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Attachments

UNDER SEPARATE COVER
ORDINARY COUNCIL MEETING

6:00 PM, TUESDAY, 27 July, 2021

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4.0 ARCHAEOLOGICAL CONTEXT

4.1 Ethnohistoric background

Evidence of human occupation of South East NSW can be dated to 20,000 years ago, from excavations at sites including the Burrill Lake rock shelter (Lampert 1971), Cloggs Cave (Flood 1980) and New Guinea 2 (Ossa et al. 1995). An excavation conducted at Bulee Brook 2 in the south coast hinterland ranges provides evidence that occupation had occurred by at least 18,000 years ago (Boot 1994).

Traditional Aboriginal tribal boundaries within Australia have been reconstructed, primarily, based on surviving linguistic evidence and are therefore only approximations. Social interaction, tribal boundaries and linguistic evidence may not always correlate, and it is likely boundaries and interaction levels varied and fluctuated over time. The assessment area is within the traditional boundaries of the Wiradjuri language group (Tindale 1974)

Clusters of neighbouring clan groups which shared a common dialect and political and economic interests are often grouped in the historical record by a language name (Barwick 1984). The Wiradjuri group is based on the shared language spoken by people who define themselves as 'people of the three rivers', these rivers being the Macquarie (or Wambool) the Lachlan (or Kalare) and the Murrumbidgee (or Murrumbidjeri) (ERM Power Pty Ltd 2010). The territories of these clans were often small, consisting of several km of river frontage and some back country.

The Wiradjuri language group is described by Tindale (1974) as the largest tribal grouping in Australia. The territory extends from the Blue Mountains in the east, north to Nyngan and south to Albury. The Lachlan and Macquarie Rivers were a rich resource that provided food and transport. The food from the rivers was supplemented with kangaroos, wallabies, bandicoots, emus, turkeys, snakes and lizards, especially in those seasons when people moved from the rivers into the ranges or plains. Bulrush roots, grass seeds, daisy yams, along with roots and tubers were also a subsistence in their diet (Tindale 1974). Trees in the area not only provided food and fuel but were also used for the manufacture of tools and implements. For example, spears, axe hafts, shields, and digging sticks. Bark was used to build houses, make canoes, coolamons and other containers.

The first recorded contact between the Wiradjuri people and colonists occurred at Bathurst on the Macquarie River where Governor Lachlan Macquarie met a group of senior Wiradjuri men wearing possum-skin cloaks (Mitchell 1839). The gold rush of the 1850s in the eastern Wiradjuri lands saw the local non-Aboriginal population around Orange and Bathurst boom, becoming one of the most densely populated areas in the state. The diseases brought by colonists had a substantial impact on the local Aboriginal people, which would have spread well beyond the new colony's population centres. This, combined with the pastoral settlement of the slopes and plains that had begun some decades earlier, displaced many Wiradjuri placing pressure on the traditional systems of cosmology and economy.

From the 1850's the British government created a series of Aboriginal reserves across the squatting districts of NSW. While attempts were often made by the government to select sites which were existing Aboriginal camp sites or areas frequented by Aboriginal people the selection of sites was primarily an act of segregation between the Aboriginal community and the colonists. A reserve was established in Wantabadgery in 1904 and officially closed in 1925 (Obituaries Australia 2020). The Wantabadgery reserve is located at Wantabadgery approximately 5 km to the south east of the eastern end of the assessment area.

Nangus Water Supply Business Case

Business Case – Safe and Secure Water Program

WI21002AP

Prepared for

Goldenfields Water County Council and
Cootamundra Gundagai Regional Council

17 June 2021

COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL

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Executive Summary

This Business Case assesses the viability of the preferred option to supply water to the township of Nangus, within the Cootamundra-Gundagai Regional Council region. The preferred option involves a total of 17km of water piping, two new reservoirs and an upgrade to the Marinna water pump station. The business case focuses on the comparison of this option to the nominated base case, which maintains the current situation.

Currently residents of Nangus use rain water supply for domestic use and recent community consultation expressed a strong desire for the provision of a reticulated potable water supply system.

This project aligns with strategic goals at the federal, state and local government level relating to the provision of safe and effective infrastructure in support of community development and well-being.

Goldenfields Water County Council is the primary supplier of potable water within the region and Cootamundra-Gundagai Regional Council supplies water to the town of Gundagai. Both organisations are capable of owning and operating the proposed Nangus scheme. The analysis presented in this report shows that there are advantages to the scheme being owned, managed and operated by Goldenfields Water County Council.

The updated cost estimate for the preferred option is $8,430,000 (inclusive of 30% contingency). The economic appraisal of this project resulted in a net present value of negative $5,323,000 and a benefit to cost ratio of 0.16. Both of these results are below the benchmark for an economically viable project. As such, this project is not expected to deliver savings and wider economic benefits to the Nangus residents. There are non-financial benefits to pursue this project for community health and well-being, enabling growth within the region and meeting stakeholder expectations.

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1 Case for Change

1.1 Background

Nangus is a village in the Cootamundra Gundagai Regional Council (CGRC) Local Government Area with an estimated population of 80 people. The village is located approximately 18 km west of Gundagai and 35 km east of Junee. Currently, Nangus does not have a reticulated water supply and the residents are responsible for obtaining their own water supplies; typically, from roof water, bottled water, bore water or water carting.

CGRC recently undertook community consultation for the Villages Strategy and one of the outcomes demonstrated strong support for provision of a reticulated supply of potable water to Nangus. CGRC has requested Goldenfields Water County Council (GWCC) investigate the options and feasibility of the provision of a reticulated town water supply.

The objectives of the overall project include:

- Provide appropriate levels of service (LOS) as part of the design assessment and ensure the LOS can be achieved throughout its design life.
- Achieve project delivery from initiation to construction completion in 4-6 years (should the project prove feasible).
- Undertake a feasibility assessment Phase (Phase 1) of the project
- Undertake a Business Case Phase of the project (Phase 2)
- Cost estimates for whole of life costs to be equal to or less than 100% of benefit, achieving benefit cost ratio (BCR) of 1 or greater
- Achieve best practice principles
- Secure construction funding
- Assess and mitigate all risks associated with the delivery and ongoing operation of this project.

Cardno completed Phase 1 of the project, providing the *Feasibility Study*, *Nangus Water Supply* (Appendix A) in February 2020. Subsequently Cardno was commissioned to proceed to Phase 2, the business case. A *Preliminary Design Assessment* (Appendix C), that compliments the Business case has been prepared to confirm the preferred option that was identified in Phase 1.

Phase 2 of the project is this Business Case which is based on NSW Government's Safe and Secure Water Program Business Case structure in its delivery. The report analyses the preferred option (Option 2) that was investigated in the *Feasibility Study* and further assessed in the *Preliminary Design Assessment* report. The Business Case also includes commentary on the key areas of project delivery including its project outcomes, expectations, costs, funding, program, and governance. The detail on the economic analysis is provided Section 4.

1.2 Expected Outcomes

The expected outcomes of the proposed solution to the water supply to Nangus are captured in Table 1-1 in the form of project objectives. The indicators of success to measure the performance to delivering to the objectives are listed.

Table 1-1 Objectives and key success indicators

Factor	Key Project Objectives	Key Success Indicators
Water Network	> Provide reliable potable reticulated water supply within Nangus	> Reduce reliance on current water supplies e.g. bottled water, bores, and water carting > Access to potable water in dwellings > Water hydrant access for fire fighting > Achieve minimum hydraulic head for fire fighting
Water Supply Quality	> Complies with Australian Drinking Water Guidelines (ADWG) > Adhere/follow ADWG's Framework for Drinking Water Quality > Implementation of quality assurance program (QAP) according to Public health Act 2010 and the Public Health Regulation 2012	> Meet minimum requirements of potable water quality as per ADWG > Achieve expected levels of service (LoS) for water users
Operational and maintenance Risk	> Minimal risk to operations. > No risk to public property > Failure result in a minor disruption to water supply. > Low risk of not retaining suitable qualified operational staff.	> Achieve expected LoS for water users > Average disruption to water supply is within NSW regional averages
Constructability	> Unimpeded construction via easy access and egress, good ground condition, rapid procurement > Minimal impacts to day to day usage of surrounding reticulation network > Low work health and safety (WHS) risk	> Low disruption to connected adjacent water reticulation networks > Delivery of construction within project timeline and costs
Project Definition Risk	> High level of project definition > Standardised design and needs	> Clear paper trail and filing of documents > Meets relevant standards, framework, and guidelines
Heritage, Environmental, and Approvals	> No heritage impact anticipated > Ability to avoid identified heritage sites > Avoid mapped key vegetation communities > Low risk of approval not being obtained (if applicable)	> No Heritage and environmental impact > All relevant applications approved
Final ownership and responsibility	> Identify final ownership and responsibility of water reticulation network	> Identified final ownership of proposed pipeline > Identified Council(s) or authorities agrees to ownership and responsibility of proposed infrastructure
Project scope, timeline, and costs	> Delivery project within scope, timeline and budget	> Achieved project delivery within budget > Achieved project scope > Achieved project with time allowance

1.3 Project Timing

The project current has a preliminary design. In order to progress to completion, the following stages need to be undertaken:

- Acceptance of Business Case
- Undertake studies required for development approval, including (but not limited to) environmental, ecology, geological, heritage and public consultation
- Detailed design
- Approval of funding
- Construction

The time allowed for the various studies, design and approvals that are required is nominally 2-4 years. The construction time of the project is 9-15 months. As such, it is as assumption of this project that the water supply could be operational within 5 years.

1.4 Stakeholder and Community Support

1.4.1 Stakeholders

The key stakeholders involved in the project are listed in Table 1-2.

Table 1-2 Key Stakeholders

Stakeholders	Description
Goldenfields Water County Council (GWCC)	GWCC is the primary potable water supplier in the region. GWCC maintains a significant network of water assets and is the preferred entity to assume ownership of this project (refer discussion in Section 3).
Cootamundra Gundagai Regional Council (CGRC)	Nangus falls within the jurisdiction of CGRC. The Council had undertaken community consultation and initiated the preliminary investigation into Nangus water supply.
Local Community	End water users within the Nangus village, including local residents, workers and regular visitors.
Land Holders	The pipeline is proposed to run through a number of privately owned lands and some council owned lands. Consultation will need to take place with these entities in future stages of this project for access and easement arrangements.

1.4.2 Community Consultation

CGRC has previously undertook community consultation as a part of preparation of the Villages Strategy. Nangus Village has a close knit, proud community with several key families that form a strong and passionate community spirit. There was a unanimous response from Nangus residents in support of a reticulated water supply. Respondents also indicated they believed the lack of a reticulated water supply was hindering the residential growth of the village.

1.4.3 Policy and Strategic Alignment

Infrastructure projects are planned and developed to serve an underlying political and strategic purpose at different levels of government, and achieve the overall goal to progress the society and economy all together. The proposition to supply potable to Nangus can be linked to most levels of government agencies from local council plans to state and federal government initiatives.

1.4.3.1 Federal Strategic Alignment

On a federal level, GWCC takes into consideration the United Nations Sustainable Development Goals (SDG) in regards to its operations. Relevant goals to this project include:

- Goal 6: Ensure availability and sustainable management of water and sanitation for all.

- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Another Australian government initiative is the Regional Development Australia (RDA) Regional Plan, which establishes a committee of 12 members spanning 14 local government area (including CGRC) and government agencies. The mission of RDA Regional Plan is to build partnerships that facilitate the development of sustainable region. The plan outlines 6 goals shown below:

- Goal 1: To proactively encourage greater economic growth, diversity & industry innovation.
- Goal 2: To nurture the development of a sustainable environment for future generations including the development of an innovative response to the water challenge.
- Goal 3: To support education and skill development initiatives that enable all people to have the capacity & confidence to contribute to the region's growth.
- Goal 4: To facilitate a collaborative approach between all tiers of government, business and community to solving the challenges of the region.
- Goal 5: To encourage a proactive approach to health and living
- Goal 6: To act with honesty, integrity, transparency and in accord with relevant legal and financial obligations, sound corporate governance procedures and to fulfil Departmental funding requirements.

The provision to provide water infrastructure to Nangus directly aligns with goals 1,2 and 5.

1.4.3.2 State Strategic Alignment

On a state level, Nangus water infrastructure development falls within NSW Government's NSW 2021 initiative to rebuild the economy, provide quality services, renovate infrastructure, restore government accountability, and strengthen local environment and communities. The provision of water infrastructure to Nangus does overall align to the strategic direction of the plan. This is particularly true its third goal 'Drive Economic Growth in Regional NSW' which goes hand in hand with population growth Nangus which is stagnant due to lack of water supply infrastructure.

The Riverina Murray Regional Plan 2036 with its vision, similar to the NSW Government's, of growing and diverse economy, a healthy environment with pristine waterways, efficient transport and infrastructure networks, as well as strong, connected and healthy communities. The Regional Plan contains 4 main goals that encompasses 29 directions, a number of them focuses on the supported growth of a sustainable regional economy via propping different sectors and infrastructure. A number of the plan's directions can be directly or indirectly aligned with the water supply provisions in Nangus; with Goal 4's directions which aims to develop 'strong, connected and healthy communities' has the most strategic alignment.

1.4.3.3 Local Strategic Alignment

Typically, local council strategic plans have the most alignment to its local regions. In this case CGRC's Nangus Village Strategy encompasses future planning necessities and economic development over the coming generations, and puts forth the opportunities for renewal and/or growth of the township; also includes issues that are experienced by the community.

As a result of the strong community feedback among other issues, and development goals, CGRC has requested GWCC to investigation provision of a reticulated water supply to Nangus and has set motion to a chain of studies and investigations leading up to this Business case.

The Council also considers the equal opportunity and consistency of services for all townships within CGRC, which enables greater social cohesion through the provision of access to similar standard of water services currently available in the larger centres. CGRC sees that the provision of a water supply system to Nangus will bring benefits to the community and enable population growth in the village.

GWCC has a number of strategic statements that support this project:

- Strategic Priority 1.0 - Provision of excellence in delivery of water supply and customer service to all stakeholders.
- Strategic Priority 2.0 - Planning of water supply for regional development through network analysis and partnerships with constituent councils
- 1.2.2 Assets are managed strategically, across whole of life to improve delivery of service and financial management.

It is noted that currently Nangus is outside of the existing network footprint of GWCC's operational area. There is currently no priority to increase the reach of the network, however there is precedence in supplying

potable water to smaller communities, as there are a number of villages within the CGRC area where GWCC currently supplies potable water, for example, Wantabadgery.

1.4.4 Local Council Collaboration and Funding

Currently there is an agreement in place for funding of this business case for this project between CGRC and GWCC. Further steps in this project are yet to be negotiated, as it depends on the outcome of the business case process and agreement on future ownership of the proposed infrastructure.

There are existing relationships between CGRC and GWCC that demonstrate a solid working relationship. There is a general supply agreement in place between the two entities for bulk water supply into Cootamundra. Additionally, GWCC directly supplies to end users in a number of smaller villages in the Cootamundra-Gundagai Shire.

2 Analysis of the Project

2.1 Information about the Project

GWCC has previously commissioned Cardno to undertake the Nangus Water Supply *Feasibility Study* (Appendix A). The study investigated and assessed a range of options to provide a reticulated water supply to Nangus. In Phase 2, the *Preliminary Design Assessment* (Appendix B) has recently been completed, outlining the requirements of the preferred option. It is used as the basis for this Business Case. Additionally, the study provides an overview of network operation with the inclusion of a Nangus water supply within the broader GWCC Oura Water Supply network.

2.1.1 Location of project

Nangus is a village in the Cootamundra Gundagai Regional Council (CGRC) Local Government Area with an estimated population of 80 people. The village is located approximately 18 km west of Gundagai, 35 km east of Junee, and 50 km east of Wagga Wagga (Figure 2-1). The centralised area of Nangus (Village) (Figure 2-2) contains infrastructure and services, such as electrical infrastructure, public school, town hall, general store, post office, mechanic, and a bus servicing depot. There is an area to the north of the village that is proposed for rezoning, this is discussed in Section 2.1.5.

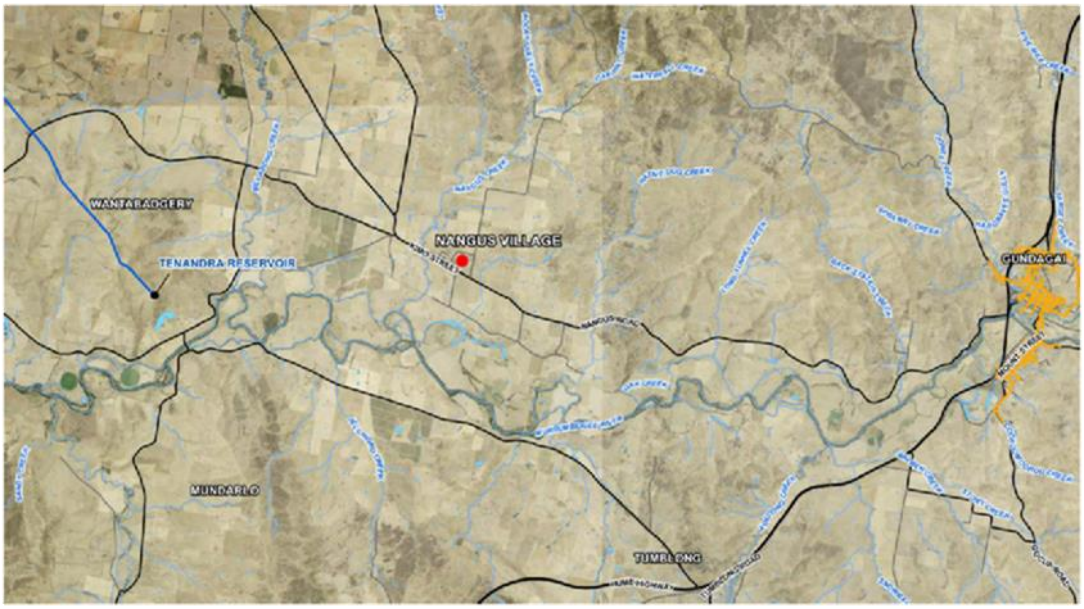

Figure 2-1 Nangus Village Regional Map

Figure 2-2 Nangus Village

2.1.2 Problem and Drivers for a Reticulated Water Supply

The current water supply arrangements are onerous for residents and there is a desire to update the current situation with a modern approach that involves the implementation of water infrastructure reticulation system. In the current state, the residents' water supply arrangements pose potential health risks due to the lack of water treatment options, as well as the unreliability and difficulty of sourcing potable water. The provision of a reticulated supply would remove the health risks associated with resident's current supplies, and increase supply security, particularly with respect to rainwater tanks.

Drivers for a reticulated water supply has been discussed in CGRC's Village Strategy as well as Cardno's *feasibility study* on Nangus Water Supply Scheme. In summary, previous investigations and studies of the drivers' point towards the Nangus' growth potential being held back by the lack of potable water infrastructure.

- Growth Potential: The lack of a reticulated water supply may be holding back potential growth in the Nangus area. Investigations by CGRC indicate that provision of a reticulated water supply would support residential and economic growth. The following factors point to the potential for growth in the Nangus area:
  - Nangus currently has other infrastructure and services, including a Public School, town hall, general store, post office, mechanic and a bus depot servicing Wagga Wagga and Gundagai. These existing facilities improve the outlook for growth in the area, should a reticulated water supply be provided.
  - Nangus Road is currently being upgraded to support B-double traffic. Improved road linkages through the area may lead to increased traffic and demand for services. Nangus could potentially develop as a service hub on this regional route.
  - At 15 minutes' drive from Gundagai, Nangus is an affordable residential lifestyle alternative to Gundagai. Nangus is also situated close to a number of other regional employment areas, including Junee (30 minutes), Wagga Wagga (45 minutes) and Cootamundra (45 minutes).

- CGRC estimates that the unoccupied dwelling rate in Nangus is lower than other villages in the Local Government Area (LGA). This may indicate potential demand for additional housing and development in the area.
- CGRC has identified an area adjacent to Nangus for subdivision into lots of 2 hectares (ha) and 5 ha, as shown in Figure 2-3. It is proposed that this land will be rezoned from RU1 (Primary Production) to RU4 (Primary Production Small Holding).
- There are approximately 27 occupied dwellings in Nangus (data from CGRC). Based on population projections from CGRC, this may increase to approximately 79 occupied dwellings.

> Community Support: CGRC recently undertook community consultation as part of preparation of the Villages Strategy. The unanimous response from Nangus residents was in support of a reticulated water supply. Respondents indicated they believed lack of a reticulated water supply was holding the village back from potential residential growth.

> Security and water quality risks associated with current water supply arrangements: Current water supply arrangements are onerous for residents, and present potential health risks to residents. Provision of a reticulated supply would remove the health risks associated with residents' current supplies, and increase supply security, particularly with respect to rainwater tanks.

> Sustainable Development Goals: GWCC takes consideration of the United Nations Sustainable Development Goals (SDG) into account in its operations. Relevant goals to this project include:

- Goal 6: Ensure availability and sustainable management of water and sanitation for all
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

> Equal opportunity and consistency of services for all townships within CGRC, which enables greater social cohesion through the provision of access to similar standard of water services currently available in the larger centres.

2.1.3 Options Identification

A considerable number of options were identified and discussed with GWCC input, and was narrowed to seven (7) feasible options for investigation in phase 1 as seen below:

> Option 1: Pipeline from Gundagai water supply

> Option 2: Pipeline from GWCC water supply – from Oura Road **– Preferred option**

> Option 3: Pipeline from GWCC water supply – from Tenandra Reservoirs following existing easement

> Option 4: Pipeline from GWCC water supply – from Tenandra Reservoirs following new route

> Option 5: Murrumbidgee River extraction and treatment

> Option 6: Groundwater extraction and treatment

> Option 7: Do nothing

A summary evaluation of each option is presented in section 2.2.

2.1.4 Mapping options and Nangus Reticulation

A summary of the identified pipeline options is mapped in Figure 2-3 for reference, as well as the proposed Nangus reticulation in Figure 2-4.

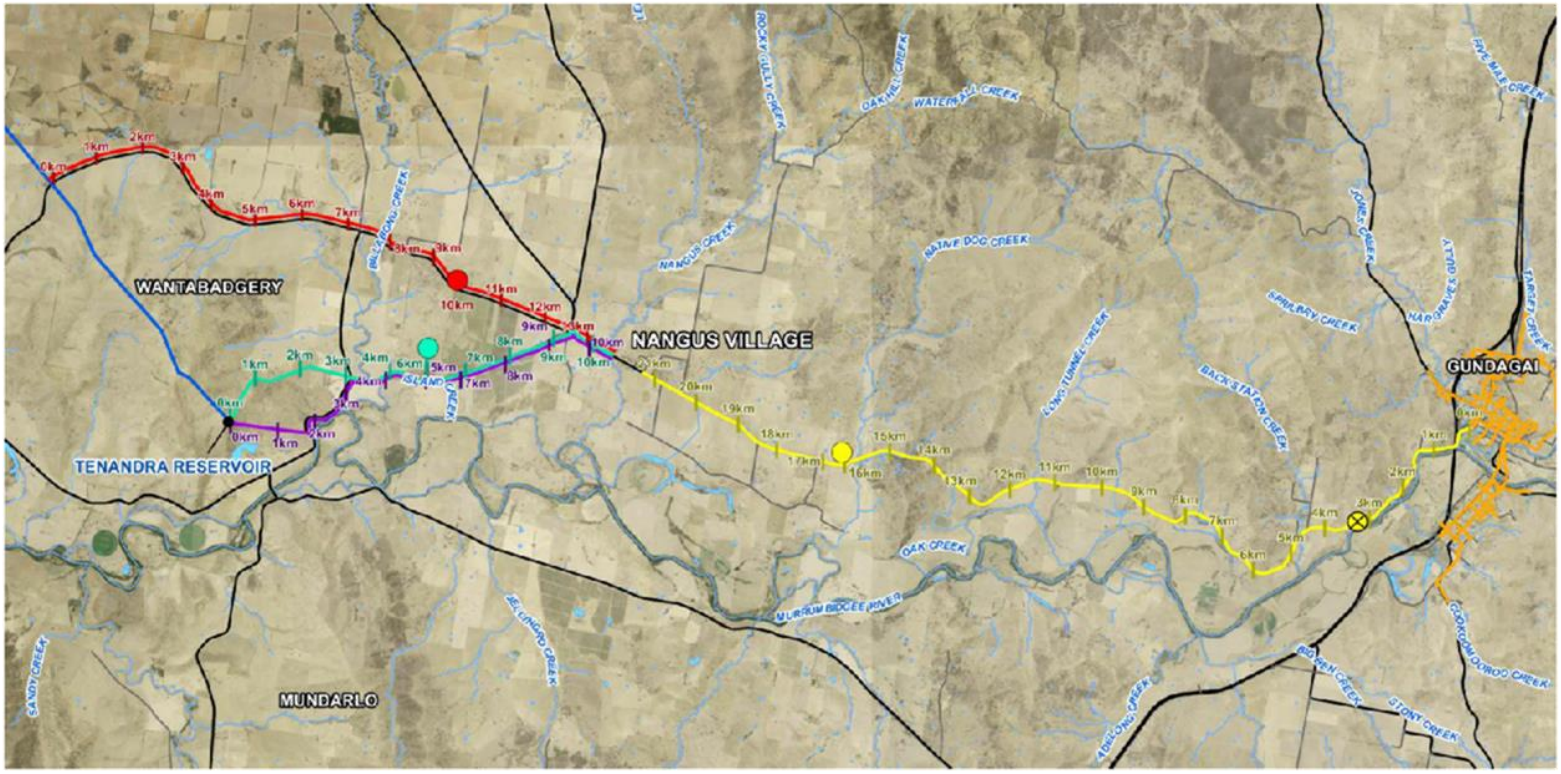

Figure 2-3 Pipeline Route Options Map (Source: Nangus Feasibility Study)

Legend

- Reservoir Option 1
- Reservoir Option 2
- Reservoir Options 3 and 4
- Booster Pump Station (Option 1)
- Pipeline Option 1 (21.5km)
- Pipeline Option 2 (13.7km)
- Pipeline Option 3 (10.5km)
- Pipeline Option 4 (10.6km)
- GWCC Existing Water Mains
- CGRC Existing Water Mains
- Major Roads (LPI)
- Local Road (LPI)
- Major Watercourses (DPI Water, 2017)
- Waterbodies (LPI)

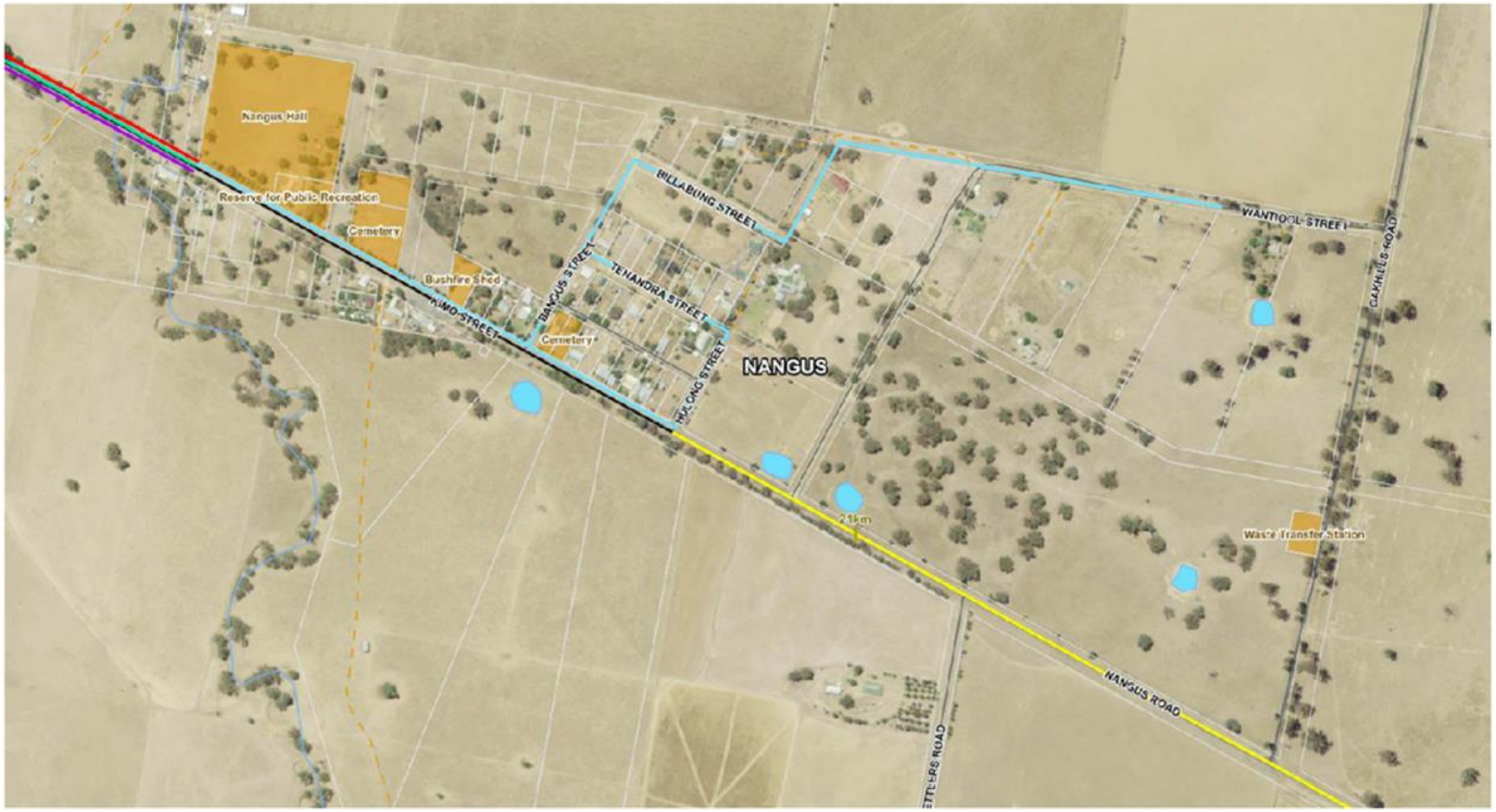

Figure 2-4 Proposed Nangus Reticulation (Source: Nangus Feasibility Study)

2.1.5 Proposed Rezoning

Included in all options is the allowance for water reticulation to be serviced to existing developed lots within the village. CGRC propose to rezone land to the north and north-west (approximately 175ha land area) of Nangus Village to allow future development seen in Figure 2-5. The lowest elevation in the service area is approximately RL 215 (reduced level) along Nangus Rd, while the high elevation is approximately RL 260 near the north west edge of proposed rezoning area. The service pressure requirements set by GWCC are between 12m to 90m, and it is proposed to service the town into a single pressure zone which is factored into the hydraulic modelling of the options.

Figure 2-5 Nangus Proposed Rezoning

2.1.6 Evaluation Criteria (Multi-Criteria Analysis)

Within the *feasibility study*, each identified option was weighted using a Multi-Criteria Analysis as seen in Table 2-1, with each criteria weighting set according to its importance and risk.

The summary of the Multi-Criteria Analysis for all options is presented in Table 2-3 for assessment.

Table 2-1 Multi-Criteria Analysis

No.	Criteria	Weighting
1	**Security of Supply** Consider the security of the water supply and the impact/risks of prolonged drought.	20%
2	**Water Quality - Health** Consider the reliability and risks to water quality with regard to health criteria.	15%
3	**Water Quality - Aesthetic** Consider the reliability and risks to water quality with regard to aesthetic criteria.	10%
4	**Operational Risk** Consider the consequence of failure with regards to operator safety, community safety, scheme complexity, time needed to reinstate supply and resourcing risk.	15%
5	**Constructability** Consider the ability to construct each option, including safety, availability of materials, availability of suitably qualified contractors, ground conditions, impact on existing services, access etc.	15%

6	**Project Definition Risk** Consider risk associated with level of definition and potential for currently unknown issues to impact schedule and budget.	10%
7	**Heritage, Environment and Approvals** Consider environmental and heritage impacts and risks and the risk associated with obtaining approvals.	15%

Source: Nangus Feasibility Study

2.1.7 Existing Water Supply Systems

Identified in the surrounding of Nangus are potential or existing supply systems that are considered for Nangus' water supply, which are:

- Connection to Tenandra scheme
- Connection to Tarcutta water supply
- Connection to Oura water supply
- Billabong Creek
- Murrumbidgee River
- Groundwater extraction

2.1.8 Water Demand

CGRC estimates the current population of Nangus to be approximately 80 people. The following facilitates are currently located within the village:

- 27 occupied dwellings
- Church
- Hall
- Public School
- Rural Fire Station Shed
- General Store
- Workshop

It is estimated there is potential for approximately 33 connections at the existing level of development. It should also be noted that there are currently approximately 36 vacant lots.

Population projections from CGRC estimate a population of 213 people could be possible in the long term. This equates to 79 property connections, using the 2016 Nangus census occupation rate of 2.7 people/dwelling.

Estimated water demand (as shown in Table 2-2) is used as the basis for hydraulic modelling in all proposed options. Hydraulic models were prepared using Infoworks WS Pro 4.0 software.

Table 2-2 Water Demand

Parameter	Nangus Village		Nangus Village and Rural Demand (pipeline options only)		
	Design Criteria (kL/d/ET)	Total Demand (kL/d)	Design Criteria for Rural Connection (kL/d/ET)	Rural Demand (kL/d)	Total Demand (kL/d)
Average Day Demand	0.81	80.5	5	25	105.5
Maximum Day Demand	4	400	25	125	525
Maximum hour Demand	7	712 (8.2L/s)	45	223	935 (10.8L/s)

Source: Nangus Feasibility Report

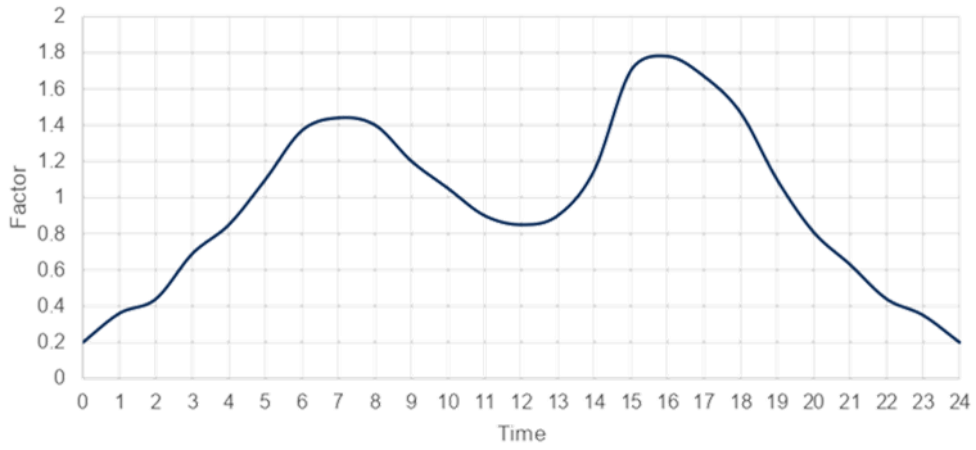

Figure 2-6 Typical Residential Diurnal Pattern

2.2 Options Considered

This section provides an overview of key options that were investigated, the analysis and the findings from the feasibility study. The summary of the Multi-Criteria Analysis for all options is located in Table 2-3 for comparison and discussions are located in the *Nangus Feasibility Report*.

2.2.1 Option 1: Pipeline from Gundagai water supply

Option 1 incorporates the supply of potable water from CGRC's water supply in Gundagai to Nangus. Key components of this option include:

- Connection to the existing CGRC water main near the intersection of Nangus Road and Sheridan Lane in Gundagai.
- Approximately 16.3 km of DN100 PVC pipeline from Gundagai to Nangus reservoir, located to the east of Nangus, as mapped in Appendix A.
- Booster pump station located at approximately CH3400 to deliver water from Gundagai to Nangus reservoir.
- Nangus reservoir, with a usable volume of 250 kL.
- Chlorine dosing facility at Nangus Reservoir to maintain quality.
- Approximately 5.2 km of DN150 PVC pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC) to service the existing developed area in Nangus.

The pipeline connects to CGRC's water network in Gundagai via the existing water main that runs along Nangus road (fronting Lot 11 DP1128590). From the connection point the pipeline runs west for 3,000m along the alignment of Nangus road, as well as the Murrumbidgee river. A booster pump station is proposed at CH3400 with a pressure of approximately 85m required. A proposed concrete Nangus reservoir, approximately 5km east of Nangus, at CH16300 with 250kL of useable volume (three days of storage based on average day demand). Also, a chlorine dosing facility has been allowed at the proposed Nangus reservoir to comply with ADWG requirements, and may require a secondary dosing facility downstream to maintain chlorine suitable levels.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 as well as pipeline reaching outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

The water pressure is modelled at 60m as the point of connection in Gundagai with 20m allowance of headloss as actual pressures were not available for study. Hydraulics were modelled using Infoworks WSPro software.

The proposed pipeline alignment travels approximately 21km (as shown in Figure 2-7) and crosses the following watercourses with proposed methodologies:

- Jones Creek – attached to bridge.
- Backstation Creek – attached to bridge.
- Long Tunnel Creek – open trench.
- Native Dog Creek – attached to bridge.
- Six un-named creeks – all open trench.

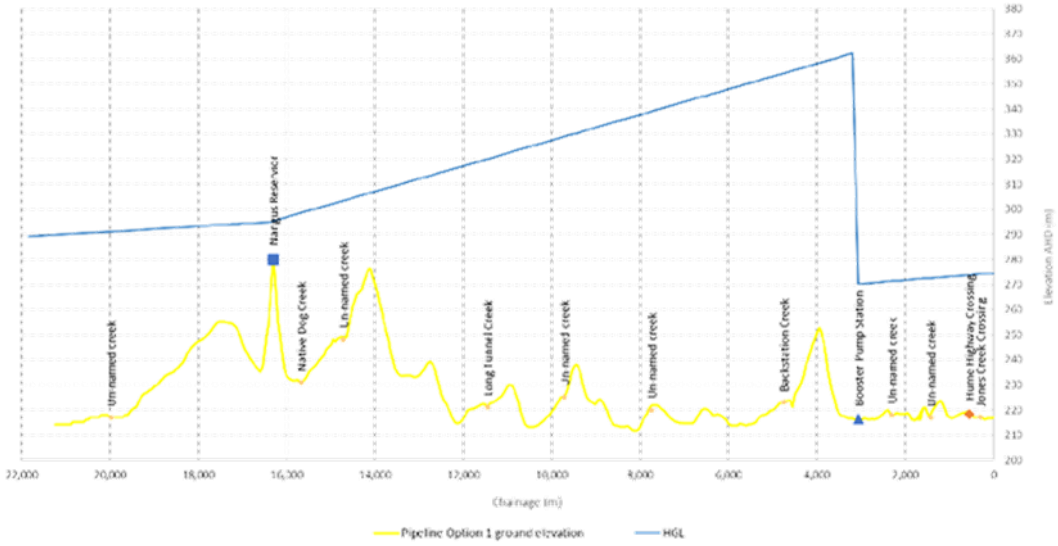

Figure 2-7 Option 1 Hydraulic Grade & Elevation Profile

Other significant areas the multi-criteria analysis encompasses were also investigated and evaluated including environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, socio-economic and zoning, as well as soil and contamination.

2.2.2 Option 2: Pipeline from GWCC water supply – from Oura Road (Preferred option)

[Option 2 is the preferred option that has been established by the multi-criteria analysis in the *Feasibility Study*, and furthered confirmed by the *Preliminary Design Assessment* written in conjunction to this business case. The information presented here is taken from the *Feasibility Study* to provide equitable comparison with the other options. The updates to the this option as presented in this business case based on the *Preliminary Design* are shown in Section 2.3.]

Option 2 incorporates the supply of potable water from GWCC's Oura Water Supply scheme. This option would see the supply of water via the connection point of an existing DN300 CI water main and travels along Oura Rd to the township of Nangus (as seen in Figure 2-3).

Key components of this option include:

- Connection to the existing DN300 CI rising / gravity main operating between Marinna Reservoir and the Tenandra Reservoir.
- Pressure reducing valve (PRV).
- Approximately 9.8 km of DN100 DICL pipeline from the existing network to Nangus reservoir, located west of Nangus.
- Nangus reservoir, with a usable volume of 250kL.
- Chlorine dosing facility at Nangus reservoir to maintain quality.

- Approximately 3.9 km of DN150 PVC pipeline from Nangus reservoir to Nangus.
- Reticulation pipe work of DN100 PVC to service the existing developed area in Nangus.

The pipeline connects to GWCC's Oura Water supply scheme via an existing DN300 CI water main that crosses Nangus Rd and fronts Lot 2 DP541744. From the connection point the pipeline heads east along Oura Rd towards Nangus.

A PRV will be located near the connection point to reduce pressure required to convey the water to Nangus. A proposed concrete Nangus reservoir, approximately 4km east of Nangus, at CH9770 with 250kL useable volume (each providing three days of storage based on average day demand).

While a chlorine dosing facility has been allowed at the proposed Nangus reservoir, there is the potential for chlorine residuals to fall between the chlorine dosing at Nangus reservoir and Nangus. Thus, for the water quality to comply with ADWG requirements at all locations in the network, a secondary chlorination facility may be required downstream in the network to ensure chlorine residuals are maintained at suitable levels.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 as well as pipeline reaching outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

GWCCs preference is for the pipeline to be installed within private property where possible, adjacent to the road reserve. GWCC's recent experience has shown installation in private property provides a more efficient pathway to obtaining environmental approvals than installation within road reserves.

The proposed pipeline alignment travels approximately 14 km (shown in Figure 2-8) and crosses the following watercourses with proposed methodologies:

- Billabong Creek – attached to bridge.
- Nangus Creek – attached to bridge.
- Four un-named creeks – all open trench.

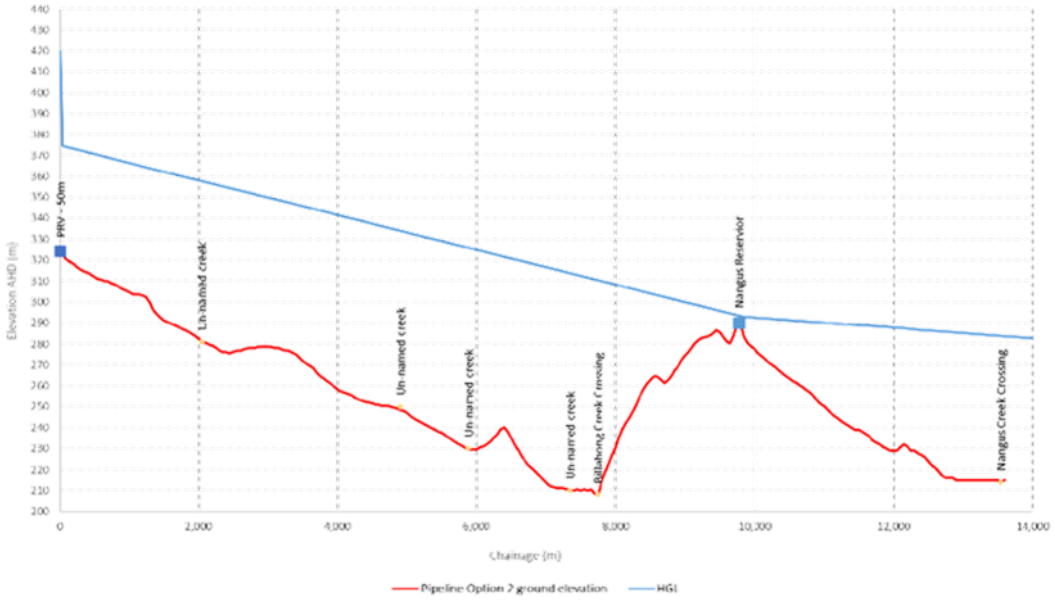

Figure 2-8 Option 2 – Hydraulic Grade & Elevation Profile

Other significant areas are scored highly in the multi-criteria analysis (Table 2-3) such as environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, socio-economic and zoning, as well as soil and contamination.

An area to note is the 'Heritage, Environmental and Approvals' within the multi-criteria analysis which scored the lowest of 8 (on a 10-point scale). This is due to the high-level nature of desktop analysis done which identified biodiversity, waterways impact, and heritage considerations. It also includes the uncertainty of the

approval pathway without a detailed analysis or confirmation of the pipeline alignment. The impacts of the alignment will require specialist studies and on-ground surveys to confirm environmental constraints, and use and applicability of Part 5 provisions, capital investment value and consideration of 'significant impacts' on the environment which could trigger the need for an environmental impact statement (EIS). Initial approval pathway advice is provided in the *Nangus Feasibility Study*.

Options 2 scored the highest overall out of all options.

2.2.3 Option 3: Pipeline from GWCC water supply – from Tenandra Reservoirs following existing easement

Option 3 incorporates the supply of potable water from GWCC's Oura Water supply scheme. This option would see the supply of water via a pipeline built from the existing Tenandra Reservoirs to the township of Nangus.

Key components of this option include:

- Connection to the existing Tenandra Reservoirs outlet pipeline.
- Approximately 2.7 km of PN35 DN100 DICL pipeline from the Tenandra Reservoirs to a PRV, located near River Road.
- A PRV located near River Road.
- Approximately 2.8 km of PN35 DN100 DICL from the PRV to Nangus reservoir.
- Nangus reservoir, with a usable volume of 250 kL.
- Chlorine dosing facility at Nangus reservoir to maintain quality.
- Approximately 5.0 km of DN150 PVC pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC) to service the existing developed area in Nangus.

