is not always the case. As through traffic on the main road is not forced to slow down as it is with a roundabout, auxiliary lanes for traffic turning right or left from the main road would likely be required to reduce the occurrences of rear-end collisions. These turning lanes often require lengthy pavement widenings and potentially substantial amounts of street lighting. Depending on the configuration, providing turning lanes can require very wide sections of pavement and subsequent land acquisition to widen the road reserve.

4.2.3.3 Selection of Appropriate Treatment

Based on current traffic movements and with the addition of traffic generated by the proposed subdivision, during the evening peak, the majority of traffic movements are expected to be as follows:

- From Old Narrandera Road: turning left into the subdivision or right on to Pine Gully Road (motorists returning home)
- From Pine Gully Road: turning left on to Old Narrandera Road (going into Wagga)
- From the proposed subdivision: few movements expected

Either a roundabout or staggered T-intersections could perform reasonably for evening peak as the major traffic movements would be relatively uninhibited.

In the morning peak periods, the major traffic movements are expected to be as follows:

- From Old Narrandera Road: turning right on to Pine Gully Road (going to the university)
- From Pine Gully Road: turning left on to Old Narrandera Road (going into Wagga)
- From the proposed subdivision: turning right on to Old Narrandera Road (going into Wagga)

In this situation, provision of a roundabout or left-right staggered T-intersections could potentially result in long delays for vehicles trying to exit the proposed subdivision due to the high volume of traffic on Old Narrandera Road turning onto Pine Gully Road.

To reduce delays for the morning peak, a potential solution could be to utilise right-left staggered T-intersections, with the new access road located to the west of Pine Gully Road. This would allow vehicles to exit the new subdivision onto Old Narrandera Road more freely as traffic movements heading west past Pine Gully Road are less frequent. However, this may result in increased delays for vehicles turning in or out of Pine Gully Road, and does not account for increases in traffic movements to or from the west of Pine Gully Road.

Subject to detailed analysis, a signalised intersection may also be appropriate.

The final choice of intersection treatment needs to take into account the specific requirements and conditions, future development around the area and subsequent increases in traffic movements, and so on. Detailed information and analysis will be required, however at this stage, there is potential for the use of either a roundabout or staggered T-intersections.

4.2.4 Internal Subdivision Roads

Internal subdivision road and corridor widths would be subject to detailed estimates of the likely traffic volumes for each road, and whether it is a cul-de-sac, local road, collector road or sub-arterial road. This would depend largely on the subdivision layout. Roads in an urban subdivision will be required to be sealed and will require kerb and gutter.

All roads would be required to be designed in accordance with Council's Engineering and Austroads Guidelines. Geotechnical investigation and pavement design would be required for any proposed roadworks, at full cost to the developer.

4.3 POTENTIAL FUTURE ROAD CHANGES AND UPGRADES

Within the vicinity of the proposed subdivision intersection, there are possible changes and upgrades to the road and traffic conditions that may occur in the future that are essentially independent of this development, but will need to be considered in the selection of intersection treatment. These include;

- Upgrade of the intersection of Colin Knott Drive and Old Narrandera Road
- Upgrade of Pine Gully Road
- Future residential development west of Pine Gully Road, nearer the intersection of Harris Road and Old Narrandera Road, with the possibility of a new intersection onto Old Narrandera Road and subsequent increase in traffic west of Pine Gully Road

Whilst further information on these potential changes is not available, during detailed design these may need to be considered to ensure the selected treatment is suitable.

5 CONCLUSION

5.1 SERVICES

Investigation into the various services has shown that there are not expected to be any significant impediments to servicing the proposed subdivision, and that all services can feasibly be extended to the site if required.

To confirm these details, a subdivision layout would need to be developed. With a layout the relevant service authority and/or designers will be able to develop detailed designs, and more accurate costs can be obtained.

5.2 STORMWATER MANAGEMENT

A number of opportunities exist for stormwater management, both by the implementation of WSUD measures as well as the potential use of the Gobba Lagoon as a recreational, ecotourism facility. There are no expected limitations with regard to stormwater management for this subdivision.

5.3 TRAFFIC

There are a number of potential intersection treatment options to cater for the proposed traffic, including the potential for a staggered T-intersection treatment. This is not expected to have a significant impact on the proposed subdivision.

ATTACHMENTS

ATTACHMENT 1: ESSENTIAL ENERGY ELECTRICAL INFRASTRUCTURE PLAN

ATTACHMENT 2A: GAS TRANSMISSION LINE PLAN

ATTACHMENT 2B: APPROXIMATE GAS AUGMENTATION AND MAIN EXTENSION

ATTACHMENT 3: NBN BACKHAUL INFORMATION

ATTACHMENT 4: RISING SEWER MAIN PLAN

ATTACHMENT 5: TRAFFIC COUNT DATA (2017)

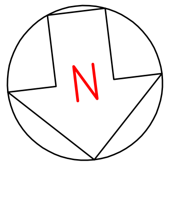

DP 1225666
DP 751402
DP 1213055
DP 751407
DP 1209232
DP 1221374
DP 1128321
DP 590325
DP 1106511
DP 1206757
DP 707812
DP 740088
DP 751422
DP 740219
11kV UG
11kV Overhead
33kV and 11 kV
RIVER RD
OLD NARRANDERA RD
COLIN KNOTT DR
GARDINER ST
HARRIS RD
71-F15219
71-FL3637
71-F3703
71-80193
71-101845
71-80146
71-F15216
71-F966
71-G4355
Old Narrandera Road
71-L14540
71-22276
71-5414
71-4953
71-L14547
71-L2876
71-A1724
71-F767
71-80155
71-F766
71-F15210
71-G3509
Gardiner St
71-G16987
71-F2553
71-F2465
71-2857
71-FL1190
71-F1079
71-3033
71-L3510
71-L14361
71-L10844
71-F4797
71-FL10606
71-3491
PT137
PT1
66kV
N
0km 0.09km 0.18km 0.27km 0.36km

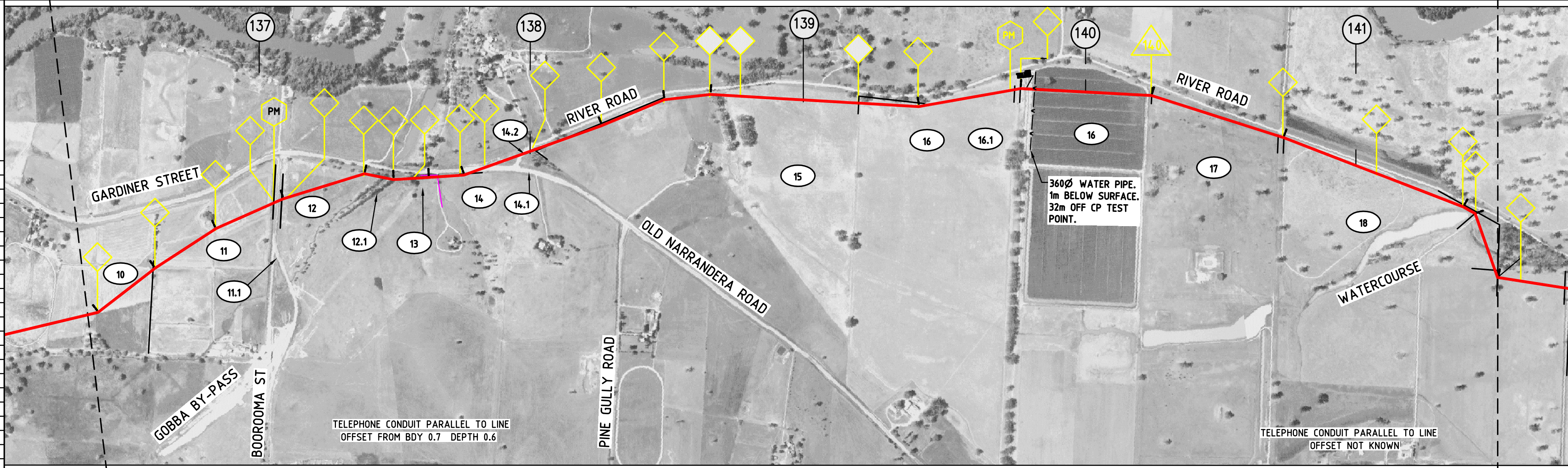
PARISH	NORTH WAGGA WAGGA	GOBBAGOMBALIN
COUNTY	CLARENDON	CLARENDON
MUNICIPALITY	CITY OF WAGGA WAGGA	CITY OF WAGGA WAGGA

FILE NUMBER	LANDHOLDER	DESCRIPTION
2/10/WGA 10	DENNIS & JOANNE HOWE	60/751422
2/10/WGA 11.1 BOOROOMA STREET		
2/10/WGA 11	Mr J & Mrs T HAZELMAN (JEFFREY & TRACEY)	7/855252
2/10/WGA 12.1 DUKES CREEK		
2/10/WGA 12	THE COUNCIL OF THE CITY OF WAGGA WAGGA	1/707812
2/10/WGA 13 GOBBA BYPASS		2/707812
2/10/WGA 14.1 OLD NARRANDERA RD		
2/10/WGA 14	GRACELANDS ESTATE	22/1070915
2/10/WGA 14.2 RIVER ROAD		
2/10/WGA 15	STEPHAINE DAY	515/1106511
2/10/WGA 16	Mr RJ DENNIS (ROD)	1/590305
2/10/WGA 16.1 ROAD RESERVE		
2/10/WGA 16	Mr RJ DENNIS (ROD)	137/751407
2/10/WGA 17	Mr SJ & Mrs VN SHAW (STEVE & VICKI)	136/751407
2/10/WGA 17.1 ROAD RESERVE		
2/10/WGA 18	SCOTT & KATHRYN ROBERTSON	1/1109914
2/10/LGA 18A	DUNCARTIN HOLDINGS	2/1109914

EASEMENT PLAN & SURVEY MARKS

SM 24/0, SM 25/0, SM26/0, SM26/1, SM27/0, SM28/0, SM 29/1, SM 30/0, SM 33/0, SM 34/0, SM 35/0, SM 35/1, SM 35/2, SM36/0, SM36/1, SM 37/0, SM 38/0, SM38/1, SM 39/0, SM 39/1, SM 40/0, SM 41/0, SM 41/1





REFERENCE DRAWINGS	DRG. NO.
AERIAL PHOTO No.	WWW2.TIF
VEGETATION	PASTURE — LOCATION CLASS R2 — LOCATION CLASS R2
TERRAIN	FLOOD PLAIN — GENTLE HILLS — FLOOD PLAIN
LAND USAGE	LIVE-STOCK GRAZING & CROPPING

HORIZONTAL ALIGNMENT

PIPE CHAINAGE FROM YOUNG SCRAPER STATION	ITEM OF DETAIL
136301.82	
136336.29	LB 24°18'24/0
136589.83	FENCE RB 4°42'25/0
136845.91	FENCE RB 9°09'26/0
136846.50	NBN BROADBAND XING 600mm OFF FENCE
137050.17	
137138.45 (137139)	63mm CONDUIT
137403.77	RB 28°25'28/0
137407.28	
137535.69	
137636.06	
137743.15	
APPROX 137763	T/PHONE CONDUIT
137880.22	
137938.12	
138037.52	
APPROX 138115.0	T/PHONE CONDUIT
138116.18	FENCE
138274.37	LB 2°48'33/0
138511.11	RB 16°00'30"34/0
138648.58	
138675.03	RB 9°52'35/0
139198.31	FENCE
	63mm CONDUIT
139410.79	LB 13°23'36/0
139760.23	
139848.14	
13985.0	360Ø WATER PIPE
140236.19	RB 14°39'38/0
	FENCE
140680.47	
140750.98	
141076.46	
141402.06	RB 7°53'40/0
141451.32	RB 41°42'41/1
141516.36	
141651.06	
141613.24	TRACK XING
141650.00	FENCE
141663.47	
141690.28	LB 61°45'42/0
141691.00	FENCE

MATERIAL AND PIPE DATA

COVER / PIPE LENGTH / PIPE TYPE / COATINGS / SPECIAL CONSTRUCTION DRAWINGS — NOT TO SCALE

COVER	PIPE LENGTH	PIPE TYPE	COATINGS	SPECIAL CONSTRUCTION DRAWINGS
				ADJOINS DRG YW80-1021
1.2m	748.4m	3	RJ	
				YW81-1107 CROSSING — REFER BORED ROAD
1.2m	268.8m	3	RJ	
				YW81-1108 CROSSING — REFER OPEN CUT CREEK
				YW81-1109 CROSSING — REFER BORED ROAD
1.5	107.1m	3	YJ	
				YW81-1110 CROSSING — REFER OPEN CUT ROAD
1.5	57.9m	3	YJ	
				YW81-1111 CROSSING — REFER OPEN CUT ROAD
1.5m	611.1m	3	YJ	
				END MARKER TAPE
1.5m	1111.6m	2	YJ	
				YW81-1112 RESERVE CROSSING — REFER OPEN CUT ROAD
1.5m	832.3m	2	YJ	
				YW81-1113 RESERVE CROSSING — REFER OPEN CUT ROAD
1.2m	765.4m	2	YJ	
				YW81-1114 WATER CROSSING — REFER OPEN CUT
1.2m	39.9m	2	YJ	
				ADJOINS DRG YW80-1023

DETAIL SKETCHES

SPECIFICATION FOR 450 NB STEEL PIPELINE

PIPE: 457mm OD x 6.8mm, 8.1mm and 9.7mm WT MANUFACTURED TO API STANDARD 5L GRADE X70 CONTRACT No.

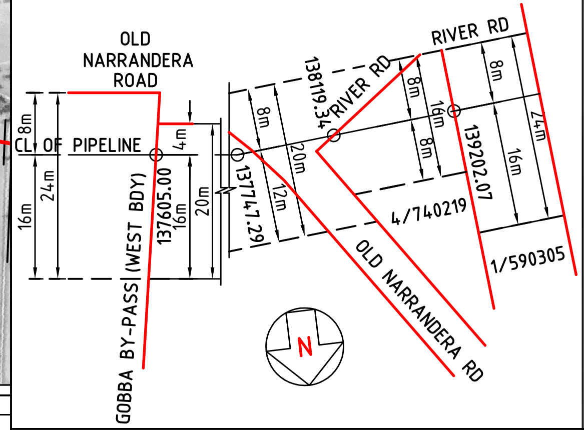
COATINGS:
- YJ: EXTRUDED POLYETHELENE 1.2mm THICK WITH HEAT SHRINK SLEEVES APPLIED AT JOINTS TO BE HIGH TEMPERATURE TYPE
- RJ: "ROCKJACKET" 25 NB THICK OVER YJ
- WC: REINFORCED CONCRETE 45 NB THICK OVER YJ
- FBE: FUSION BONDED EPOXY
- DYJ: DOUBLE COAT YJ
- SC: SMOOTH CONCRETE 25 NB THICK OVER DYJ

FIELD WELDING AND BENDS: AS 2885.2 – 1995

HYDROSTATIC TESTING: AS 2885 – 1997 AND AS 1978 – 1987 REFER TO QUALITY RECORD DOCUMENTATION MANUALS

PLACEMENT OF PIPELINES WITHIN EASEMENT

N.T.S.



LEGEND

- LB 25° 30' — LEFT HAND HORIZONTAL BEND IN DIRECTION OF PROGRESSIVE HORIZONTAL DISTANCE
- RB 25° 30' — RIGHT HAND HORIZONTAL BEND IN DIRECTION OF PROGRESSIVE HORIZONTAL DISTANCE
- △ AERIAL MARKER
- ◇ PIPELINE MARKER
- ⬡ C.P. TEST POINT & TYPE
- C P — C.P. GROUND BED
- TEMPORARY BENCH MARK (T.B.M.)
- PERMANENT MARK (P.M.)
- LINE VALVE STATION
- BRANCH CONNECTION (FUTURE OFFTAKE)
- (5) KILOMETRES FROM DATUM
- TRENCH BARRIER
- (1) LIGHT WALL PIPE (457mm O.D. x 6.8mm W.T. – 5L X70)
- (2) MEDIUM WALL PIPE (457mm O.D. x 8.1mm W.T. – 5L X70)
- (3) HEAVY WALL PIPE (457mm O.D. x 9.7mm W.T. – 5L X70)
- TOP / BOTTOM
- CASING PADDING
- CONCRETE SLAB
- (15) PROPERTY LINE & No.