The pipeline connects to CGRC's Oura Water supply scheme at the Tenandra Reservoirs located in Lot 1 DP172773, before heading east towards Nangus. The pipeline alignment for Option 3 primarily follows the top of natural ridge lines, fence lines, Island Creek and Local access roads to Nangus.

A PRV will be included near River Road located at base of the Tenandra mountain to reduce the pressure head for suitable water flow required for Nangus.

A proposed Nangus concrete reservoir located on elevated ground at pipeline's CH5500 which is approximately 5 km east of Nangus. The reservoir will have a volume of 250 kL (three days of storage based on average day demand). Also, a chlorine dosing facility has been allowed at the proposed Nangus reservoir to comply with ADWG requirements, and may require a secondary dosing facility downstream to maintain chlorine suitable levels.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 as well as pipeline reaching outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

Modelling observed no significant impacts were and it is therefore considered that no upgrade to the existing network will be required to supply Nangus on the basis of the additional demand. However, noted future investigations should include the existing conditions of these existing assets.

The proposed pipeline alignment travels approximately 10 km (as shown in Figure 2-9) and crosses the following watercourses with proposed methodologies:

- Billabong Creek – horizontal directional drill.
- Nangus Creek – attached to bridge.

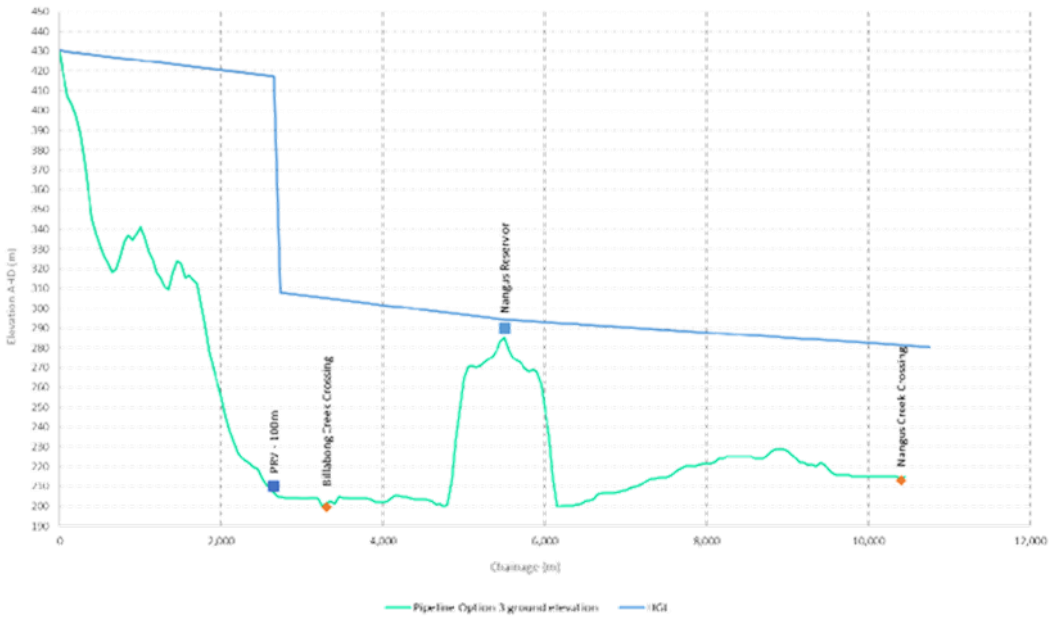

Figure 2-9 Option 3 Hydraulic Grade & Elevation Profile

Other significant areas the multi-criteria analysis encompasses were also investigated and evaluated including environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, socio-economic and zoning, as well as soil and contamination.

2.2.4 Option 4: Pipeline from GWCC water supply – from Tenandra Reservoirs following new route

Option 4 incorporates the supply of potable water from GWCC's Oura Water Supply Scheme. This option would see the supply of water via a pipeline built from the existing Tenandra Reservoirs to Nangus.

Key components of this option include:

- Connection to the existing Tenandra Reservoirs outlet pipeline.
- Approximately 1.7 km of PN35 DN100 DICL pipeline from the Tenandra Reservoirs to a PRV, located near River Road.
- A PRV located near River Road.
- Approximately 3.9 km of PN35 DN100 DICL from the PRV to Nangus reservoir.
- Nangus reservoir, with a usable volume of 250 kL.
- Chlorine dosing facility at Nangus reservoir to maintain quality.
- Approximately 5.0 km of DN150 PVC pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC) to service the existing developed area in Nangus.

The pipeline connects to CGRC's Oura Water supply scheme at the Tenandra Reservoirs located in Lot 1 DP172773, before heading east towards Nangus. From that point the pipeline heads east along an old pipeline alignment to River Road.

A PRV will be included near River Road located at base of the Tenandra mountain to reduce the pressure head to meet the flow requirements for Nangus.

A proposed Nangus concrete reservoir located on elevated ground at pipeline's CH6500 which is approximately 5 km east of Nangus. The reservoir will have a volume of 250 kL (three days of storage based on average day demand). A chlorine dosing facility has been allowed at the proposed Nangus reservoir to

comply with ADWG requirements, and may require a secondary dosing facility downstream to maintain chlorine suitable levels.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 and the pipeline reaching to the outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

The proposed pipeline alignment travels approximately 10 km (as shown in Figure 2-10) and crosses the following watercourses with the proposed methodologies:

- Un-named creek (River Road) – within pavement above culvert.
- Billabong Creek – horizontal directional drill.
- Nangus Creek – attached to bridge.

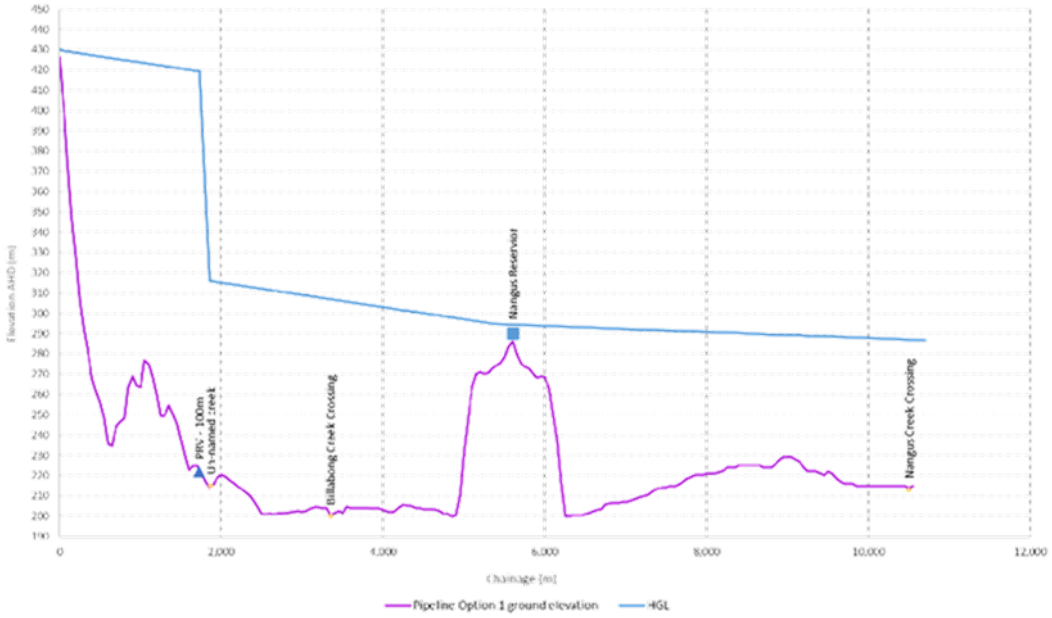

Figure 2-10 Option 4 Hydraulic Grade & Elevation Profile

Other significant areas the multi-criteria analysis encompasses were also investigated and evaluated including environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, socio-economic and zoning, as well as soil and contamination.

2.2.5 Option 5: Murrumbidgee River extraction and treatment

Options 5 would extract raw water from Murrumbidgee River via a new water intake. The raw water would then be pumped to a new water treatment plant (WTP) located near Nangus and treated in compliance to ADWG as well as relevant health guidelines/standards. Once treated the water would be discharged to a reservoir then pump into the proposed Nangus reticulation system for supply. This is an indicative plan only and requires further investigations for both WTP and intake locations. In addition, the system is proposed to comply with all requirements of the ADWG.

A detailed analysis of the proposed surface water treatment option is found in Surface and Groundwater Treatment Options report referenced in the *Nangus Feasibility Report*.

The proposed new raw water intake and pump station would be constructed at Murrumbidgee River to transfer water to the WTP. The inlet would include the typical wedge wire screen to prevent entry of solids and fish which is surrounded by reinforced concrete structure to protect the screen and channel floor. A pumping station near the shore will pump the raw water to the WTP via a DN100 pipe. It is noted that the actual configuration would need to be determined based on a detailed investigation of the river conditions and adjacent flood plain.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 as well as pipeline reaching outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

It has been assumed that the raw water source is a vulnerability category 4 (unprotected) catchment under the draft ADWG health based targets (HBTs). The water treatment process (diagrammatically shown in Figure 2-11) would involve the following major process components:

> Powdered activated carbon (PAC) dosing for taste and odour control

> pH correction

> Oxidation for iron and manganese removal

> Coagulation, flocculation and sedimentation

> Membrane ultrafiltration

> Ultraviolet disinfection

> Chlorine dosing

> Fluoridation

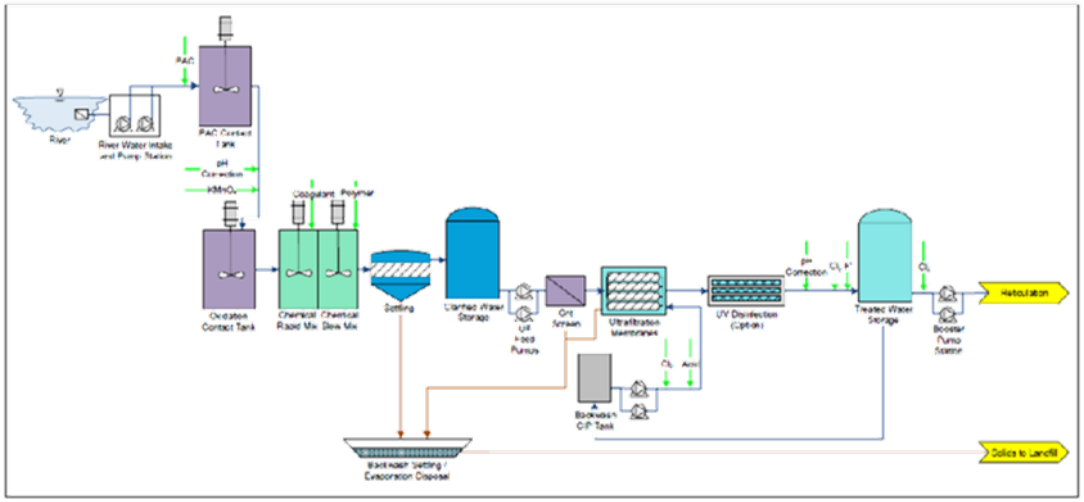

Figure 2-11 Option 5 Water Treatment Process

Other significant areas the multi-criteria analysis encompasses were also investigated and evaluated including water access licence, environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, groundwater, socio-economic and zoning as well as soil and contamination.

2.2.6 Option 6: Groundwater extraction and treatment

For Option 6 raw water would be taken from new groundwater bores. The raw water would be pumped to a new WTP located near Nangus. The water would be treated in compliance with the ADWG and draft ADWG health based targets (HBTs) and discharged to a reservoir. From the reservoir, treated water would be pumped into the reticulation system for supply. It is noted that the plan described is indicative only, serving as a general guide of the infrastructure required; and requires further detailed investigation.

Cardno undertook a desktop hydrogeological review to investigate the viability of groundwater resources in the area surrounding Nangus, which is detailed in the feasibility study.

New bores will be required to be constructed into the alluvial aquifer. It was assumed two bores would provide sufficient yield and redundancy. Each bore would require a bore pump, surface well head protection to prevent contamination and backflow, and an electrical supply.

Bore locations have been indicatively shown near to the Murrumbidgee River, as salinity levels are expected increase with distance from the river (NSW DPI, 2016). The required bore depth is estimated to be around 25 m. There are a few existing bores near these locations that may be impacted.

From the bores, a DN100 raw water pipeline would convey the water to the WTP.

Reticulation system within Nangus will consist of DN100 PVC for the delivery of potable water with its extents shown in Figure 2-4 as well as pipeline reaching outer boundaries of proposed rezoning territories (Figure 2-5), matching other options.

The water treatment process (diagrammatically shown in Figure 2-12) would involve the following major process components:

> Chlorine treatment and filtration
> Anti-scalent treatment
> Reverse Osmosis
> Calcite filtration
> Ultraviolet disinfection
> Chlorine dosing
> Fluoridation

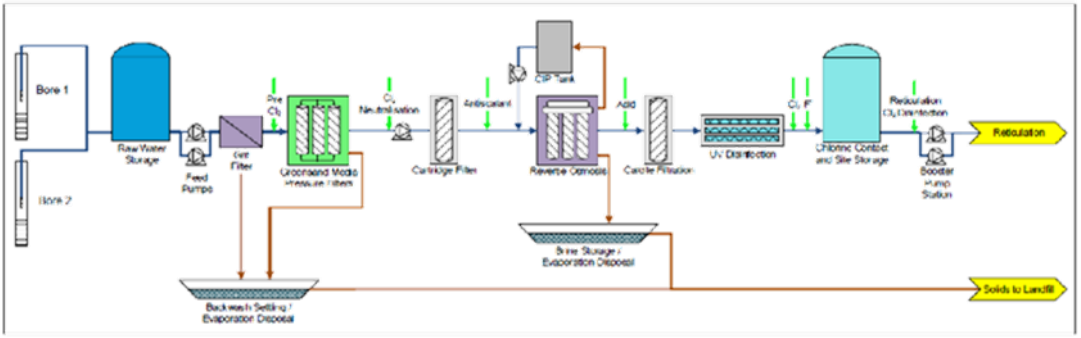

Figure 2-12 Option 6 Water Treatment Process

Other significant areas the multi-criteria analysis encompasses were also investigated and evaluated including water access licence, environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, groundwater, socio-economic and zoning as well as soil and contamination.

2.2.7 Option 7: Do nothing

Options 7 is the controlled or 'do nothing' option, in which the current situation is maintained. No reticulated water is supplied to Nangus, and residents will continue make their own water supply arrangement as described in section 2.

The 'do nothing' option (7) is mapped on multi-criteria analysis for applicable areas where by it is investigated and evaluated including, environmental constraints, biodiversity constraints, all areas of heritage, hydrology, water quality, groundwater, socio-economic and zoning as well as soil and contamination.

2.2.8 Multi-criteria Analysis and Risk Assessment Summary

The summary of the Multi-Criteria Analysis of the options considered is found in Table 2-3 below:

Table 2-3 Multi-Criteria Analysis Summary

No.	Criteria	Weighting	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
1	**Security of Supply**	20%	10	10	10	10	10	6	0
2	**Water Quality – Health**	15%	8	9	9	9	9	10	0
3	**Water Quality – Aesthetic**	10%	10	10	10	10	9	10	0
4	**Operational Risk**	15%	7	9	7	7	6	3	10
5	**Constructability**	15%	7	9	5	6	6	5	10
6	**Project Definition Risk**	10%	7	9	6	6	5	3	10
7	**Heritage, Environment and Approvals**	15%	7	8	5	8	6	7	10
	Weighted Average	100%	8.1	**9.2**	7.5	8.1	7.5	6	5.5

2.2.9 Capital Cost of all Options

The initial capital cost estimate of all options is shown in Table 2-4 based on the feasibility study.

Table 2-4 Capital Cost Summary

Option	Estimated Capital Cost from Feasibility Study (ex. GST)
Option 1: Pipeline from Gundagai water supply	$4,590,000
Option 2: Pipeline from GWCC water supply – from Oura Road	$3,260,000
Option 3: Pipeline from GWCC water supply – from Tenandra Reservoirs following existing easement	$3,070,000
Option 4: Pipeline from GWCC water supply – from Tenandra Reservoirs following new route	$3,040,000
Option 5: Murrumbidgee River extraction and treatment	$9,120,000
Option 6: Groundwater extraction and treatment	$8,760,000
Option 7: Do nothing	$0

Source: Nangus Feasibility Report

2.3 Preferred Option and Preliminary Design

The preferred option incorporates the supply of potable water from GWCC's Oura Water Supply scheme. The option would see the supply of water via the connection point of an existing DN300 CI water main and travels along Oura Rd to the township of Nangus as seen in Figure 2-3.

Following the selection of Option 2 as the preferred option, a preliminary design exercise was undertaken where further assessment and engineering design was conducted. The *Preliminary Design Assessment* is attached in Appendix C. The assessment looked at an overview of the network operations as a result of the Nangus water supply scheme through hydraulic modelling; and environmental and heritage assessment covering biodiversity, heritage, hydrology, soil and contamination, socio-economic, land use, zoning and cumulative impacts.

The key environmental constraints related to pipeline Option 2 are the biodiversity and heritage constraints. Desktop review identified a number of native and threatened species that may be present along the

proposed route, as well as a number of aboriginal heritage sites. The final route alignment should be developed to avoid impacting these sites and species.

The *Preliminary Design Assessment* identified that some minor upgrades were needed to the existing Oura Water supply scheme (connecting pipeline and the Marinna WPS) in order to supply water to the proposed Nangus Scheme. The assessment predicted two (2) impacts to the current level of service that GWCC provides their existing customers. These impacts are associated with the Nangus connection and comprise:

- Insufficient capacity of the existing supply line between Junee Silos inline booster and the Marinna Reservoir to maintain operational levels during peak summer conditions. This incapacity of supply results in the volume of available water in Marina Reservoir decreasing to critical levels during summer peak demand conditions.
- Pump inefficiencies associated with the change in downstream demands at the Marinna pump station. The modelling indicated that adding on the Nangus demands, the pump station's run time would increase from 12 hrs/day to 14 hrs/day based on winter demands, and 19hrs/day to 22hrs/day based on summer demands. This would increase the risk of water shortages during extreme events (such as main bursts or bushfire).

To address these two impacts, the following should be included as part of providing water supply to Nangus:

- Replacement of 1 km of existing DN200 AC main in Prince Road, with DN200 PVC main to allow sufficient supply pressure.
- Upgrade the existing pumps at Marinna pumping station to meet the needs of the downstream catchment, and reduce run times. A pump sizing of 50 L/s at 105 m head has been identified as part of the assessment. This meets the minimum needs to the system with the addition of Nangus. GWCC may wish to increase the size of the station to provide additional system redundancy and security of supply. This results in predicted run times of:
  - Average day (winter) condition - 7 hours per day
  - Peak day (Summer) conditions - 11 hours per day

The reduction in runtime provides GWCC with greater operation flexibility, and reduces the risk of supply shortages during times of extraordinary water usage.

Additionally, it is noted that future investigations should include the existing condition of the Nangus scheme existing assets to ensure continued service.

The conclusion of the study found the following infrastructure is required for the preferred option for provision of potable supply to Nangus:

- A new connection to the existing DN300 CI rising / gravity pipeline operating between Marinna Reservoir and the Tenandra Reservoir.
- Approximately 6.4 km of PN20 DN100 PVC pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation higher than 250 m AHD in areas of lower pressure in the pipeline based on the modelling. The alignment to follow along Oura Road.
- Approximately 3.5 km of PN35 DN100 DICL pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation lower than 250 m AHD in areas of higher pressure in the pipeline based on the modelling. The alignment to follow along Oura Road.
- Nangus reservoir, to be a dual reservoir configuration (two vessels) with a usable volume of 250 kL each; set to operate between a minimum of 70% and 90% of maximum capacity in order to maintain service pressures.
- Chlorine dosing facility at Nangus reservoir to maintain water quality.
- Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC-O) to service the existing developed area in Nangus (allowance of 3km).

Required existing system upgrades to retain the existing level of service to existing GWCC customers:

- Replace 1 km of the DN200 AC water main in Prince Street, Junee, with DN200 PVC pipework.
- Upgrade Marinna pump station capacity to 50 L/s at 105 m head.

A revised cost estimate was prepared based on the preliminary design outputs and is detailed in Section 4.1.

A desktop review of the potential impacts to the environment and areas of heritage importance has identified the following potential constraints:

- The alignment has the potential to impact on areas of significant biodiversity and heritage importance. The review of Environment Factors will need to include as a minimum:
  - Field investigation is needed to confirm the alignment constraints, and recommend if minor alteration to the alignment is necessary to avoid detailed approvals pathways.
  - Field investigation is needed to confirm the feasibility of creek crossings via connection to existing bridges.
  - Ecological field investigation to confirm the importance/classification of the identified unnamed creeks that are to be crossed. This will include defining construction methodologies.
  - A heritage due diligence assessment of the proposed alignment is needed to comply with the findings of the heritage assessment and to minimise the risks to potential heritage artefacts.

3 Ownership Structure and Funding Options

3.1 Background and purpose

Nangus is located within the CGRC local government area. CGRC provides water services within its local government area. However, GWCC also provides water services within the CGRC local government area and the wider region. The location of Nangus with respect to the wider GWCC supply network is shown in Figure 3-1.

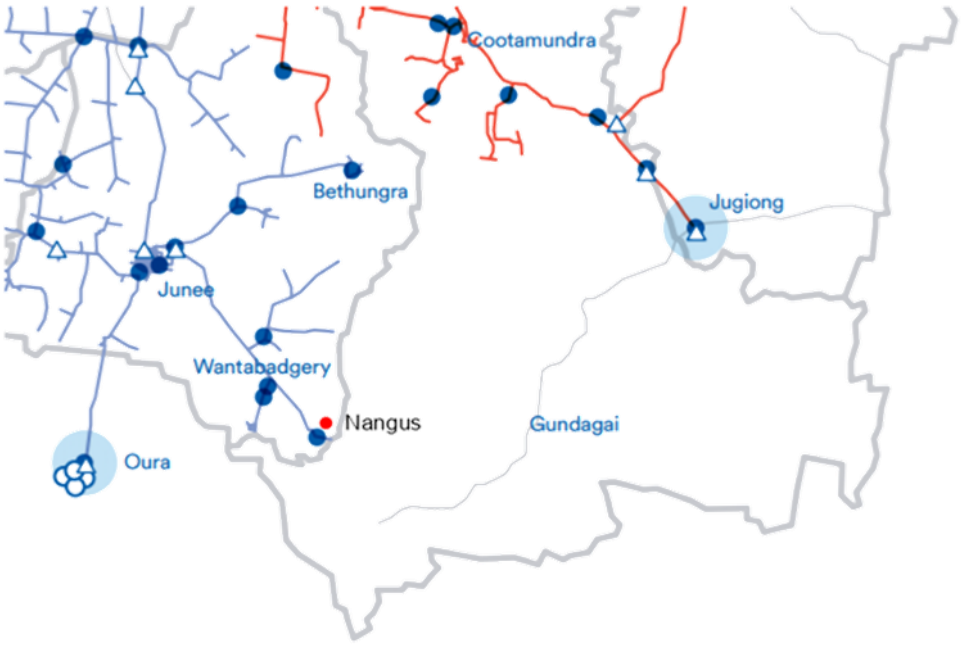

Figure 3-1 Location of Nangus with respect to existing GWCC supply network

As both CGRC and GWCC have existing capability to own, manage and operate water supply services and Nangus is very close to or within the existing operating area of both organisations there is no clear reason for one organisation to own, manage and operate any future assets in preference to the other. The purpose of the following analysis is to provide insight into relevant consideration to informing selection of the future asset owner, manager and operator if the preferred options proceeds.

3.2 Governance of CGRC and GWCC

CGRC is a local government formed under the Local Government Act 1993. GWCC is a County Council formed by proclamation in July 1997 under the same Act. Local governments are formed to provide a range of services within a defined geographical area. A County Council is constituted for a stated function (or functions) delivered by a number of constituent local governments. In the case of GWCC, its function is "provision, care, control and management of water supply works, services and facilities within its area of operations". Its areas of operations are within the local government areas of Bland, Coolamon, Junee, Temora, and parts of Cootamundra-Gundagai, Hilltops and Narrandera.

The Local Government Act (394(2)) doesn't allow a local government to undertake the function conferred to a County Council within it operating area unless allowed for by the proclamation that forms the County Council or if delegated by the County Council. The proclamation that formed GWCC allowed for the water supply to be undertaken by the local governments in the former Harden Shire and Young Shire local government areas and by the former Cootamundra Shire Council within the town of Cootamundra. Therefore, under the current governance arrangements, GWCC would be the "default" water service provider to Nangus. However, this function could also be readily delegated by GWCC to CGRC.

The proclamation that formed GWCC requires it to "review the relative efficiencies and economies of the reticulation and distribution of water" in the areas supplied by the former Harden and Young Shire Councils and in the town of Cootamundra "compared with reticulation and distribution of water within such areas by the County Council". This review is to be undertaken every three years and reported to the relevant Minister. The last review was reported to the Minister in February 2019 and supported Hilltops and Cootamundra Council to continue providing water in their respective operating areas.

The requirements of the Local Government Act 1993 and supporting regulations relevant to the ownership, management and operation of any infrastructure to supply to Nangus apply equally to CGRC and GWCC. For example, GWCC has to undertake planning and reporting under the Integrated Planning and Reporting Framework, as does CGRC.

Other than GWCC being the "default" provider of water services to Nangus, there are no obvious advantages or disadvantages to either organisation being the designated owner, manager and operator of water supply services based on the governance framework applying to each organisation.

3.3 Service delivery models

The following broad functions need to be considered when assessing the future ownership of any supply to Nangus:

- Asset ownership
- Planning and reporting
- Operation and maintenance
- Retail (billing and customer service).

It is entirely possibly to mix the above functions between the organisations. However, this would create inefficiencies and potential obstacles at the interfaces. Therefore, for this assessment, it is assumed that one organisation only is responsible for all of the above functions. As noted, GWCC is able to delegate responsibilities to its constituent local governments if desired.

3.4 Considerations for ownership and funding

Based on the experience of the project team, considerations for public service delivery and measures reported on by NSW government for financial sustainability, the following factors have been considered in assessing the potential for either CGRC or GWCC to own, manage and operate the scheme:

- Strategic considerations
  - Proximity of resources
  - Other strategic considerations
- Financial
  - Assets managed
  - Funding ability
  - Bill impacts and alignment
  - Efficiency
- Organisational capacity
  - Resources
  - Operational considerations

Table 3-1 provides an assessment against these considerations. Data has been taken from the 2019/20 financial statements of each organisation where relevant.

Table 3-1 Comparison of CGRC and GWCC

	CGRC	GWCC	Conclusion
Strategic			
Proximity of resources	Nangus is 30km from Gundagai, the nearest centre in CGRC.	Nangus is 40km from Oura where GWCC has significant assets. There are works depots located at Junee and Cootamundra. GWCC currently supplies potable water to Wantabadgery and a number of other villages within the CGRC region.	There is no obvious difference between CGRC and GWCC in this area
Other strategic considerations	CGRC as a local government can often secure a higher percentage of grant funding than GWCC is able to Future consideration of a local sewer system would require a local operator	GWCC can often only obtain grant funding for a maximum of 25% of a capital project Future growth would be better managed by GWCC in terms of increased supply and demand on the network.	If the project is to be partially or wholly grant funded, there may be benefit in CGRC being the owner as it may be able to access greater levels of grant funding.
Financial			
Assets managed	$766 million replacement cost for all assets, $88 million of which is water and sewerage assets	$475 million replacement cost of water supply assets (no sewer)	GWCC manages a substantially larger asset base of water assets compared with CGRC. This suggests that GWCC would have relatively greater capacity to take on the new scheme.
Funding ability (OLG benchmark) – Debt service cover ratio (>2) – Operating performance ratio (>0%)	Debt service cover ratio: 5.26x CGRC currently has $6.6 million of debt Operating performance ratio: -19.47%	Debt service cover ratio – infinite GWCC currently has no outstanding debts. Operating performance ratio: -1.57%	On the basis of its current debt free position and the negative operating performance ratio of CGRC, GWCC has a relatively greater ability to take on any debt funding if required for the project
Bill impacts / alignment	It is assumed that whichever organisation takes responsibility for the pipeline would charge in accordance with existing standard charges. For CGRC these are: Access charge 20mm residential: $400 / year First 39kL per quarter: $2.00 >39kL per quarter: $3.00	It is assumed that whichever organisation takes responsibility for the pipeline would charge in accordance with existing standard charges. For GWCC these are: Access charge 20mm residential: $200 / year All consumption: $2.45/kL	Irrespective of which organisation is responsible for the pipeline and other assets, revenue will not cover costs. The difference between revenue and costs will differ based on the tariff structure. However, from a wider perspective, this difference does not matter as the shortfall will need to be made up somewhere else. We discuss this further in Section 4.4

	CGRC	GWCC	Conclusion
Efficiency	The 2019 review found that CGRC was operating its systems relatively efficiently	Generally, economies of scale would be expected through a larger operator such as GWCC managing and operating the scheme	There is no obvious difference between CGRC and GWCC in this area
Organisational capacity			
Resources	CGRC manages existing water supply assets. However, it has fewer technical staff	GWCC manages existing water supply assets. However, its extent of operations is substantially larger than CGRC's therefore will have more resources and capability, all else being equal	There is a small advantage in GWCC being the asset operator in this area
Operational considerations	The preferred option connects to the existing GWCC network. There is likely benefit in GWCC operating the Nangus supply so that operation can be integrated with the wider network.	The preferred option connects to the existing GWCC network. There is likely benefit in GWCC operating the Nangus supply so that operation can be integrated with the wider network.	There is a small advantage in GWCC being the asset operator in this area

3.5 Conclusions for Ownership

The preceding analysis shows that there are advantages in the Nangus scheme being owned, managed and operated by GWCC for the following reasons:

- Greater ability to take on debt funding for the scheme, if required
- Greater scale of existing operations and resources
- Integration with its existing operations as the preferred option is to source water supply from the from GWCC network.
- Increased capacity to manage future demand within the supply constraints of the network.

4 Cost and Financial Appraisal

4.1 Project Cost Estimate

Cardno developed a new cost estimate based on the updated *Preliminary Design Assessment* information. The following assumptions were made:

- Allowance of 20% overheads within each unit rate (account for PM, design, site costs, etc.)
- Pipeline installed in rock type soil
- Water connections and hydrants included in the DN100 pipeline for reticulation in the village
- Water connections and hydrants excluded in all other pipelines
- Contingency of 30% applied for concept level design

The cost estimate, inclusive of contingency is $8,430,000 and the detail are shown in Table 4-1.

Table 4-1 Cost Estimate for Option 2

Description	Comment	Quantity	Unit	Rate	Cost
PN20 DN100 PVC pipeline	Installed at minimum depth (assume in rock)	6400	m	$217	$1,389,794
PN35 DN100 DICL pipeline	Installed at minimum depth (assume in rock)	3500	m	$249	$869,958
Creek Crossings - attached to bridge	2 off, allow 100m trenchless installation each	200	m	$525	$105,000
Creek Crossings - open trench	4 off, trenchless installation	400	m	$750	$300,000
250kL Steel Reservoir	2 off	2	each	$305,941	$611,882
Chemical Dosing unit	Chlorine injection into the reservoir	1	each	$70,000	$70,000
DN150 PVC pipeline	Installed at minimum depth (assume in rock)	3900	m	$274	$1,067,628
DN100 PVC pipeline	Local reticulation lines - include water meters, etc. for 36 connections	3000	m	$303	$908,168
DN200 PVC	Oura Scheme upgrade - road installation, minimum depth	1000	m	$607	$607,091
85kW Water Pump Station	Oura Scheme upgrade - Marinna WPS, 50L/s @105m	1	each	$555,177	$555,177
Sub-total					$6,484,698
Design and Project Management	A factor of 20% overheads is already included in individual rates (PM, design, site costs, etc.)			0%	$0
Sub-total					$6,484,698
Contingency	Concept level estimate – inherent risk			30%	$1,945,410
Total					$8,430,108

4.1.1 Changes to assumptions

It is noted that the updated cost estimate resulting from the preliminary design has increased significantly compared to the cost estimate used in the Feasibility Study to assess the options. There are a number of factors driving this change:

- The scope of the option has changes since the Feasibility Study. New items now incorporated in the preliminary design as they are required to ensure the current level of service is maintained for existing GWCC customers, once the Nangus supply is established. The additional infrastructure includes:

- Additional storage reservoir (previously one, now two in total) and change in material from concrete to steel. This provides greater operational flexibility to the Nangus community and moves the need for downstream pressure control.
- Inclusion of trenchless and pipeline installations for creek crossings.
- Inclusion of the reticulation network to connect the existing Nangus community to the water supply scheme.
- Upgrade works at the Marinna water pump station to 85kW to meeting the pumping requirements (effectively costed as a new pump station, as the existing station may not be able to accommodate the larger pumps)
- Upgrade works for the Oura scheme, 1,000 m of DN200 PVC pipe to ensure sufficient pressure supply

> The cost estimates in the Feasibility Study were based on the NSW Reference Rates Manual. While this is a useful reference for planning level investigations, it is Cardno's experience that the construction costs reported by our clients are generally higher than the reference rates. For this cost estimate, we used our internal database of unit rates that takes into consideration modern equivalent materials and construction techniques. These rates are calibrated regularly and are comparable to recent construction costs from our contract database. These rates are routinely accepted at audits for valuation.

> The level of detail has increased as the project moves through the design stages, thus there is more information available upon which to base assumptions. As such, the 10% contingent risk was removed from the previous estimate. The inherent risk remains (currently at 30%), but should be decreased in future detailed design stages.

> The unit rates of pipe installed in rock type soil is a conservative assumption.

4.2 Economic Appraisal

4.2.1 Introduction

The purpose of economic appraisal is to report findings of the Economic Appraisal undertaken for the project. Projects of this type are normally suited to one of three major assessment methodologies:

> Conventional Cost Benefit Analysis (CBA),

> Cost Effectiveness Analysis (CEA), and

> Least Cost Analysis (LCA)

Based on our appreciation of the project and the data available the CEA method has been chosen, because it provides for more water security, capacity and storage than is expected with the base case, or the other project options.

4.2.2 Project Timing

For the purposes of this economic appraisal, it is assumed construction will commence January 2022 and finish in December 2023. The project will be operational from January 2024.

It is noted that subsequent discussions suggested it is more likely the project would be completed within five (5) years, say during 2026, rather than the assumed dates (shown above) used at the time of undertaking this assessment. Any differences resulting from the difference in timing to the reported results would be immaterial to the outcome of the assessment.

4.2.3 Methodology

Section 4 covers the first eight stages of the 9-steps approach as depicted in Figure 4-1 which is compatible with NSW Treasury and Commonwealth guidelines. Stage 9 is the balance of this business case document.

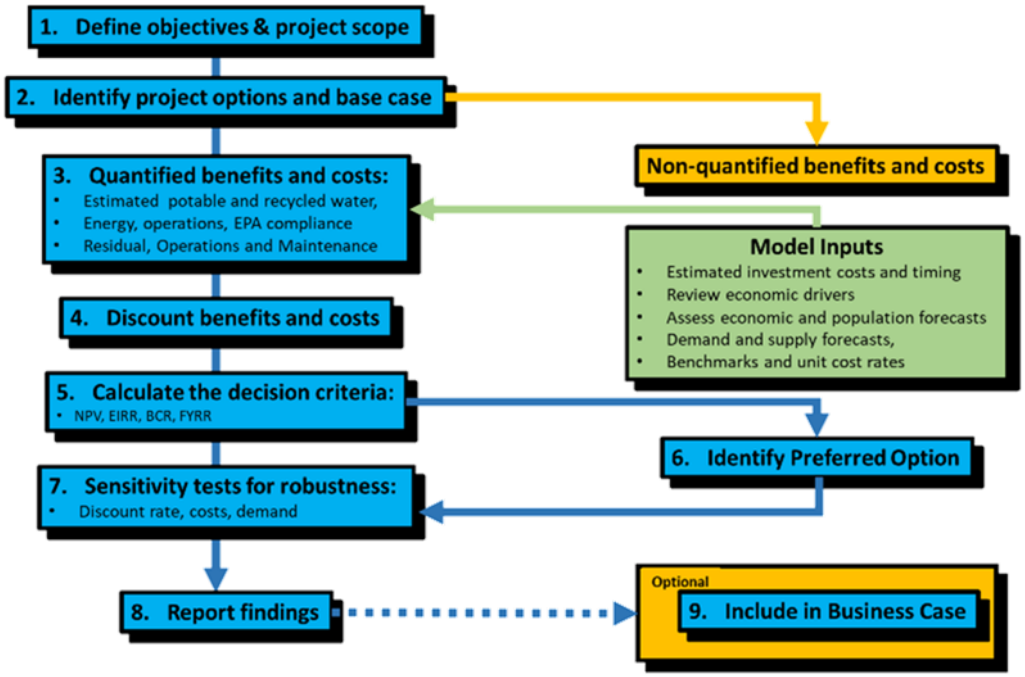

Figure 4-1 Cost-Benefit Analysis Framework

This analysis serves to document the results and provide necessary qualifications in determining the preferred option based on the Net Present Value and Benefit-Cost Ratio.

- **Net Present Value (NPV)** of a project is the present value (PV) of estimated benefits minus costs. NPV gives an estimate of the absolute size of the net social benefit of a proposal. The decision rule when using NPV is:
  - Accept a proposal only if NPV is greater than 0
  - In deciding between alternatives, select the one with the highest NPV
- **Benefit-Cost Ratio (BCR)** of a project is the PV of the estimated benefits divided by the PV of the estimated costs. BCR summarises the relative size of the costs and benefits of a proposal. The decision rule when using BCR is:
  - Accept a proposal only if BCR is greater than 1
  - In deciding between alternatives, select the one with the highest BCR

4.2.4 Project Background and Options

Section 2.1 described the project background and details, with the options discussed in Section 2.2.

The preferred option is Option 2 based on the multi-criteria analysis. This option incorporates the supply of potable water from GWCC's Oura Water Supply scheme via the connection point of an existing DN300 CI water main and travels along Oura Rd to the township of Nangus. Key components of this option include:

- Connection to the existing DN300 CI rising / gravity main operating between Marinna Reservoir and the Tenandra Reservoir with 9.9 km of PN35 DN100 DICL pipeline from the existing network to a new Nangus reservoir
- Two reservoirs of 250kL useable volume (each providing three days of storage based on average day demand) located west of Nangus
- Approximately 3.9 km of DN150 PVC pipeline from Nangus reservoir to Nangus
- Approximately 3.0km of DN100 PVC pipeline for reticulation, including water meters for 36 connections
- An upgrade to the existing water pump station at Marinna

Options 7 is the controlled or 'do minimum' option (base case) in which the current situation is maintained. No reticulated water is supplied to Nangus, and residents will continue make their own water supply arrangements. An allowance has been included for water cartage in the costs for this option.

4.2.5 Project Cost and Benefits

4.2.5.1 Cost Estimate – Capital and Ongoing Maintenance, operations and service costs

For the purposes of the economic appraisal, the spend profile of the cost estimate has been assumed to be over two financial years as shown in Table 4-2. Contingency has been set based on a benchmark rate of 30% of the base construction and material cost.

Table 4-2 Project case, cost estimates ($2020)

Year	Base	Contingency	Total
2022	$3,242,350	$972,705	$4,215,055
2023	$3,242,350	$972,705	$4,215,055
Total	$6,484,700	$1,945,410	$8,430,110

Annual operating and maintenance (O&M) costs are based on benchmarked practice equal to 0.5 per cent of the upfront capital cost

Table 4-3 Operating Costs (undiscounted)

Item	Cost
Average Annual Water O&M Expenses for Nangus at 0.5%	$42,150
Average Annual cost (per residence) 2024	$1,560
Average Annual cost (per residence) 2043	$535

4.2.5.2 Benefits

The Project is unlikely to generate substantial benefits to the local users, particularly through improved amenity, hygiene and cost savings. As part of this economic analysis, the perceived benefits were quantitatively evaluated against a do-minimum scenario. Direct benefits outlined in the SaSWP CBA Toolkit and are categorised into three groups:

- Type 1 - Health and maintenance
- Type 2 - Environmental benefits
- Type 3 - Other benefits – usually residual value

Table 4-4 Classes of benefit

Key types of benefits identified and used in CBA	Type
Avoided social costs of water born disease (for both water and sewerage projects)	1
Avoided costs of on-site sewerage systems (including septic, on-site pump out and aerated wastewater treatment systems)	1
Avoided costs of household water filtration systems	1
Avoided costs of water carting (in the case of water supply failure)	1
Willingness to pay to avoid water restrictions	1
Willingness to pay to recycle water (to houses, the environment, Council or business/ industry)	1
Willingness to pay to provide fish passage associated with water security or dam safety projects	1
Willingness to pay to avoid receiving water quality affects	2
Willingness to pay to avoid loss of riverine habitat	1
Value of Statistical Life (for dam safety projects).	1

In this case the main benefit is avoiding the cost of carting in water during extended dry periods.

Table 4-5 provides a summary of the present value of benefits associated with each of these parameters based on a seven per cent real discount rate.

Table 4-5 Summary of benefit present values

Constant 2021 dollars	Drinking	Other	Combined
Avoidable cost - drinking water	$698,000		$698,000
Other Benefits (Residual)		$298,000	$298,000
TOTAL			$996,000

It is seen that savings in avoiding the costs experienced in the base case produce the majority of the benefit stream in comparison to other types of benefits at approximately 70 per cent.

4.2.5.3 Avoided cost of carting drinking water to Nangus

The base case requires trucks carrying drinking water to houses for approximately four months a year. This cost is avoided in the project case. Estimated costs are summarised in Table 4-6.

Table 4-6 Cost of providing on site deliveries of water

Year	Undiscounted	Discounted at 7 %
2024	$32,400	$26,448
2034	$65,242	$27,073
2044	$98,084	$20,691

4.2.5.4 Intangible Economic Benefits

The intangible economic benefits of this project include:

- Increase in amenity value
- Government Value – Public perception of government value and trust in government (e.g. meeting commitments given to the community and compliance with best practice and legislation).
- Social Value – Providing increased satisfaction to the public at large (including the disadvantaged) through improved and / or subsidised, accessible and affordable water services. This might also be described as a 'community service obligation'.

As such, the economic evaluation of the Project is conservative. Benefits will be realised upon Project completion and commissioning of the service.

4.2.6 Cost Benefit Analysis

The economic analysis considers the comparative costs and benefits of two strategic options against the base case or "do-minimum" scenario based on available data. "base case" and "do-minimum" are used interchangeably hereafter.

The economic merit of the preferred option was determined by comparing the present value of the change in net economic benefits (compared with the base case scenario) less the change in capital and maintenance costs. The key benefits incorporated within this Cost-Benefit Analysis (CBA) assessment were in the form of savings in the provision of potable drinking supplies and operating costs. As discussed in Section 4.2.1, a cost effectiveness analysis approach was used for the CBA.

The economic appraisal is undertaken in line with:

- *Cost-Benefit Analysis Guide 2019* (iNSW, 2019)
- *Safe and Secure Water CBA Toolkit (2017 – ongoing)*

> *Economic viability of recycled water schemes* (2013)[1]

It should be noted that a range of non-quantified economic factors, physical and engineering constraints exist, such that this CBA is considered to be conservative in nature, producing a conservatively low Benefit Cost Ratio (BCR). In addition, standard evaluation metrics of Net Present Value (NPV), Net Present Value of Investment (NPVI), First Year Rate of Return (FYRR) and Internal Rate of Return (IRR), have been determined to support the assessment of viability.

As a way of assessing the robustness of the assessment findings, a sensitivity analysis for the change in key calculation assumptions was also undertaken and is discussed in Section 4.2.8.

4.2.7 Assumptions used in the Economic Appraisal

For the purposes of this assessment a number of assumptions have been made to facilitate estimation of economic and financial values, these include:

> 2020 was utilised as the base year of assessment.

> Consumption, benefits and cost growth rates were estimated and applied based on expected uptake of tenancies.

> A benefit evaluation period of 30 years from project opening (2024) was adopted.

> A discount rate of seven per cent per annum has been applied (Treasury NSW). This is to ensure that projects are fairly compared against a common benchmark where the project relates to projects in transport, health, education, etc.

These timeframes and discount factors were utilised in all present value calculations undertaken for this CBA. Other assumptions in the identification and evaluation of relevant costs and benefits are documented as necessary in the following sections.

4.2.8 Cost-Benefits Analysis Results

4.2.8.1 Economic Appraisal Results of Options

The results of the assessment performed for the preferred option against the base case are shown in Table 4-7 and Table 4-8.

Table 4-7 Economic appraisal results – at 7 per cent discount rate

Performance Indicator	Value
PV COST ($000)	6,319
PV BENEFIT ($000)	996
NPV ($000)	-5,323
BCR	0.16
NPVI	-0.84
FYRR	-0.1%
IRR	-2%

Table 4-8 Economic appraisal results – Preferred Option

Performance Indicator	3%	4%	7%	10%
PV COST ($000)	6,983	6,789	6,319	5,956
PV BENEFIT ($000)	2,353	1,868	996	584
NPV ($000)	-4,630	-4,921	-5,323	-5,371
BCR	0.34	0.28	0.16	0.10

[1] Marsden Jacob Associates, 2013, Economic viability of recycled water schemes: A report of a study funded by the Australian Water Recycling Centre of Excellence

Performance Indicator	3%	4%	7%	10%
NPVI	-0.66	-0.72	-0.84	-0.90
FYRR	-0.1%	-0.1%	-0.1%	-0.1%
IRR	-2%	-2%	-2%	-2%

Analysis of results

Projects with a positive BCR above one are considered to be economically viable projects. Under a seven per cent real discount rate, the project has a BCR of 0.16. For every dollar invested, the project returns only 16 cents in benefits.