AS BUILT DRAWING

200 0 200 400 600 800 1000

SCALE OF METRES

NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN
2. ALL PIPE CHAINAGES ARE HORIZONTAL CHAINAGES
3. DATUM FOR LEVELS A.H.D.
4. MARKER TAPE (EXCEPT AT DRILLS/BORES) APPROX. 500mm BELOW SURFACE
5. TEST POINTS TO BE INSTALLED DIRECTLY OVER THE PIPELINE.
6. CO-ORDINATES SYSTEM - ISG.

SYM	DATE	REVISION	DES	DRN	CHK	APP'D
0	1.08.97	ISSUE		GWN	RLD	M.McD
1	18.09.97	GENERAL REVISION		GWN	GW	M.McD
A	13.08.98	AS BUILT	GW	SJS	MMcD	WEH
B	28.2.02	UPDATES ADDED		ML		
C	23.10.03	UPDATES ADDED		ML		
D	14.12.07	LAND OWNERS UPDATED, CONDUIT ADDED		SS		
E	16.1.2012	NBN BROADBAND CROSSING ADDED		SS		
F	24.4.2012	360Ø WATER PIPE CROSSING ADDED-13985		SS		

East Australian Pipeline Limited
ACN 064 629 009

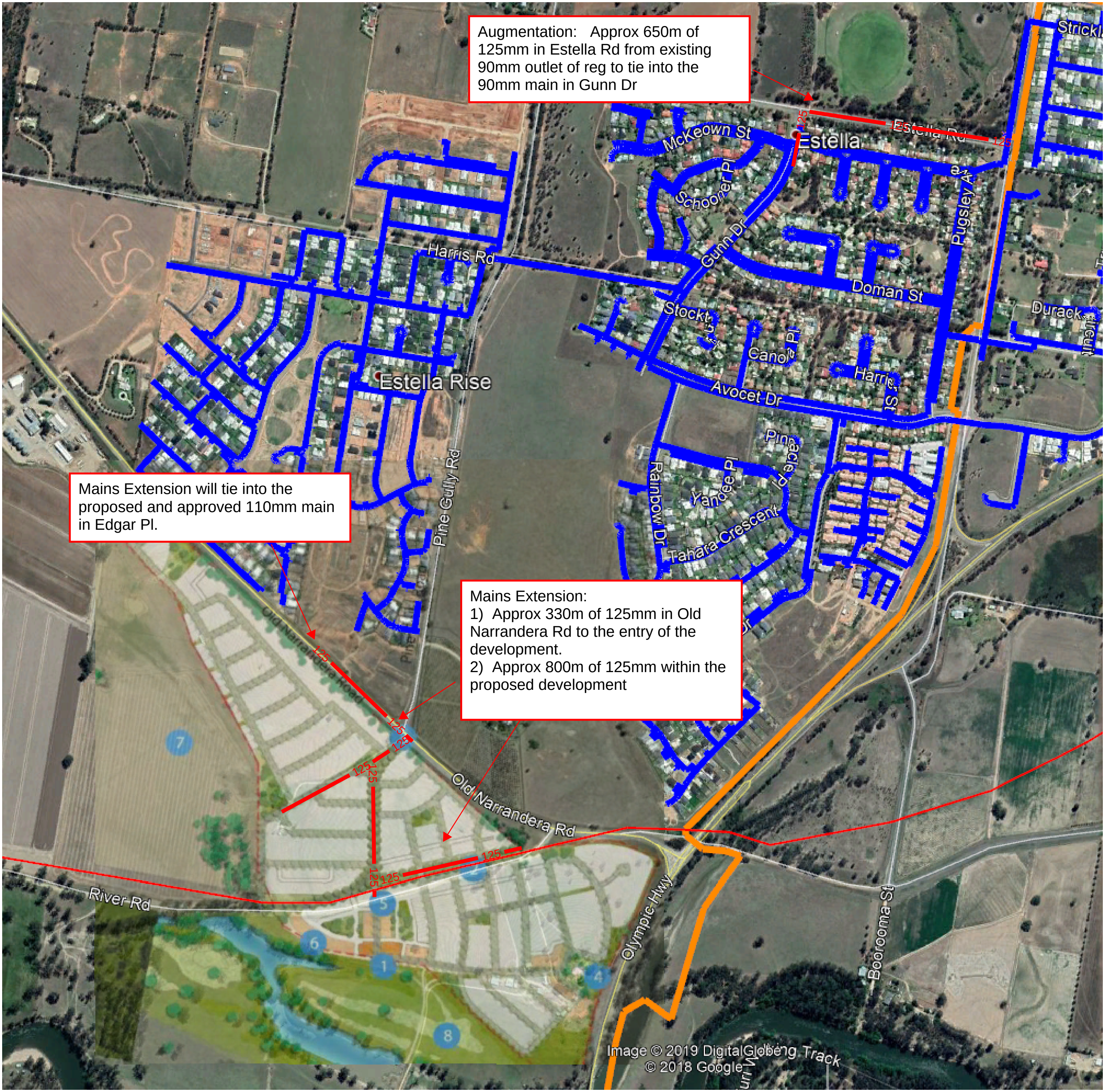
DESIGNED		DATE	
DRAWN	GWN & SD	DATE	30/7/97
CHECKED	G.WITTY	DATE	1/8/97
APPROVED	M.McDERMOTT	DATE	1/8/97

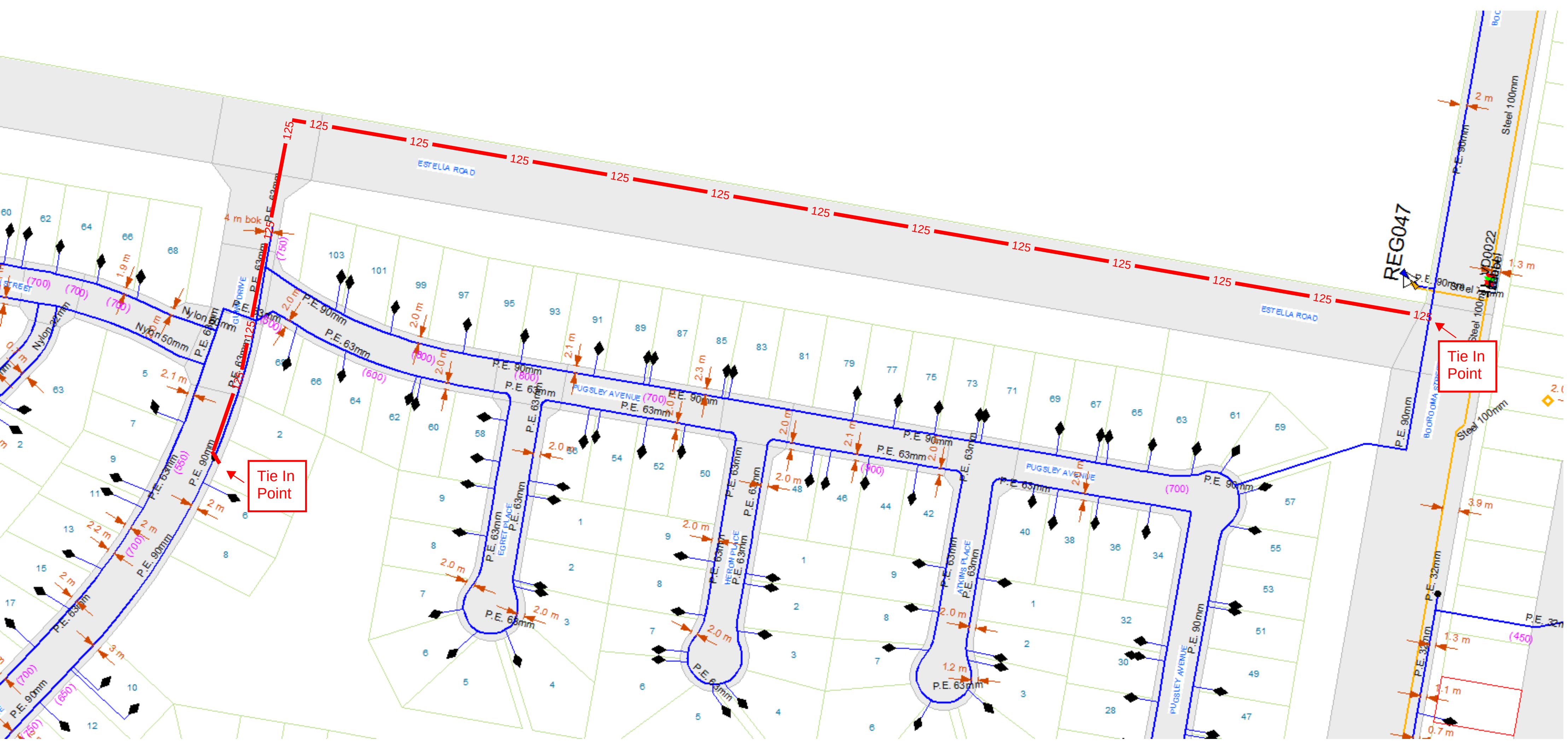
WODONGA WAGGA WAGGA NATURAL GAS PIPELINE