The project is expected to generate Net Present Value to community of negative $5.23 million over the thirty years of the appraisal.

As such, the results of the economic analysis indicate that the project is not economically viable.

Sensitivity analysis

It is recognised that the results of the assessment presented in Table 4-8 are dependent upon a range of assumptions made as part of the economic analysis. Both in terms of financial parameters (i.e. discount rates) as well as cost and benefit assessments (e.g. demand growth rates, strategic cost estimates). Consequently, to demonstrate the robustness of the observed results, a sensitivity analysis of the Project was undertaken, as shown in Table 4-9.

Table 4-9 Sensitivity analysis – Preferred Option

Sensitivity Factor	NPV ($m)	BCR	IRR	NPVI
3% discount rate	-4,630	0.3	-2.0%	-0.7
4% discount rate	-4,921	0.3	-2.0%	-0.8
7% discount rate	-5,323	0.2	-2.0%	-0.9
10% discount rate	-5,371	0.1	-2.0%	-1.0
Cost estimate +40%	-7,668	0.1	-3.2%	-0.9
Cost estimate +20%	-6,496	0.1	-2.6%	-0.9
Cost estimate – 20%	-4,151	0.2	-1.2%	-0.9
Benefits +20%	-5,124	0.2	-1.2%	-0.9
Benefits – 20%	-5,522	0.1	-3.0%	-0.9
Benefits -40%	-5,722	0.1	-4.3%	-1.0
Ops and Maintenance cost +20%	-5,415	0.2	-2.2%	-0.9
Ops and maintenance cost -20%	-5,232	0.2	-1.8%	-0.9
Worst case	-6,786	0.1	-3.9%	-1.0

Negative BCRs and NPVs were observed under all sensitivity tests, including the cases for an increase in the benefits and reduction in the cost estimate.

4.2.9 Financial Appraisal

Financial Appraisal is not required for a project of this size and scope. The project is unlikely to generate revenues and/or involve a Public Private Partnership (PPP).

4.2.10 Conclusion of Economic Appraisal

The above results show that the associated costs outweigh the benefits of undertaking the project for each analysed option. As such, the preferred option for reticulated water supply to Nangus is not economically justified.

In conventional economic terms, the project is not expected to deliver savings and wider economic benefits to the Nangus residents. It would be more effective to look at other options, for example the purchase and operation of a water cart, to supplement potable water supply.

4.3 Proposed Funding Arrangements

There are a number of potential options available for funding this project. These include

- Self-funding through the capital budget of the owning organisation
- Partnership funding by agreement between GWCC and CGRC
- Obtaining grant funding
- Debt funding
- A combination of the above

The key stakeholders expressed a preference to focus on grant funding, acknowledging that some funding models require the proponent to contribute a portion of the funds (for example, some arrangements require between 20 – 50% funds from the proponent). If the project is funded through one of these grant opportunities, GWCC and CGRC will need to determine the most appropriate funding arrangement for the balance of funds required from the above options. The final funding arrangement will be determined by the proponents in the next stage of the process of this project evaluation.

4.4 Impact on Revenue from the Typical Residential Bill

To provide a level of insight into the impact of the proposed Nangus scheme, an analysis was undertaken to determine the likely revenue from the water bills and nominal costs that have been assumed for the operations of the network. This analysis was conducted for both the potential asset owners being CGRC and GWCC. The assumptions used were consistent with those used in the cost benefit analysis and shown in Table 4-10 for reference. Billing information was sourced from the currently published fees and charges of each council.

Table 4-10 Assumptions for Revenue Analysis

Item	Data	Source
Average daily demand	0.81 kL/day/ET	Preliminary Design Assessment, Section 2.2
Typical usage per household	296 kL/year/ET	
Population growth rate	5.00%	Assume growth to 79 connections in 20 years, as per Section 2.1.8
Starting connections	33	As per Section 2.1.8
CAPEX estimate	$8,430,110	As s per Section 4.1
Operating Costs	$42,151	Based on 0.5% of the CAPEX estimate
Useful life (of the system)	100 Years	Nominal life of long term infrastructure

Table 4-11 Tariff structure

Rate	CGRC	GWCC
Access Charge (20mm connection)	$400 pa	$200 pa
Volumetric Charge	$2.00 /kL first 39kL /quarter $3.00 /kL above 39kL /quarter	$2.45 /kL

Developing the model to assess the impact yields the results shown in Table 4-12 and Table 4-13 for each case in year 1 and Year 20. In both cases, the proposed network has a negative cost impact in the first year for operational expenditure (OPEX) costs and a positive cost impact once the customer base grows. If the return of capital is taken into account, neither case comes positive within the 20-year horizon. This can be seen graphically in Figure 4-2 through to Figure 4-5.

Table 4-12 Year 1 Analysis

Metric	CGRC	GWCC
Fixed charge Revenue	$13,200	$6,600
Usage charge Revenue	$24,121	$23,903
Total Revenue	$37,321	$30,503
Operating Cost	-$42,151	-$42,151
Sub-total Revenue Balance	-$4,829	-$11,647
Return of Capital	-$84,301	-$84,301
Total Revenue Balance	-$89,130	-$95,948

Table 4-13 Year 20 Analysis

Metric	CGRC	GWCC
Fixed charge Revenue	$33,356	$16,678
Usage charge Revenue	$60,953	$60,402
Total Revenue	$94,309	$77,080
Operating Cost	-$42,151	-$42,151
Sub-total Revenue Balance	$52,159	$34,930
Return of Capital	-$84,301	-$84,301
Total Revenue Balance	-$32,142	-$49,371

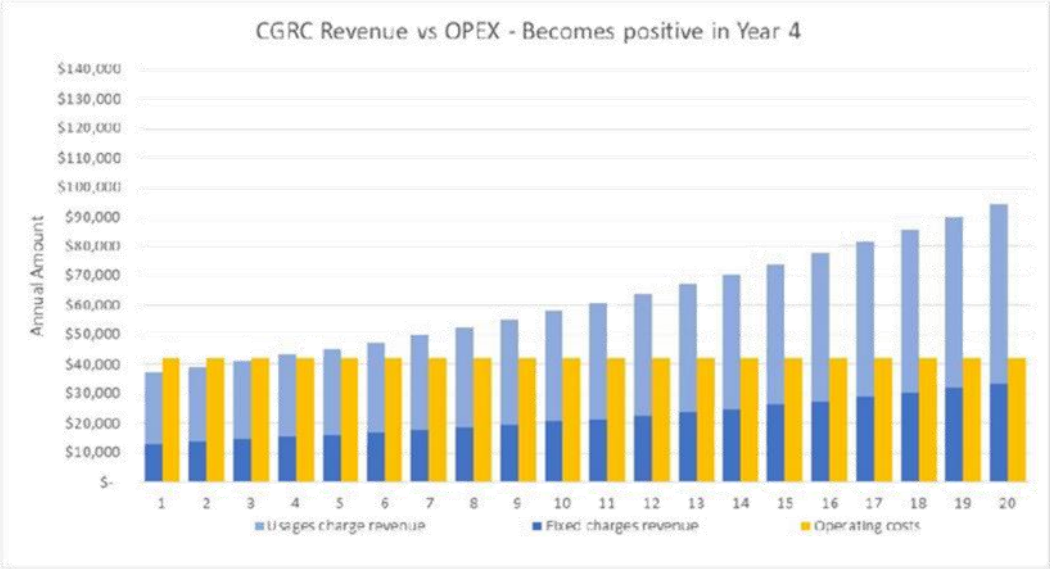

Figure 4-2 CGRC - Revenue vs OPEX

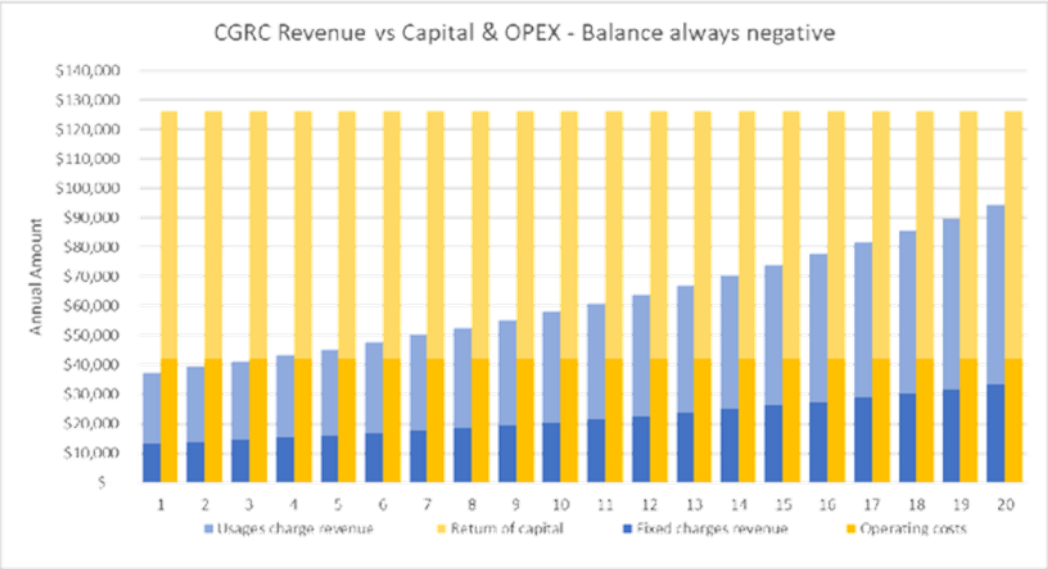

Figure 4-3 CGRC Revenue vs Capital return and OPEX

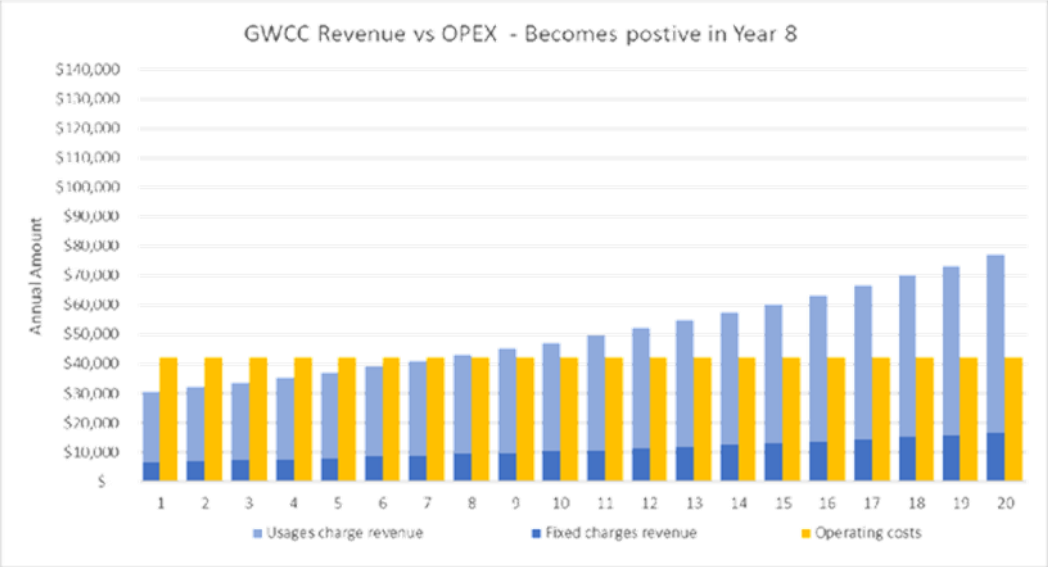

Figure 4-4 GWCC - Revenue vs OPEX

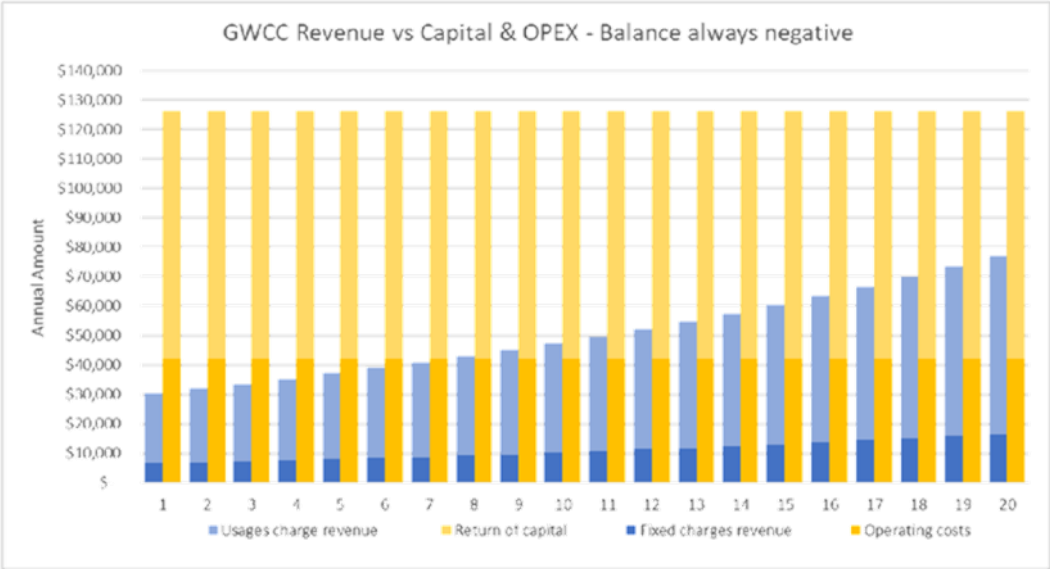

Figure 4-5 GWCC Revenue vs Capital return and OPEX

From an operational view, the scheme becomes cashflow positive once growth in the township results in sufficient connections to the network (i.e. >38 connections under the CGRC tariffs and >46 for GWCC). This will ensure the routine costs incurred will be met via the income received from rates. The issue is the project will not cover the capital costs incurred to construct the scheme. Typically, this would be used to repay any finance on the project, and following that, pay for renewals and replacements in the future as the need arises. As such, under the current assumptions, these capital costs would have to be funded by grants or the asset owner from elsewhere within their budget.

Given the non-financial benefits to the community of providing potable water, there may be a case to progress the project with alternate funding arrangements in place.

5 Program and Milestones

As discussed in Section 1.3, there are a number of stages to progress following the acceptance of this Business Case. These are depicted in Figure 5-1. The overall time frame is to commission the project within five (5) years.

Task	H1 2021	H2 2021	H1 2022	H2 2022	H1 2023	H2 2023	H1 2024	H2 2024	H1 2025	H2 2025	H1 2026
Acceptance of Business Case											
Project scoping and pre-approval activities											
Undertake studies required for development approval, including (but not limited to) environmental, ecology, geological, heritage and public consultation											
Development Approval											
Detailed Design											
Approval of funding											
Construction											
Commissioning											

Figure 5-1 Proposed Project Schedule

6 Governance

6.1 Organisational Structure

The asset owner will establish a project team that consists of key decision makers in council, and representatives from operations and maintenance staff to ensure all areas of the project are considered through the design, construction and commissioning stages. These key decision makers in the figure below will also be the primary point of contact for the project internally, as well as externally to successful tendered contractors. Contractors will report directly to its associated key project supervisor on the day-to-day constructions activities. High levels communication between the key decision makers in the project team, and the contractors is imperative for the project to be delivered on time and on budget.

Figure 6-1 Project Team

A project management plan will be set up to cover all aspects of executing the project including communication requirements. Some of the key activities to be undertaken be Council will include:

- Monthly project reporting to the Infrastructure Services Committee
- Cost and schedule tracking
- Regular project meetings (monthly during initial studies, fortnightly during detailed design and weekly during construction)
- Quality assurance
- Design reviews
- Safety audits during construction
- Monitoring of the project objectives and outcomes
- Ensuring environmental outcomes are achieved.

6.2 Asset Ownership / Ownership structure

Once the pipeline, pump station, WTP, and reservoir has been commissioned and are operational, responsibility for the facility will fall under the role of Manager Water & Sewer. The asset owner will ensure professional operational and maintenance staff will conduct the day to day activities of the supply infrastructure. As noted in Section 3.5, it is recommended GWCC is best placed to assume ownership and management of the assets, including all maintenance activities.

6.3 Key Risks

Risks associated with the project must be identified and managed by the asset owner throughout the project's lifecycle. The asset owners most current relevant risk management policy and risk management procedures will provide the basis of the project's risk identification and management and will inform part of the requirements for the engagement of any contractors during project execution. Risk management will be in accordance with industry best practise, legislative requirements and the corporate risk approach of the proponent.

Initial risks for each option assessed at the feasibility stage have been outlined in Section 2.2 and summarised in the Multi-Criteria Analysis shown in Table 2-3.

However, further detailed risk identification and assessment should be conducted by the asset owner (and any engaged contractors), which may affect the project's scope, construction, financing, planning and approvals, legal, property acquisitions, utility relocation, procurement, sustainability, stakeholder management, safety or other relevant factors.

Risk mitigation measures should be developed to minimise its risk level from a strategic perspective. The asset owner will include a requirement that a detailed risk management plan is to be to put in place during execution of the project to address the identified risk in order to mitigate and manage the outcomes for the construction and operational phases of the infrastructure.

A number of high level risks relating to the design and approvals have been identified by the stakeholders at this stage of the process. These risk and associated mitigation strategies are summarised in Table 6-1. Further details are provided in the risk assessment in Appendix A. This risk assessment is relevant to this stage of planning only and needs to be updated as the project progresses.

Table 6-1 Key project risks

Risk	Mitigation strategies
Funding availability	▪ Preparation of project business case ▪ Inclusion of project in forward budgets ▪ Application for available grant funding
Projected growth under and over estimates	▪ Sensitivity analysis conducted as part of economic analysis ▪ Flexible project execution plan for construction commencement based on requirements
Impact on GWCC Network	▪ Network modelling to be undertaken as part of detailed design
Construction Risks - Route issues not identified i.e. property / environmental / geotechnical / Biodiversity / heritage	▪ Further assessments to be undertaken as part of detailed design
Construction Risks - Unforeseen pricing issues: ▪ Materials pricing ▪ Materials supply ▪ Construction difficulty	▪ Sensitivity analysis conducted as part of economic analysis ▪ Updated cost estimate following detailed design ▪ Procurement plan developed prior to approaching the market to ensure competitive pricing

6.4 Legislative, Regulatory Issues and Approvals

6.4.1 Summary of Assessment

A high-level assessment of potential issues with legislative, regulatory, issues and approvals which involved desktop review undertake in areas of environment and heritage identification and assessment. Preliminary results returned no apparent issues or impact were discovered for the preferred option in *Preliminary Design Assessment*.

A more detailed field assessment of the final alignment during future stages of the development will allow for avoidance or minimisation of potential impacts identified. Impacts on other matters can generally be managed through careful construction management processes developed at future construction stages of development. Impacts to private property will also need to be minimised where possible with appropriate consultation with interested stakeholders and impacted community members where necessary.

In addition, detailed assessment of construction permits required on the different Council owned land the pipeline travel under should be investigated in the future.

6.4.2 Initial Approval pathway advice

An approval pathway advice has been developed in the *Preliminary Design Assessment,* but it has been noted that the approval pathway will need to be confirmed and will be dependent on confirmation of the pipeline alignment and its potential impacts during future stages of the project.

6.5 Project Management Supporting Document

For the successful delivery of the project the Council, consultants, and contractors are to abide by various management plans for each component of the project. These plans are to be developed by the asset owner or the contractors involved, and are not limited to the items shown in Table 6-2, which shows the current status of the management plans.

Table 6-2 Supporting management plans

Management Plan	Responsibility	Current Status	Comments
(Strategic) Asset Management Plan	Asset Owner	Would require update to include the Nangus scheme	Details the asset management objectives, lifecycle planning processes and future forecasts
Project Procurement Plan	Asset Owner	Yet to be developed	Based on procurement standards of the asset owner
Project Communications Plan	Asset Owner	Yet to be developed	Details internal and external communications, including relevant stakeholders
Project Governance Plan	Asset Owner	Yet to be developed	Oversight to ensure the correct processes are in place for monitoring project progress and outcomes
Benefits Realisation Plan	Asset Owner	Yet to be developed	Generally required for grant funding
Safety Management Plan	Asset Owner / Contractor	Yet to be developed	Based on legislative requirements and the existing policies of the asset owner
Environmental Management Plan	Asset Owner / Contractor	Yet to be developed	Based on legislative requirements and the existing policies of the asset owner
Risk Management Plan	Asset Owner / Contractor	Yet to be developed	Based on legislative requirements and the existing policies of the asset owner
Project Implementation Plan	Asset Owner / key stakeholders	Yet to be developed	Out the implementation requirements of a joint project between the key stakeholders

6.6 Consultation – End users/customers

As discussed in section 1.4.2, CGRC has previously undertook a community consultation and received a unanimous response from Nangus residents in support of a reticulated water supply. The end users, Nangus residents, of the reticulated water supply will be consulted by a Council representative on the outcome of this business case; development, changes, and progress of the project; and construction of the reticulated water supply. After the construction and operation of the water reticulation, a follow up consultation to Nangus' end users will provide insight into the realised benefits of the project.

APPENDIX A

RISK ASSESSMENT

Context/source	Risk Types	Risk Owner	Risk Description	Likelihood	Severity	Risk Rank	Existing Management Controls	Additional Mitigation Strategies
Planning	Approvals		Scope not clearly defined	Possible	Severe	High	Peer Review of Scope of Works	Consultation with stakeholders, early contractor engagement.
Planning	Environmental (inch cultural / heritage)		Possible Aboriginal Heritage Issues	Likely	Severe	High	Prepare Review of Environmental Factors	Conduct due diligence assessment
Planning	Environmental (incl. cultural / heritage)		Biodiversity along the proposed route of the main	Likely	Moderate	High	Prepare Review of Environmental Factors	Conduct biodiversity assessment
Planning	Legal / Liability		Land and easement acquisition for pipe line and reservoirs	Likely	Moderate	High	Early negotiation with land owners	Survey and preparation of easement plans.
Planning	Project		Geology and geotechnical site conditions	Possible	Moderate	Moderate	Site investigations during detailed design.	Detailed investigation including interpretive reports
Planning	Procurement		Probity risks not identified / not managed	Unlikely	Severe	Moderate	Follow established procurement process	Prepare project specific procurement plan.
Construction	Environmental (incl cultural / heritage)		Contaminated material and naturally occurring asbestos	Likely	Severe	High	Prepare Review of Environmental Factors	Use appropriate safe work method statements (SWMS)
Construction	Financial		Potential Cost overrun	Likely	Moderate	High	Investigation work and well defines scope of works	Review scope of work with risk based estimate
Construction	Program		Project design and construction delays due to latent conditions	Possible	Moderate	Moderate		Planning input and manage during delivery phase. Regular project updates between asset

Context/source	Risk Types	Risk Owner	Risk Description	Likelihood	Severity	Risk Rank	Existing Management Controls	Additional Mitigation Strategies
								owner, project team and contractors.
Construction	Project		Inadequate quality plan	Unlikely	Moderate	Low	Quality Management System	Develop project Specific Quality Management Plan
Construction	Project		Program risks not continually reviewed & monitored	Possible	Severe	High	Risk Management workshop held. Program risks communicated to Steering Committee. Mitigation strategies implemented	Review risks phase by phase Undertake risk studies at package / program level Escalate program risks as appropriate Implement mitigations & report status at meetings
Construction	Project		Implementation timeframe tight	Possible	Severe	High	Project Schedule developed with critical paths identified. Contingencies developed on a needs basis Project managers escalate to client	Regular meeting to monitor schedule. Seek to improve working relationships with other providers

Business Case

APPENDIX

B

NANGUS FEASIBILITY STUDY

This document has been provided separately.

Business Case

APPENDIX C

NANGUS PRELIMINARY ASSESSMENT

Nangus Water Supply Business Case

Preliminary Design Assessment

WI21002AP

Prepared for
Goldenfields Water

11 June 2021

Cardno

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1	26/10/2020		J. Lake	S. Bessell
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1 Introduction

Nangus is a village in the Cootamundra Gundagai Regional Council (CGRC) Local Government Area with an estimated population of 80 people. The village is located approximately 18 km west of Gundagai. Nangus does not currently have a reticulated water supply, and residents provide their own water supplies, typically from roof water, bottled water, bore water or water carting.

CGRC recently undertook community consultation for the Villages Strategy, which received strong support for provision of a reticulated water supply. CGRC has requested Goldenfields Water County Council (GWCC) investigate provision of a reticulated town water supply to Nangus.

The objectives of the overall project include:

- Provide appropriate levels of service (LOS) as part of the design assessment and ensure the LOS can be achieved throughout its design life.
- Achieve project delivery from initiation to construction completion in 4-6 years (should the project prove feasible).
- Undertake a feasibility assessment Phase (Phase 1) of the project
- Undertake a Business Case Phase of the project (Phase 2)
- Cost estimates for whole of life costs to be equal to or less than 100% of benefit, achieving BCR of 1 or over
- Achieve best practice principles
- Secure construction funding
- Assess and mitigate all risks associated with the delivery and ongoing operation of this project.

Cardno completed Phase 1 of the project with a report issued February 2020, *Feasibility Study, Nangus Water Supply* (Cardno, 17 February 2020). Subsequently Cardno was commissioned to proceed to Phase 2, the preliminary business case. This report provides supplementary support to the business case.

This report has been prepared to confirm the preferred option, identified in Phase 1. Provide an overview of network operation as a result of the inclusion of a Nangus water supply water supply scheme within the broader GWCC Oura Water Supply network.

2 Assumptions

This section details the assumptions used in developing the hydraulic network model that has been used to undertake the preliminary design of the proposed Nangus water supply scheme.

2.1 Background

Cardno's 2019 report, *Feasibility Study, Nangus Water Supply* (Cardno, 17 February 2020) assessed seven options for the provision of a reticulated water supply scheme for Nangus. The seven options included:

- Option 1: Pipeline from Gundagai water supply
- Option 2: Pipeline from GWCC water supply – from Oura Road
- Option 3: Pipeline from GWCC water supply – from Tenandra Reservoirs following existing easement
- Option 4: Pipeline from GWCC water supply – from Tenandra Reservoirs following new route
- Option 5: Murrumbidgee River extraction and treatment
- Option 6: Groundwater extraction and treatment
- Option 7: Do nothing

Following a multi-criteria assessment (MCA), including CAPEX and OPEX, Option 2 was selected as the preferred strategy.

Option 2 incorporates the supply of potable water from GWCC's Oura Water Supply Scheme. This option would see the supply of water via a pipeline built along Oura Road from an existing DN300 CI pipeline along Wantabadgery Road to the village of Nangus.

Key infrastructure this option includes:

- Connection to the existing DN300 CI rising / gravity pipeline operating between Marina Reservoir and the Tenandra Reservoir.
- Pressure reducing valve (PRV).
- Approximately 9.8 km of PN35 DN100 DI pipeline from the existing network to Nangus reservoir, located west of Nangus.
- Nangus reservoir, with a usable volume of 250 kL.
- Chlorine dosing facility at Nangus reservoir to maintain quality.
- Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC-O) to service the existing developed area in Nangus.

This report provides the detailed hydraulic assessment of the identified Option 2 infrastructure.

2.2 Population and design flows

CGRC estimates the current population of Nangus to be approximately 80 people. The following are currently located within the village:

- Approximately 27 occupied dwellings
- Church
- Hall
- Public School
- RFS Shed
- General Store
- Workshop

Therefore, there is potential for approximately 33 connections at the existing level of development. In addition, there are currently 36 vacant lots.

Population projections from CGRC estimate a population of 213 people could be possible in the long term. This equates to 79 property connections at the 2016 Nangus census occupation rate of 2.7 people/dwelling.

To allow for additional growth, CGRC and GWCC have agreed the feasibility study should be based on a supply for 100 ET (equivalent tenements) in the village of Nangus.

The design average day demand (ADD) and maximum day demand (MDD) from within the village of Nangus are shown in Table 2-1. In the hydraulic modelling it has been assumed that the full demand will be catered for in the pipelines through to Nangus, as it is unknown where these rural demands will be located along the pipeline.

Table 2-1 Nangus water demand

Parameter	Nangus Village		Nangus Village and Rural Demand (pipeline options only)		
	Design Criteria (kL/d/ET)	Total Demand (kL/d)	Design Criteria for Rural Connection (kL/d/ET)	Rural Demand (kL/d)	Total Demand (kL/d)
Average Day Demand	0.81	80.5	5	25	105.5
Maximum Day Demand	4	400	25	125	525
Maximum hour Demand	7	712 (8.2L/s)	45	223	935 (10.8L/s)

2.3 Network modelling

The current Oura Water Supply hydraulic model was utilised for this assessment. The model was prepared in the InfoWorks WS Pro 5.0 software.

3 Hydraulic network assessment

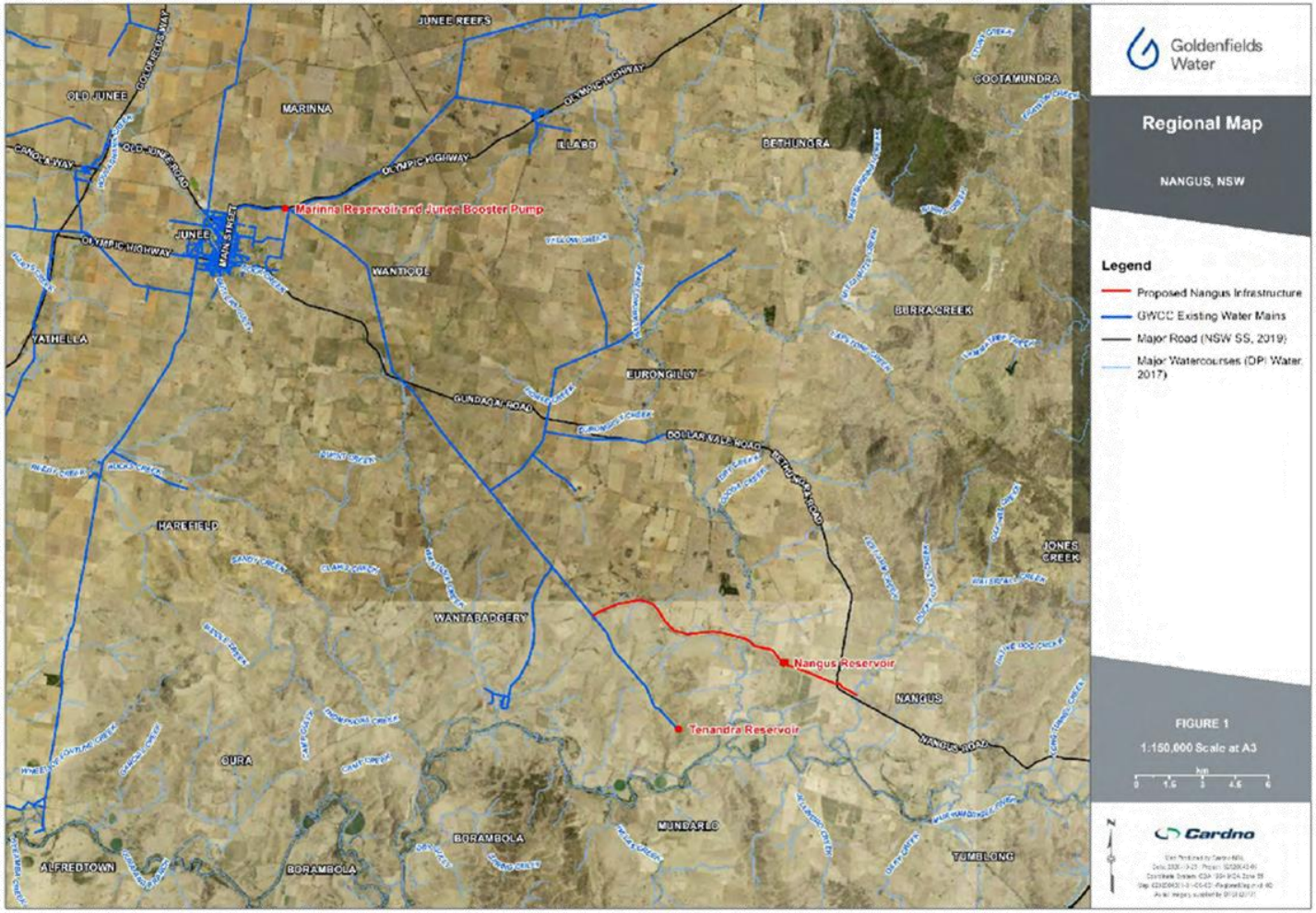
This section provides a summary of the inputs and construction of the Nangus water supply scheme in the network model and the presentation of the results.

3.1 Existing network

The existing water supply network in the vicinity of Nangus and the limit of this review includes; the Oura scheme trunk offtake at Junee, the Marina reservoir and pump station as the supply point. The Marinna pump station provides supply to the southern network via a DN300 pipeline generally along Wantabadgery Road, to the Tenandra reservoir. It is noted that the smaller connections and reservoirs located between the pumps and Tenandra reservoirs have not been assessed in detail, but are represented in the model as a system demand as per the provided Oura Scheme model.

An overview of scheme is provided in Figure 3-1.

Figure 3-1 Overview of water supply scheme



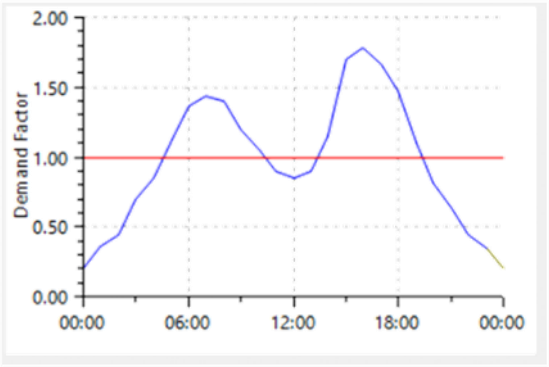
3.1.2 Scenarios, Controls and Demand sets

This model includes a summer and winter demand scenarios. In addition, each demand type has been separated, with a summary of the demand profiles provided in the following sections.

3.1.2.1 Demand Diagram Sets

The model uses a demand diagrams to describe the diurnal profile. A standard/typical residential profile observed in the Oura Scheme was adopted for the Nangus Village. The adopted residential profile is shown in Figure 3-2.

Figure 3-2 Residential profile



3.1.2.2 Demand Scaling Groups

Demand scaling groups allow for the seasonal variation in demand to be assessed. The model includes both Winter and Summer demand scales. The scaling factors for the "rural" demand has been applied for Nangus.

The scaling factors for each season is presented in Table 3-1.

Table 3-1 Demand scaling per scenario

Demand Code	Summer Ratio	Winter Ratio
Rural	2.34	1.00

3.1.2.3 Model run time

All scenarios have been for fourteen (14) consecutive days to ensure long-term trends and impacts are appropriately identified.

3.2 Infrastructure to service Nangus

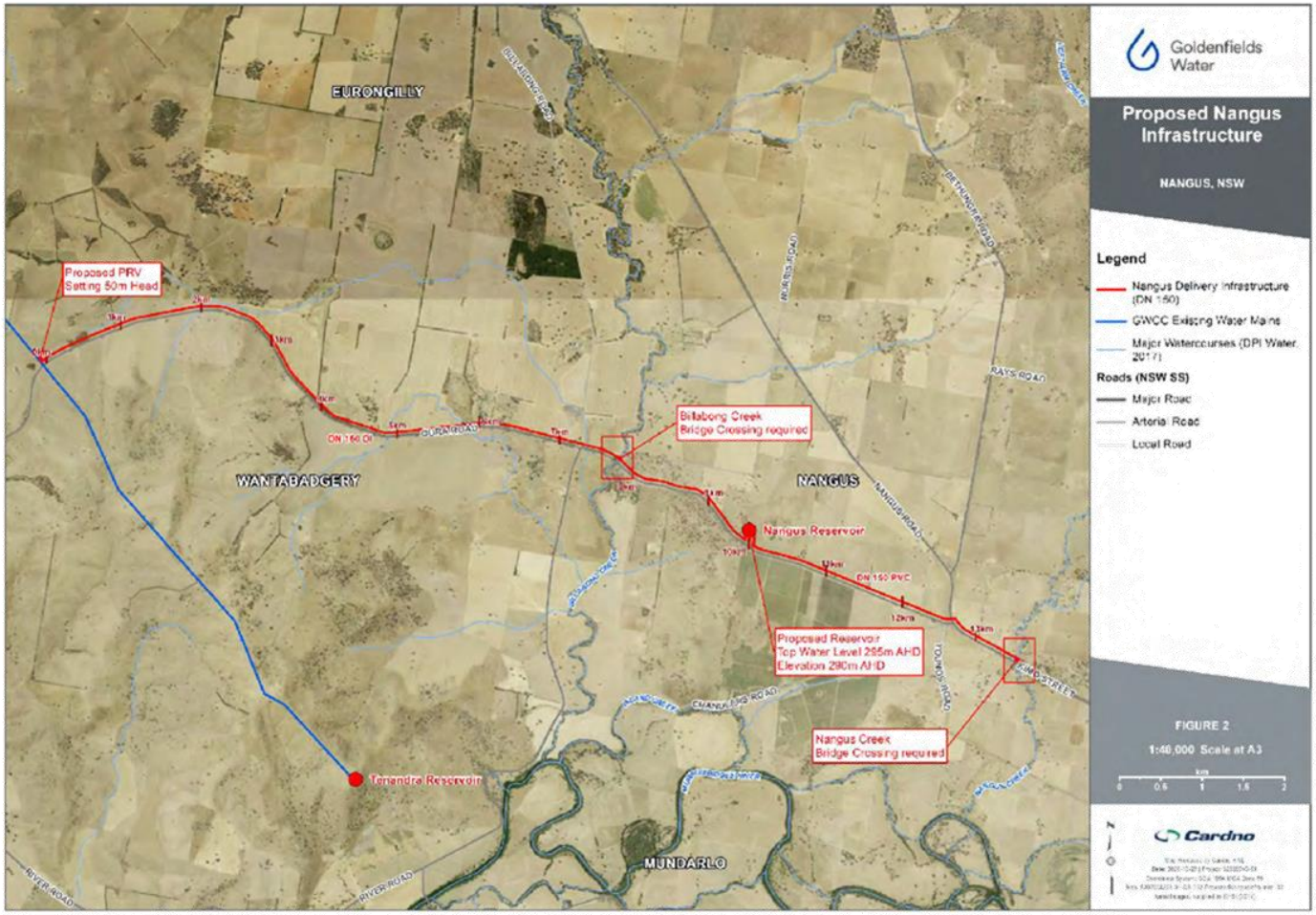
The infrastructure identified in the February 2020 Cardno report to connect the existing DN300 trunk main to the Village of Nangus forms the basis of this assessment. This was modelling assessment was undertaken to optimise the design and ensure prudency and efficiency in the preferred supply option.

The infrastructure proposed as part of the preliminary preferred option included:

- Connection to the existing DN300 CI rising / gravity pipeline operating between Marina Reservoir and the Tenandra Reservoir.
- Pressure reducing valve (PRV) – set to 50 m.
- Approximately 9.9 km of PN35 DN100 DI pipeline from the existing network to Nangus reservoir, located west of Nangus. Following an alignment along Oura Road.
- Nangus reservoir, with a usable volume of 250 kL. Located at a site along Oura Road.
- Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC-O) to service the existing developed area in Nangus.

The network proposed for Nangus is illustrated in Figure 3-3.

Figure 3-3 Proposed Nangus network



3.2.2 Nangus Supply infrastructure

The infrastructure identified in the February 2020 report was reviewed and optimised in the InfoWorks WS model following consultation with GWCC. This was undertaken to ensure the identified scheme can operate and integrate with the existing network efficiently.

3.2.2.1 Delivery infrastructure

This section covers the infrastructure required to deliver water to the proposed Nangus reservoir. This includes, the identified PRV, the delivery pipeline along Oura Road and the reservoir.

3.2.2.1.1 Delivery pipeline

The proposed supply pipeline was a PN35 DN100 DI pipeline. The initial assessment considered the supply of flow to Nangus based on the peak design flow (approximately 6 L/s maximum day demand). This assessment has also considered network operation, i.e. reservoir filling and by-pass arrangements.

Modelling was undertaken comparing the proposed DN100 pipeline and a DN150 pipeline to understand any operational advantages. The model was undertaken with and without the PRV on the offtake from the existing Oura Scheme. The predicted flow into the reservoir are:

- DN100 main – 7.8 L/s
- DN150 main – 22.6 L/s

The peak day demand for Nangus is 525 kL/day, or approximately 6 L/s for the full development of the community, including the proposed rural connections. Based on this review, a DN100 water main is considered sufficient to supply the future Nangus reservoir.

It should be noted that the smaller diameter main, has a lower impact on the existing Oura Scheme. These impacts are discussed in Section 3.4

3.2.2.1.2 Pressure reducing valve

A pressure reducing valve (PRV) was identified in the 2020 report. The hydraulic grade at the proposed connection location ranges between 406 m to 439 m AHD (82m to 114m Head). This variation is dependent on the operation of the Marinna pumps.

The requirement of the PRV was reviewed in consultation with GWCC. The review was to determine two things

a. Could PVC PN20 pipe material be installed, rather than ductile Iron pipe material?
b. Is the PRV was necessary

The material change from ductile iron to PVC would significantly reduce the cost of the project.

The model was run to determine the predicted pipeline pressures when the Nangus Reservoir was filling and importantly, when it was not filling. The pressures in the pipeline would be at maximum when the valving to the reservoir is closed, as the main would equalise to the pressure in the DN300 Oura Scheme offtake.

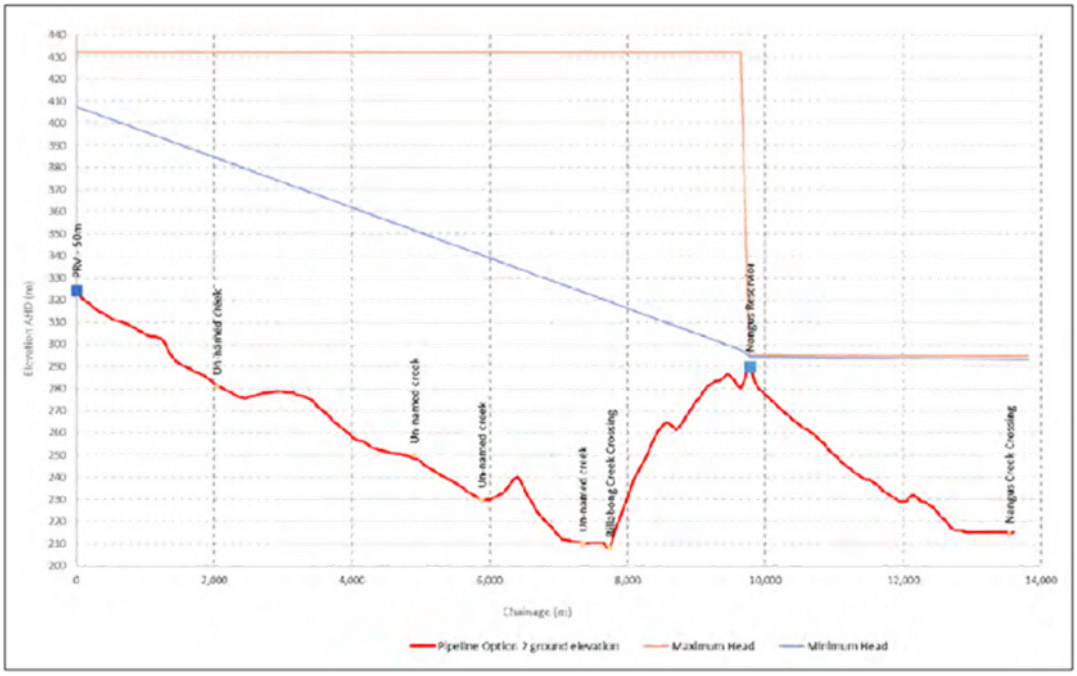
The predicted minimum (reservoir filling) and maximum (reservoir full) HGL for the Nangus Supply line are shown in Figure 3-4.

The hydraulic grade line during period where the reservoir is not filling shows that the pressures in the low section of the pipeline, Billabong Creek Crossing, are predicted to be in excess of 230 m. PVC PN20 pipeline is pressure rated to 200 m of pressure, thus is to not recommended that PVC material be used for the entirety of the pipeline.

There is a potential that pipeline that is installed above 250 m AHD be PVC PN20, and anything installed at a lower elevation be DICL PN35. Based on this approach the length of each pipe material would be:

- PVC PN20 – 6.4 km (4.7km + 1.2km)
- DICL PN35 – 3.5 km

Figure 3-4 Hydraulic grade and Nangus water supply scheme profile



Considering the pipeline is design to accommodate pressure during periods of PRV failure, the installation of a combined PVC PN20 and DICL PN35 lead-in, or a wholly DICL PN35 main negates the need for the PRV to protect the pipeline from high pressures.

It is noted that the pressures associated with private connections along this main should be reviewed, as these high pressures could damage domestic fixtures and fittings.

It is recommended the supply pipeline be a DN100 pipeline, comprising of mixed pipe materials (PVC PN20 and DICL PN35) dependent on maximum pressures. This pipeline would connect to the existing DN300 CI pipeline along Wantabadgery Road. The pipeline would extend for approximately 9.9 km to the proposed reservoir from the connection location. The proposed pipe alignment crosses the following watercourses (stream order 3 and higher), with the potential crossing methodologies are also provided:

- Billabong Creek – attached to bridge.
- Nangus Creek – attached to bridge.
- Four un-named creeks – all open trench.

Detailed design will be required to confirm the appropriate methodology for securing the pipeline to the identified bridges. This would be generated through structural assessment of the existing structures and geotechnical assessment of the localised ground conditions.

The appropriateness of trenched installation across the unnamed creeks will need to be confirmed via ecological survey during the review of environment factors.

A summary of the delivery pipeline is provided in Table 3-2.

Table 3-2 Delivery pipeline details

Pipe Material	Diameter (DN - ID)	Pressure Class (PN)	Length (m)	Peak modelled flow (L/s)	Velocity at Peak modelled flow (m/s)
DICL	100-112	35	3500	7.8	0.79
PVC	100-107	20	6,400	7.8	0.87

3.2.2.1.3 Reservoir

While a detailed site investigation has not been undertaken. A site for the reservoir has been selected to provide sufficient pressures for Nangus, while minimising the risks to local areas of environmental and heritage significance (Section 4). The proposed Nangus reservoir is located on elevated ground approximately 4 km east of Nangus. The preliminary selected site is property number 3410157, 279 Oakhills Road, Nangus. This land is freehold and zoned for primary production. Further detailed site investigations including environmental, cultural heritage, and acquisition is required. This site is approximately 9.9km from the proposed connection to the Oura water supply scheme and is located adjacent to Oura Road.

The reservoir will have a usable volume of 250 kilolitres, equal to three days of storage for the average day demand. A ground level reservoir is proposed, with the preferred material to be determined as part of the later design stages. The physical characteristics of the reservoir include a floor of 290m AHD, a minimum operating level of 292m AHD, allowing for dead storage and firefighting reserve, with a top water level of 295m AHD. The operating levels for modelling have been assumed to be based on a minimum operating level of 70% full (293.5m AHD) and 90% full (294.5m AHD).

The reservoir would be controlled by an inlet valve. The model has been set up to allow the reservoir to operate independently of the existing network. As demand is drawn from the reservoir, the inlet control will open and close as required. When the Marinna pumps are in operation the Nangus reservoir would fill from this source. When the pumps are not in operation, supply would be sourced from the Tenandra reservoirs. The impact on the existing network has been assessed (refer Section 3.4).

To provide greater operational flexibility, it is proposed that dual reservoir tanks be installed at this location. This configuration would provide an added layer of protection to the community from the high pressure upstream, as there will always be an operational reservoir at this site to reduce/buffer pressures.

The installation of two (2) tanks at this site removes the requirement for a PRV, as pressures in Nangus will be controlled by the tanks and there will not be a requirement to bypass the tanks during times of maintenance.

It is noted that a re-chlorination station would be co-located with the reservoir to ensure residual levels are maintained for Nangus.

A summary of the reservoir is provided in Table 3-3.

Table 3-3 Nangus reservoir details

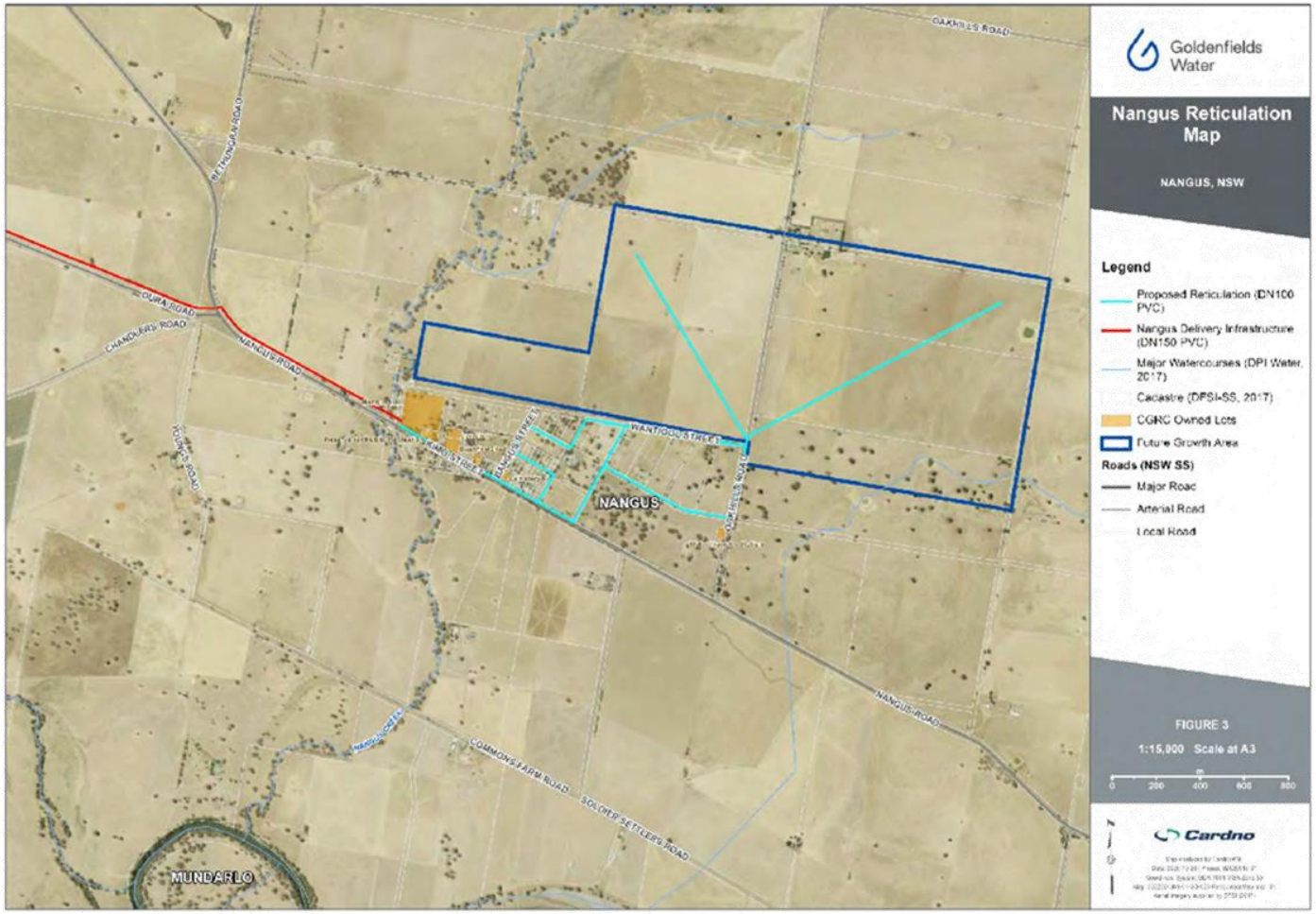
Parameter	Height (m AHD)
Floor level	290
Bottom Water Level	292
Minimum Operating Level	293.5
Maximum Operating Level	294.4
Top Water Level	295

3.2.3 Nangus reticulation network

The network proposed to service Nangus includes both DN150 and DN100 PVC. An allowance has been made for reticulation to service the existing developed lots within the town, as well as future areas of subdivision. These future growth areas include the areas CGRC propose to rezone, which are located to the north and north-west of the existing town. A representative network for these properties has been included. The lowest elevation in the service area is approximately RL 215 m (along Nangus Road), while the highest elevation is approximately RL 260 m (at the north-west edge of the area noted for rezoning). GWCC design service pressure is 12 m to 90 m. Therefore, it is proposed to service the town in a single pressure zone.

For the purposes of modelling, the township demand was attributed to four nodes. These demands represent the existing demand, and the planned growth. An overview of the Nangus service zone is shown in Figure 3-5.

Figure 3-5 Nangus reticulation network



3.2.4 Summary of Infrastructure to Connect Nangus

The review of the preliminary preferred option (Option 2) to connect the Village of Nangus to the Oura Water Scheme, has refined the option to include the following infrastructure:

- Connection to the existing DN300 CI rising / gravity pipeline operating between Marina Reservoir and the Tenandra Reservoir.
- Approximately 6.4 km of PN20 DN100 PVC pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation higher than 250 m AHD. The alignment to follow along Oura Road.
- Approximately 3.5 km of PN30 DN100 DICL pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation lower than 250 m AHD. The alignment to follow along Oura Road.
- Nangus reservoir, to be a dual reservoir configuration with a usable volume of 250 kL. Located at a site along Oura Road.
- Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC-O) to service the existing developed area in Nangus.

3.3 Nangus distribution network

The hydraulic network model was run for both the winter and summer demands. The results of these runs are detailed in the following sections.

3.3.1 Nangus reservoir

The proposed Nangus reservoir was modelled with controls to maintain an operating volume between 70% and 90% full. It is noted that during the summer demand scenario the minimum level reduces to 60% full. However, network pressures are not affected (refer below). It is noted that, modifying the inlet control to maintain higher levels could be achieved, within the model. However, detailed design and the level of SCADA control and programming would need to be assessed further.

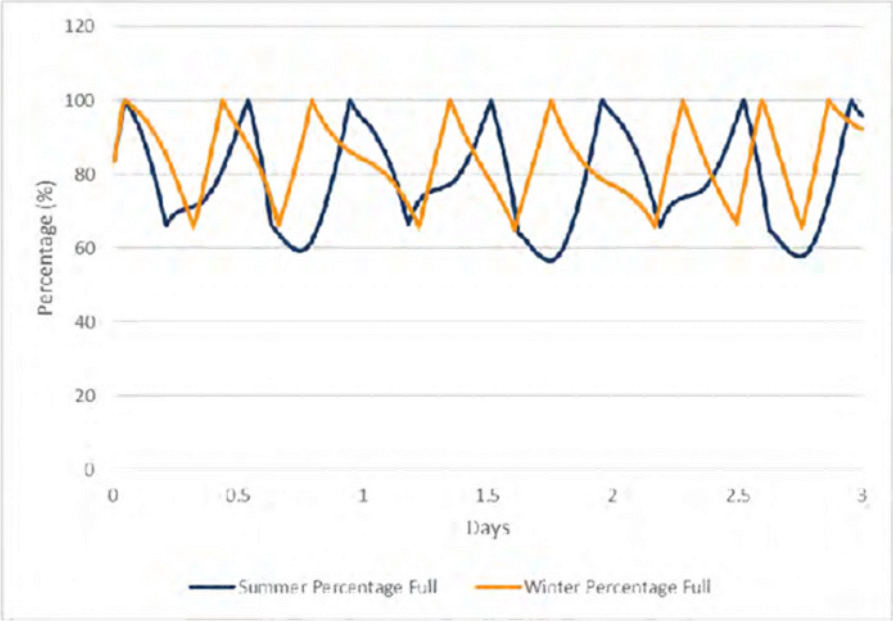
In addition, further consideration of water quality would be required when programming operating levels. With consideration to the re-chlorination station operation required as well. For both the summer and winter scenarios this operating volume was sufficient to maintain serviceable pressure to the village and promote turnover within the reservoir.

The increased demand of the summer scenario sees the Nangus reservoir experience a turnover every 8 hours. While during the winter scenario the reservoir fills in under four hours with the reduced demand. Both values can be considered reasonable at this level of investigation.

The inclusion of a re-chlorination booster will assist residuals within the scheme. Further detailed assessment as part of the future design works is required to confirm the parameters of the re-chlorination booster.

The results of the summer and winter scenarios are presented in Figure 3-6.

Figure 3-6 Nangus reservoir operation



3.3.2 Nangus village pressures

Network pressures in Nangus are maintained between GWCC design service pressures of a minimum 12 m and a maximum 90 m for both summer and winter demand scenarios.

The representative nodes, cover a range of elevations, from 217m AHD for the existing Nangus village to 260m AHD the highest peak in the identified growth regions.

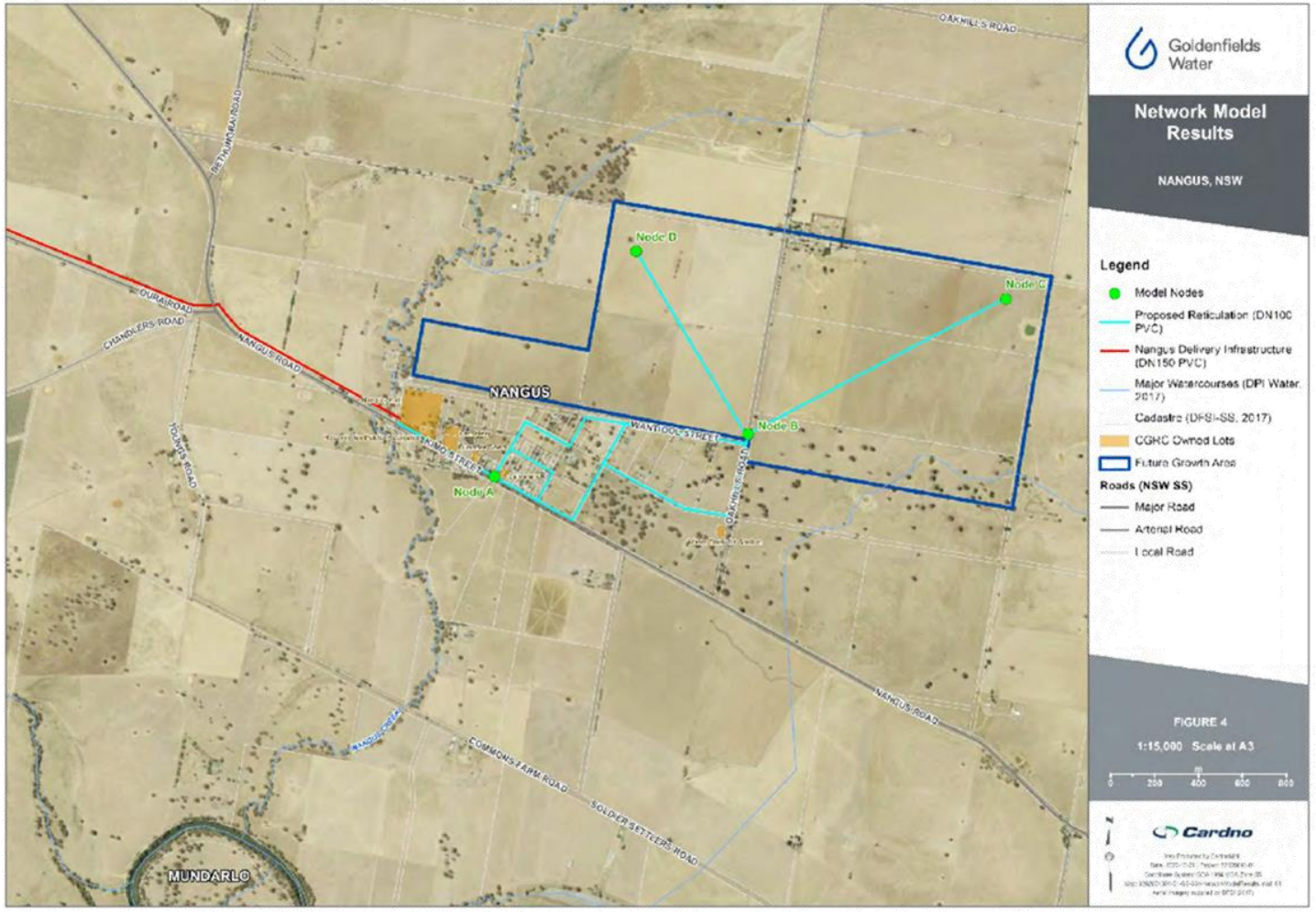
A summary of the results is presented in Table 3-4 and the modelled locations in Figure 3-7.

Table 3-4 Nangus network pressure summary

Demand Scenario	Node A	Node B	Node C	Node D
Elevation	217	245	260	239
Summer				
Average pressure (m)	72	42	27	48
Minimum pressure (m)	64	31	15	36
Maximum pressure (m)	78	50	35	56
Winter				
Average pressure (m)	77	48	33	54
Minimum pressure (m)	75	50	31	52
Maximum pressure (m)	78	46	35	56

The modelling analysis has confirmed that the preferred infrastructure to supply Village of Nangus is sufficient to meet GWCC level of service in terms of supply flows and pressures.

Figure 3-7 Modelled network



3.4 Impact on the Existing Oura Water Supply Scheme

A review of the Oura Water Supply Scheme with and without the Nangus connection was undertaken to determine the impact of the addition of the proposed Nangus water supply scheme. This assessment considered the network between the Oura Scheme Trunk offtake (Junee) to Marinna reservoir and pump sets and the Tenandra reservoirs. The assessment included both the winter and summer demand scenarios.

It should be noted that the smaller networks that are also supplied through the DN300 pipeline between the Marinna pumps and the Tenandra reservoirs have been retained within in the model as demands, but were not been assessed in detail.

3.4.1 Model Validation

A review of the Oura trunk system between the Junee Booster pump station and the Tenandra reservoirs was undertaken. This included a review of the modelled predictions compared to recorded performance based on available SCADA Data. This was undertaken to confirm the performance of the existing model to actual conditions.

The current configuration of the study area is:

- Junee balance tanks control the upstream flow and pressures
- Junee Silos inline booster provides assistance during peak periods to supply Marinna Reservoir
- Marinna pump station push flows to the Tenandra Reservoir. The pump station is the primary point of supply for the system during operation.
- When the pumping station is not operating, water is back-feed into the system from Tenandra Reservoir

It is noted that while the Marinna pumps are controlled by the levels in the Tenandra Reservoir, when in operation they also provide direct supply to the smaller schemes along the Tenandra trunk main and to the east, including Illabo and Bethungra.

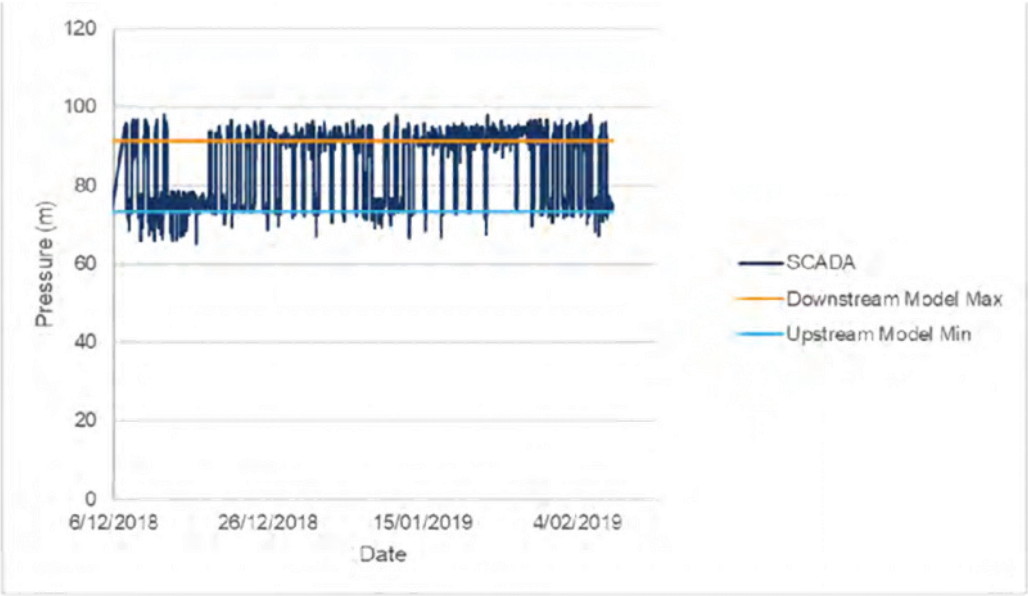
The available SCADA data was for the period between 2018 to 2020. This range included both the nominal Winter and Summer demand periods. The validation included an assessment of reservoir performance (operating levels) and pump performance (operating pressures and duration, where available).

The SCADA data was assessed against the existing Summer demand period without the addition of the Nangus scheme.

3.4.1.1 Junee Silos

The SCADA data for the Junee Silos included the runtime and operational pressures. The available runtime data had significant gaps and could not be used to very performance compared to the model. The recorded pressures correlate well with suction and discharge pressures matching the record SCADA values.

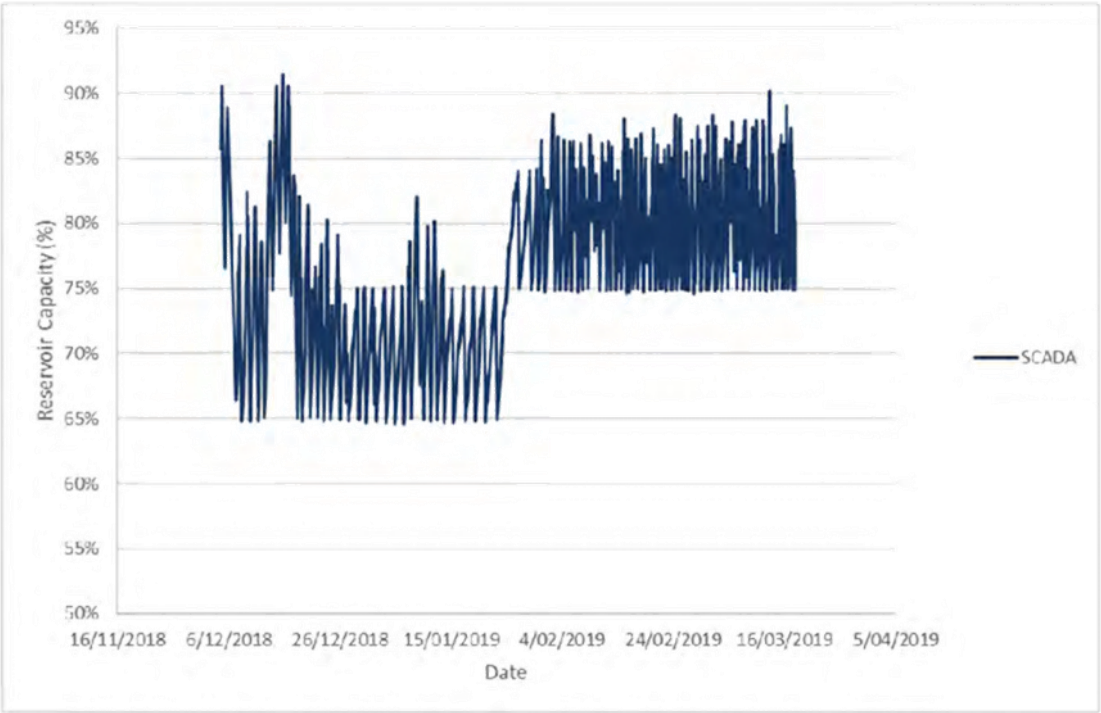
Figure 3-8 Junee Silos Booster Pump Station SCADA Comparison



3.4.1.2 Marinna Reservoir

The SCADA indicated an operating range generally equal to 10% of storage capacity. This range includes a period operating between 65% to 75% in 2018 and 75% to 85% in 2019. The 2018 range reflect the typical controls provided by GCWW. The SCADA data is illustrated in Figure 3-9.

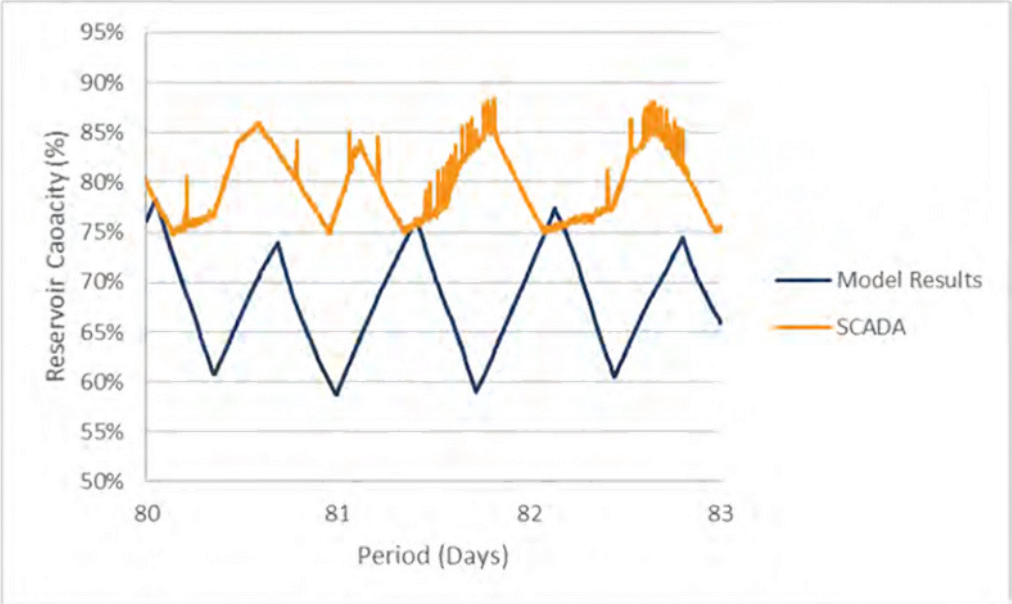
Figure 3-9 Marinna Reservoir SCADA Profile



The model generally reflects the suggested operating range of 65% to 75%. The model system performance can maintain the provided operating ranges. A summary of the typical operating range and the comparison to a summer period is provided in

The controls provided in the model reflect the 65% to 75% operating range, with the predicted emptying and filling of the reservoir providing a good match to recorded SCADA data. This comparison of SCADA and the model predicted levels is shown in Figure 3-10. A summer period in 2019 was used (actual operation set to 75 to 85%) to allow clear comparison of graphs.

Figure 3-10 Marinna Reservoir Data Comparison

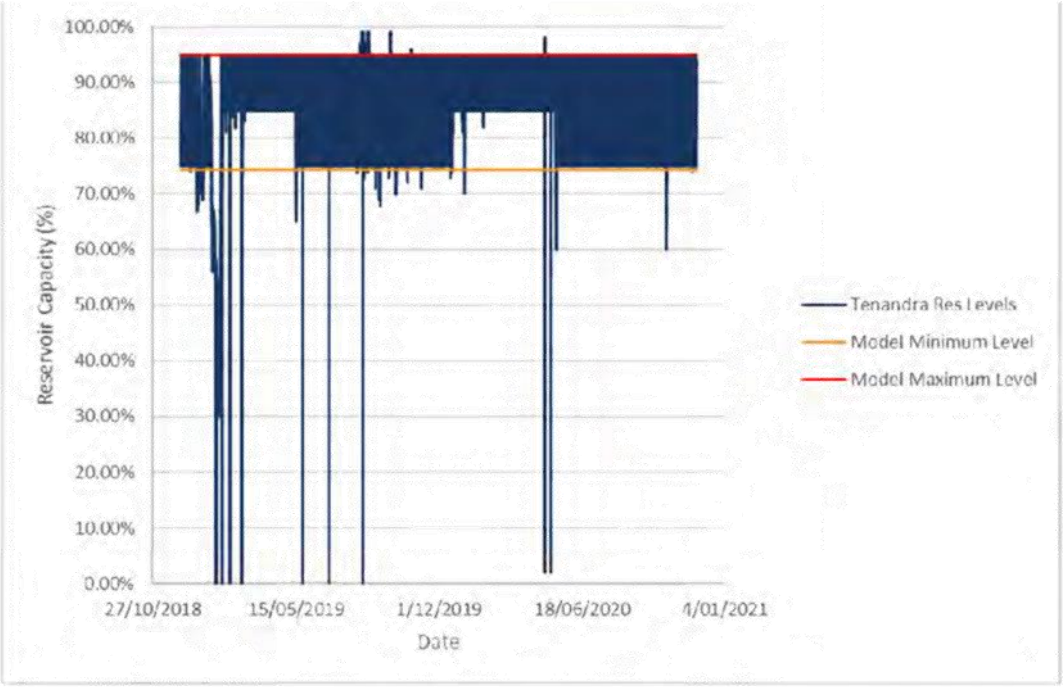


3.4.1.3 Tenandra Reservoir

The Tenandra reservoir represented a consistent performance when compared to the available SCADA data. The typical operating range for the Tenandra reservoir is between 75% to 95%. These controls are included in the model and confirmed by GWCC.

The Tenandra reservoir performance in provided in Figure 3-11.

Figure 3-11 Tenandra Reservoir SCADA Comparison



The performance of the model at the key locations, including the Junee Silos inline booster, Marinna Reservoir and pump station and the Tenandra Reservoirs are consistent with the SCADA data provided. This provides good confidence that the model is reflective of actual demands and conditions within the network. It should be noted that detailed investigations with respect to localised demands has not been undertaken at this stage.

The results of the validation provide a level of confidence in the predictive performance of the model. This predictive power is sufficient to utilise the model to undertake a comparative assessment of network performance and identify the impact of the Nangus water connection, on the Oura Water Supply Scheme.

The results of both the summer and winter demand scenarios with and without Nangus are presented in the following sections.

3.4.2 Oura Trunk Offtake to Marinna Reservoir

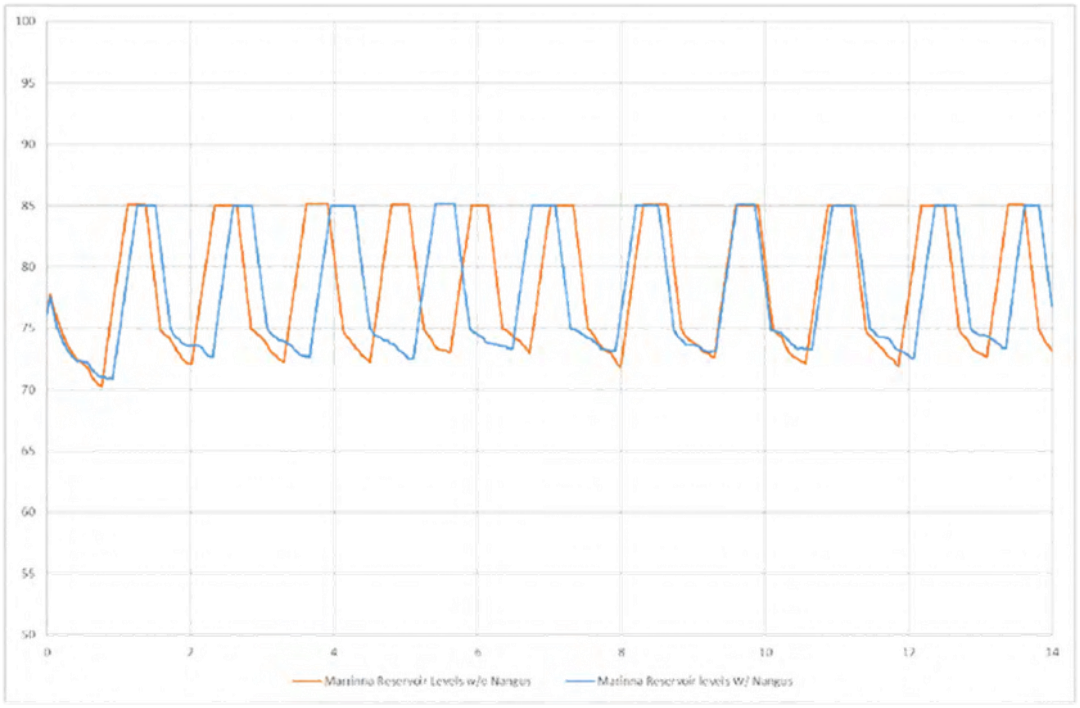
The trunk network between Junee Silos inline booster and the Marinna reservoirs was modelled against both the winter and summer demands with and without Nangus. In particular the performance of the Marinna reservoirs was assessed to determine the impact of the Nangus scheme.

3.4.2.1 Winter Operation

During the winter demands the Marinna reservoirs maintain a similar operational levels with and without Nangus. The impact on winter operation was considered minor. A comparison of the predicted winter reservoir levels at Marinna Reservoir is shown in Figure 3-12.

The comparison of the two (2) scenarios show that the upstream network has the capacity to supply the Marinna Reservoir, and maintain the set operational levels.

Figure 3-12 Marinna Reservoir Winter Operation



3.4.2.2 *Summer Operation*

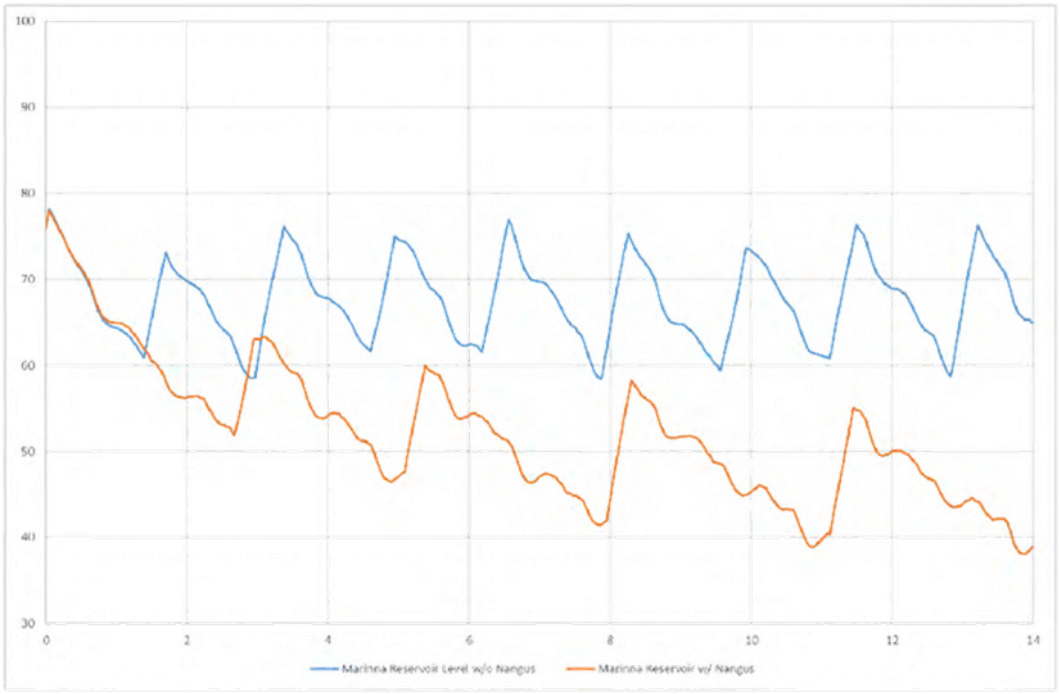
The model predicts that under the existing system configuration (without Nangus) the volume of supply from the Junee Balance tanks and Junee Silos inline booster, is sufficient to retain the operational range within the Marinna Reservoir. During a simulation of 14 consecutive summer day, the model predicts the levels at Marinna Reservoir to maintain a steady daily level between 60% and 75%.

The addition of the Nangus scheme places additional demands on this reservoir, in the form of Marinna pump station increase it time of operation. This increase in runtime of the pumps, reduces the time that the reservoir can refill without waters being lost. The reservoir gradually empties, resulting in reservoir levels dropping to 40% after 14 days of peak summer simulation.

The performance of the Marinna pump station is discussed in the following sections.

The reduction in the Marinna Reservoir levels indicates that the infrastructure upstream of the Marinna Reservoir does not have sufficient capacity to supply the additional demands associated with the Nangus connection.

Figure 3-13 Marinna Reservoir Summer Operation



3.4.2.3 *Oura Off-take to Marinna Reservoir Options*

The impact of the Nangus water supply connection has identified that the existing infrastructure between Junee Silos inline booster and the Marinna Reservoir does not have sufficient capacity to support maximum day demands, inclusive of the Nangus.

There are two (2) potential options to address this incapacity:

1. Upsize the Junee Silos inline booster pumps
2. Replace existing 1 km of DN200 AC main with DN200 PVC pipe

Junee Silos Upgrade

The existing Junee Silos inline booster pumps are currently discharging approximately 30 L/s at 17 m head. This pumping capacity helps to retain a discharge pressure of approximately 85 m, which is sufficient to supply the downstream direct connects and the Marinna Reservoir, under the existing configuration (no connection to Nangus).

The increased demand at Marinna Reservoir as a result of the Nangus connection, increases the flow demand through the system, which increases the pressure losses in the pipework between the inline booster and Marinna Reservoir. To meet the increased demands as a result of the Nangus connection, the Junee Silos inline booster will need to be increase the discharge pressure to 95 m. to achieve this the existing pumps need to be upsized to approximately 37 L/s @ 26 m.

At this capacity the Marinna Reservoir is able to maintain levels in the operational range, thus achieving a level of service consistent with the existing system performance.

The velocity in the DN200 AC discharge main is predicted to be 1.5 m/s, which is high considering the criticality and material of this pipe.

The predicted levels at the Marinna Reservoir are shown in Figure 3-14.

Replace existing DN200 Cast Iron Supply Main

A critical section of the primary supply line to the Marinna Reservoir is a 1 km section of DN200 asbestos cement (AC) water main. This main is installed in Prince Street, connecting the Junee Silos inline booster to the DN300 cast iron main in the Olympic Highway.

It is understood that this main is in good condition, but being of AC material it will need to be renewed at some point in the future.

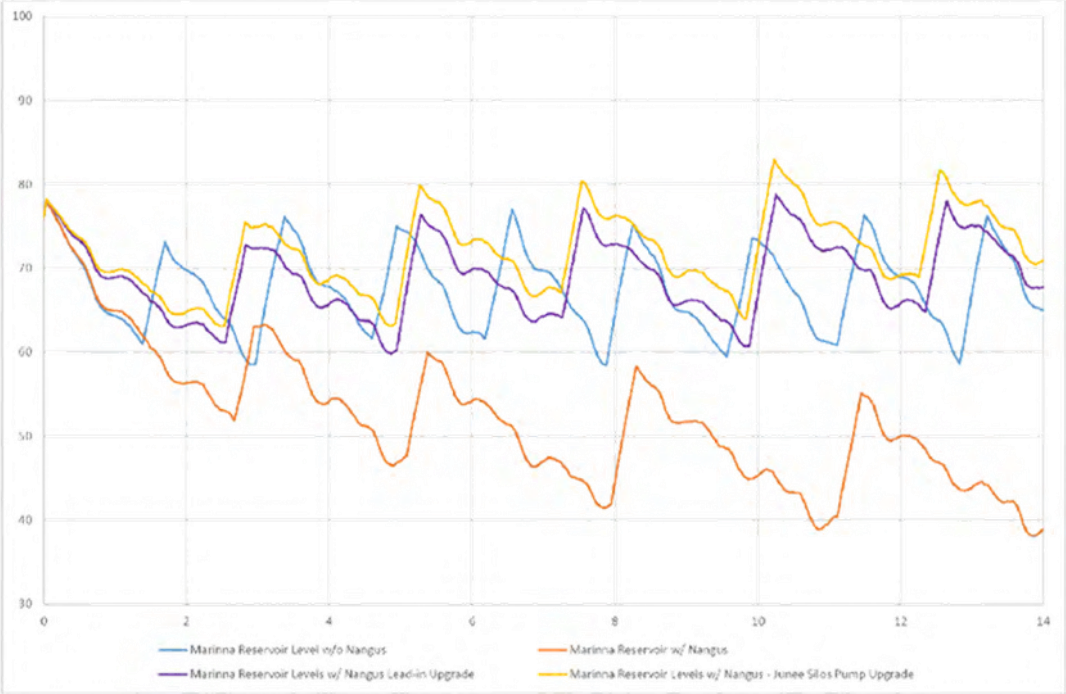
The DN200 AC main has an internal diameter (ID) of 186 mm.

There is a potential to replace this AC main with a DN200 PVC main (PN16). The ID of the PVC is typically 220.1 mm, which would provide additional capacity, as well are reduced losses through pipe roughness.

The model was updated with the new DN200 PVC supply main, to confirm sufficient supply to Marinna Reservoir could be achieved. Based on the modelled predictions, the replacement of the main increases the flows to the Marinna Reservoir sufficiently to allow the operational range to be maintained, thus achieving a level of service consistent with the existing system performance.

The predicted levels at the Marinna Reservoir are shown in Figure 3-14.

Figure 3-14 Marinna Reservoir levels as a result of upstream upgrades - Summer



Recommendations

Although both options improve the supply capacity to Marinna Reservoir, Option 2, the replacement of the existing 1 km AC water main is considered the preferred option. This is due to the criticality of the AC water main as a primary water supply to the Marinna Reservoir, and surrounding customers. Increasing the velocities, and resultant pressures in this main has the potential to increase leakage and the risk of pipe bursts. Based on these risks, it is recommended that the 1 km of DN200 AC water main be replaced with DN200 PVC main to ensure sufficient water is available at Marinna Reservoir to supply the existing network and Nangus.

3.4.3 Marinna pump station

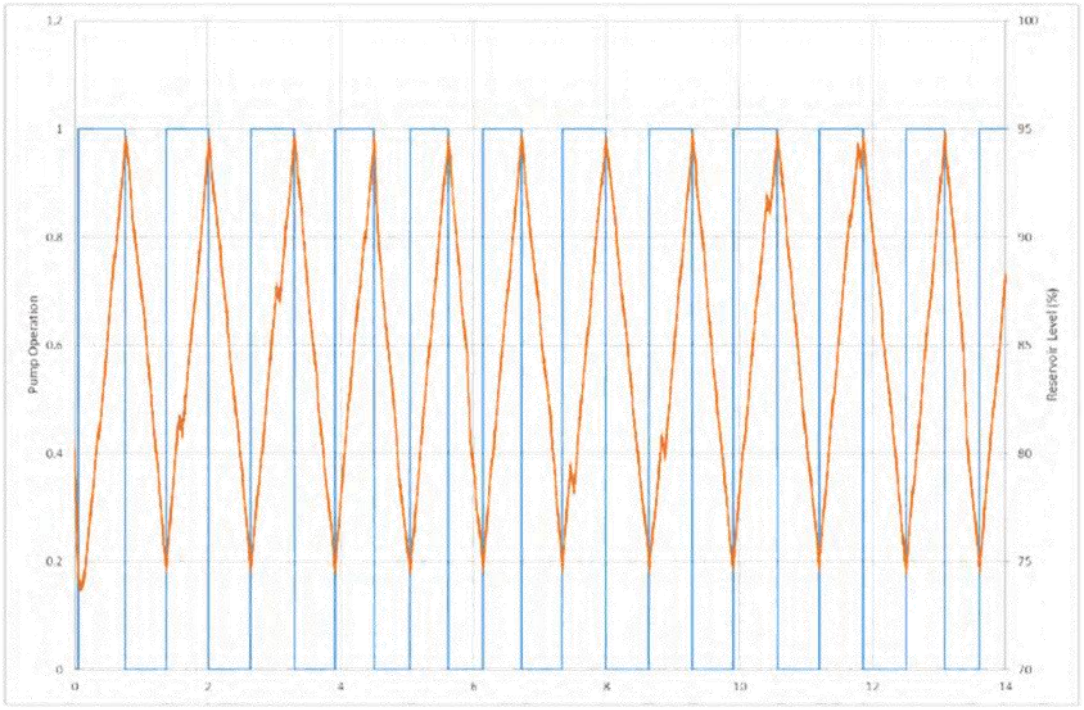
3.4.3.1 Winter operation without Nangus

The Marinna pump station provides the flow from the Marina Reservoir to the southern part of the network, Tenandra Reservoir. The pumps have a capacity of 26 L/s at a head of 85 m, and are controlled by the levels in the Tenandra Reservoirs. The pumps are set to retaining an operational levels between 75% to 95% capacity.

It is noted that during the winter configuration, the operation of the pump is consistent, which is reflected in the levels observed the Tenandra Reservoir. Over the fourteen (14) day simulation the Marinna pumps are predicted to operate for 177 hours, which equates to just over 12 hours of operation per day.

The operation of the Marinna pumps and Tenandra Reservoirs are presented in Figure 3-15.

Figure 3-15 Modelled winter network performance without Nangus



3.4.3.2 *Winter operation with Nangus*

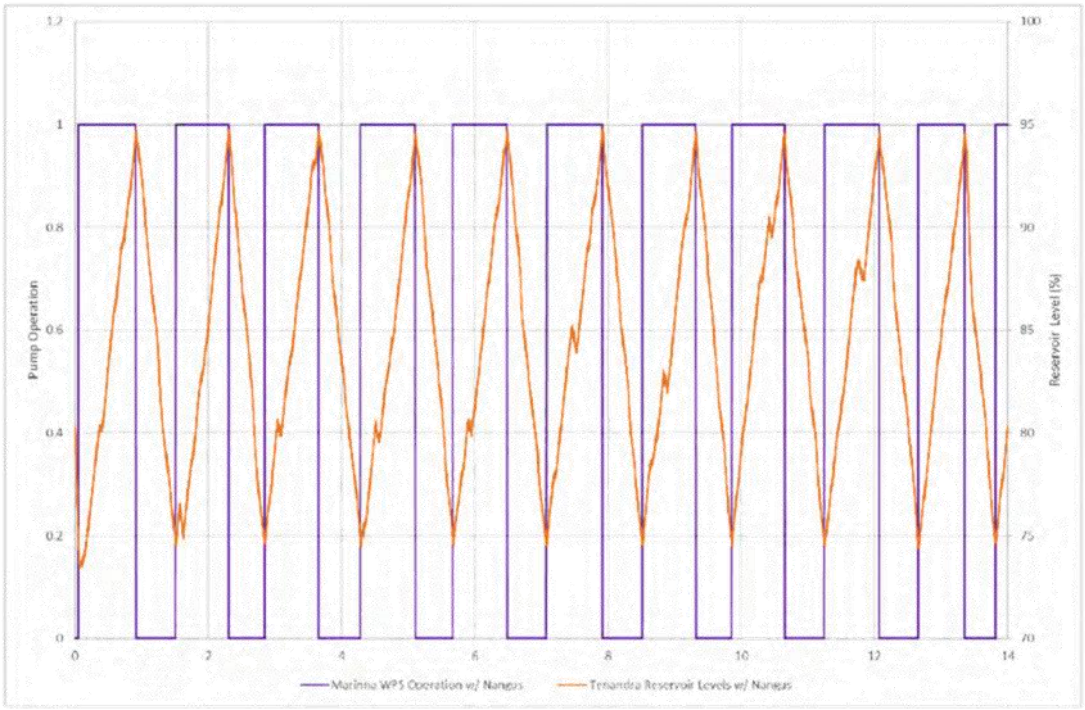
The addition of Nangus increases the run times of the Marinna pumps. The model predicts a run time of 198 hours over the 14 day continuous average day simulation. This equates to 14 hours of operation per day, which is a 12% increase in pump runtimes during average conditions. Although this increase is relatively minor, it will increase operational expenditure of the existing pump station.