ALIGNMENT PLAN
Km 136.3 TO Km 141.7

SHEET 2 OF 30

SITE	SCALE	DRAWING NUMBER	REVISION	SIZE
	NTS	YW80-1022	F	A1


Augmentation: Approx 650m of 125mm in Estella Rd from existing 90mm outlet of reg to tie into the 90mm main in Gunn Dr
Mains Extension will tie into the proposed and approved 110mm main in Edgar Pl.
Mains Extension:
1) Approx 330m of 125mm in Old Narrandera Rd to the entry of the development.
2) Approx 800m of 125mm within the proposed development
Estella
Estella Rise
McKeown St
Estella Rd
Schooner Pl
Gunn Dr
Pugsley Av
Harris Rd
Doman St
Durack
Stockton
Avocet Dr
Pine Gully Rd
Rainbow Dr
Yandee Pl
Tahara Crescent
Old Narrandera Rd
Olympic Hwy
River Rd
Booroomba St
Image © 2019 DigitalGlobe
© 2018 Google
125



ESTELLA ROAD
PUGSLEY AVENUE
EGRET PLACE
HERON PLACE
ATKINS PLACE
GUNN DRIVE
BOOROOMA STREET
REG047
Tie In Point
Tie In Point
125
P.E. 90mm
P.E. 63mm
Nylon 50mm
Steel 100mm
P.E. 32mm

Saxon Xeros

From: Kareena Prado <kareenaprado@nbnco.com.au>
Sent: Friday, 5 July 2019 3:39 PM
To: Saxon Xeros
Subject: NBNCo Backhaul quote for Proposed Subdivision, Gobbagombalin (Development ref AYCA-4RYM2E) - 170685 [nbn-Confidential:Commercial]

nbn-Confidential: Commercial

Hello Saxon,

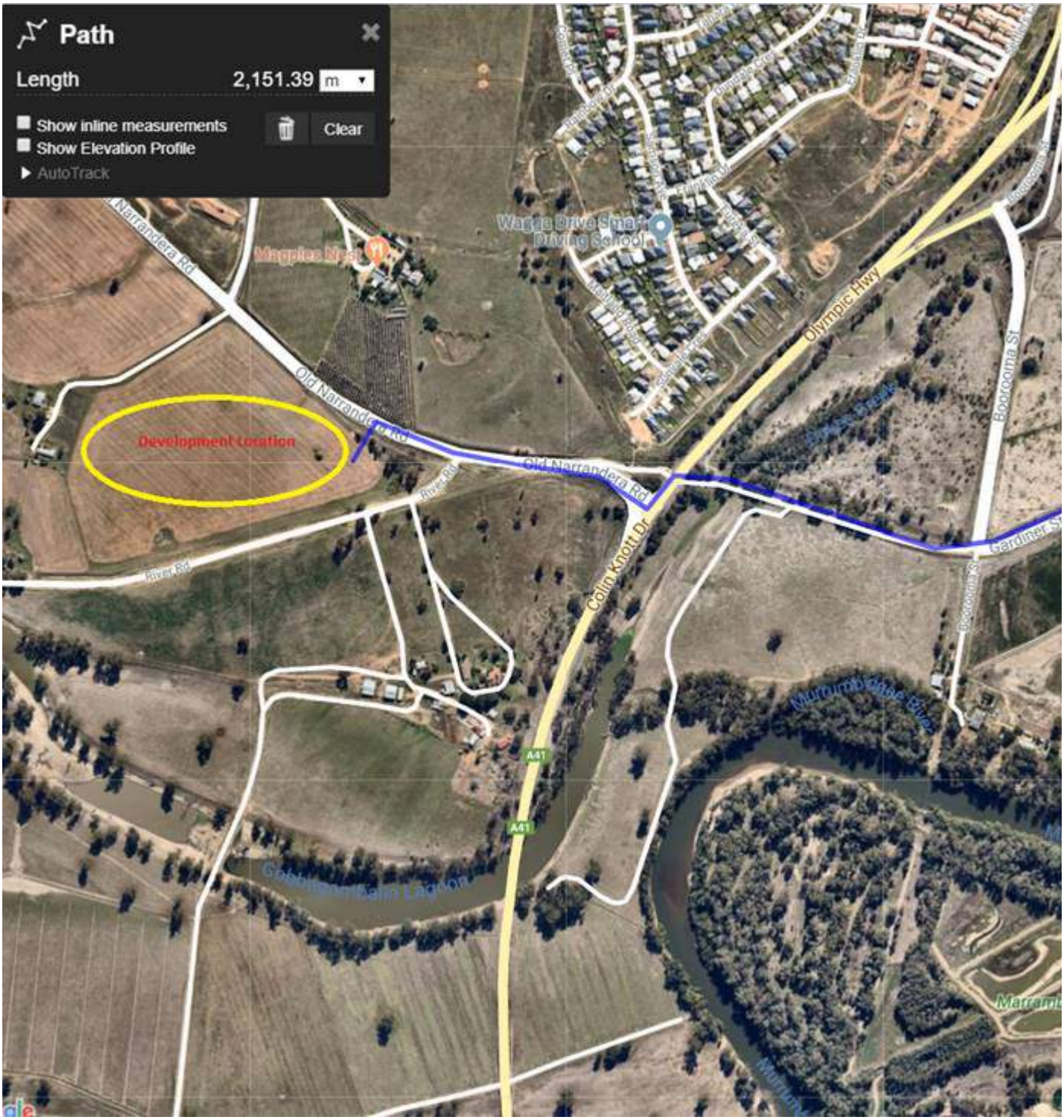
Feasibility result for Proposed Subdivision, Gobbagombalin

Thank you for considering nbn for the delivery of FTTP network infrastructure to your development.
We have carefully reviewed your development and undertaken a feasibility assessment to estimate the anticipated costs you may be required to pay when connecting to the **nbn** network.
The purpose of this estimate is to provide you with early planning information and indicative costs to consider before applying for **nbn** network infrastructure via the online application form.

Based on the information you have provided on the location and size of your development we have calculated the below estimate.
All prices shown include GST.

DEPLOYMENT CONTRIBUTIONS
SDU $600 x 750 lots/premises = $450,000.00

BACKHAUL ESTIMATE
Distance of backhaul required = 2. Kms
Backhaul Cost = $13,000.00
Backhaul Cost per premises = $34.67



Explanation of Costs
Backhaul charges apply to the distance of infrastructure required to connect the development to the **nbn** access infrastructure.
For new developments where there is no existing **nbn** access infrastructure (i.e. Fibre Access Node) charges will apply for this installation.

It is important to note that this is an estimate only.
The estimate has been calculated on current infrastructure costs, the distance of your development from the existing **nbn** network and is based on the premise count and the location of the first stage that will require service.