Comparison of the existing manufactures pump curve for the Marinna pumps, show that existing pumps will not be able to provide a level of service consistent with existing system. To ensure negligible impacts on existing customers, the pumps at Marinna would need to be replaced as part of the Nangus supply scheme. The new pump would need to be sized to accommodate this additional Nangus demand, and optimised to ensure key operational efficiencies are achieved.

The performance of the Tenandra Reservoirs is not adversely affected with the Nangus water supply scheme. The reservoir maintained an operational volume between 75% and 95%, beyond the additional pump run times at Marinna.

The performance of the existing system with Nangus is shown in Figure 3-16.

Figure 3-16 Modelled winter network performance with Nangus



3.4.4 Modelled Summer Demand Assessment

3.4.4.1 Summer operation without Nangus

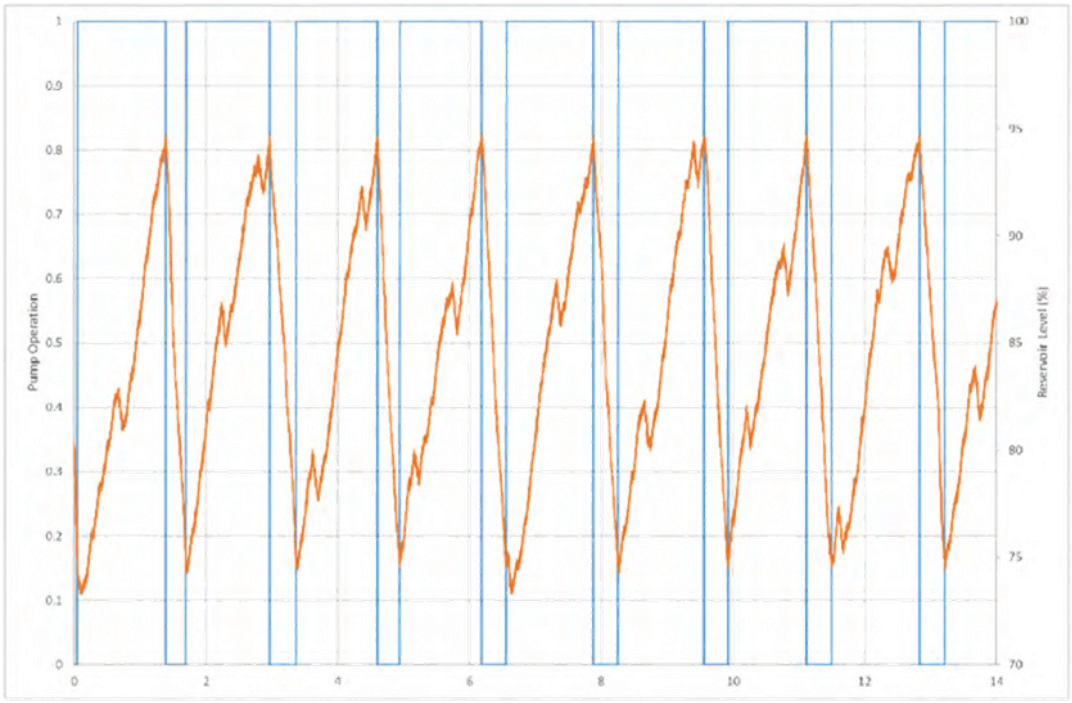
The existing pumps at Marinna pump station during summer conditions have the capacity to convey approximately 28 L/s, based on the modelled predictions. At this pump rate, the model predicts that the pumps will operate on average 19 hours a day to meet the downstream demand.

It is noted that at this pump runtime and pump capacity, the operational levels in the Tenandra Reservoirs are maintained at a range of 75% to 95% full. However, the model does show that during peak hour conditions the reservoir reduces in volume, even during pumping. This suggests that the pumps are just meeting peak day demands, and that any restriction on the pump rate could result in a progressive reduction in the reservoir level.

This reduction overtime due to inefficiencies in pump operation have been confirmed by GWCC, with reservoir levels reducing to 30% during the summer of 2019.

The operation of the Marinna pumps and Tenandra reservoirs are presented in Figure 3-17.

Figure 3-17 Modelled summer network performance without Nangus



3.4.4.2 *Summer operation with Nangus*

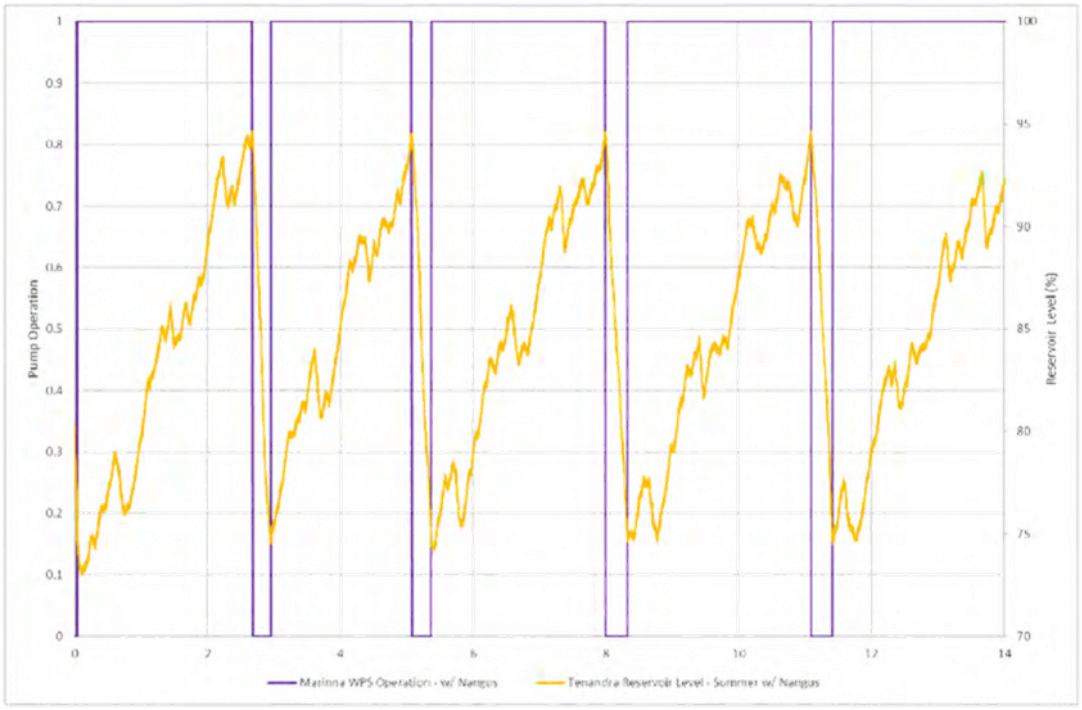
The addition of Nangus increases the operational flow and runtimes of the Marinna pumps during peak summer conditions. The pumps are estimated to operate on average for 22 hours a day, at an average flow of 28 L/s. This is a 15% increase in runtime during peak conditions. As noted in the Winter operation, the increase in demand from Nangus impacts on the level of service to the existing customers. To retain the existing network performance, the Marinna pumps will need to be updated as part of the Nangus supply scheme.

The performance of the Tenandra Reservoirs is not adversely affected by the connection of the Nangus water supply scheme. However, it should be noted that without upgrading the existing pumps at the Marinna pumping station, the risks associated with water shortages during periods of operational restriction, or extraordinary events (bursts or extreme events (bushfire)) are increased with the connection of Nangus.

In addition to this, with the Nangus connection the pumps are not operating in their optimal level of efficiency, which could impact their capacity, as well as increase operational costs. This will impact on the existing level of service provided to GWCC existing customers.

The operation of the Marinna pumps and Tenandra reservoirs are presented in Figure 3-18.

Figure 3-18 Modelled summer network performance with Nangus



3.4.4.3 *Marinna Water Pump Station Upgrade*

The Marinna pump station is operating in excess of 14 hours a day during average/winter conditions to meet the demands of the existing customers and the Nangus connection.

To meet the needs of the additional Nangus community, it is proposed that this pumping station be upgraded to a capacity of 50 L/s at 105 m head has been identified as part of the modelling exercise. The installation of this pump will reduce predicted run time for:

- Average day (winter) condition to 7 hours per day
- Peak day (Summer) conditions to 11 hours per day

The reduction in runtime provides GWCC with greater operation flexibility, and reduces the risk of supply shortages during times of extraordinary water usage.

3.4.5 Modelled Network Conditions

Network pressures along the DN300 pipeline were considered with the addition of the Nangus water supply scheme. As demonstrated above, the operation of the Tenandra reservoirs largely remains unchanged. Based on this, addition storage at Tenandra Reservoir is not considered necessary to support the Nangus supply scheme.

3.4.6 Summary of impacts to the Oura Water Supply Scheme

The connection of the Village of Nangus to the Oura Water supply scheme is predicted to generate two (2) impacts on the level of service that GWCC currently provides their existing customers. These impacts are associated with the Nangus connection are:

- Incapacity of the existing supply line between Junee Silos inline booster and the Marinna Reservoir, to maintain operational levels during peak summer conditions.
- Pump inefficiencies associated with the change in downstream demands at the Marinna pump station

To address these two (2) impacts the following infrastructure should be included as part of servicing Nangus with water:

- Replacement of 1 km of existing DN200 AC main in Prince Road, with DN200 PVC main.

- Upgrade the existing pumps at Marinna pumping station to meet the needs of the downstream catchment, and reduce run times. A pump sizing of 50 L/s at 105 m head has been identified as part of the assessment. This meets the minimum needs to the system with the additional of Nangus. GWCC may wish to increase the size of the station to provide additional system redundancy and security of supply.

3.5 Summary of Hydraulic Investigation Findings

The infrastructure identified in the February 2020 feasibility report was optimised to maintained to deliver a desired service levels within the proposed Nangus reticulation network.

The following infrastructure is required for the provision of potable supply to Nangus:

- A new connection to the existing DN300 CI rising / gravity pipeline operating between Marina Reservoir and the Tenandra Reservoir.
- Approximately 6.4 km of PN20 DN100 PVC pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation higher than 250 m AHD. The alignment to follow along Oura Road.
- Approximately 3.5 km of PN30 DN100 DICL pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation lower than 250 m AHD. The alignment to follow along Oura Road.
- Nangus reservoir, to be a dual reservoir configuration with a usable volume of 250 kL. Set to operate between a minimum of 70% and 90% full in order to maintain service pressures.
- Chlorine dosing facility at Nangus reservoir to maintain water quality.
- Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
- Reticulation (DN100 PVC-O) to service the existing developed area in Nangus.

The impact to the existing Oura Water supply scheme caused by the Nangus connection was reviewed. Based on this review the following system upgrades are needed to retain the existing level of service to existing GWCC customers:

- Replace 1 km of the DN200 AC water main in Prince Street, Junee, with DN200 PVC pipework.
- An augmentation the existing Marinna booster pump, to accommodate the increased operational capacity. A capacity in the order of 50 L/s at 105 m head has been identified in the model to accommodate the addition of Nangus. Further opportunities to optimise any new pump configuration at Marinna should be investigated.

Based on the findings of the hydraulic assessment, a desktop environmental and heritage assessment was undertaken on the preferred infrastructure alignment (Option 2).

4 Environmental and Heritage Assessment

A desktop review has been undertaken using online resources to provide initial high-level advice of the environmental constraints associated with the preferred water supply infrastructure. This constraints assessment includes; biodiversity, heritage, major waterbodies and watercourses, socio-economic considerations, soils and contamination, cumulative impacts and land use and land zoning.

Key features are presented in Appendix A and the findings of the desktop review are discussed in the following sections.

Database searches were conducted between 20 and 25 November 2019 and are considered accurate at the time of writing. Most of the searches conducted present findings at a scale that does not allow for precise impact assessment, and the constraints would need to be confirmed on-site during future design stages of the project in order to determine and either avoid and/or minimise potential impacts.

This is particularly the case for heritage items and threatened flora, fauna and vegetation communities where the records reported generally relate to those found within a 10 km search area and/or are recorded imprecisely in public databases.

4.1 Biodiversity

NSW listed biodiversity constraints

The vegetation communities present in the area are mapped on the vegetation map in Appendix A and a brief description of the constraints is provided below:

The area is primarily dominated by non-native vegetation

There are three native vegetation communities present along the preferred pipeline alignment and reservoir site. These PCT's may be associated with TEC's protected under the BC Act as shown in Table 4-1.

Table 4-1 State listed vegetation communities and associated BC Act TECs

PCT - ID	PCT	Associated BC Act listed TEC name*	Probable TEC Status*
79	River Red Gum Shrub/Grass Riparian Tall Woodland or Open Forest Wetland	** Status of this vegetation under state and federal legislation is currently unknown and should be investigated further in later project development stages.	**
266	White Box Grassy Woodland	White Box Yellow Box Blakely's Red Gum Woodland	EEC
277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box Yellow Box Blakely's Red Gum Woodland	EEC

* Derived from the NSW Vegetation Information System (VIS) which allows you to match PCTs with probable TECs.
** Data not available in the VIS.

The alignment traverses' areas of PCT listed as Blakely's Red Gum and White Box Grassy Woodland. The reservoir location is adjacent to an area mapped as White Box Grassy Woodland. It is possible that the specific future alignment can be determined so as to prevent impact to the PCTs. This fine-tuning would occur in future concept and detailed design stages, with associate field survey and ground confirmation of the distribution/impact to the mapped community.

NSW BioNet Atlas (OEH, 2019c) – a search for threatened species, populations and ecological communities was undertaken on 22/11/2019 with 22 listed species under the BC Act were recorded within the vicinity of the alignment. The alignment would potentially impact on four recorded threatened flora species locations (Bionet, 2019). Ground truthing is necessary to determine the actual impact on threatened flora species due to the potential inaccuracy of these recorded locations.

A search of DPI – Key Fish Habitat found that Option 2 crosses two waterbodies that are considered Key Fish Habitat including:

- Nangus Creek

- Billabong Creek.

It is noted that four (4) unnamed creeks are crossed by the proposed pipeline. These unnamed creeks are not identified within the DPI search, but are stream order 3 and above. Based on aerial photography of the unnamed creeks, they appear to be empirical stream and would not be considered a key fish habitat. It is recommended that the importance of these unnamed creeks be confirmed during the review of environmental effects assessment.

According to the Gundagai LEP and Junee LEP, Option 2 may have an impact on areas mapped as 'sensitive land' according to the Natural Resources Sensitivity Biodiversity Map. The objective of the mapped sensitive land is to help maintain terrestrial and aquatic biodiversity.

Federally listed biodiversity constraints

NSW BioNet Atlas (OEH, 2019c) – a search for threatened species, populations and ecological communities was undertaken on 22/11/2019 with 5 listed species under the *EPBC Act* within the vicinity of the alignment.

A search of the PMST (DoEE, 2019) was undertaken on 22/11/2019. The following MNES have been identified within 10km of this option. Federally listed TEC's have been identified below in Table 4-2:

- 4 Wetlands of International Importance all of which are located approximately 400km – 800km downstream of Option 2
- 30 threatened species and 11 migratory species

Table 4-2 Federally listed TECs

TEC	Status: Endangered (EEC) or Critically Endangered (CEEC)
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EEC
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CEEC

Important conservation tenures

Areas of Outstanding Biodiversity Value (AOBV): AOBVs are special areas that contain irreplaceable biodiversity values that are important to the whole of NSW, Australia or globally. Areas of declared critical habitat under the TSC Act have become the first AOBVs in NSW with the commencement of the new BC Act. A search of the Critical habitat registers NSW Office of Environment and Heritage (OEH, 2019a) was conducted on 22/11/2019 and no areas of critical habitat/AOBVs are located within proximity of this option.

Option 2 does not impact on any listed National Parks and Wildlife Services (NPWS) reserves and national parks.

A search of the Biobanking Public Register (NSW OEH, 2019) was used to search for Biobanking agreements, expressions of interest and statements within the Cootamundra - Gundagai LGA and Junee LGA.

No Biobanking sites were located within the area of this option.

4.2 Heritage

4.2.1 Historic heritage

Local Heritage

There is one heritage item identified under the Gundagai LEP 2011 in proximity to the proposed option (and none under the Junee LEP 2012):

> I20: War Memorial Nangus – located on the outskirts of the town of Nangus.

The abovementioned locally listed heritage item will not be impacted by the proposed option.

State Heritage

There are no State Heritage Register listed heritage items within proximity of Option 2.

Federal Heritage

A search of the Australian Government's Australian Heritage Database (DoEE, 2019) identified 15 federally listed heritage items within the Cootamundra - Gundagai LGA.

A search of the Australian Governments Australian Heritage Database (DoEE, 2019) identified 14 federally listed heritage items within the Junee LGA.

The PMST search undertaken on 25/11/2019 found that no World Heritage Properties or National Heritage Places were identified within 10 km of the pipeline route.

A search of the Native Title Register and Native Title Claims Register (Native Title Tribunal, 2019) conducted on 25/11/2019 returned no records within the Cootamundra – Gundagai LGA and Junee Shire Council LGA.

4.2.2 Aboriginal Heritage

A desktop Aboriginal Heritage Constraints Assessment has been prepared to investigate the potential Aboriginal heritage constraints associated with the proposed reticulated water supply and associated pipeline. The details associated with this heritage assessment are provide in the *FINAL Nangus Water Supply Constraints Assessment* in Appendix B. The heritage report is a preliminary constraints assessment, completed as a desktop assessment only. This assessment is intended to provide initial advice on the location of registered Aboriginal objects and a preliminary assessment of areas of archaeological sensitivity within the assessment area.

Aboriginal Heritage Information Management System Search

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on 24 July 2020. The AHIMS search provides archaeological context for the area and identifies whether any previously recorded Aboriginal sites are located within or near the assessment area. The search contained an area of approximately 33 kilometres (east-west) by 25 kilometres (north-south). A total of 73 distinct sites were identified within the search area. Identified AHIMS sites in close proximity to the assessment areas are largely comprised of modified trees (carved or scarred) and Artefact sites.

There are five previously recorded Aboriginal sites within 200 metres of the general alignment (Appendix A). There are no registered Aboriginal Places within the assessment area.

Sites within the general alignment area:

- Billabong TSR Scar Tree 3 (AHIMS ID 56-02-0220): Located in open woodland to the south of the general alignment area. A single scar tree was identified on the south of Oura Road, consisting of an occluded scar on a box tree.
- Billabong TSR Scar Tree 4 (AHIMS ID 56-02-0219): Located in open woodland to the south of the general alignment area. A single scar tree was identified on the south of Oura Road, consisting of a shield scar on a red gumtree.
- Billabong TSR Scar Tree 1 (AHIMS ID 56-02-0222): Located in open woodland to the north of the general alignment area. A single scar tree was identified on the north of Oura Road, consisting of a fire scar on a box tree.
- Billabong TSR Scar Tree 2(AHIMS ID 56-02-0221: Located in open woodland to the north of the general alignment area. A single scar tree was identified on the north of Oura Road, consisting of a canoe scar on a box tree.
- Billabong TSR Rock Core 1(AHIMS ID 56-02-0225): Located in open woodland to the north of the general alignment area. Comprised of a single rock core, made from river stone, the site is located in an open woodland and is considered to be in a disturbed condition.

Aboriginal Archaeological Sensitivity

Archaeological sensitivity is closely related to observed levels of ground disturbance. The assessment area is largely situated within the road reserve of Oura Road and the adjacent pastural land which has been ploughed and grazed. While scar trees are susceptible to destruction through land clearance stone artefacts are more durable and are unlikely to have been destroyed through ploughing and grazing. Stands of trees do remain throughout the assessment area and surrounding landscape, and scar trees have been identified within them. While construction of Oura Road may have resulted in substantial disturbance within the road corridor, exposures present on the edges of the road corridor retain the potential for Aboriginal material. A site inspection would be required to further delineate areas of disturbance across the assessment area.

Based on the consideration of landform contexts, information from the AHIMS site register, and review of previous archaeological investigations, there are multiple landforms across the assessment area with

archaeological sensitivity. Due to its linear nature, the assessment area traverses multiple areas of archaeological sensitivity, such as watercourses and stands of trees. Potential sensitive landforms identified within the assessment area include:

> Crest and ridgeline landforms

> Areas where old growth trees may remain, such as stands of remnant vegetation, isolated old growth trees remaining in pastoral paddocks

> Areas in proximity to watercourses

> Other areas that require further investigation, such as raw material resources and other salient features of the landscape were not identified in the preliminary desktop assessment.

> The current assessment has identified that proximity to water and presence of remnant woodlands is a strong predictive factor in the location of Aboriginal sites in the region.

Further archaeological investigation and Aboriginal stakeholder consultation must be undertaken for the project. In the first instance, further assessment may consist of a site inspection, further desktop assessment, and consultation with the Local Aboriginal Land Councils (LALCs) for the preferred option in accordance with the Due Diligence Code of Practice. The site inspection undertaken for the due diligence assessment should ground-truth the preliminary identification of areas of archaeological sensitivity identified in this report, as well as targeted inspection of the remainder of the preferred option to investigate other potentially sensitive areas.

The due diligence assessment would identify what further steps would be required as part of the approvals process, such as comprehensive consultation with Aboriginal stakeholders, further more detailed archaeological fieldwork and reporting, and potentially a permit(s) application under the *National Parks and Wildlife Act 1974*.

Option 2 alignment can be developed so as to ensure the Aboriginal heritage items listed above will not be impacted. This will be supported by further archaeological investigation.

4.3 Hydrology, Water Quality and Groundwater

The hydrological, water quality and groundwater related features associated with this option are shown on the Hydrology figure in Appendix A.

From east to west, the proposed Option 2 would traverse:

- Nangus Creek
- Billabong Creek

Waterways range in size and under the Strahler stream order system are classified as ranging from fifth order streams to third order watercourses (DPI Water, 2017).

The Murrumbidgee River is mapped as Key Fish Habitat (DPI Water, 2017).

While works will be within 40m of these watercourses, a controlled activity approval under the Water Management Act 2000 (WM Act) is not required as the works would be undertaken by a public authority.

Creek crossings would need to be designed to be sensitive to the biodiversity values present at site.

Groundwater Dependent Ecosystems (GDE) are aquatic and terrestrial ecosystems which are sustained, to a degree, by groundwater. Two named waterways are crossed by the pipeline (Nangus Creek and Billabong Creek) which are listed as moderate potential GDE (BOM, 2019).

The pipeline would cross areas mapped as 'sensitive land' according to Gundagai LEP 2011 and within Groundwater Vulnerable areas mapped in Junee LEP 2012.

In the vicinity of Option 2, there a number of groundwater bore locations. The eastern extent of the alignment in Nangus Village has a large number of bores within 50m of the alignment. It is not expected that the pipeline would have any impact on the bores as the alignment could be set to avoid them.

According to the Australian Flood Study Database, there have been three studies conducted surrounding the Murrumbidgee River and surrounds. The studies include:

- Gundagai Flood Scoping Study – 2013
- Oura to Braehour Flood Model Extension – 2011

- Murrumbidgee River Flood Modelling.

A thorough investigation into these studies will help understand the impacts and constraints to any of the proposed above ground infrastructure.

4.4 Soil and Contamination

Soils present within the area are shown on the Soils figure in Appendix A.

Option 2 traverses the following soil classes:

- Kurosols
- Kandosols

Option 2 passes through soils that are identified as saline land according to the DPE (2019) mapping.

A search of the OEH Contaminated Land Record and the Protection of the Environment Operation (POEO) Act Public Register of Licences was undertaken on 24/11/2019. The search highlighted 22 locations where a POEO License has been issued in Cootamundra – Gundagai LGA and 4 issued in Junee LGA. The listed locations of issued licences are not impacted by Option 2.

There are no known contaminated sites listed on the OEH Contaminated Land Register in the vicinity of Option 2. This does not mean there is no contaminated land on site as not all contaminated areas have been recorded and constraints would need to be confirmed in future project stages.

4.5 Socio-economic, Land Use and Zoning

The majority of Option 2 alignment is within land zoned RU1 – Primary Production land zoning (see the land use and zoning map in Appendix A).

This option traverses both Junee LGA and Cootamundra – Gundagai LGA.

The pipeline option traversed across private properties in multiple locations.

The PMST search identified 1 potential area of Commonwealth Land protected under the EPBC Act within 10 km of this option. The precise location of this land parcel will need to be confirmed in future investigations with impacts to these areas avoided and/or minimised where possible. If the project is likely to have a significant impact on Commonwealth land it may require referral to DoEE under the EPBC Act.

Socio-economic considerations relevant to this option include:

- Potential adverse impacts on private properties during pipeline installation
- Positive impacts associated with securing a water supply for Nangus.
- Positive impacts associated with rural property connections to the Nangus supply pipeline

4.6 Cumulative Impacts

The potential for cumulative impacts was considered through review of the Major Projects Register which identifies major projects proposed, under assessment or approved (including State Significant Development (SSD) and State Significant Infrastructure (SSI) projects) either under assessment or approved. The register was searched for Cootamundra - Gundagai LGA and Junee LGA. Three major projects were identified (the Adjungbilly Wind Farm, Sebastopol Solar and Young to Wagga Looping Pipeline), however the projects are not in close proximity to Option 2 and is therefore unlikely to generate cumulative impacts.

Cootamundra – Gundagai Regional Council DA Tracking portal for Gundagai LGA was accessed on 25 November 2019 to check for any development that may impact on the proposed pipeline option. The search included results from January 2019 through to June 2019 and concluded that there are no relevant DA Applications that will have an influence on the proposed project.

Junee Council DA Tracking portal for Junee LGA was accessed on 25 November 2019 to check for any development that may impact on the proposed pipeline option. The search included results from October 2019 through to November 2019 and concluded that there are no relevant DA Applications that will have an influence on the proposed project.

It is noted that this search was not comprehensive and local developments should be checked as part of future project stages.

4.7 Summary of Environmental Constraints & Approval Pathway

Summary

The key environmental constraints related to pipeline Option 2 are the biodiversity and heritage constraints identified above. Specifically, the proximity of the alignment to recorded Aboriginal Heritage items and potential Endangered Ecological Communities.

A more detailed field assessment of the final alignment during future stages of the development will allow for avoidance or minimisation of potential impacts identified above. Impacts on other matters can generally be managed through careful construction management processes developed at future construction stages of development. Impacts to private property will also need to be minimised where possible with appropriate consultation with interested stakeholders and impacted community members where necessary.

The location and extent of all constraints, but in particular the biodiversity and heritage constraints, will need to be confirmed in future stages of the project through on-ground surveys and research. Significant impacts to biodiversity can trigger the need for an Environmental Impact Statement (EIS) under Part 5, Division 5.1, Subdivision 3 of the EP&A Act. Significant impacts to Commonwealth listed threatened entities or Commonwealth land can trigger the need for a referral to the Federal Government and assessment under the EPBC Act. If an EIS becomes necessary due to unavoidable impacts, the project approval timeframes and budgets allocated could be substantially increased. From this high level desktop constraints analysis, and given the proposed pipeline route could be developed to avoid or minimise such impacts, it is considered unlikely that the proposed alignment would have a significant impact on biodiversity and/or Commonwealth matters. This would need to be confirmed during future stages of the project as the constraints analysis is high level and the design is at a preliminary stage.

Initial approval pathway advice

The project will need assessment under the EP&A Act. State Environmental Planning Policy (SEPPs) guide the approval pathways under the EP&A Act.

The initial approval pathway will be assessed under the State Environmental Planning Policy (Infrastructure) 2001 (ISEPP), as the pipeline and associated ancillary structures is considered a "water reticulation system". Under Clause 125(1) of ISEPP, development for the purpose of a water reticulation system (including reservoirs) may be carried out by or on behalf of a public authority without consent on any land. As the pipeline project would be undertaken by GWCC or CGRC (both public authorities) the proposal would be permissible without consent, and therefore it is currently anticipated that the applicable approval pathway is via a Review of Environmental Factors under Part 5 of the EP&A Act. Clause 14(1) of the State and Regional Development SEPP states that development for the purpose of water storage facilities that has a capital investment value of more than $30 million would be subject to a more intense approvals pathway which may trigger the need for an Environmental Impact Statement.

The approval pathway will need to be confirmed and will be dependent on confirmation of pipeline alignment and potential impacts which will be confirmed during future stages of the project. This will involve specialist studies and on-ground surveys to confirm environmental constraints, confirmation of land use and applicability of Part 5 provisions, confirmation of capital investment value and consideration of 'significant impacts' on the environment which could trigger the need for an EIS.

5 Conclusions and recommendations

Following the assessment of the proposed Nangus reticulated water supply scheme the following conclusions and recommendations are made:

5.1 Conclusions

- The infrastructure identified in the February 2020 feasibility report was found to be sufficient and maintained minimum service levels within the proposed Nangus reticulation network.
- The following infrastructure is required for the provision of potable supply to Nangus:
  - A new connection to the existing DN300 CI rising / gravity pipeline operating between Marina Reservoir and the Tenandra Reservoir.
  - Approximately 6.4 km of PN20 DN100 PVC pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation higher than 250 m AHD. The alignment to follow along Oura Road.
  - Approximately 3.5 km of PN30 DN100 DICL pipeline from the existing network to Nangus reservoir, located west of Nangus in areas with an elevation lower than 250 m AHD. The alignment to follow along Oura Road.
  - Nangus reservoir, to be a dual reservoir configuration with a usable volume of 250 kL. Set to operate between a minimum of 70% and 90% full in order to maintain service pressures.
  - Chlorine dosing facility at Nangus reservoir to maintain quality.
  - Approximately 3.9 km of DN150 PVC-O pipeline from Nangus reservoir to Nangus.
  - Reticulation (DN100 PVC-O) to service the existing developed area in Nangus.
- Required existing system upgrades to retain the existing level of service to existing GWCC customers:
  - Replace 1 km of the DN200 AC water main in Prince Street, Junee, with DN200 PVC pipework.
  - Upgrade Marinna pump station capacity to 50 L/s at 105 m head.
- A desktop review of the potential impacts to the environment and areas of heritage importance has identified the following areas of constraints:
  - The alignment has the potential to impact on areas of significant biodiversity and heritage importance. The review of Environment Factors will need to include as a minimum:
    - Field investigation is needed to confirm the alignment constraints, and recommend if minor alteration to the alignment is necessary to avoid detailed approvals pathways
    - Field investigation is needed to confirm the feasibility of creek crossings via connection to existing bridges.
    - Ecological field investigation to confirm the importance/classification of the identified unnamed creeks that are to be crossed. This will include defining construction methodologies.
    - A heritage due diligence assessment of the proposed alignment is needed to comply with the findings of the heritage assessment and to minimise the risks to potential heritage artefacts.

5.2 Recommendations

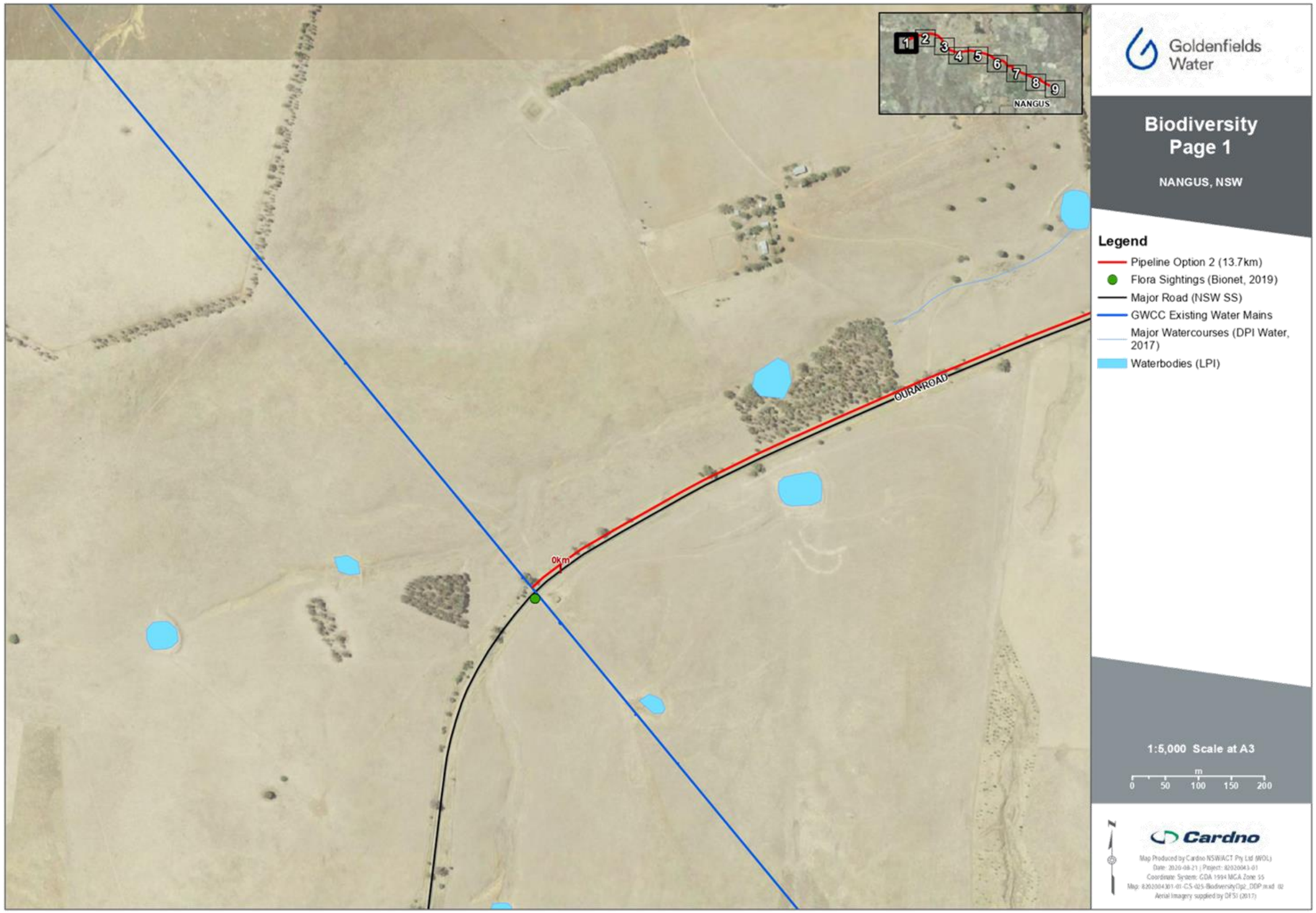
It is recommended that the following works are progressed in order to the advance the provision of the Nangus water supply scheme.

- Detailed environmental, cultural heritage, approvals and acquisition studies be undertaken to confirm the identified infrastructure alignments and sites.
- Feasibility assessment and concept design is undertaken to confirm the augmentations identified to the existing network and further analysis of water quality to refine the Nangus reservoir operation and the operational settings for the re-chlorination station.