Actual amounts charged by nbn may change between now and the point when you ultimately enter into a contract for nbn to connect your development.

For example, costs may reduce over time as additional network is rolled out. Conversely, costs may increase if the details, premise count or staging of your development changes.
In any case, a new estimate will be provided prior to work commencing.

Once you have reviewed the above estimate please contact me to discuss the next steps.

I look forward to working with you to deliver quality broadband services to your development.

Kind regards,
Kareena Prado
Business Development Manager, NSW/ACT | New Developments, Business Entreprise & Government
|M +61 4 2853 7208 | **E** kareenaprado@nbnco.com.au

Visit our New Developments site: www.nbn.com.au/newdevelopments
Remember to submit all Pre-Construct and As-Built designs for review via the new upload tools.
For all existing application updates please use the tracker

business nbn™

From: David Da Silva <daviddasilva@nbnco.com.au>
Sent: Friday, 5 July 2019 12:26 PM
To: 'Saxon Xeros' <saxon@xerospiccolo.com.au>; Kareena Prado <kareenaprado@nbnco.com.au>
Cc: Kristine Lam <KristineLam@nbnco.com.au>
Subject: RE: NBNCo Backhaul quote for Proposed Subdivision, Gobbagombalin (Development ref AYCA-4RYM2E) [nbn-Confidential:Commercial] - 170685

Hi Saxon,

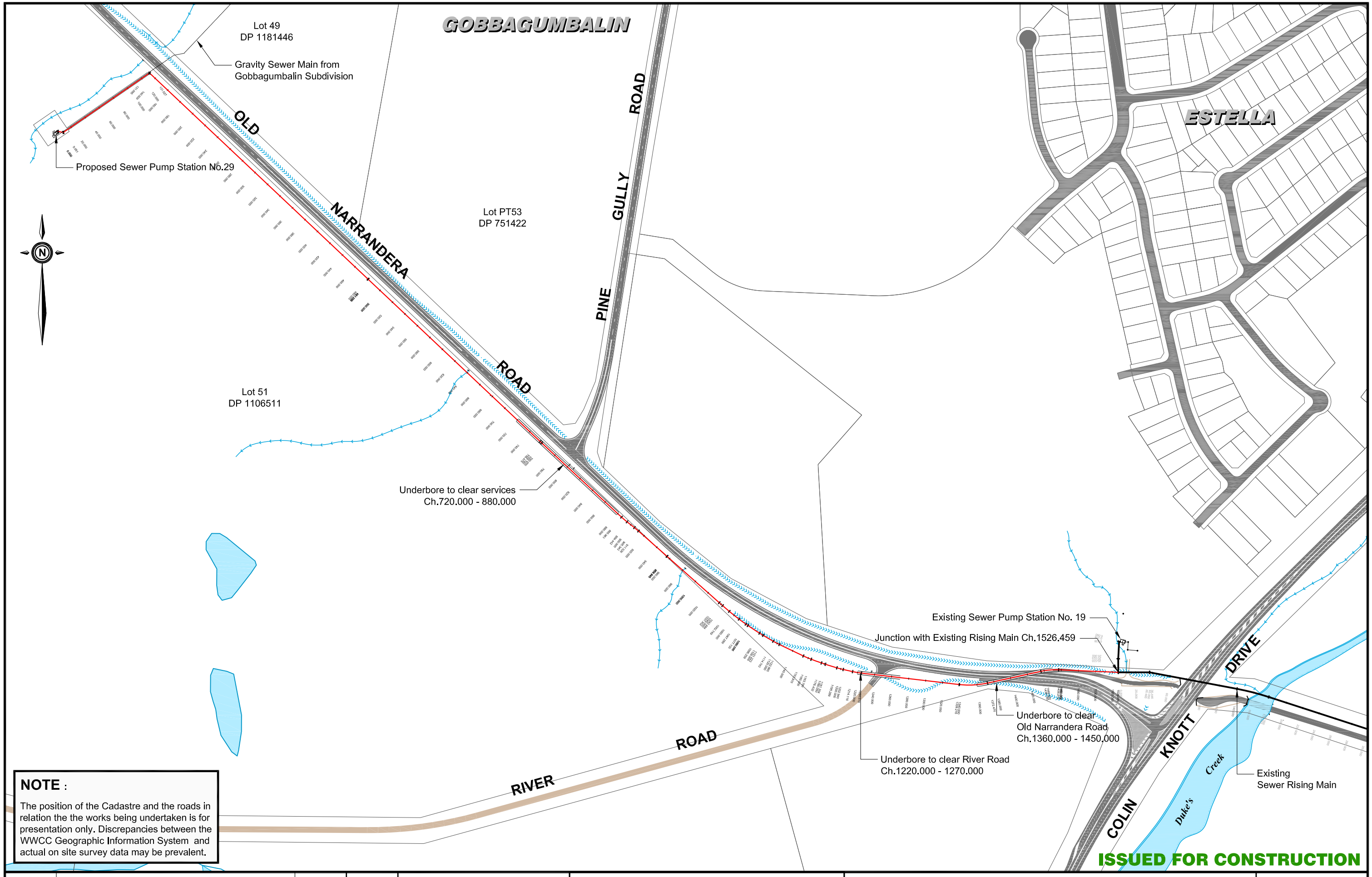
Thank you for the update. Based on the increase in potential premises and change to the site entry it's definitely worth reviewing the required developer backhaul contribution as it will likely be different.

Due to some changes in how nbnco manages developments and agreements I now only directly look after applications ***post*** agreement acceptance, up until the site is live. To that end I've requested your Business Development Manager, Kareena Prado lodge a fresh feasibility request with our planning team. From there they'll be able to more accurately answer your questions around the network access points and so on.

Hi Kareena,

As discussed could you please urgently follow this up with the planning team, noting the updated estate entry? As per Saxon's email it's important to have the info sometime next week ahead of the submission of the data to the developer on the 17th. Could you also confirm with Saxon if there's anything else you require for the feasibility study? Thanks in advance. The previous report is already in the system under Opp-ID AYCA-4RYM2E.

Regards,
David Da Silva
Relationship manager NSW Enterprise | nbn New Developments
M +61 428 026 167 | **E** daviddasilva@nbnco.com.au
100 Arthur St, North Sydney NSW 2060



NOTE :

The position of the Cadastre and the roads in relation the the works being undertaken is for presentation only. Discrepancies between the WWCC Geographic Information System and actual on site survey data may be prevalent.

ISSUED FOR CONSTRUCTION

REVISION	AMENDMENT :	ISSUED
A	Issued for Construction	3.7.2017

SCALE : A3 PLAN 1:1250 0 5 10 20 30 40 50 METRES

CO ORDS :	DESIGNED :	DATE :
MGA	Z. Wrobel	14.4.2014
DATUM :	DRAWN :	DATE :
AHD	G. Day	17.4.2014

Wagga Wagga Infrastructure Services
Infrastructure Planning & Design

PROJECT : ESTELLA WEST SEWER PUMP STATION No. 29

PROPOSED LOCATION FOR PUMP STATION & SEWER RISING MAIN

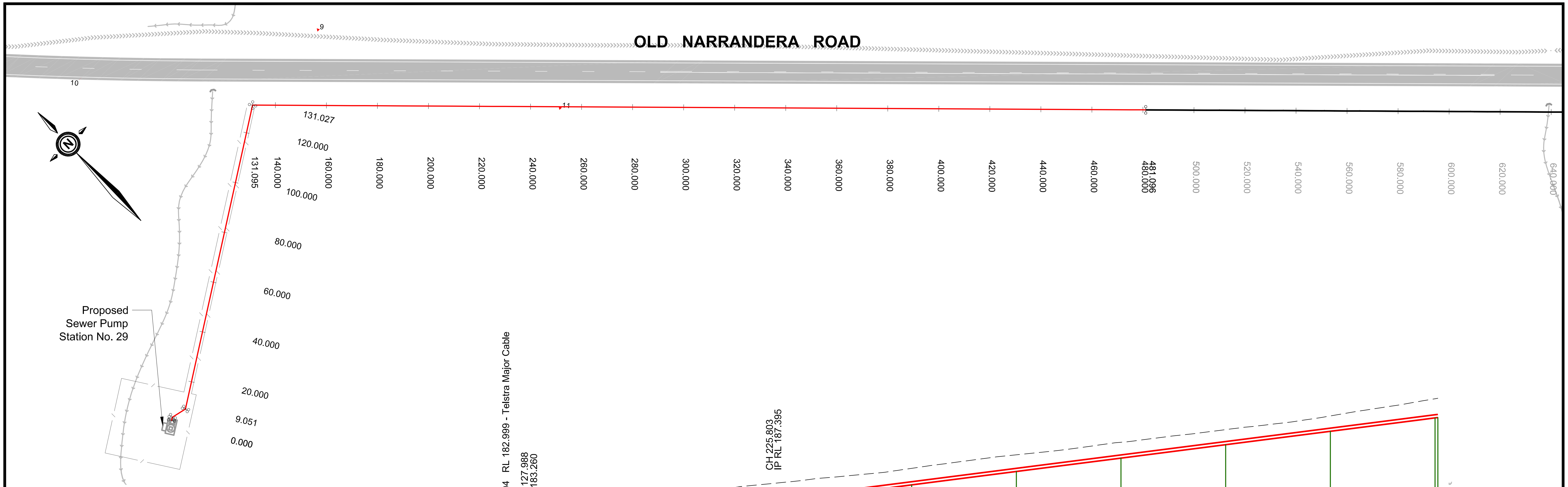
PUMP STATION LAYOUT AND RISING MAIN POSITION

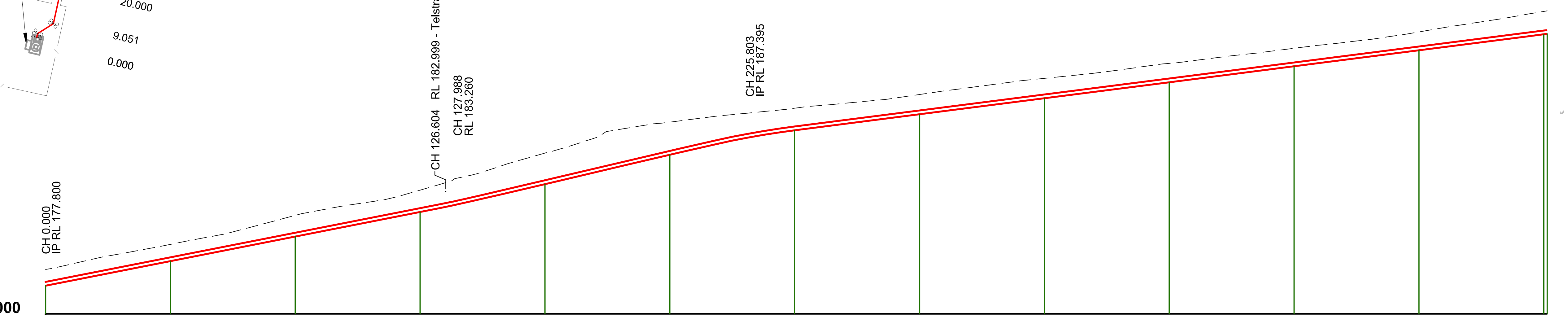
PLAN REGISTRATION: J401003

SHEET NUMBER: ISSUE : A

Y:\DESIGN PROJECTS\EstellaWest SPS29\acad\ESTELLA WEST PS29 - PRESENTATION DRAWINGS\ISSUE A - ESTELLA WEST SPS29 (Issued for Construction).dwg

43 of 7





DATUM 176.000

PIPE CLASS: 250mmØ PE Rising Main

PIPE LENGTH: 481.096m (shown) [1200m Total Length to junction with PS 19]

GRADIENT: G=3.94% L=127.07M | L | G=4.69% L=73.74M | L=30.00M | G=2.56% L=240.29M

CHAINAGE	EXISTING LEVEL	PROPOSED LEVEL	DEPTH TO INVERT
0.000	178.837	177.800	1.037
20.000	179.703	178.587	
40.000	180.448	179.375	1.073
60.000	181.244	180.162	
80.000	182.306	180.950	1.356
100.000	183.049	181.737	
120.000	183.922	182.524	1.398
127.066		182.803	
137.066		183.234	
140.000	185.086	183.371	
160.000	186.296	184.309	1.987
180.000	187.684	185.247	
200.000	188.279	186.185	2.094
210.803		186.692	
220.000	188.757	187.093	
240.000	189.170	187.758	1.410
240.803		187.779	
260.000	189.561	188.271	
280.000	190.049	188.783	1.266
300.000	190.594	189.295	
320.000	191.083	189.808	1.275
340.000	191.513	190.320	
360.000	192.040	190.832	1.208
380.000	192.530	191.344	
400.000	193.009	191.857	1.152
420.000	193.475	192.369	
440.000	194.055	192.881	1.174
460.000	194.705	193.393	
480.000		193.906	
481.096	195.368	193.934	1.462

SEWER RISING MAIN (Ch.0.000 - 481.096) : MCRM - LONG SECTION

ISSUED FOR CONSTRUCTION

REVISION	AMENDMENT	ISSUED
A	Issued for Construction	3.7.2017

SCALE : A3 PLAN 1:1500 (Hori) 0 250 m 1:250 (Vert) 0 1 2 3 4 5 m

CO ORDS : MGA | DATUM : AHD

DESIGNED : Z. Wrobel DATE : 14.4.2014

DRAWN : G. Day DATE : 23.6.2014

Wagga Wagga Infrastructure Services

Infrastructure Planning & Design

PROJECT : ESTELLA WEST SEWER PUMP STATION No. 29

PROPOSED LOCATION FOR PUMP STATION & SEWER RISING MAIN

RISING MAIN - PLAN & LONG SECTION (Ch.0.000 - 481.096)

PLAN REGISTRATION SHEET NUMBER: J401004

ISSUE : A

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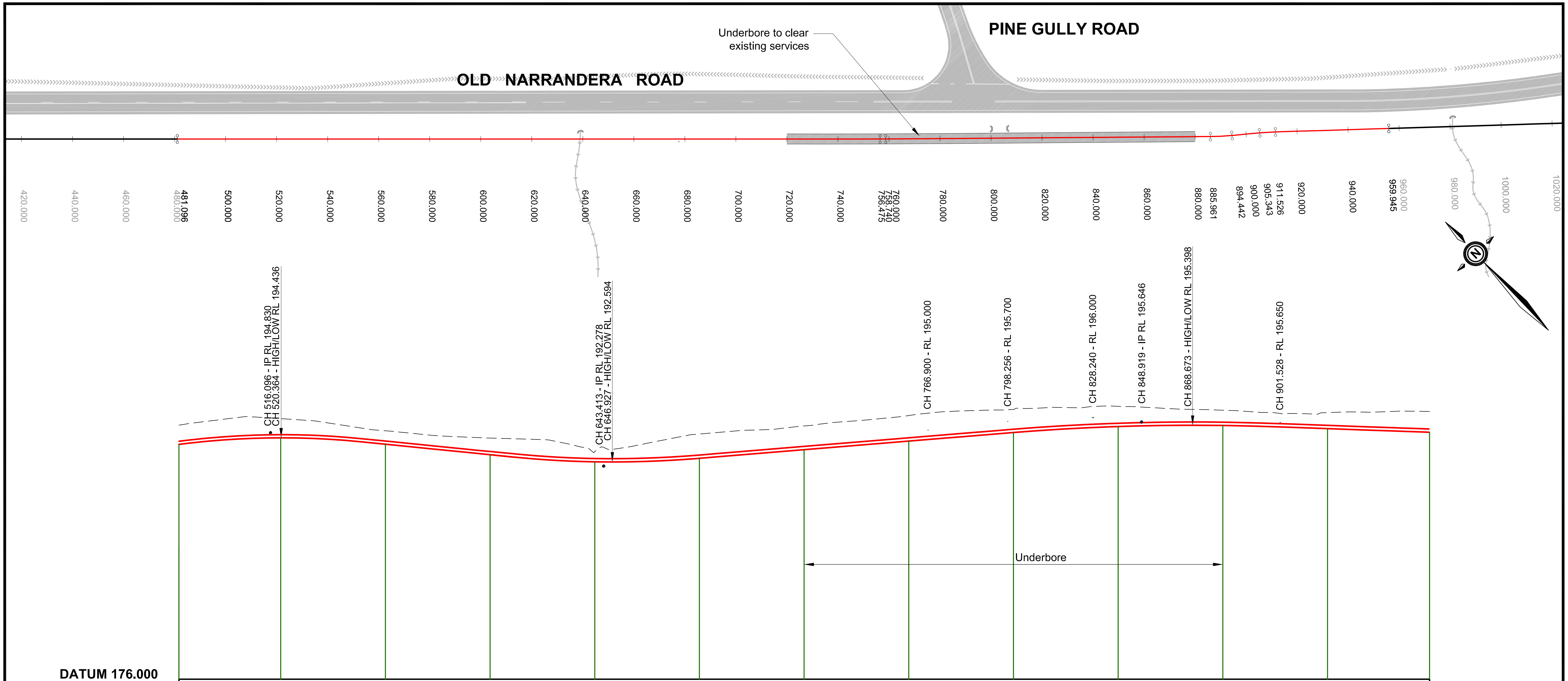