Preliminary Design

APPENDIX A

ENVIRONMENTAL CONSTRAINT MAPS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Biodiversity Page 1
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Legend
Pipeline Option 2 (13.7km)
Flora Sightings (Bionet, 2019)
Major Road (NSW SS)
GWCC Existing Water Mains
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
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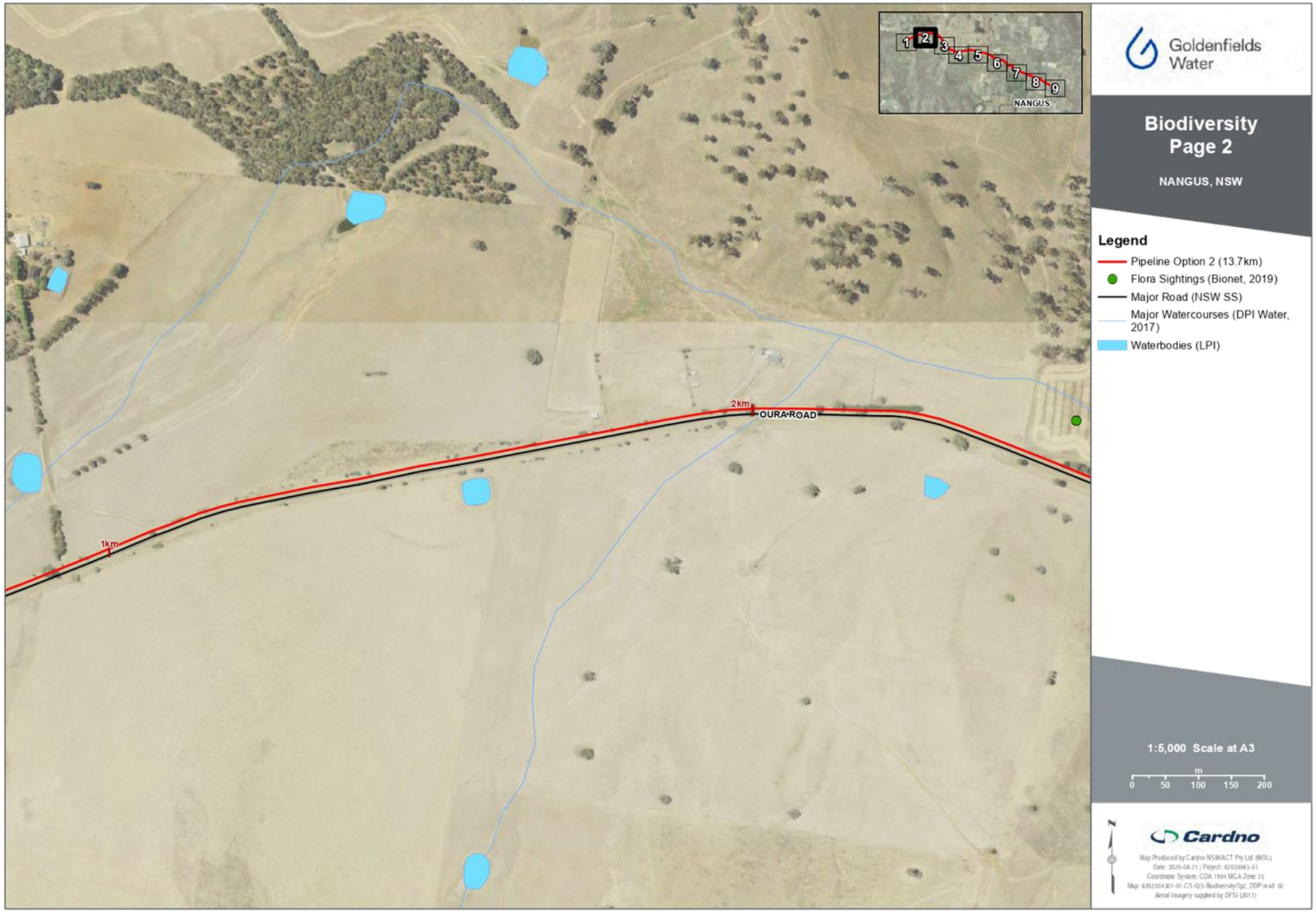
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Pipeline Option 2 (13.7km)
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Major Road (NSW SS)
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Legend
Pipeline Option 2 (13.7km)
Flora Sightings (Bionet, 2019)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Key Fish Habitat (DPI Water, 2017)
Waterbodies (LPI)
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NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Key Fish Habitat (DPI Water, 2017)
Terrestrial Biodiversity (DPE, 2019)
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Biodiversity Page 7
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Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
Terrestrial Biodiversity (DPE, 2019)
Waterbodies (LPI)
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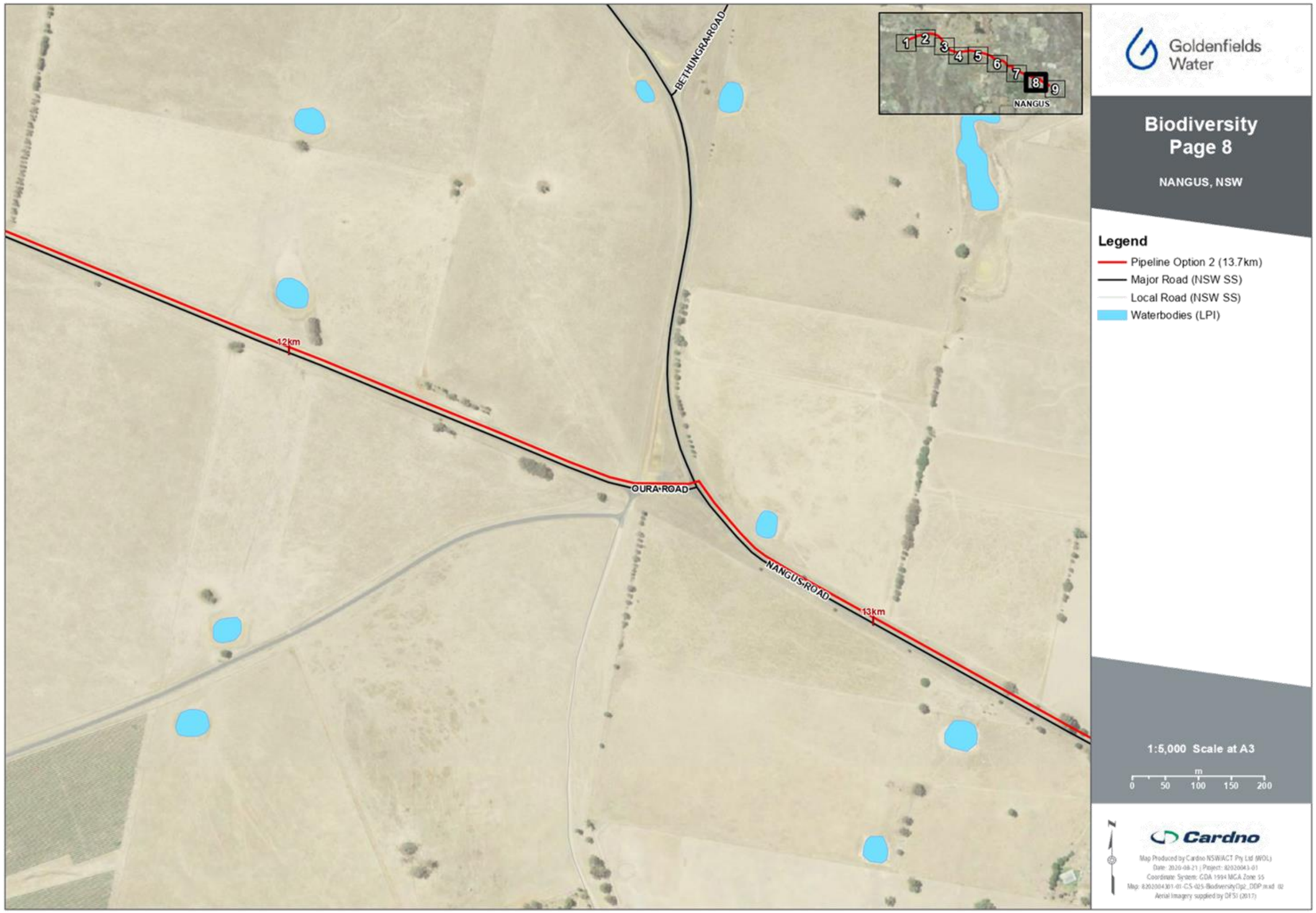
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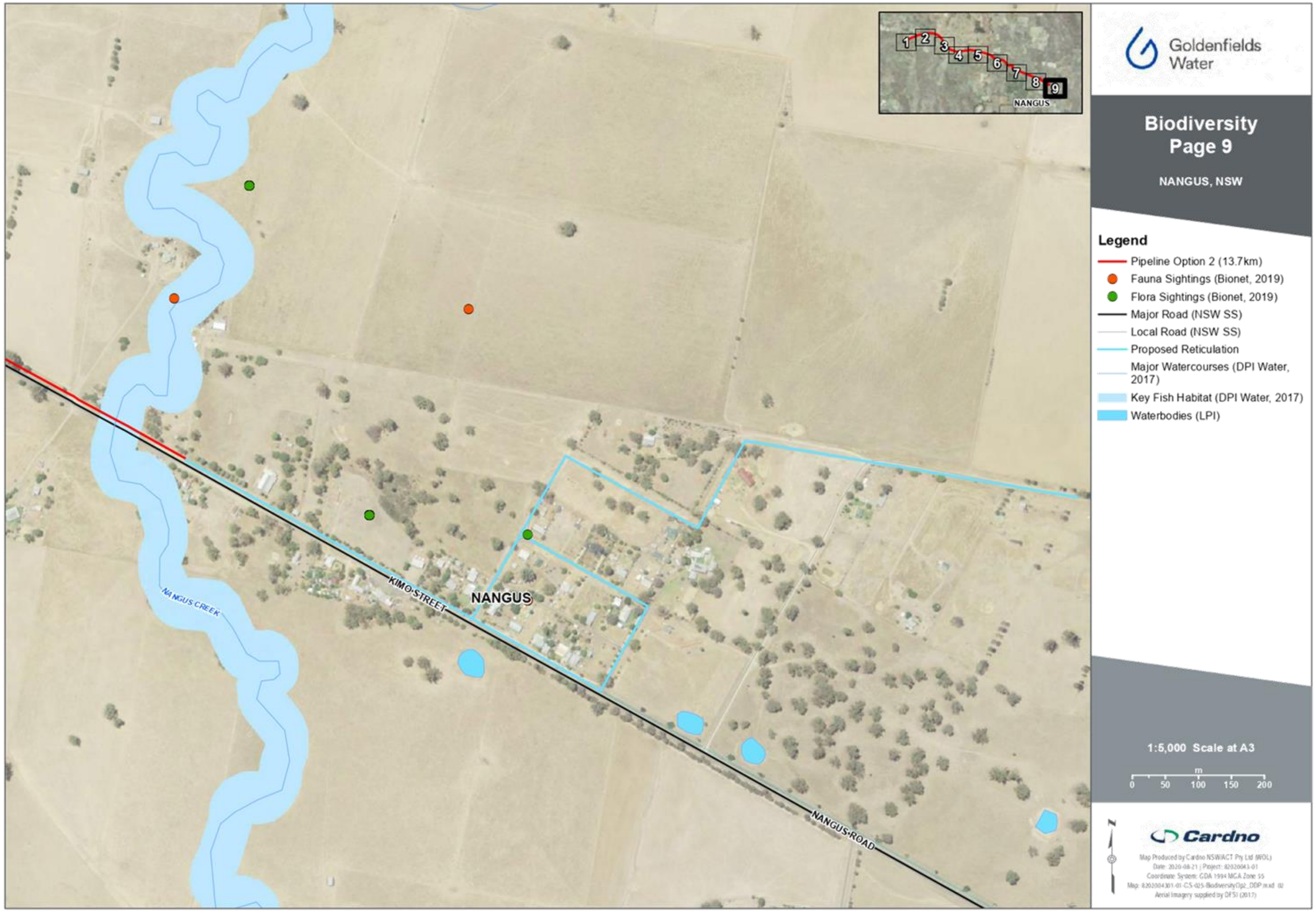
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Legend
Pipeline Option 2 (13.7km)
Fauna Sightings (Bionet, 2019)
Flora Sightings (Bionet, 2019)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
Major Watercourses (DPI Water, 2017)
Key Fish Habitat (DPI Water, 2017)
Waterbodies (LPI)
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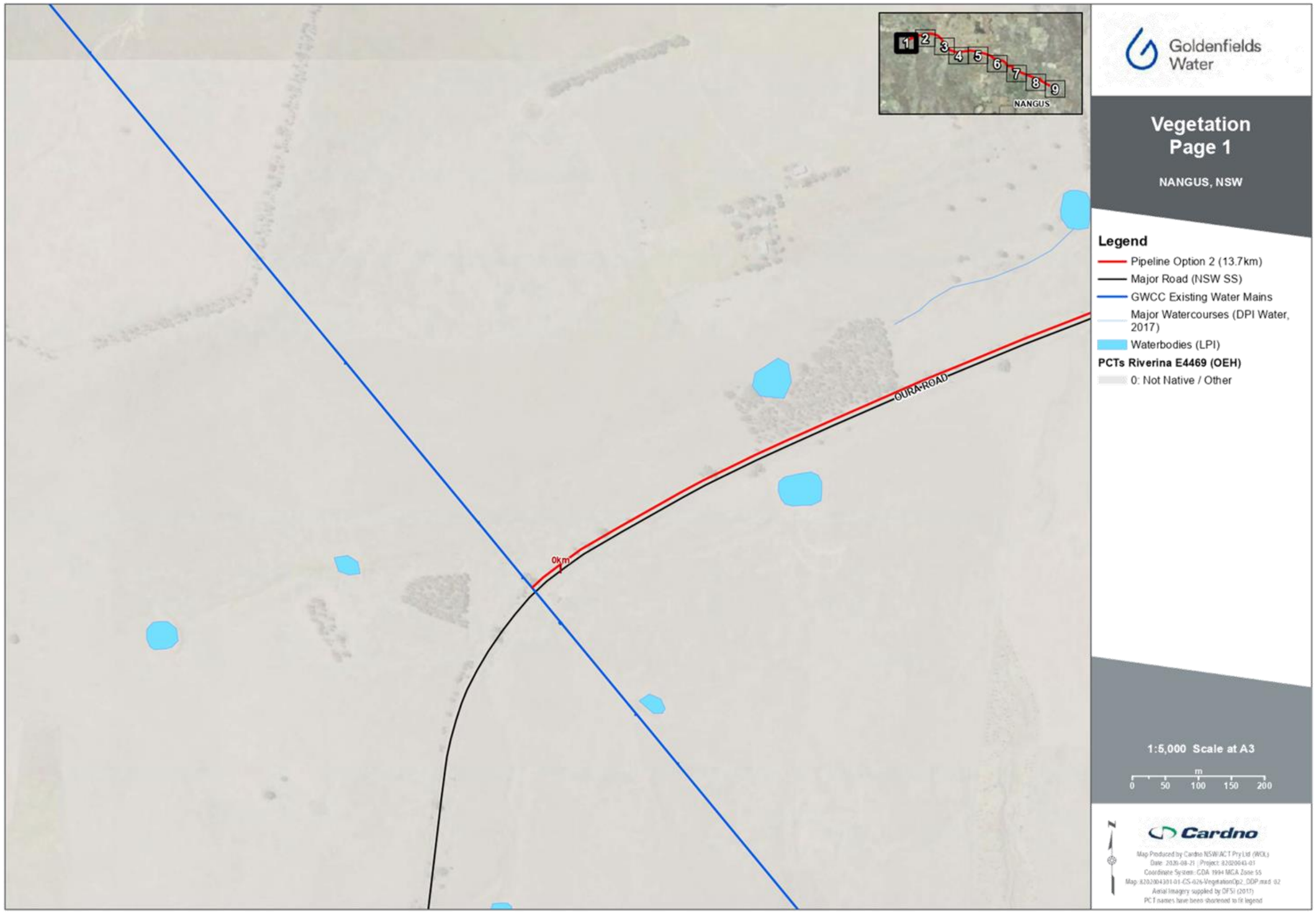
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Pipeline Option 2 (13.7km)
Major Road (NSW SS)
GWCC Existing Water Mains
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
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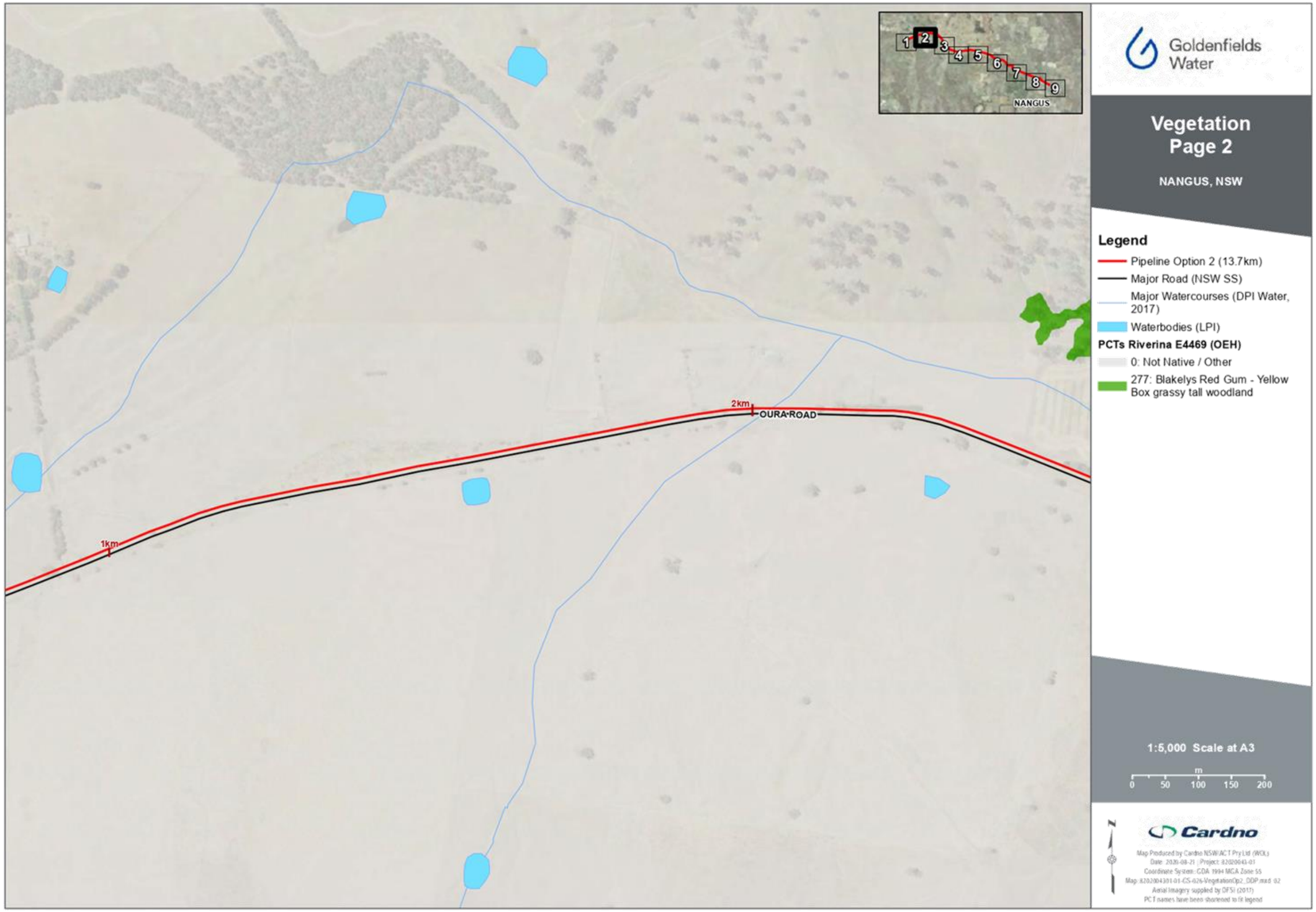
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Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
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277: Blakelys Red Gum - Yellow Box grassy tall woodland
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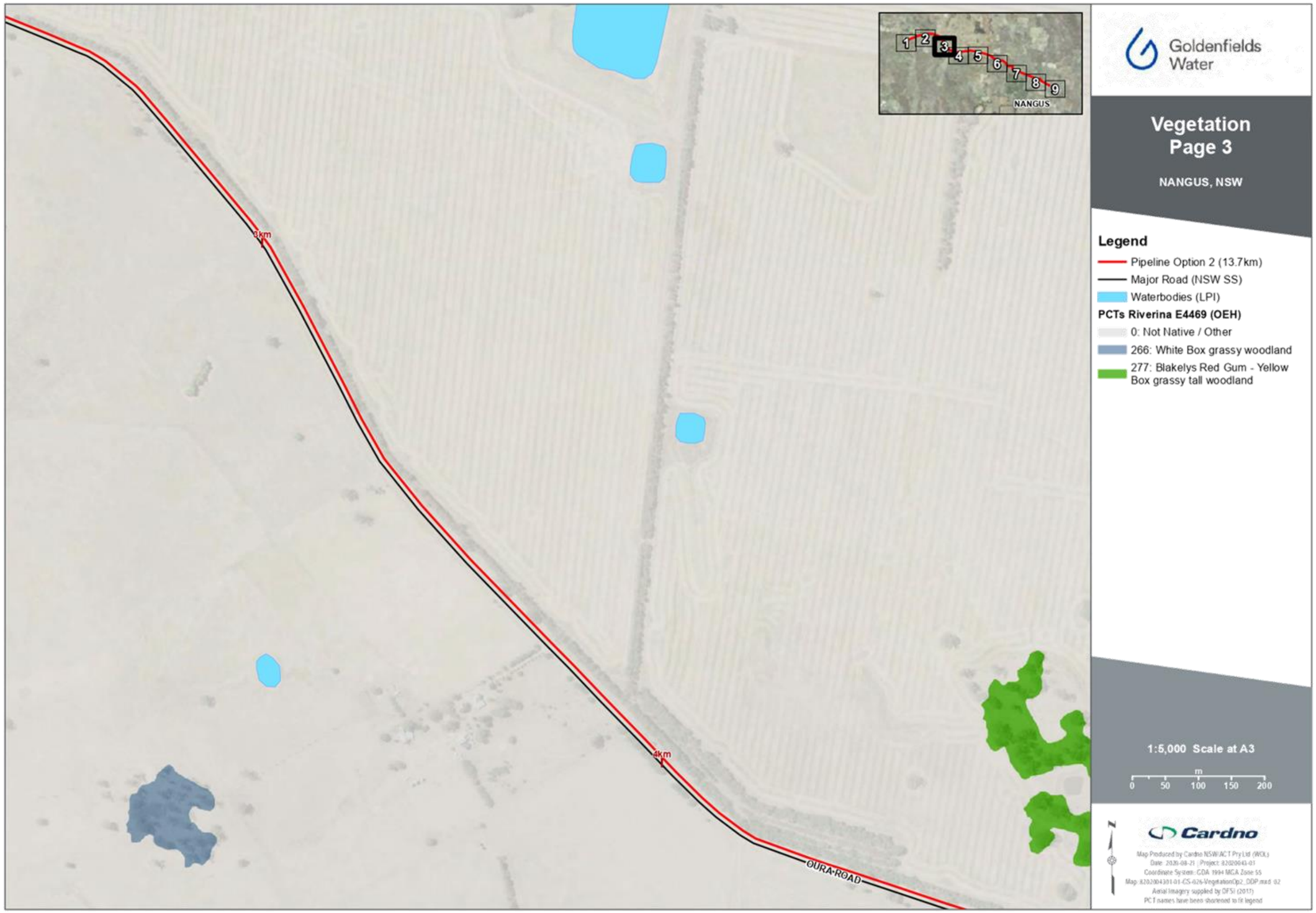
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Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
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266: White Box grassy woodland
277: Blakelys Red Gum - Yellow Box grassy tall woodland
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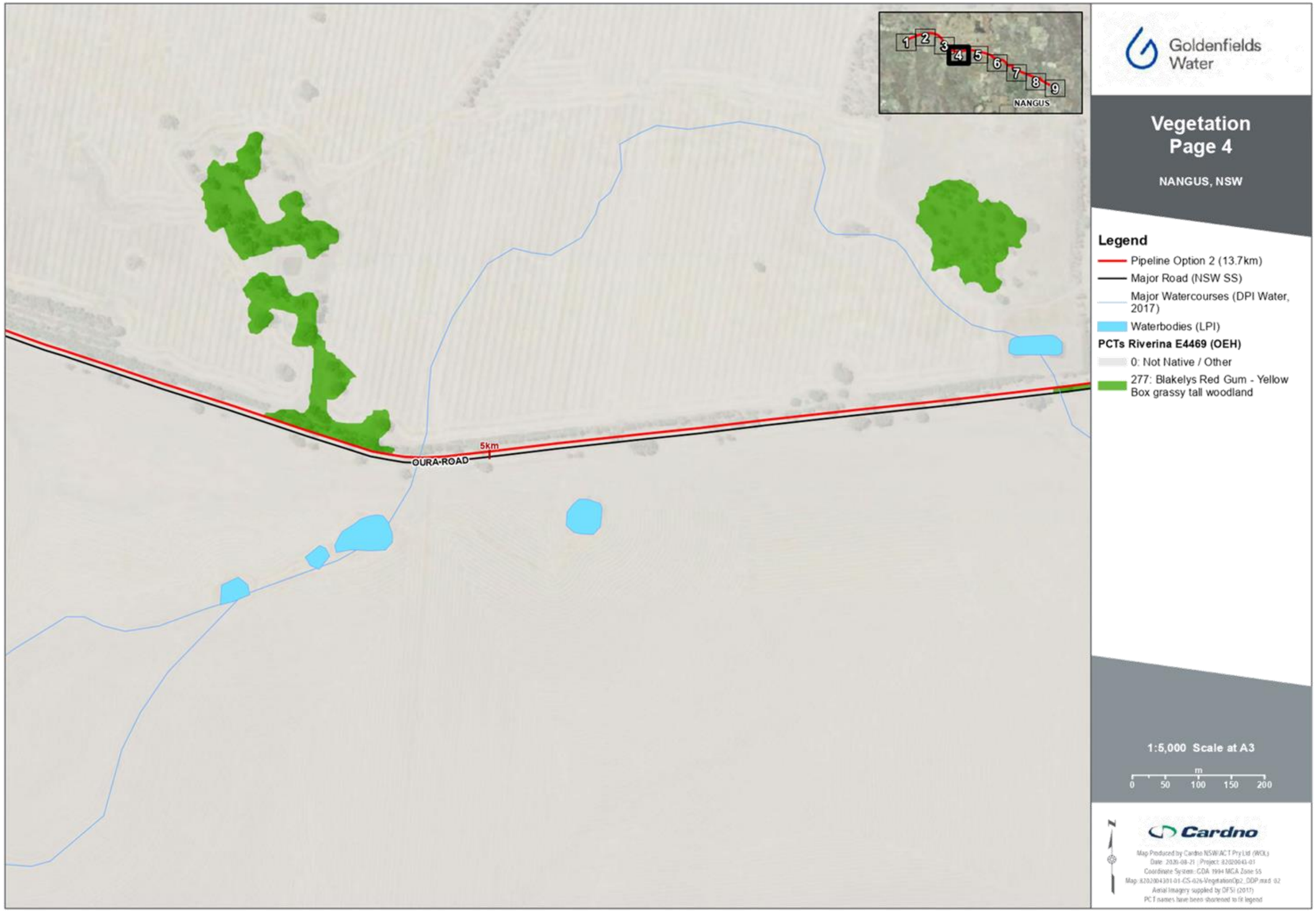
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Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
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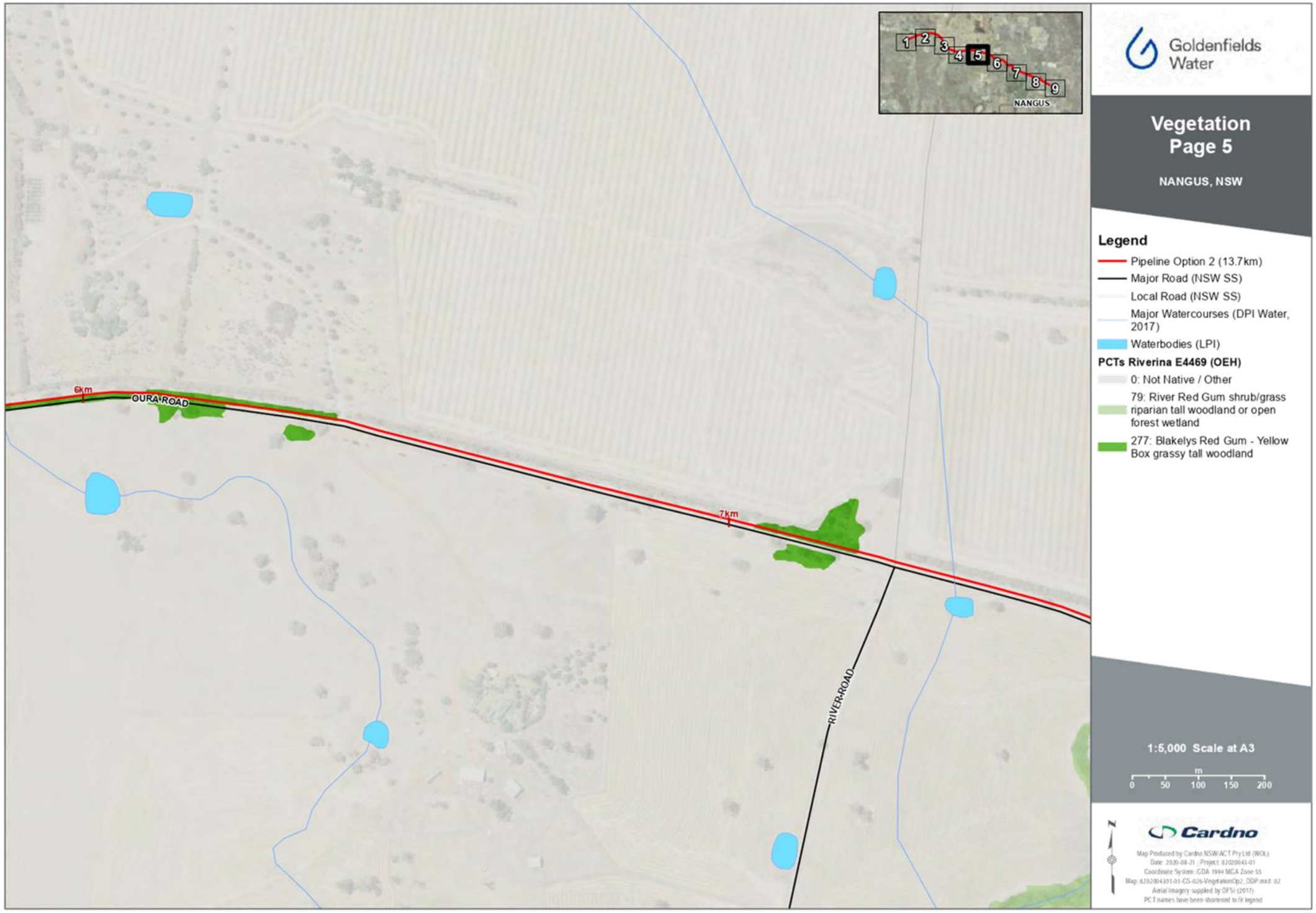
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NANGUS, NSW
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Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
0: Not Native / Other
79: River Red Gum shrub/grass riparian tall woodland or open forest wetland
277: Blakelys Red Gum - Yellow Box grassy tall woodland
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Vegetation Page 6
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
PCTs Riverina E4469 (OEH)
0: Not Native / Other
5: River Red Gum herbaceous-grassy very tall open forest wetland
79: River Red Gum shrub/grass riparian tall woodland or open forest wetland
266: White Box grassy woodland
277: Blakelys Red Gum - Yellow Box grassy tall woodland
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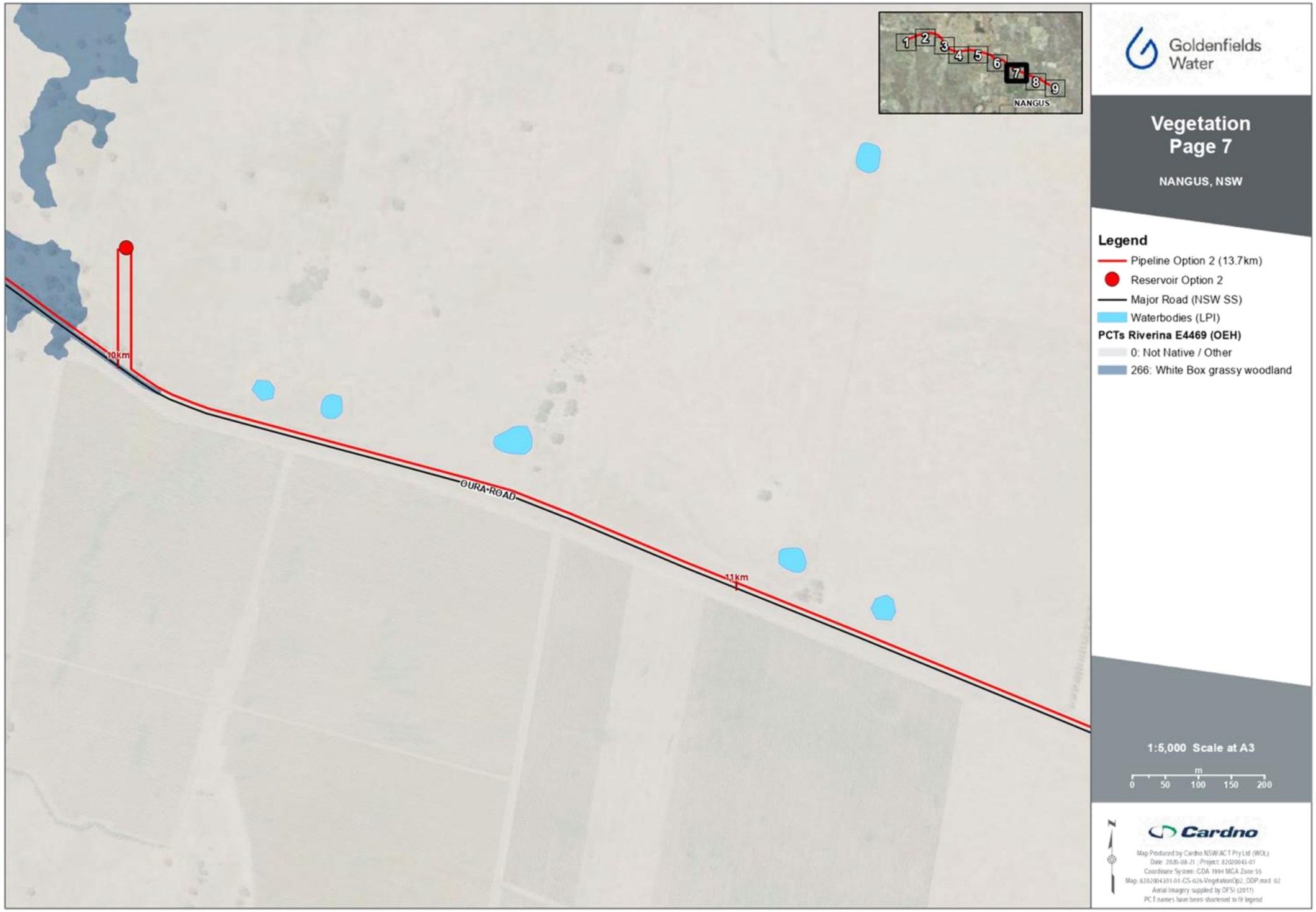
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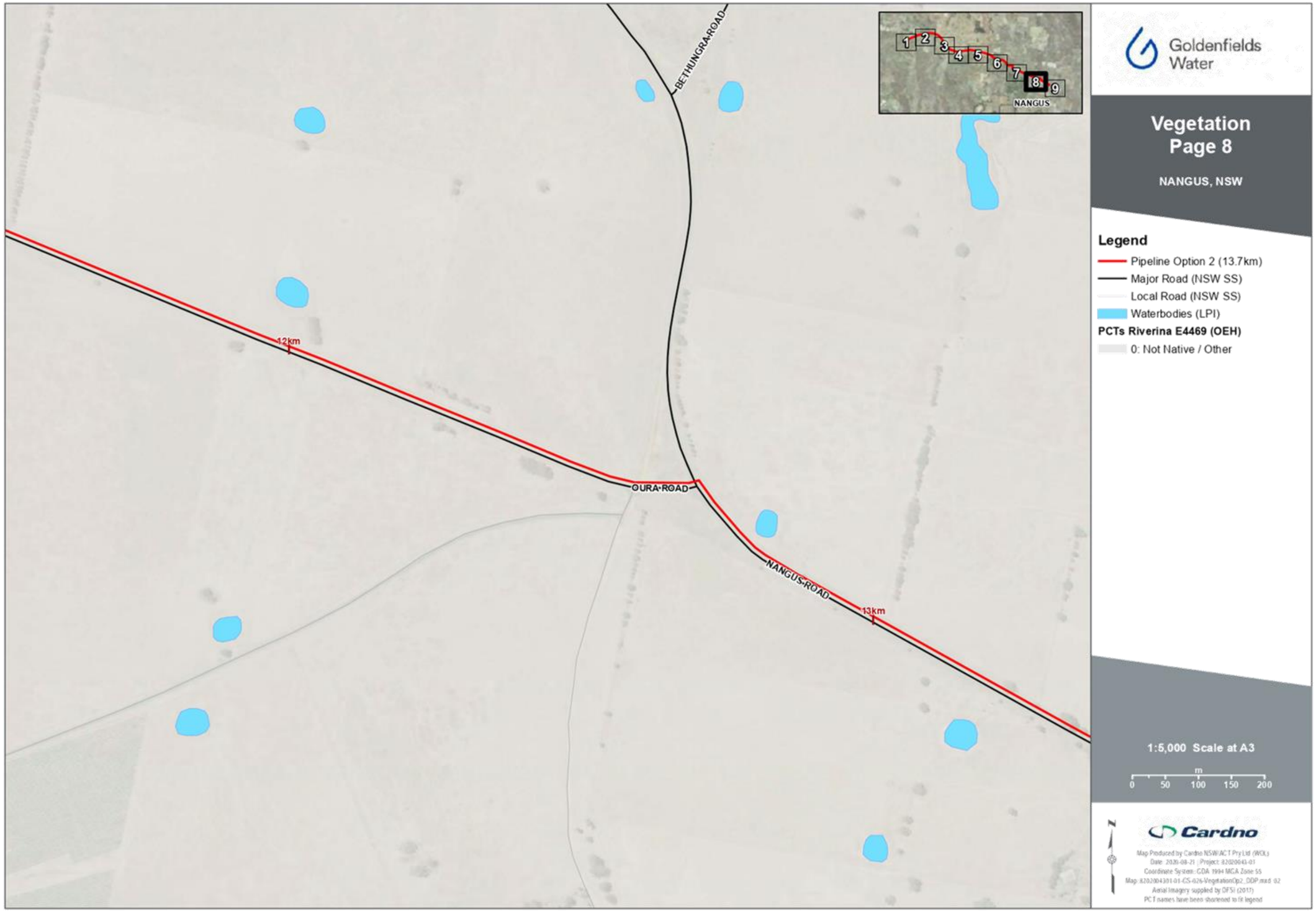
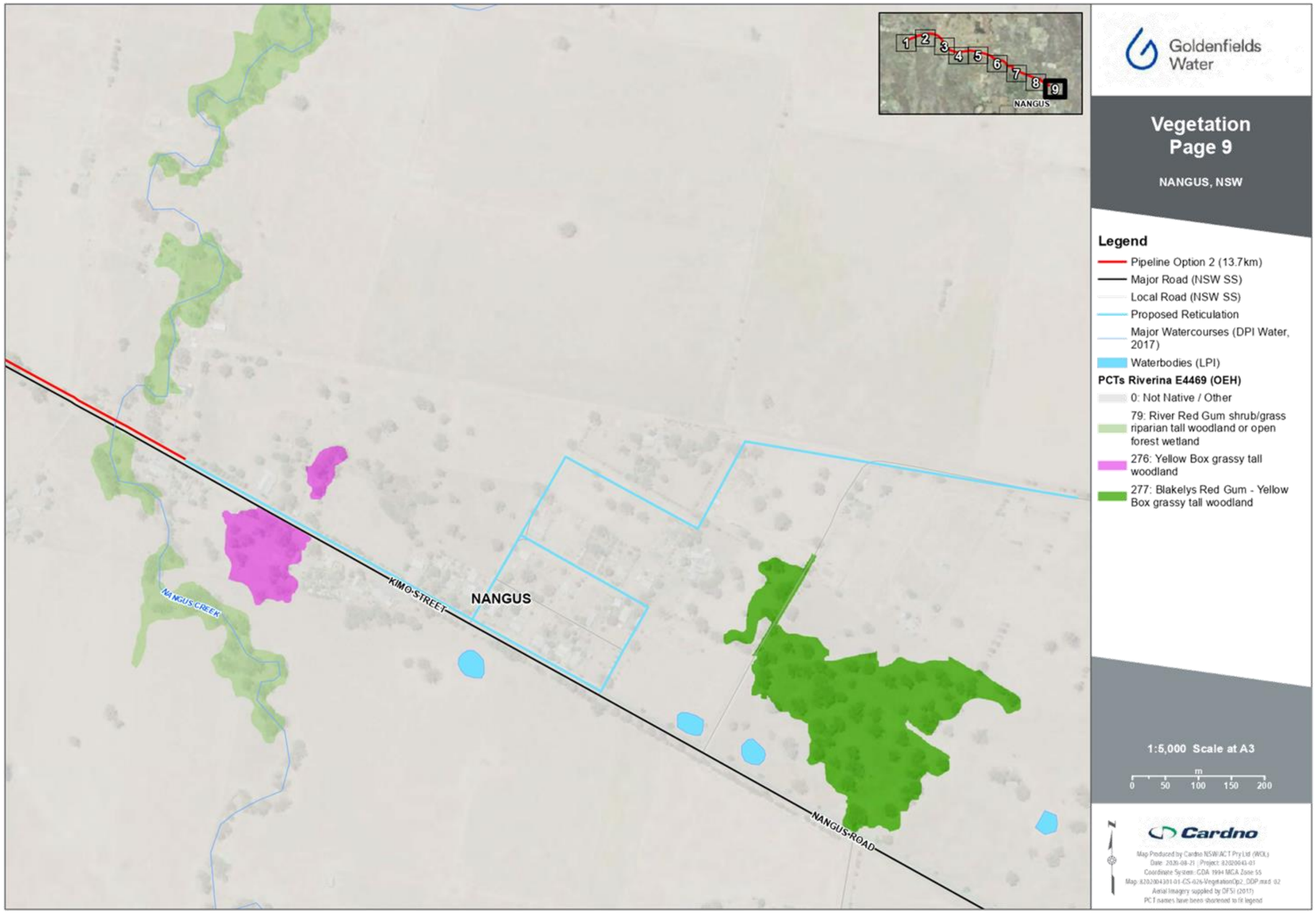
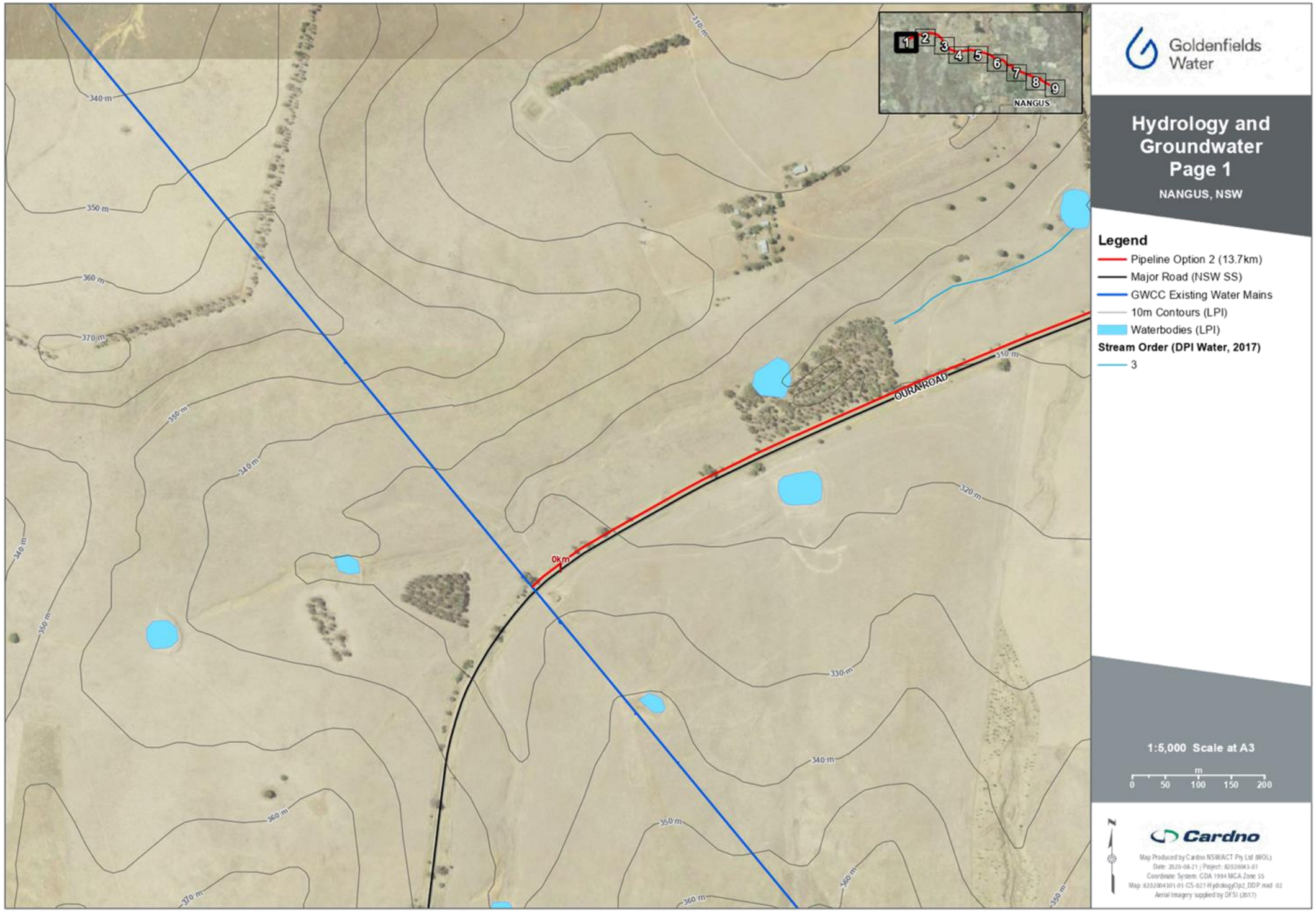
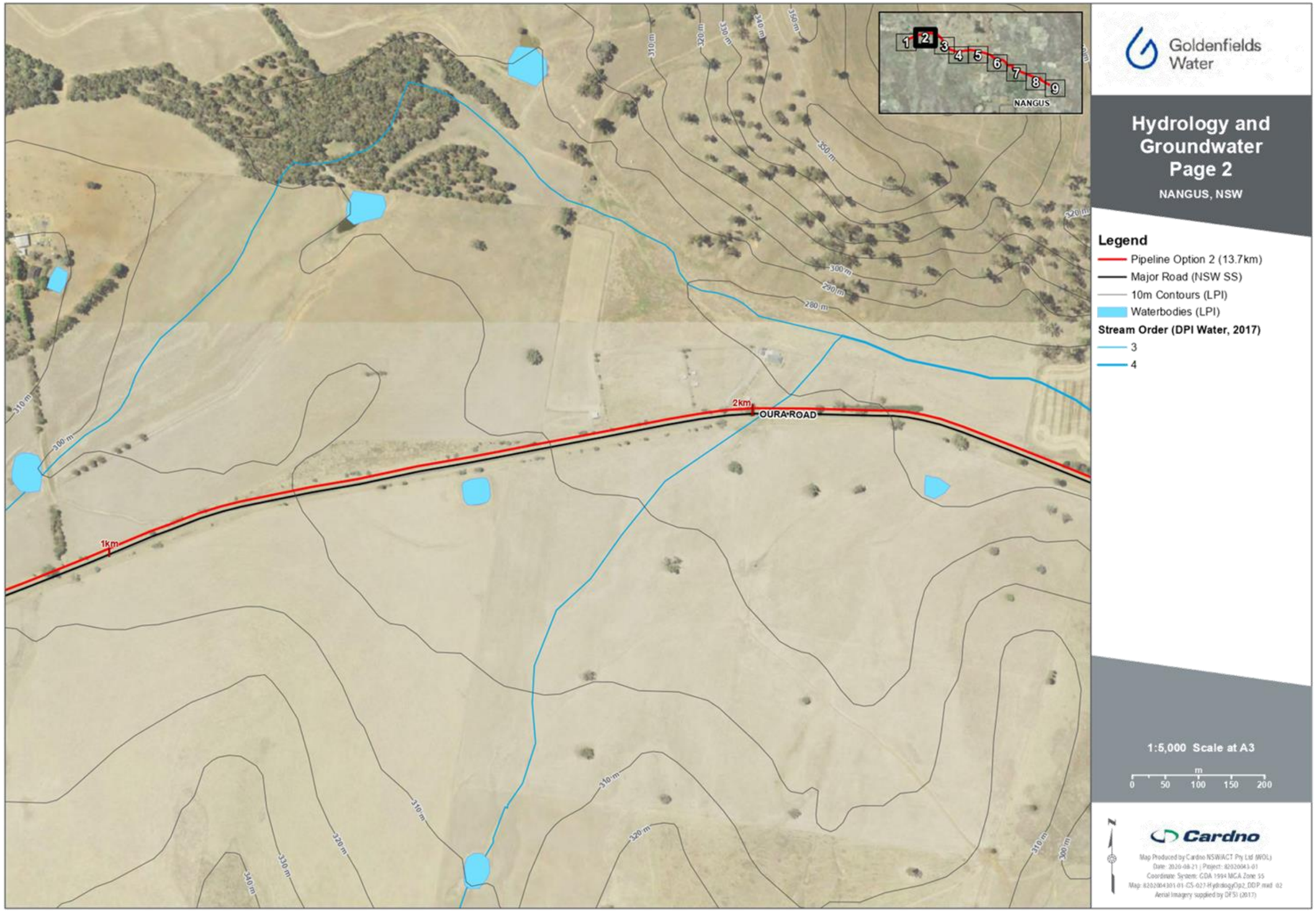
Goldenfields Water
Vegetation Page 7
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
0: Not Native / Other
266: White Box grassy woodland
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020430101-01-CS-026-VegetationOp2_ODP.mxd 02
Aerial Imagery supplied by DFSI (2017)
PCT names have been shortened to fit legend

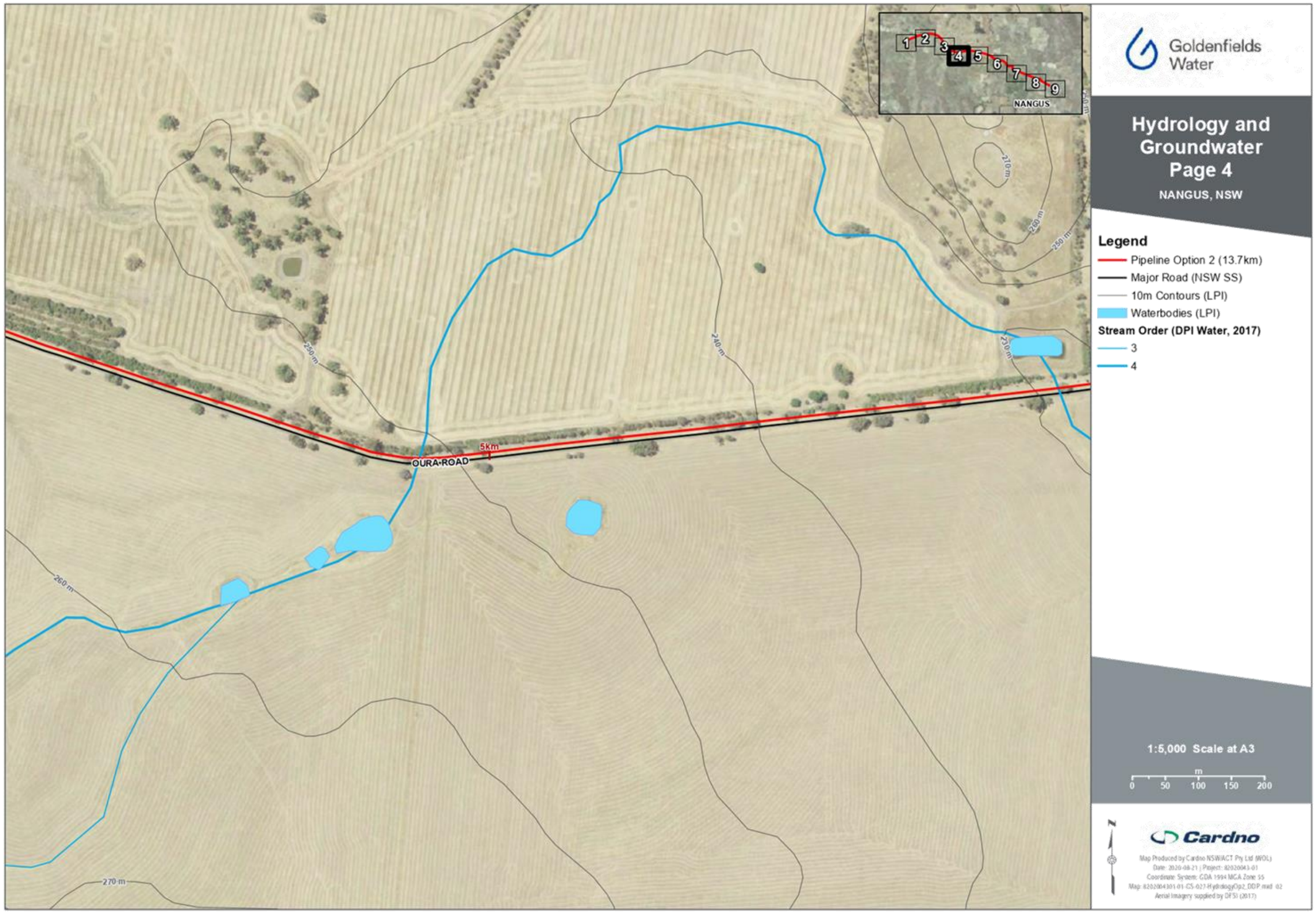

BETHUNGRA ROAD
OURA ROAD
NANGUS ROAD
12km
13km
1
2
3
4
5
6
7
8
9
NANGUS
Goldenfields Water
Vegetation Page 8
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
0: Not Native / Other
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-026-VegetationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)
PCT names have been shortened to fit legend