DATUM 176.000

PIPE CLASS: 250mmØ PE Rising Main

PIPE LENGTH: 478.849m (shown) [1200m Total Length to junction with PS 19]

GRADIENT: L=70.00M | G=-2.00% L=57.32M | L G | L=70.00M | G=1.64% L=120.51M | L=100.00M | G=-0.71% L=61.03M

CHAINAGE	EXISTING LEVEL	PROPOSED LEVEL	DEPTH TO INVERT
481.096		193.934	
500.000	195.902	194.301	
520.000	195.903	194.436	1.467
540.000	195.515	194.311	
551.096		194.128	
560.000	194.975	193.950	1.025
580.000	194.597	193.549	
600.000	194.418	193.148	1.270
608.413		192.980	
620.000	194.297	192.782	
640.000	193.382	192.606	0.776
660.000	194.022	192.638	
678.413		192.852	
680.000	194.728	192.878	1.850
700.000	195.029	193.205	
720.000	195.344	193.533	1.811
740.000	195.742	193.861	
760.000	196.139	194.188	1.951
780.000	196.491	194.516	
798.919		194.826	
800.000	196.608	194.844	
820.000	196.749	195.119	
840.000	196.843	195.301	1.542
860.000	196.665	195.389	
880.000	196.548	195.383	1.165
898.919		195.290	
900.000	196.346	195.283	
920.000	196.366	195.140	1.226
940.000	196.418	194.998	
959.945	196.462	194.857	1.605

SEWER RISING MAIN (Ch.481.096 - 959.945) : MCRM - LONG SECTION

ISSUED FOR CONSTRUCTION

REVISION	AMENDMENT :	ISSUED
A	Issued for Construction	3.7.2017

SCALE : A3 PLAN 1:1500 (Hori) 0 250 m 1:250 (Vert) 0 1 2 3 4 5 m

CO ORDS : MGA | DESIGNED : Z. Wrobel | DATE : 14.4.2014

DATUM : AHD | DRAWN : G. Day | DATE : 26.6.2014

Wagga Wagga Infrastructure Services
Infrastructure Planning & Design

PROJECT : ESTELLA WEST SEWER PUMP STATION No. 29

PROPOSED LOCATION FOR PUMP STATION & SEWER RISING MAIN

RISING MAIN - PLAN & LONG SECTION (Ch. 481.096 - 959.945)

PLAN REGISTRATION SHEET NUMBER: J401005

ISSUE : A

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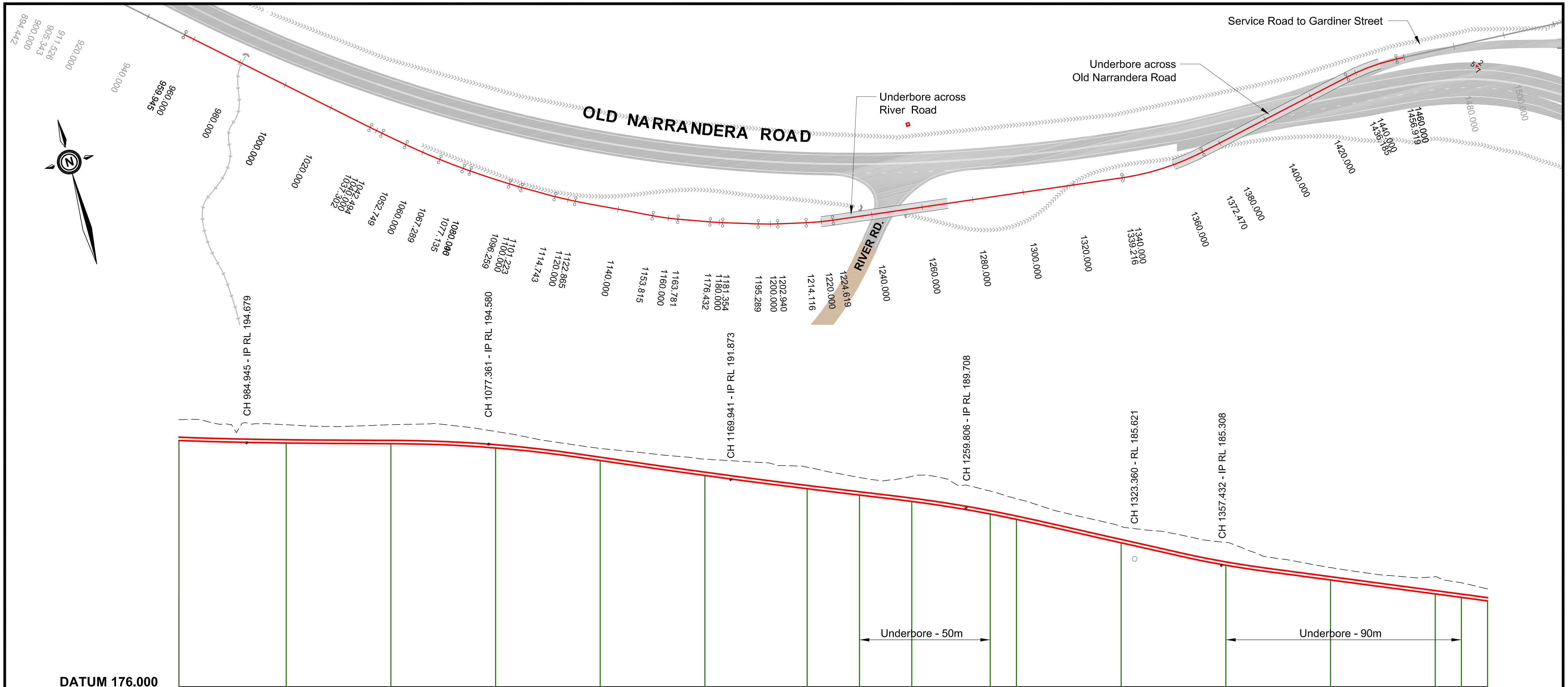

DATUM 176.000

PIPE CLASS: 250mmØ PE Rising Main

PIPE LENGTH: 500.055m (shown) [1200m Total Length to junction with PS 19]

GRADIENT: L=50.00M; L=32.42M G=-0.11%; L=70.00M; L=22.58M G=-2.92%; L=70.00M; L; L=29.87M G=-2.41%; L=50.00M; L=57.63M G=-4.51%; L=30.00M; L=87.03M G=-2.67%

CHAINAGE	PROPOSED LEVEL	EXISTING LEVEL	DEPTH TO INVERT
959.945	194.856	196.462	1.605
980.000	194.738	195.773	
1 000.000	194.669	196.066	1.397
1 020.000	194.641	195.923	
1 040.000	194.620	196.070	1.450
1 042.361	194.617		
1 060.000	194.536	196.091	
1 080.000	194.292	195.553	1.017
1 100.000	193.887	194.825	
1 112.361	193.557		
1 120.000	193.333	194.256	0.923
1 134.941	192.897		
1 140.000	192.750	193.838	
1 160.000	192.187	193.433	1.246
1 180.000	191.654	193.195	
1 200.000	191.150	192.785	1.635
1 204.941	191.030		
1 220.000	190.667	192.000	
1 234.806	190.311		
1 240.000	190.180	192.169	1.989
1 260.000	189.571	191.439	
1 280.000	188.793	190.362	1.569
1 284.806	188.582		
1 300.000	187.897	189.204	
1 320.000	186.995	188.226	1.231
1 340.000	186.094	187.706	
1 342.432	185.984		
1 360.000	185.286	187.050	1.764
1 372.432	184.907		
1 380.000	184.704	185.803	
1 400.000	184.169	185.110	0.941
1 420.000	183.634	184.557	
1 440.000	183.099	184.399	1.300
1 459.461	182.579		
1 460.000	182.564	183.463	

SEWER RISING MAIN (Ch.959.945 - 1460.000) : MCRM - LONG SECTION

ISSUED FOR CONSTRUCTION

REVISION	AMENDMENT :	ISSUED
A	Issued for Construction	3.7.2017

SCALE : A3 PLAN 1:1500 (Hori) 0 250 m 1:250 (Vert) 0 1 2 3 4 5 m

CO ORDS : MGA | DESIGNED : Z. Wrobel | DATE : 14.4.2014

DATUM : AHD | DRAWN : G. Day | DATE : 26.6.2014

Wagga Wagga Infrastructure Services

Infrastructure Planning & Design

PROJECT : ESTELLA WEST SEWER PUMP STATION No. 29

PROPOSED LOCATION FOR PUMP STATION & SEWER RISING MAIN

RISING MAIN - PLAN & LONG SECTION (Ch.959.945 - 1420.000)

PLAN REGISTRATION SHEET NUMBER: J401006

ISSUE : A

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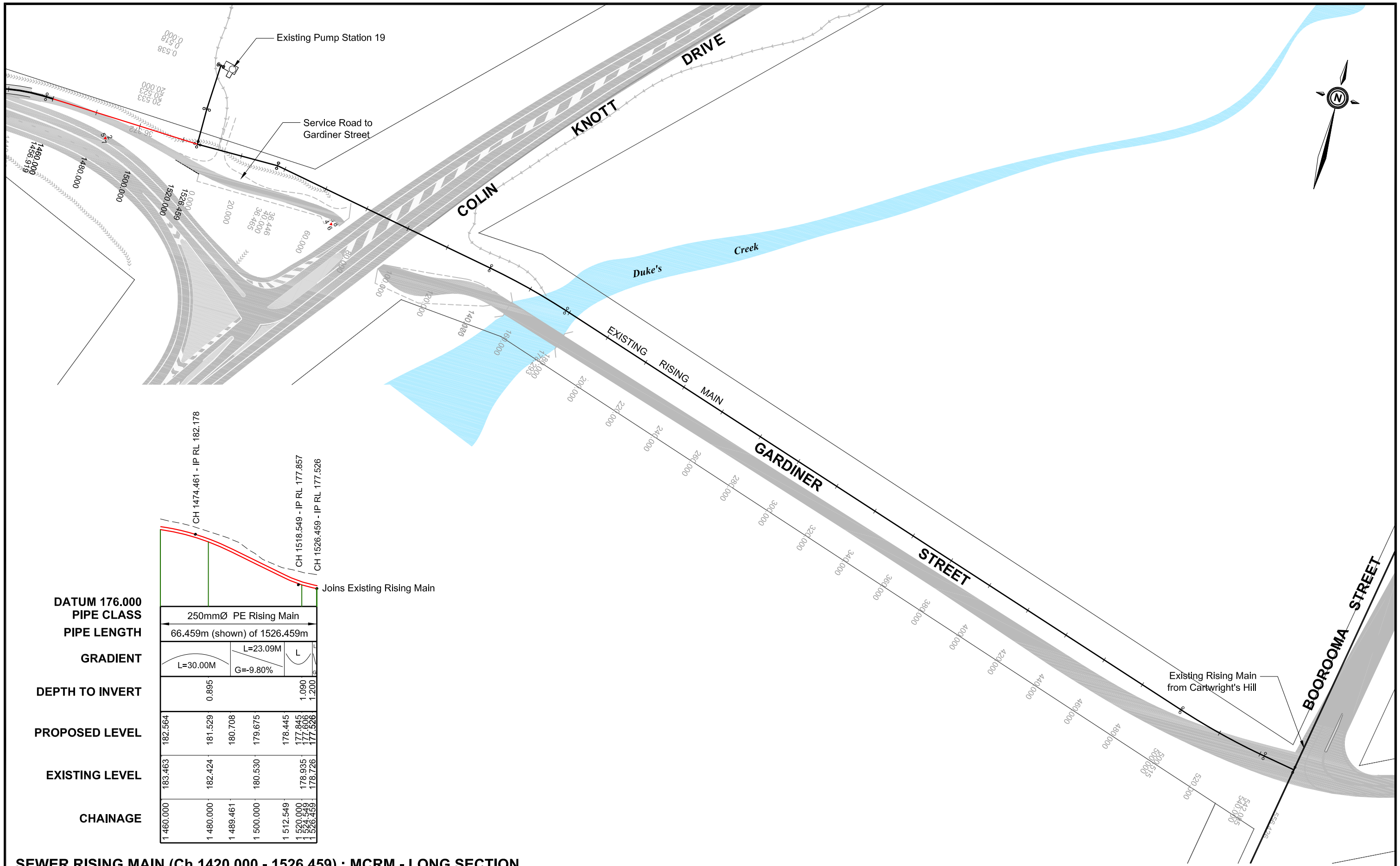

DATUM 176.000 PIPE CLASS	250mmØ PE Rising Main												
PIPE LENGTH	66.459m (shown) of 1526.459m												
GRADIENT	L=30.00M			L=23.09M G=-9.80%		L							
DEPTH TO INVERT		0.895										1.090	1.200
PROPOSED LEVEL	182.564	181.529		180.708		179.675		178.445		177.845	177.606	177.526	
EXISTING LEVEL	183.463	182.424		180.530				178.935		178.726			
CHAINAGE	1 460.000	1 480.000	1 489.461	1 500.000	1 512.549	1 520.000	1 524.549	1 526.459					

SEWER RISING MAIN (Ch.1420.000 - 1526.459) : MCRM - LONG SECTION

ISSUED FOR CONSTRUCTION

REVISION	AMENDMENT :	ISSUED
A	Issued for Construction	3.7.2017

SCALE : A3 PLAN 1:1500 (Hori) 0 250 m 1:250 (Vert) 0 1 2 3 4 5 m

CO ORDS :	DESIGNED :	DATE :
MGA	Z. Wrobel	14.4.2014
DATUM :	DRAWN :	DATE :
AHD	G. Day	26.6.2014

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Wagga Wagga Infrastructure Services
Infrastructure Planning & Design

PROJECT : ESTELLA WEST SEWER PUMP STATION No. 29

PROPOSED LOCATION FOR PUMP STATION & SEWER RISING MAIN

RISING MAIN - PLAN & LONG SECTION (Ch.1420.000 - 1526.459)

PLAN REGISTRATION J401007

SHEET NUMBER ISSUE : A

Old Narranderra Road

Location	Date From	Date to	AADT 5	AADT 7	AADT 5 HV	AADT 5 Art	% HV	% Art	Av Speed	Max Speed	Comments
East of Pine gully_Location 1	13/08/2017	20/08/2017	4,910	4,226	435	118	8.9%	2.40%	61	144	
West of Pine gully_Location 2	13/08/2017	20/08/2017	1,089	978	164	77	15.1%	7.07%	65	121	
Nth of Old Narranderra rd_Location 3	13/08/2017	20/08/2017	3925	3337	401	61	10.2%	1.55%	65	121	

Key

AADT5	Average Annual Daily Traffic weekdays
AADT7	Average Annual Daily Traffic full week
HV	Heavy vehicles = AustRoads94 Classes 3-12
Art	Articulated vehicles Class 6-12