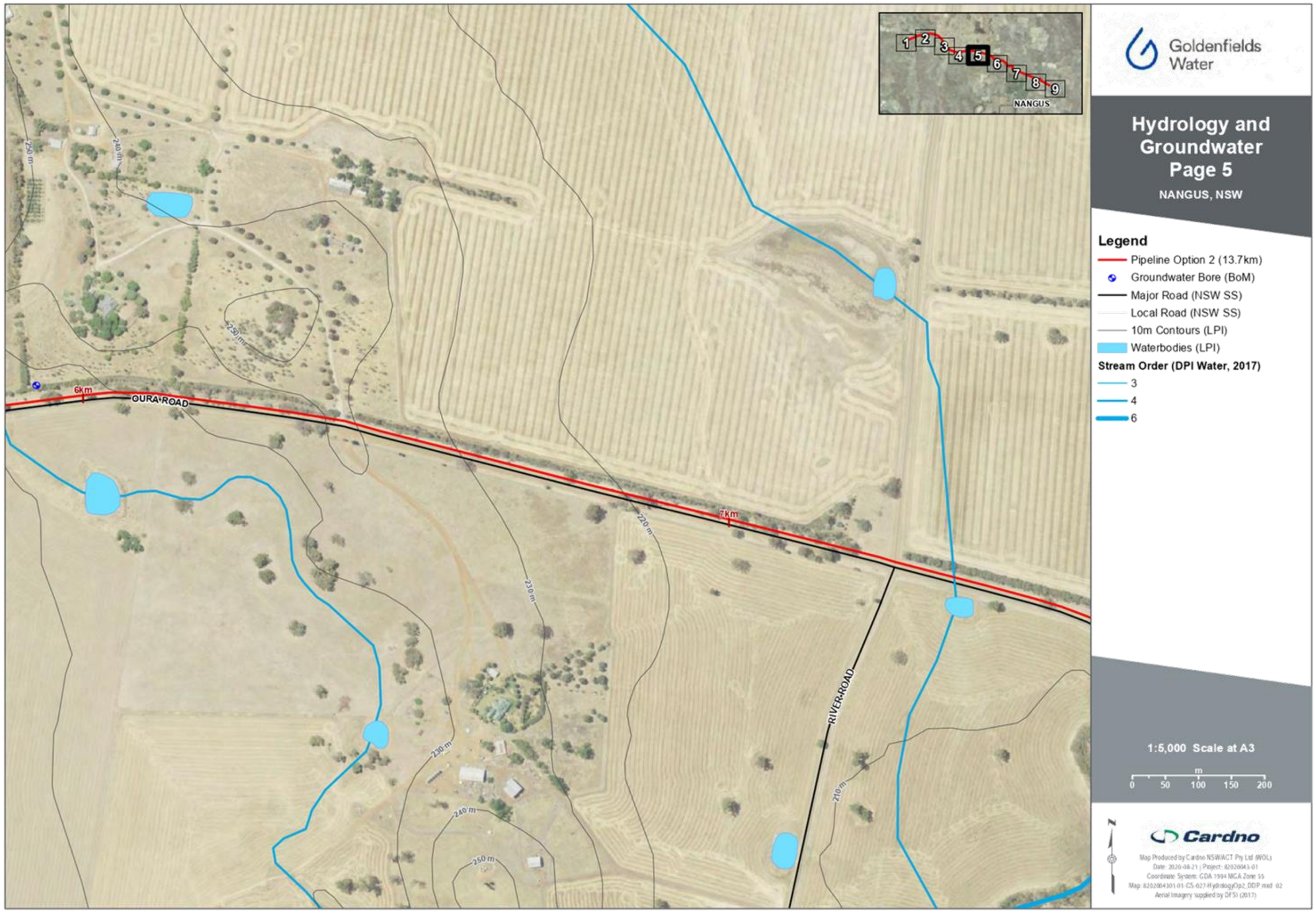

1
2
3
4
5
6
7
8
9
NANGUS
NANGUS CREEK
KIMO STREET
NANGUS
NANGUS ROAD
Goldenfields Water
Vegetation Page 9
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
PCTs Riverina E4469 (OEH)
0: Not Native / Other
79: River Red Gum shrub/grass riparian tall woodland or open forest wetland
276: Yellow Box grassy tall woodland
277: Blakelys Red Gum - Yellow Box grassy tall woodland
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-026-VegetationDp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)
PCT names have been shortened to fit legend

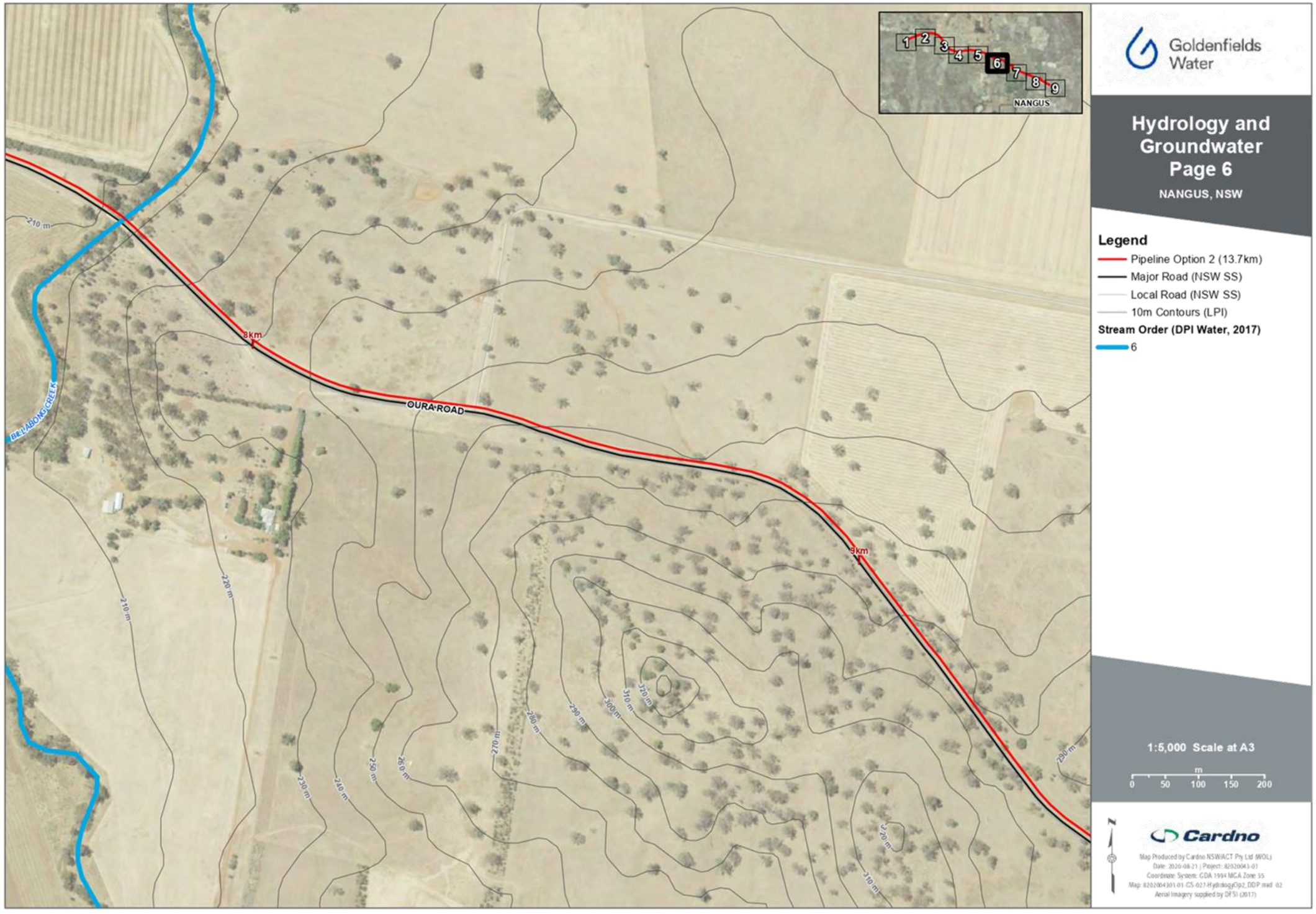

1
2
3
4
5
6
7
8
9
NANGUS
OURAROAD
0km
340 m
350 m
360 m
370 m
310 m
320 m
330 m
Goldenfields Water
Hydrology and Groundwater Page 1
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
GWCC Existing Water Mains
10m Contours (LPI)
Waterbodies (LPI)
Stream Order (DPI Water, 2017)
3
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-GS-027-HydrologyOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

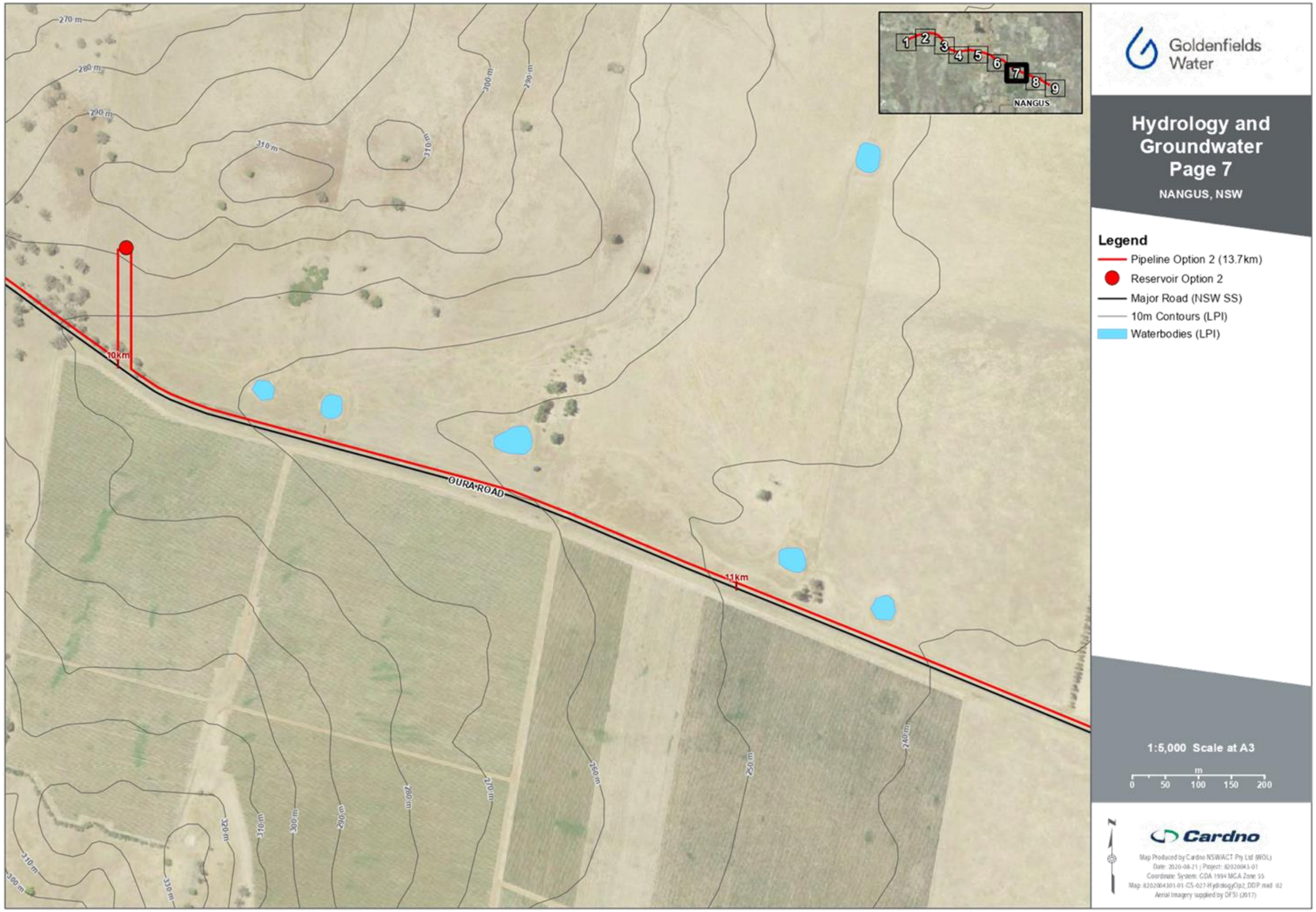

1
2
3
4
5
6
7
8
9
NANGUS
2km
1km
OURA ROAD
310 m
320 m
330 m
340 m
350 m
300 m
290 m
280 m
Goldenfields Water
Hydrology and Groundwater Page 2
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
Stream Order (DPI Water, 2017)
3
4
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-027-HydrologyOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


1
2
3
4
5
6
7
8
9
NANGUS
3km
4km
OURA ROAD
220 m
270 m
280 m
290 m
300 m
310 m
320 m
330 m
340 m
Goldenfields Water
Hydrology and Groundwater Page 3
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020430101-01-CS-027-HydrologyOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

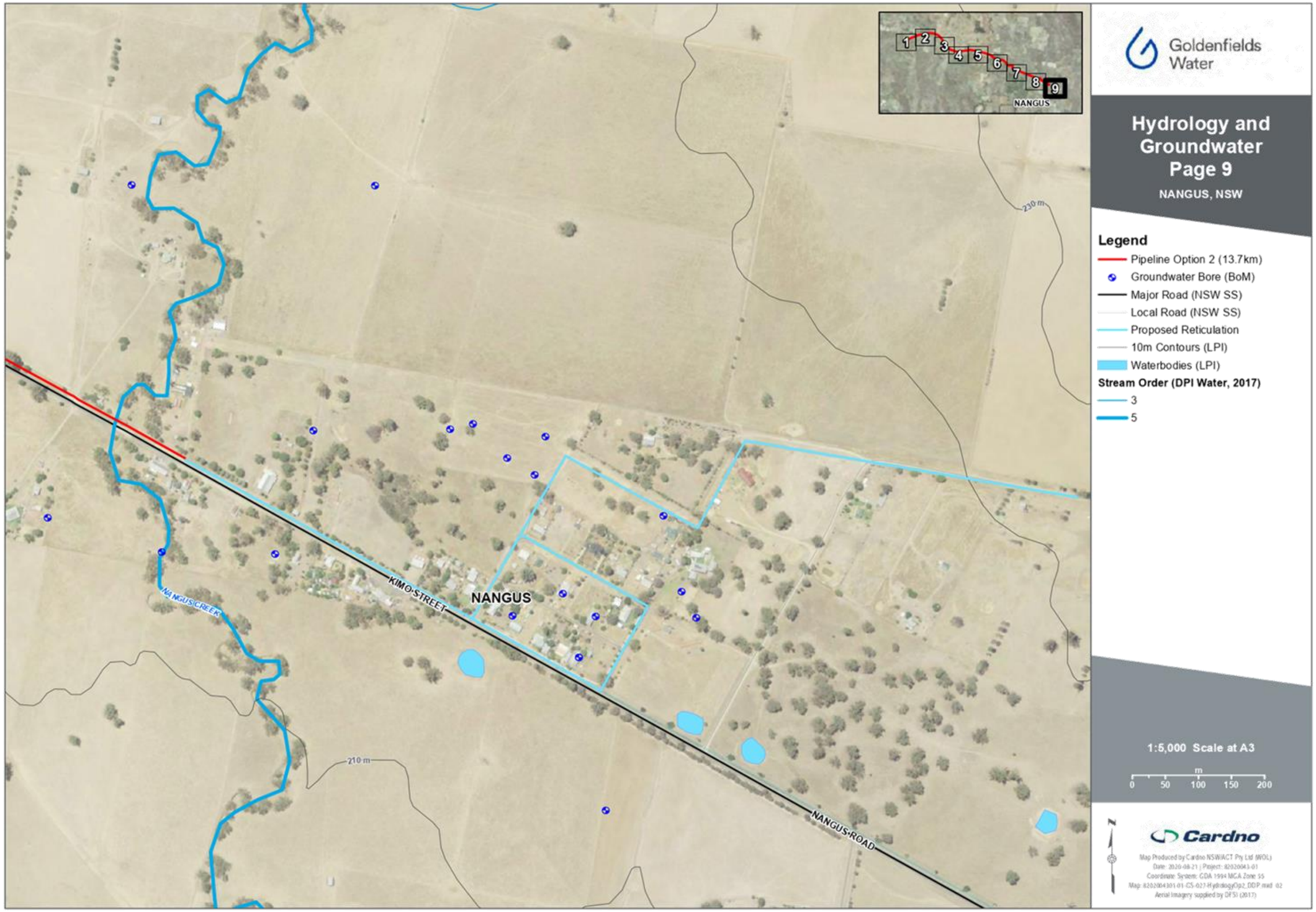

1
2
3
4
5
6
7
8
9
NANGUS
OURA ROAD
5Km
260 m
270 m
250 m
240 m
230 m
220 m
210 m
Goldenfields Water
Hydrology and Groundwater Page 4
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
Stream Order (DPI Water, 2017)
3
4
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-GS-027-HydrologyOp2_DDP.mxd v2
Aerial Imagery supplied by DFSI (2017)

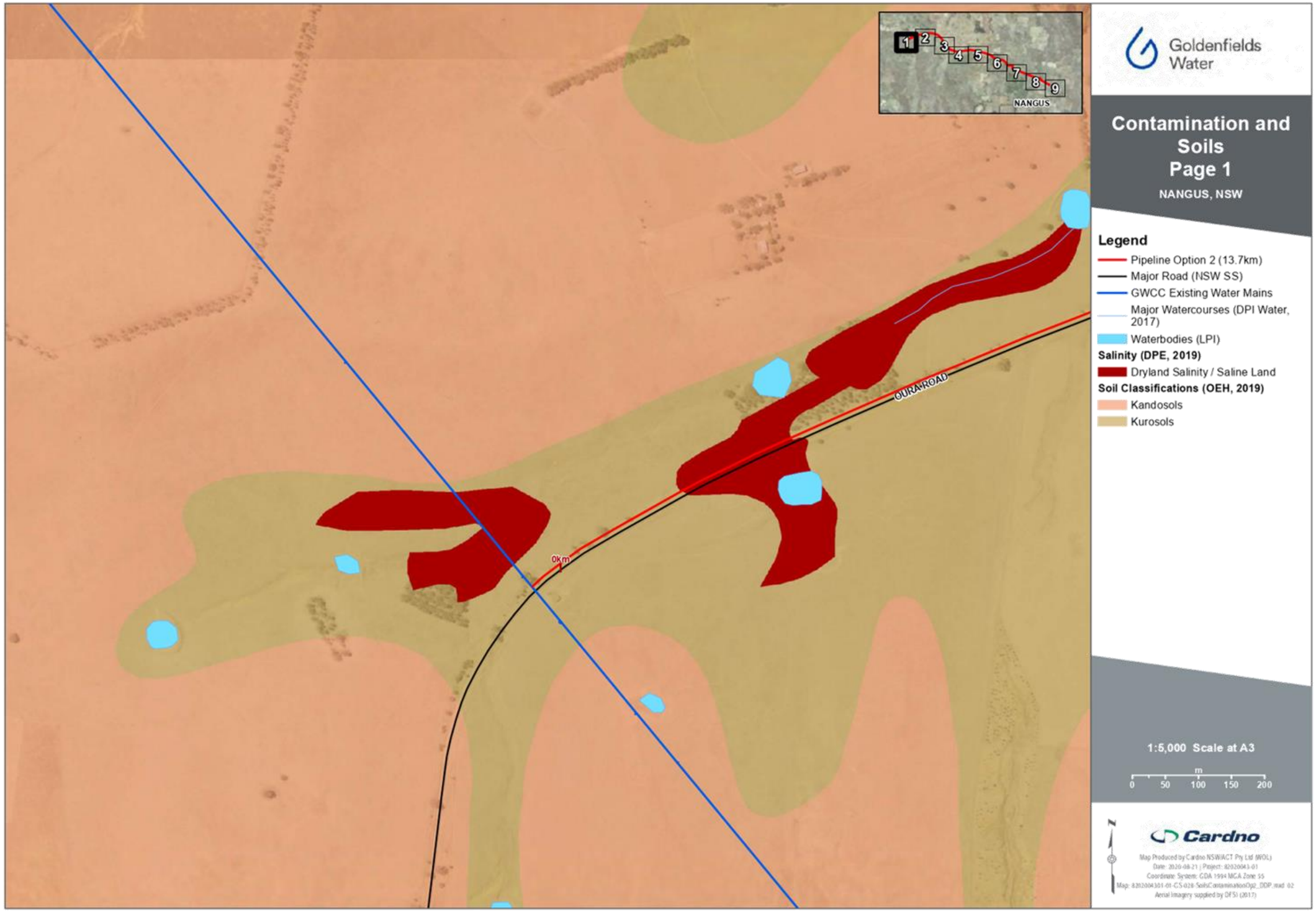

1
2
3
4
5
6
7
8
9
NANGUS
6km
OURA ROAD
7km
RIVER ROAD
250 m
240 m
230 m
220 m
210 m
Goldenfields Water
Hydrology and Groundwater Page 5
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Groundwater Bore (BoM)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
Stream Order (DPI Water, 2017)
3
4
6
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-GS-027-HydrologyOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

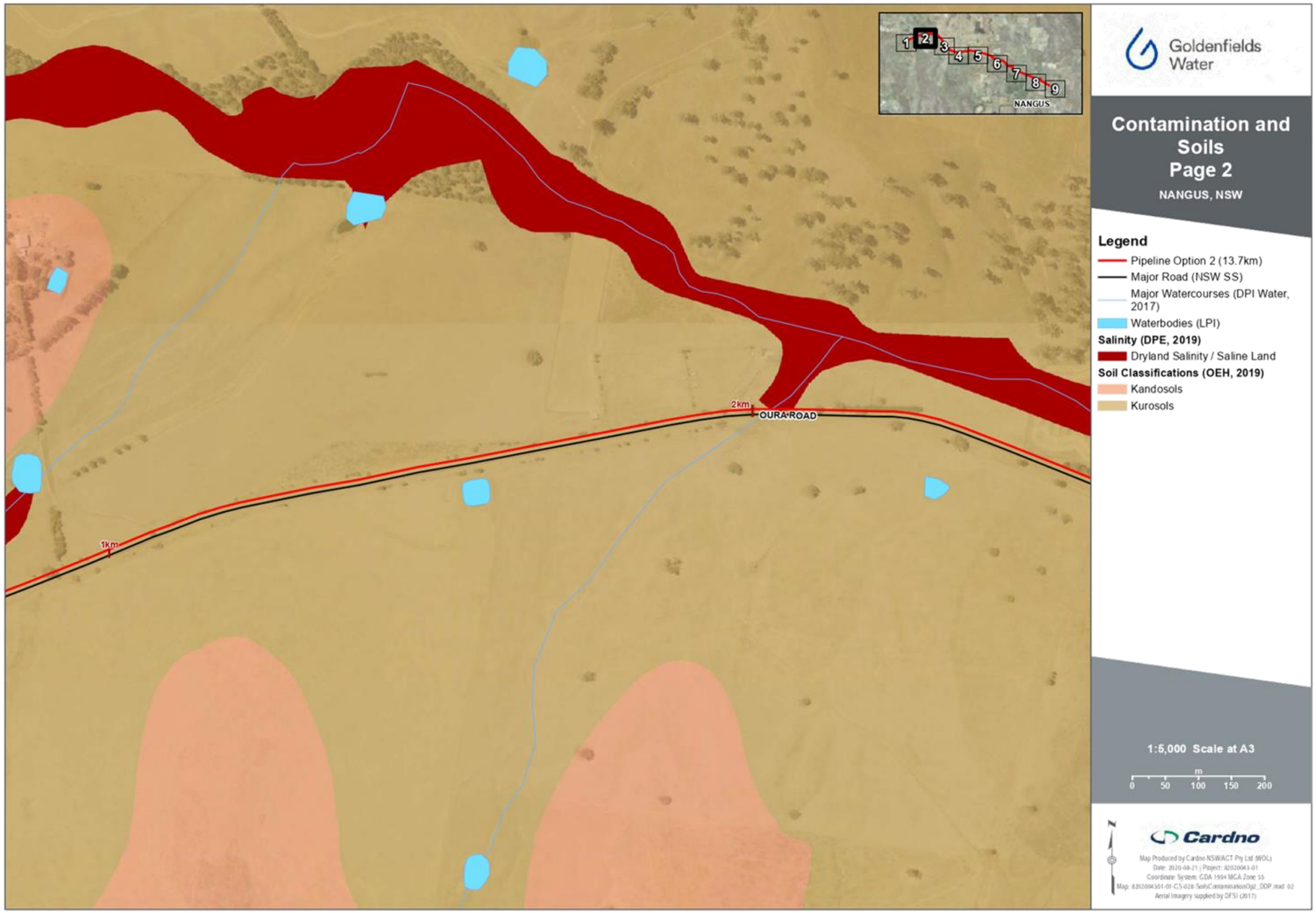

1
2
3
4
5
6
7
8
9
NANGUS
Goldenfields Water
Hydrology and Groundwater Page 6
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Stream Order (DPI Water, 2017)
6
OURA ROAD
BULLABONG CREEK
3km
6km
9km
210 m
220 m
230 m
240 m
250 m
260 m
270 m
280 m
290 m
300 m
310 m
320 m
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-027-HydrologyGp2_DDP.mxd -02
Aerial Imagery supplied by DFSI (2017)

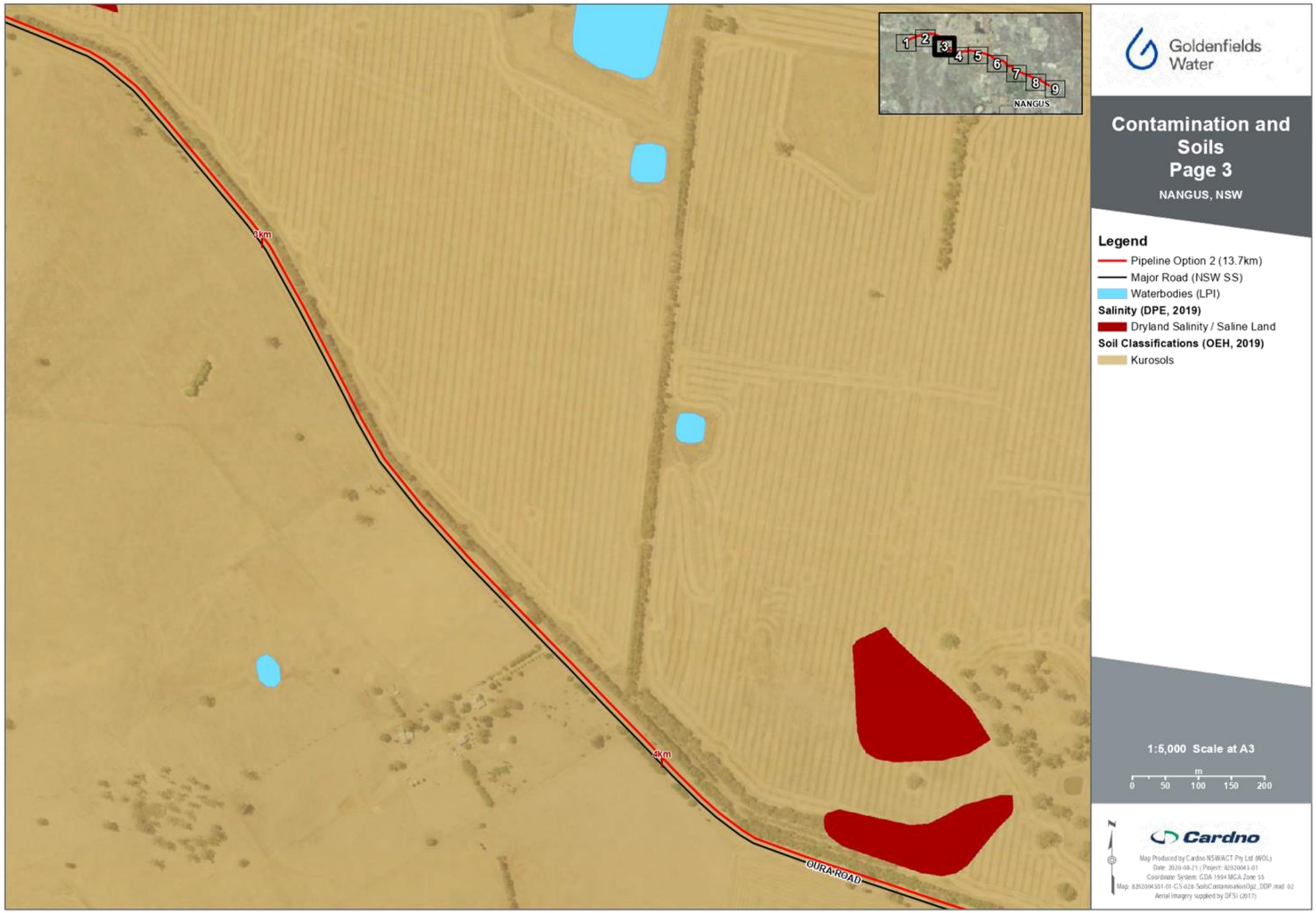

270 m
280 m
290 m
310 m
300 m
10km
11km
GURA ROAD
1
2
3
4
5
6
7
8
9
NANGUS
Goldenfields Water
Hydrology and Groundwater Page 7
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-GS-027-HydrologyOp2_DDP.mxd -02
Aerial Imagery supplied by DFSI (2017)

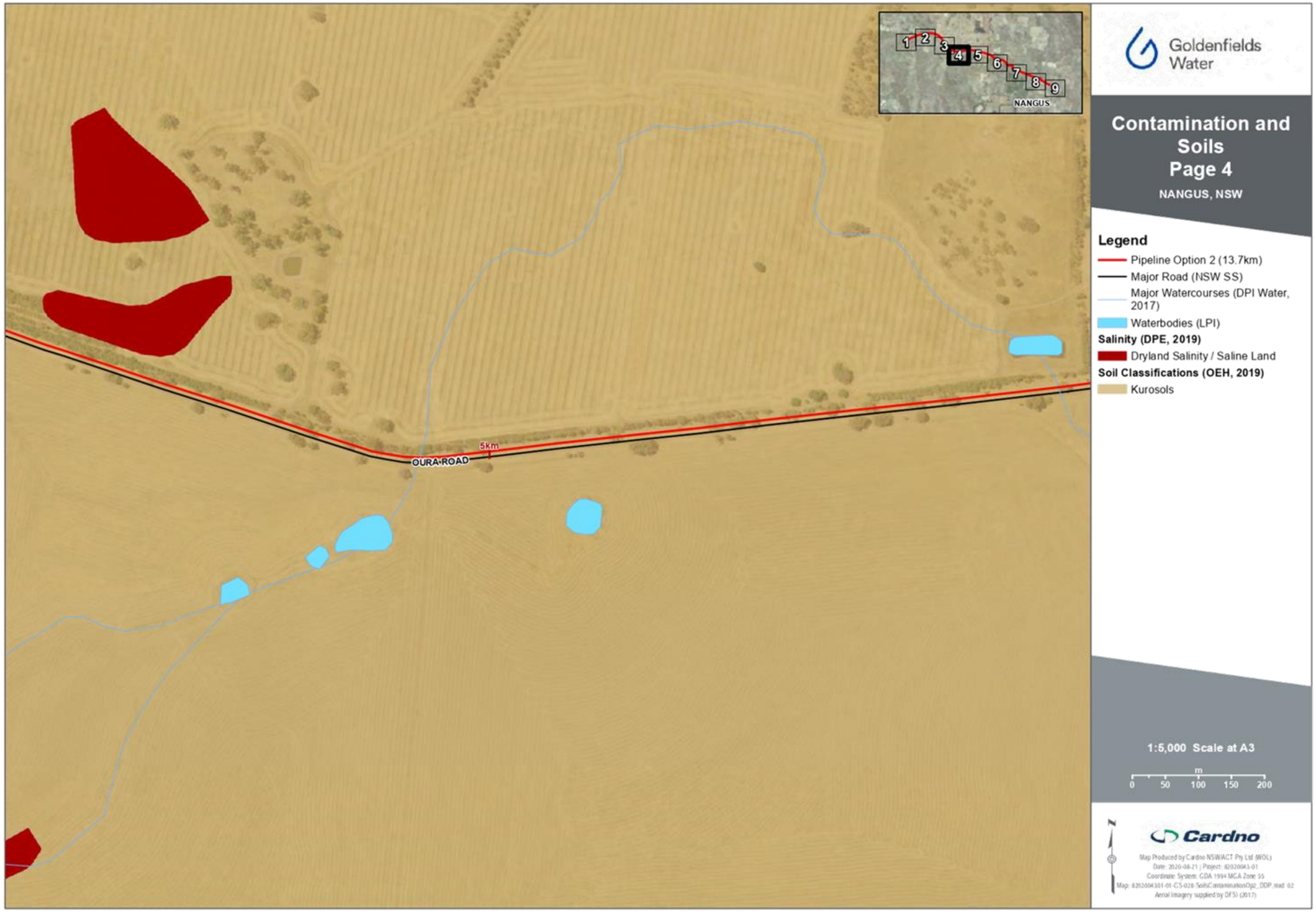

BETHUNGRA ROAD
OURA ROAD
NANGUS ROAD
NANGUS
12km
13km
240 m
230 m
220 m
Goldenfields Water
Hydrology and Groundwater Page 8
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Aerial Imagery supplied by DFSI (2017)

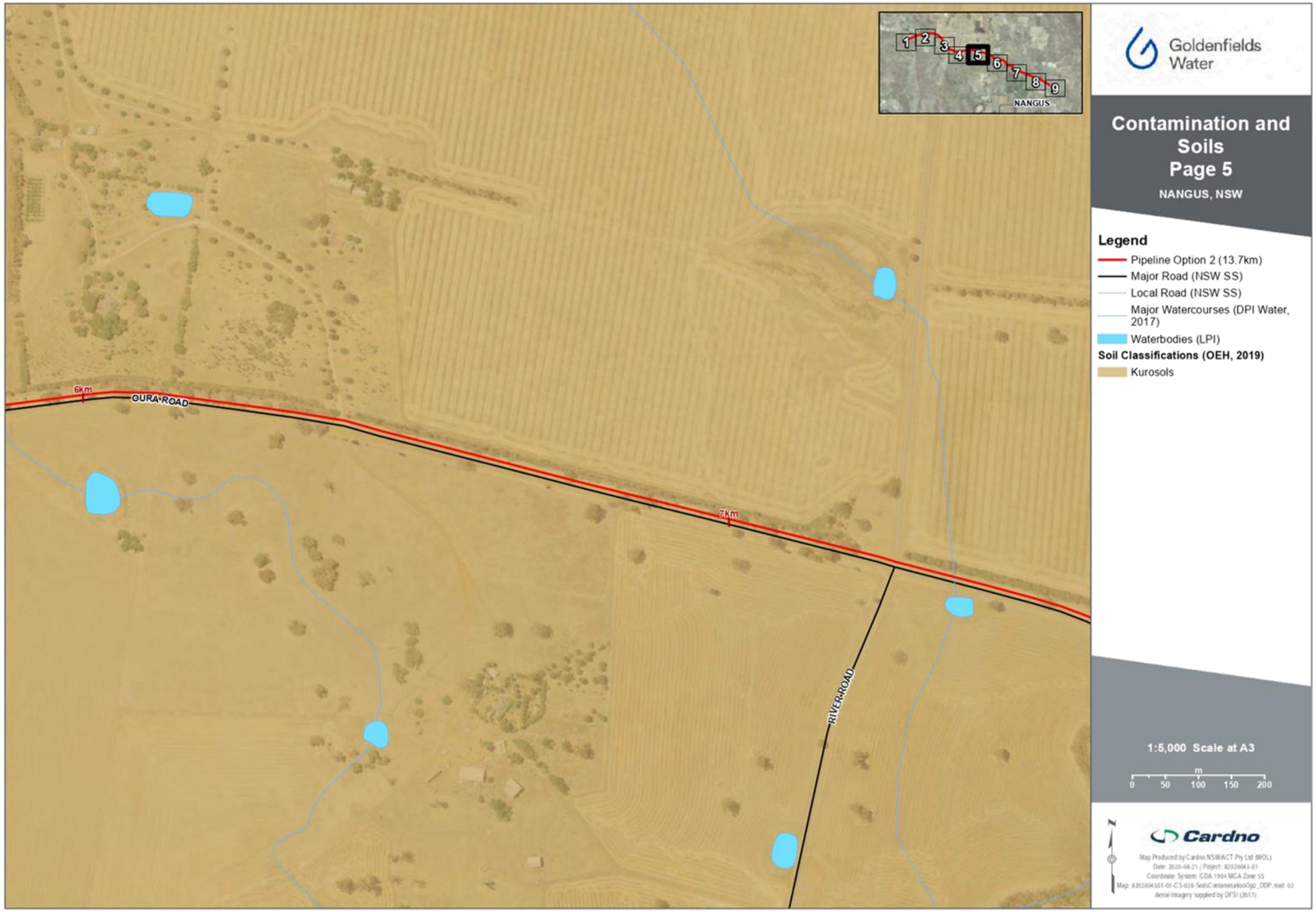

1
2
3
4
5
6
7
8
9
NANGUS
Goldenfields Water
Hydrology and Groundwater Page 9
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Groundwater Bore (BoM)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
10m Contours (LPI)
Waterbodies (LPI)
Stream Order (DPI Water, 2017)
3
5
230 m
210 m
NANGUS CREEK
KIMO STREET
NANGUS
NANGUS ROAD
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-027-HydrologyOp2_DDP.mxd -02
Aerial Imagery supplied by DFSI (2017)

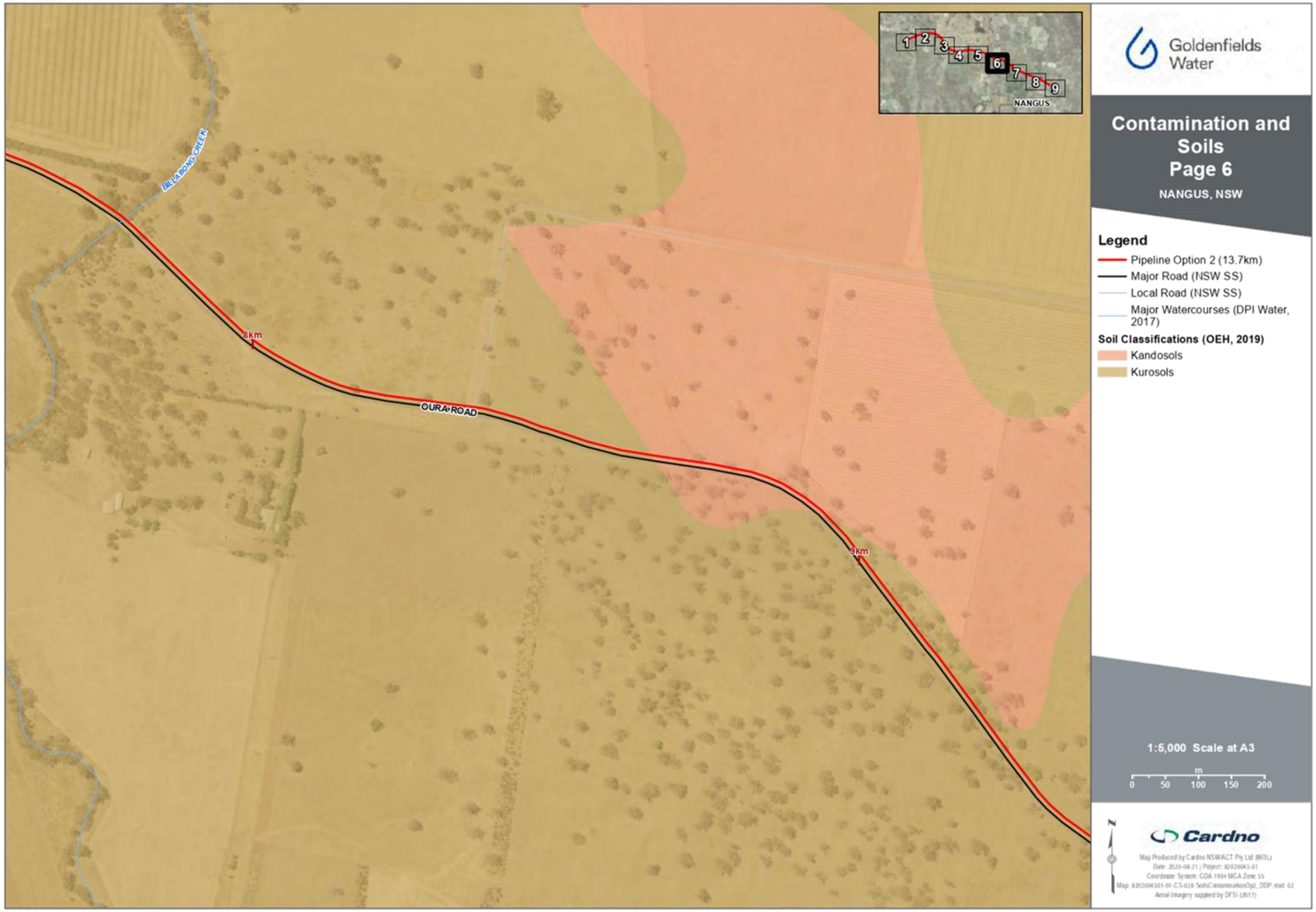

1
2
3
4
5
6
7
8
9
NANGUS
OURA ROAD
0km
Goldenfields Water
Contamination and Soils Page 1
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
GWCC Existing Water Mains
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Salinity (DPE, 2019)
Dryland Salinity / Saline Land
Soil Classifications (OEH, 2019)
Kandosols
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-CS-028 SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

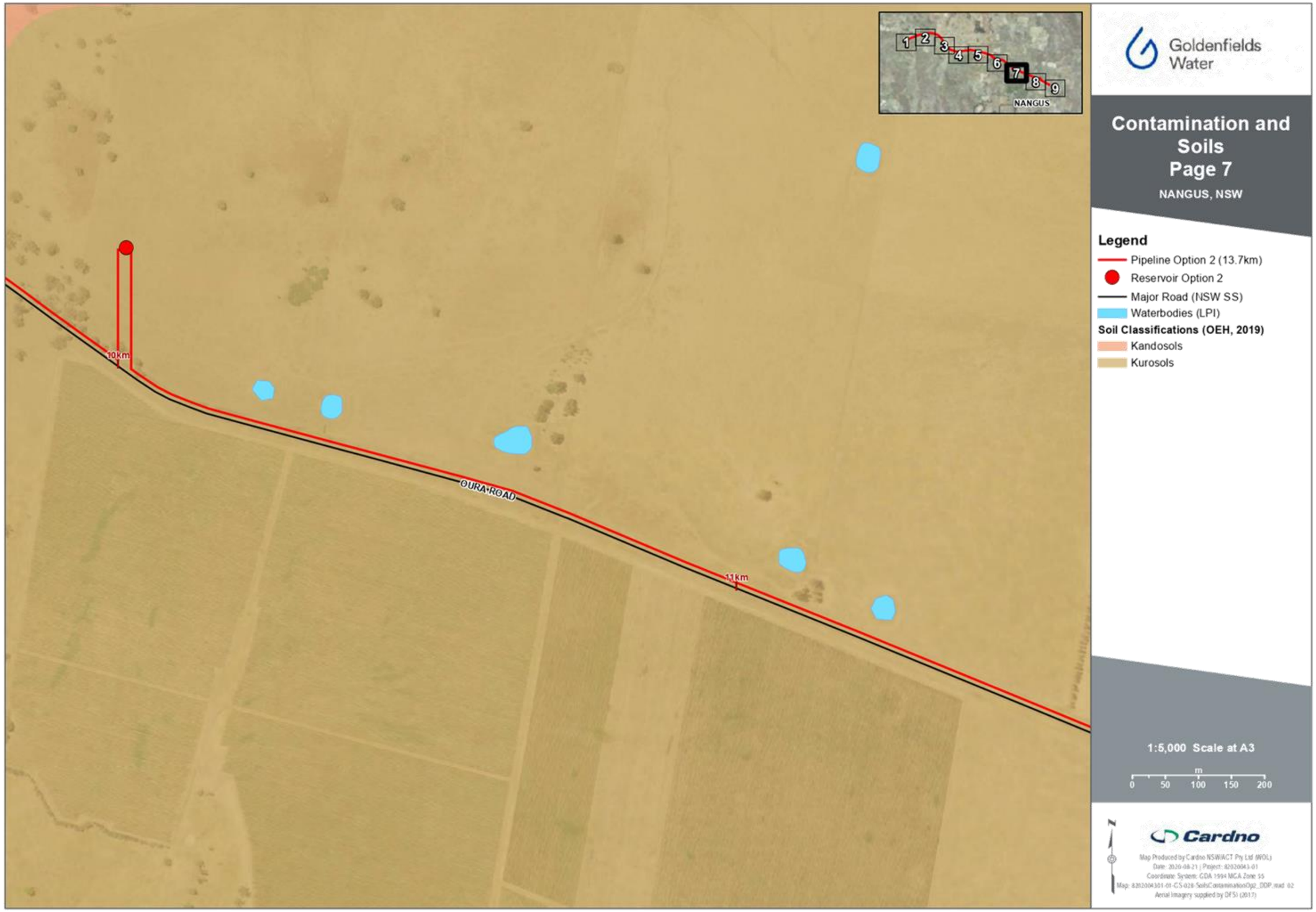

1
2
3
4
5
6
7
8
9
NANGUS
2km
OURA ROAD
1km
Goldenfields Water
Contamination and Soils Page 2
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Salinity (DPE, 2019)
Dryland Salinity / Saline Land
Soil Classifications (OEH, 2019)
Kandosols
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043-01-GS-028-SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


1
2
3
4
5
6
7
8
9
NANGUS
3km
4km
OURA ROAD
Goldenfields Water
Contamination and Soils
Page 3
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Waterbodies (LPI)
Salinity (DPE, 2019)
Dryland Salinity / Saline Land
Soil Classifications (OEH, 2019)
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043-01-01-CS-028 SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

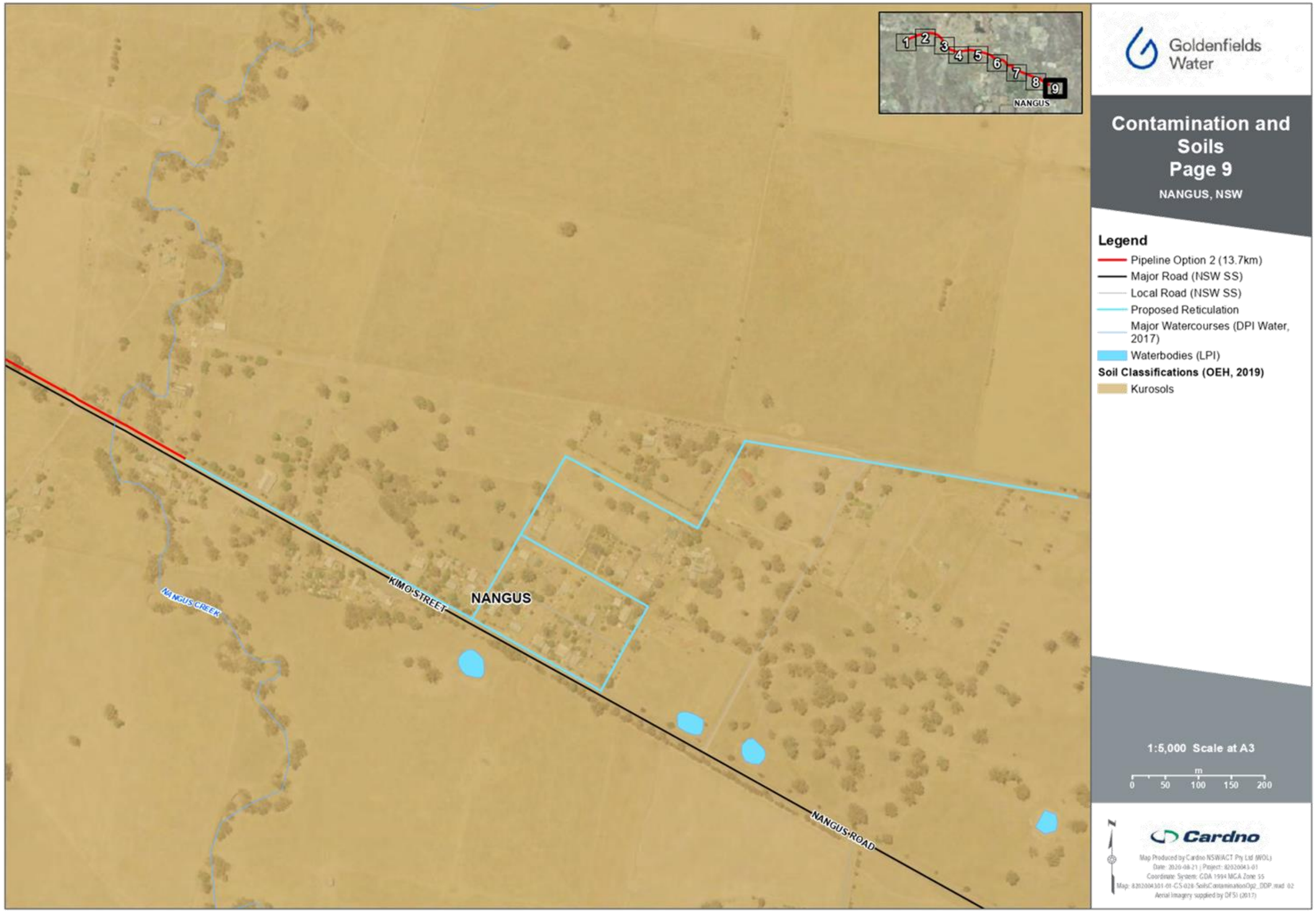

1
2
3
4
5
6
7
8
9
NANGUS
OURA ROAD
5km
Goldenfields Water
Contamination and Soils
Page 4
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Salinity (DPE, 2019)
Dryland Salinity / Saline Land
Soil Classifications (OEH, 2019)
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043_01-01-GS-028-SoilsContaminationOp2_SDP.mxd 02
Aerial Imagery supplied by DFSI (2017)

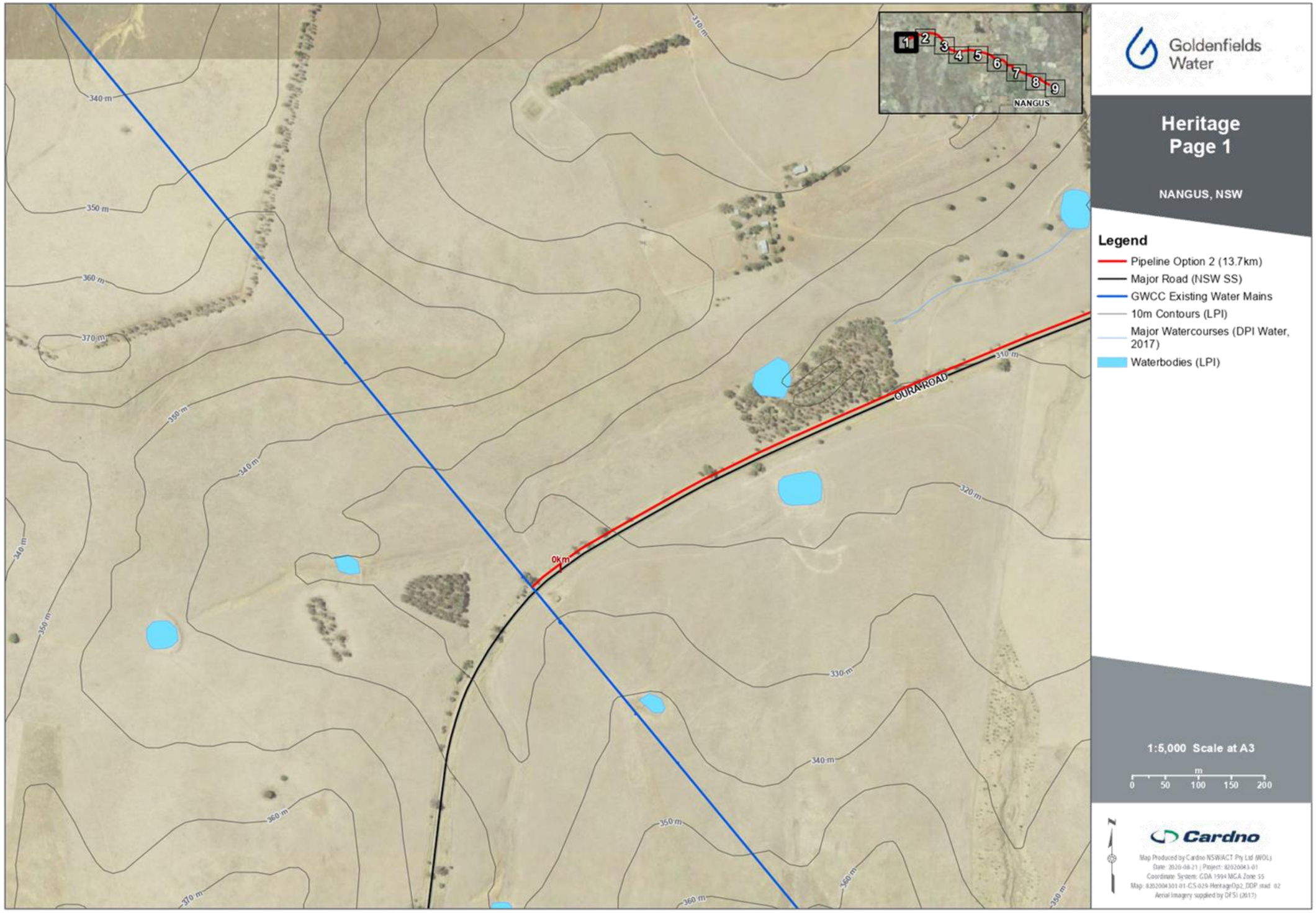

1
2
3
4
5
6
7
8
9
NANGUS
6km
OURA ROAD
7km
RIVER ROAD
Goldenfields Water
Contamination and Soils
Page 5
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Soil Classifications (OEH, 2019)
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020430101-01-CS-028-SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


1
2
3
4
5
6
7
8
9
NANGUS
BILLABONG CREEK
8km
OURA ROAD
9km
Goldenfields Water
Contamination and Soils
Page 6
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Soil Classifications (OEH, 2019)
Kandosols
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043-01-01-CS-028 SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


1
2
3
4
5
6
7
8
9
NANGUS
10km
OURA ROAD
11km
Goldenfields Water
Contamination and Soils
Page 7
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
Waterbodies (LPI)
Soil Classifications (OEH, 2019)
Kandosols
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043-01-CS-028-SoilsContaminationDg2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


BETHUNGRA ROAD
OURA ROAD
NANGUS ROAD
12km
13km
1
2
3
4
5
6
7
8
9
NANGUS
Goldenfields Water
Contamination and Soils
Page 8
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Waterbodies (LPI)
Soil Classifications (OEH, 2019)
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043-01-CS-028-SoilsContaminationOp2_DDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


1
2
3
4
5
6
7
8
9
NANGUS
KIMO STREET
NANGUS
NANGUS CREEK
NANGUS ROAD
Goldenfields Water
Contamination and Soils
Page 9
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Soil Classifications (OEH, 2019)
Kurosols
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
Coordinate System: GDA 1994 MGA Zone 55
Map: 82020043301-01-GS-028-SoilsContaminationOp2_SDP.mxd 02
Aerial Imagery supplied by DFSI (2017)


Goldenfields Water
Heritage Page 1
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
GWCC Existing Water Mains
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
OURA ROAD
NANGUS
0km
1:5,000 Scale at A3
m
0 50 100 150 200
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
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Coordinate System: GDA 1994 MGA Zone 55
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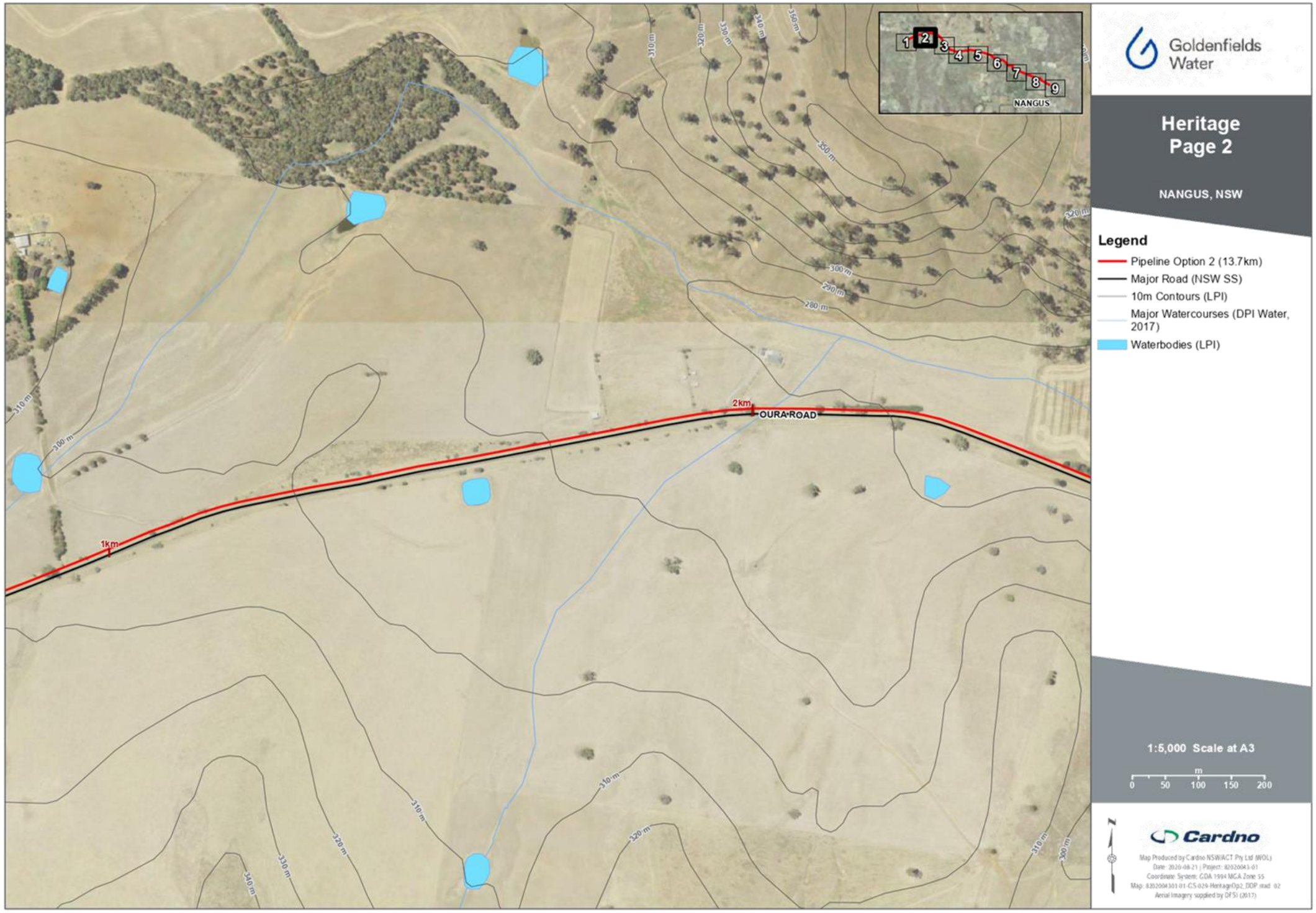
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Goldenfields Water
Heritage Page 2
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
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Goldenfields Water
Heritage Page 3
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
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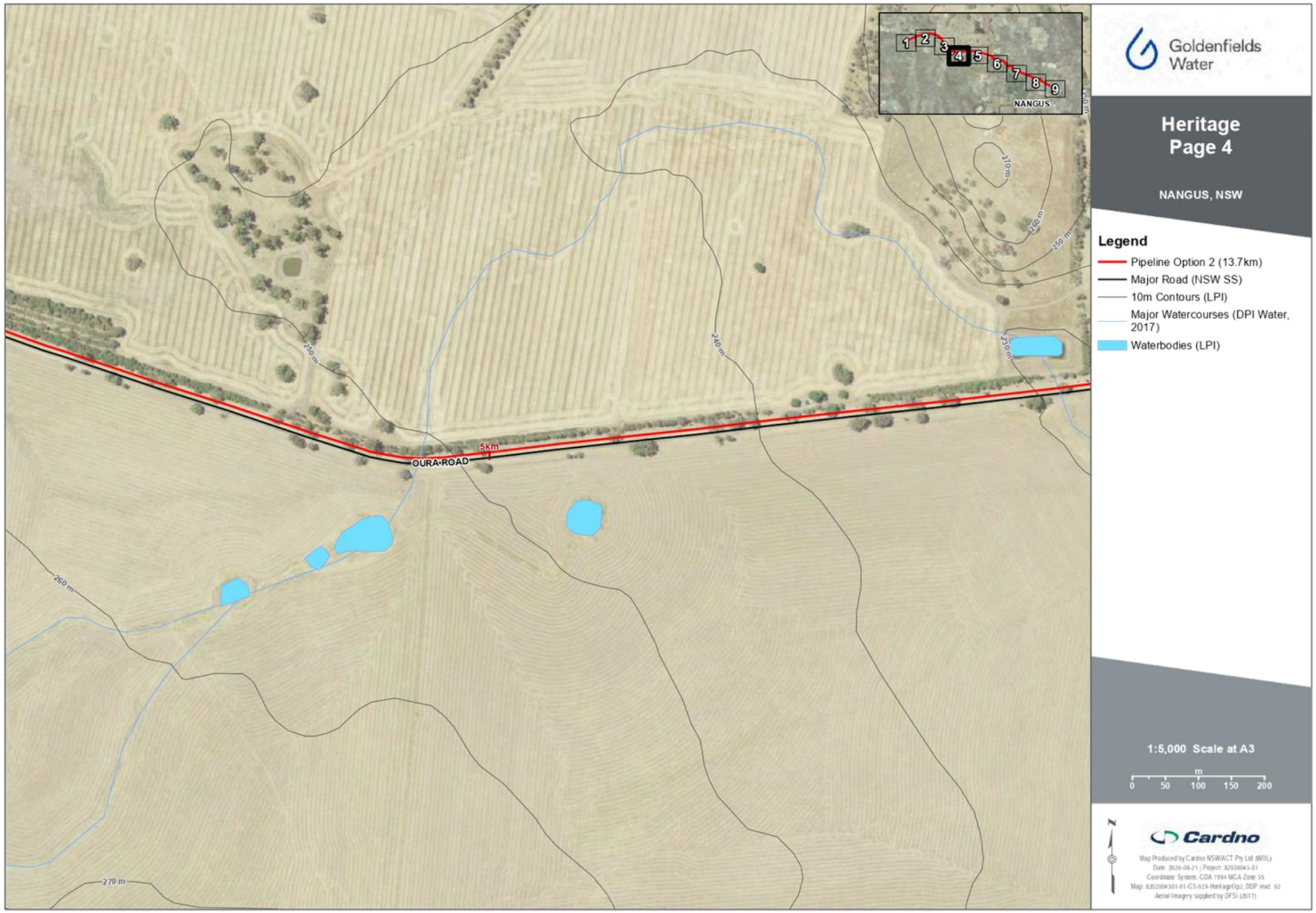
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Major Road (NSW SS)
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
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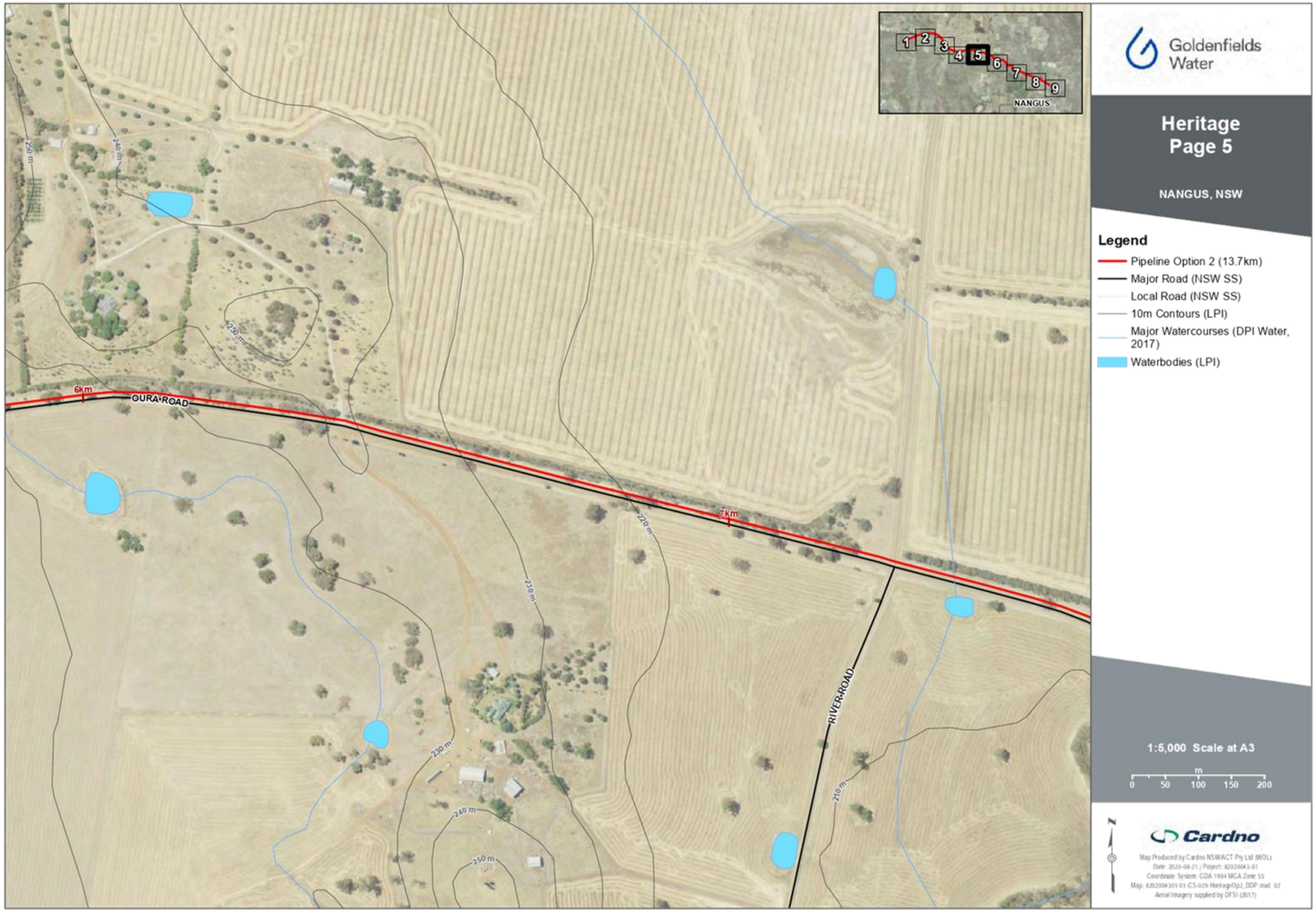
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220 m
210 m
Goldenfields Water
Heritage Page 5
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
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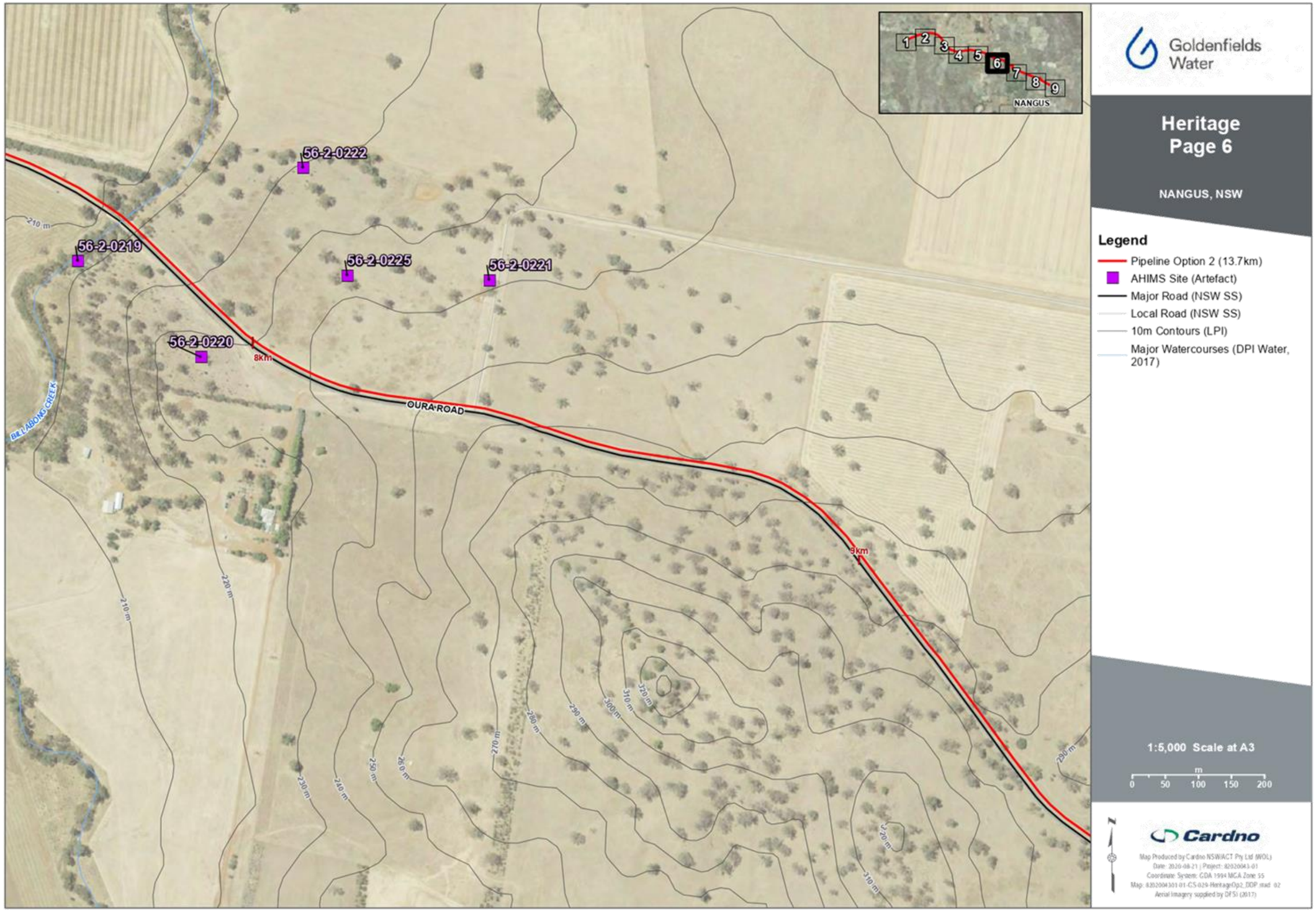
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56-2-0225
56-2-0221
56-2-0220
8km
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BULLABONG CREEK
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270 m
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300 m
310 m
320 m
Goldenfields Water
Heritage Page 6
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
AHIMS Site (Artefact)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
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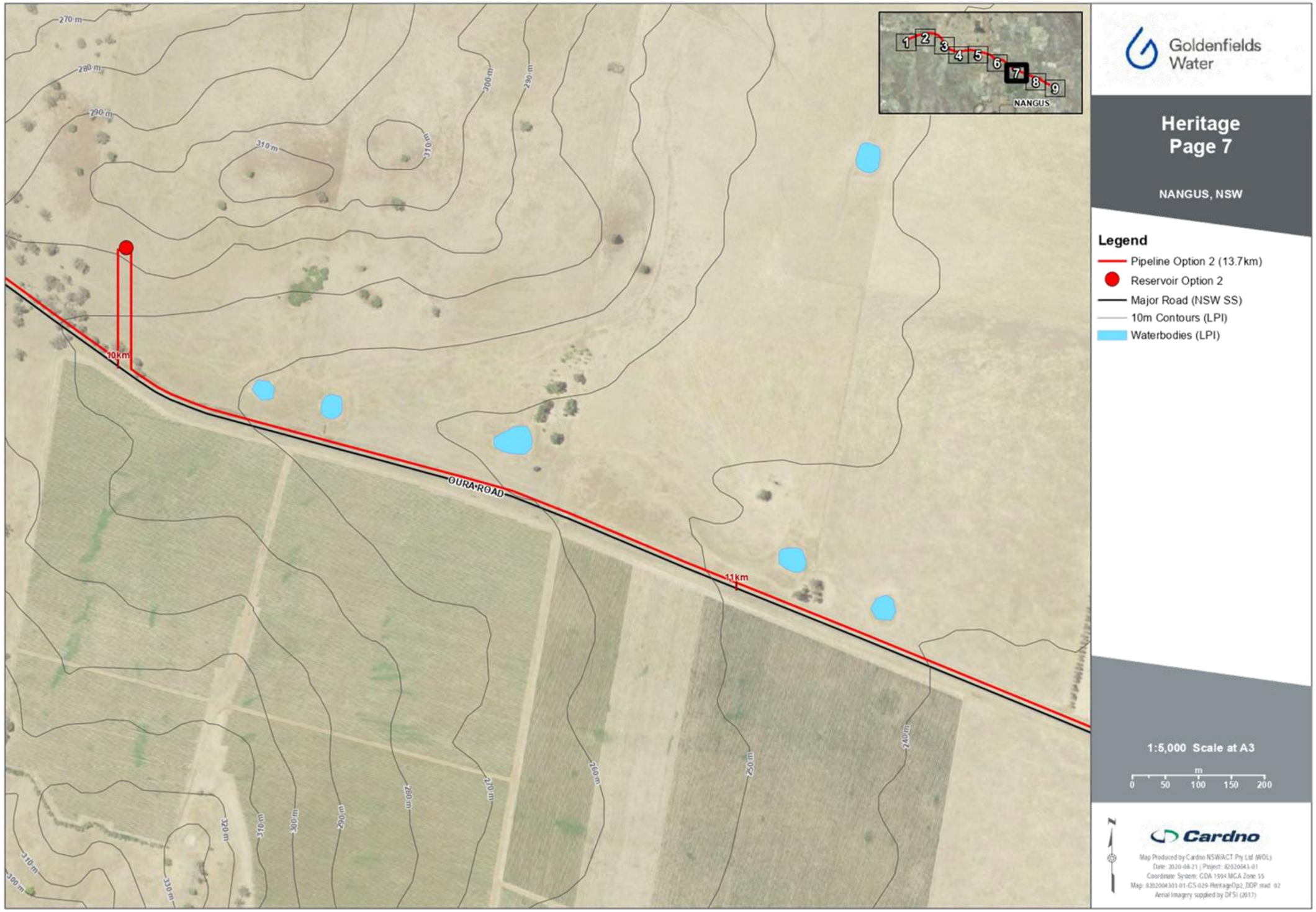
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Heritage Page 7
NANGUS, NSW
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Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
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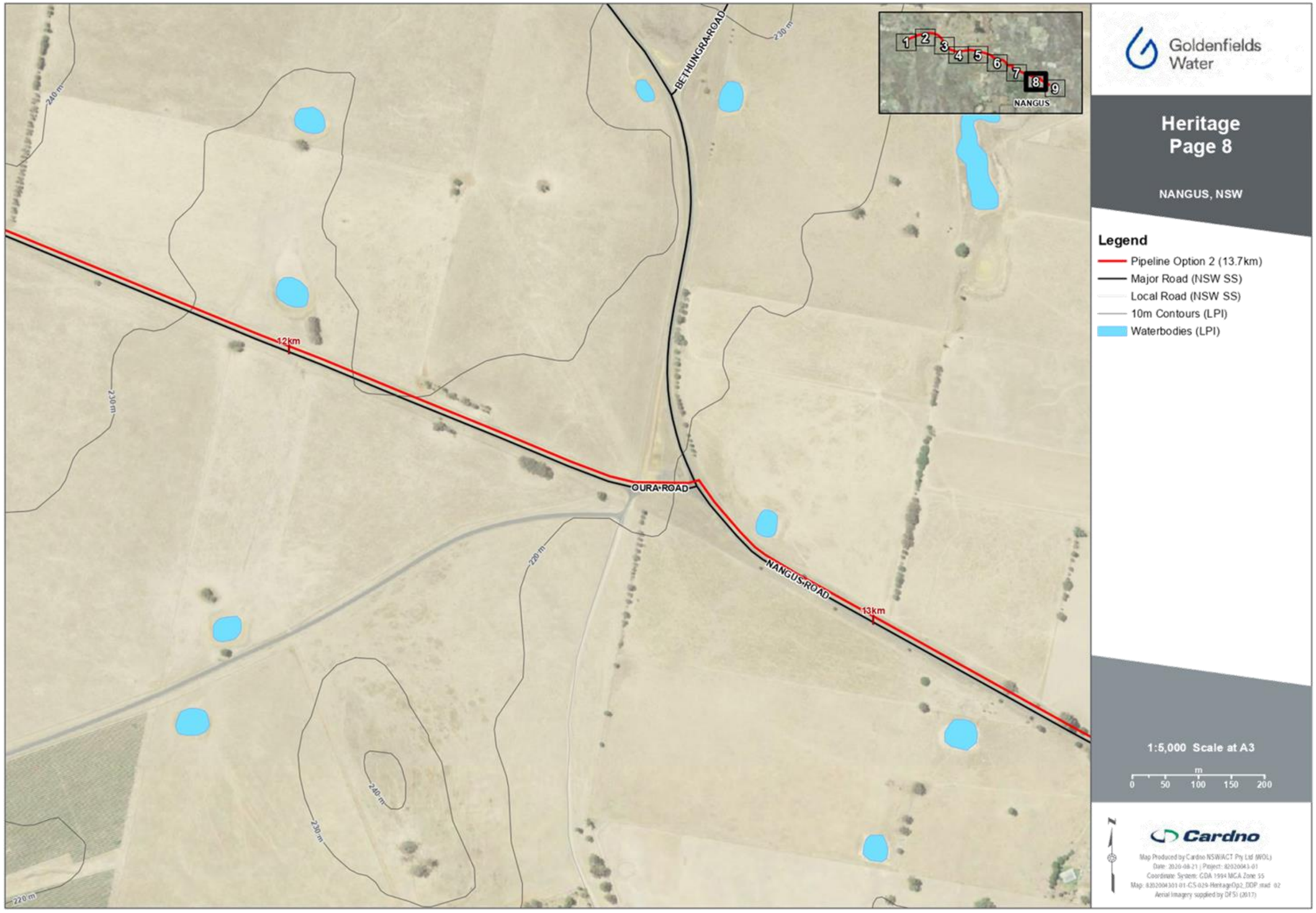
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OURA ROAD
NANGUS ROAD
NANGUS
12km
13km
240 m
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220 m
Goldenfields Water
Heritage Page 8
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
10m Contours (LPI)
Waterbodies (LPI)
1:5,000 Scale at A3
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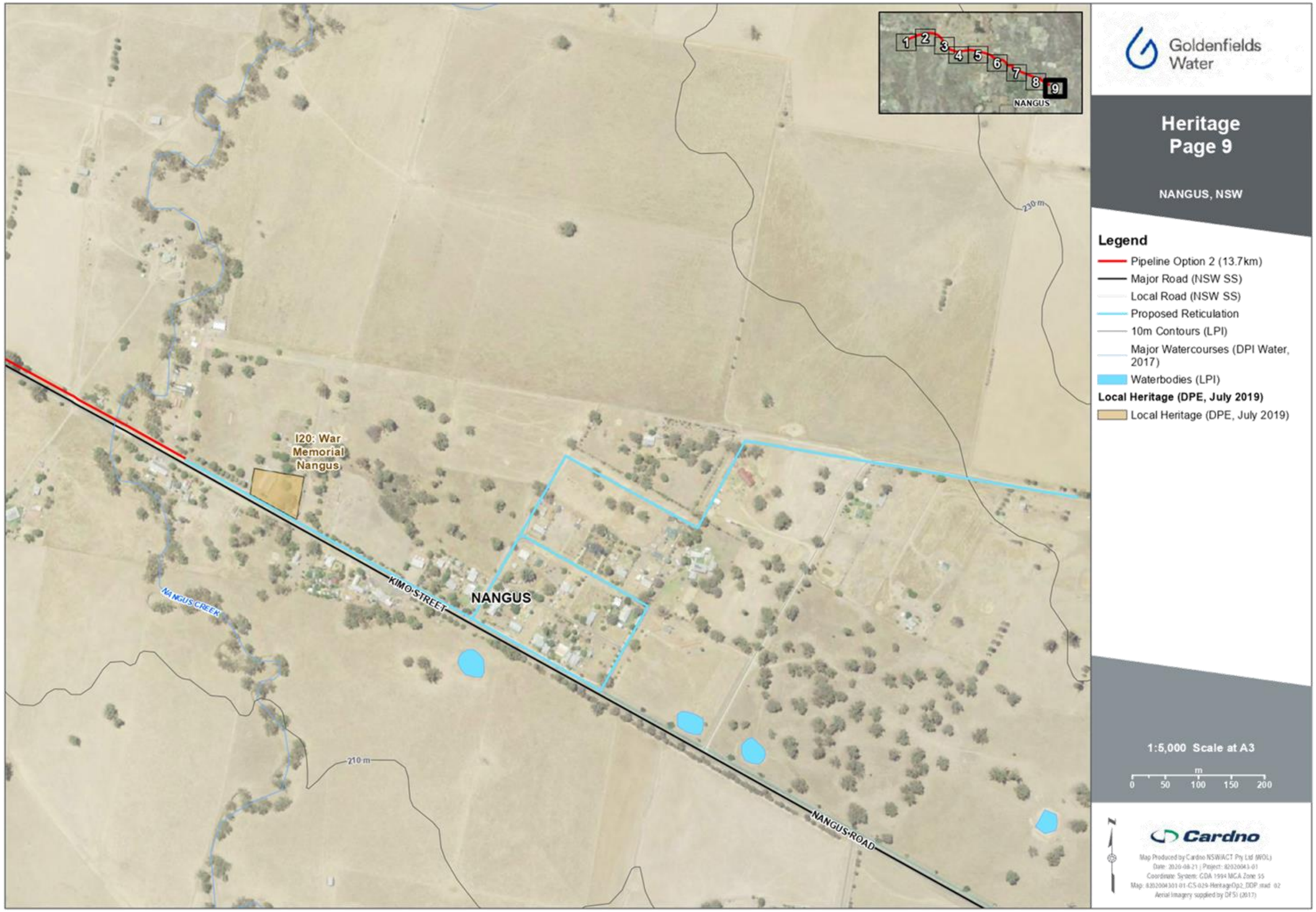
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NANGUS CREEK
KIMO STREET
NANGUS
NANGUS ROAD
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Goldenfields Water
Heritage Page 9
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
10m Contours (LPI)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Local Heritage (DPE, July 2019)
Local Heritage (DPE, July 2019)
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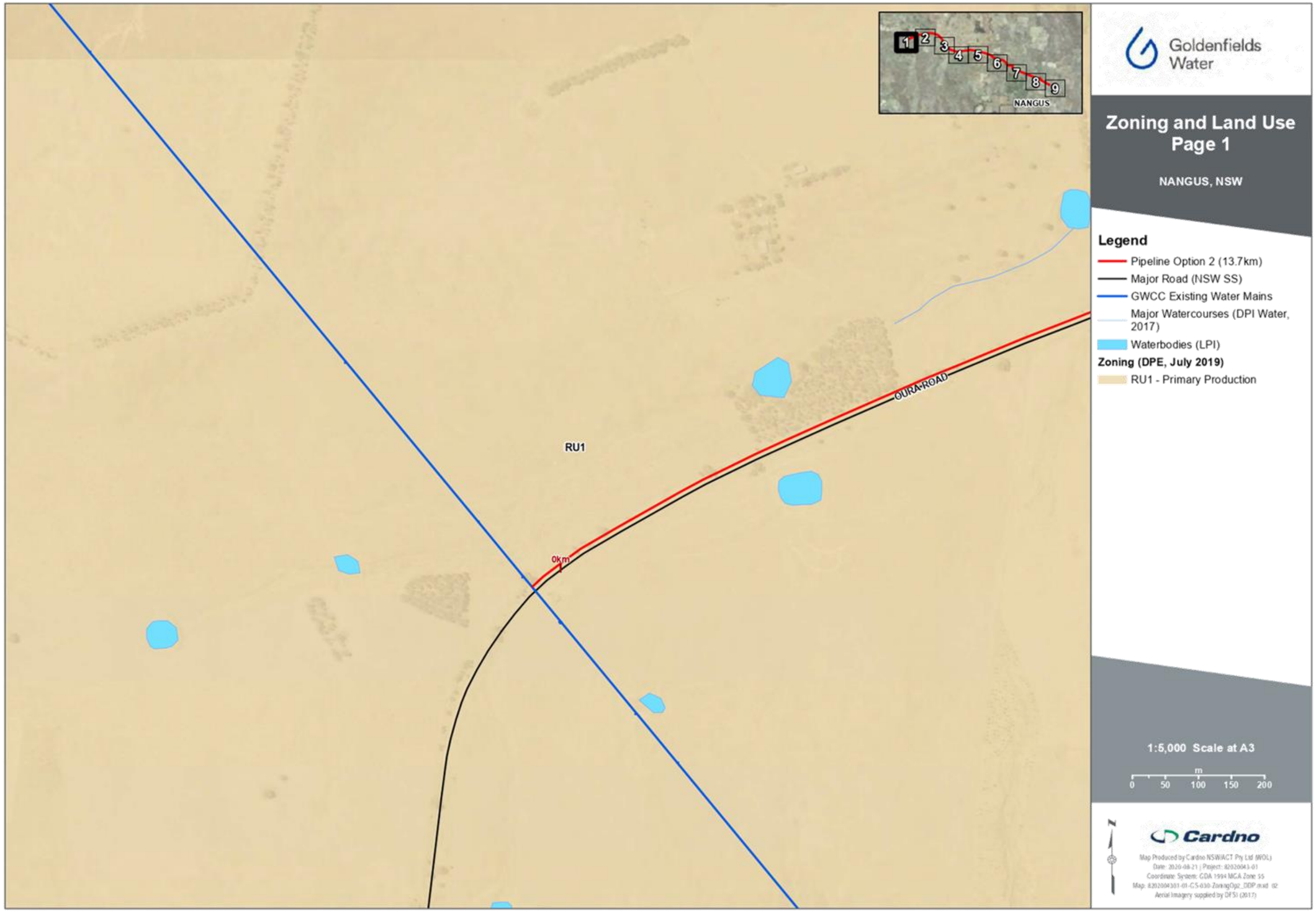
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NANGUS
RU1
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Goldenfields Water
Zoning and Land Use Page 1
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
GWCC Existing Water Mains
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
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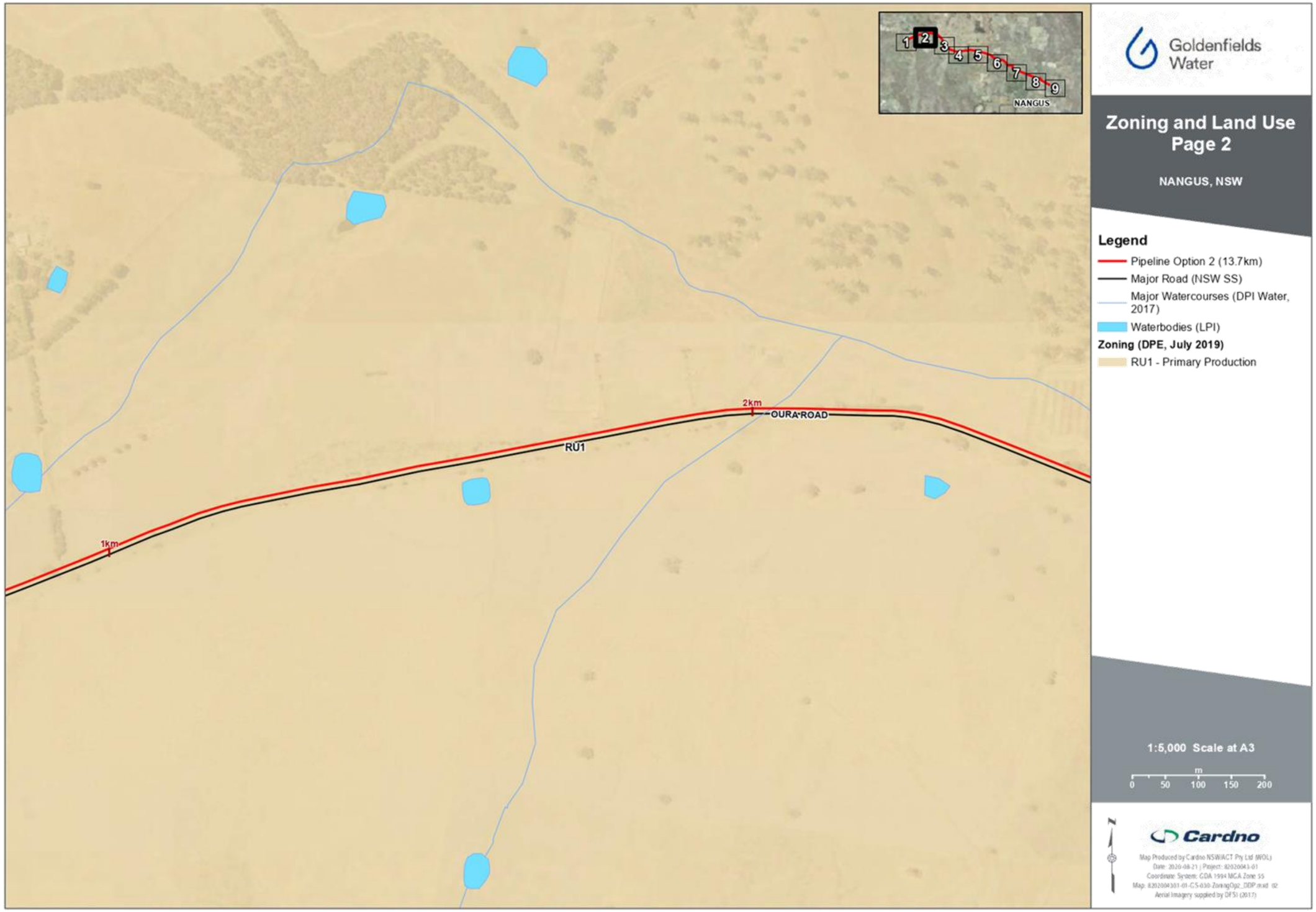
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OURA ROAD
RU1
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Goldenfields Water
Zoning and Land Use Page 2
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
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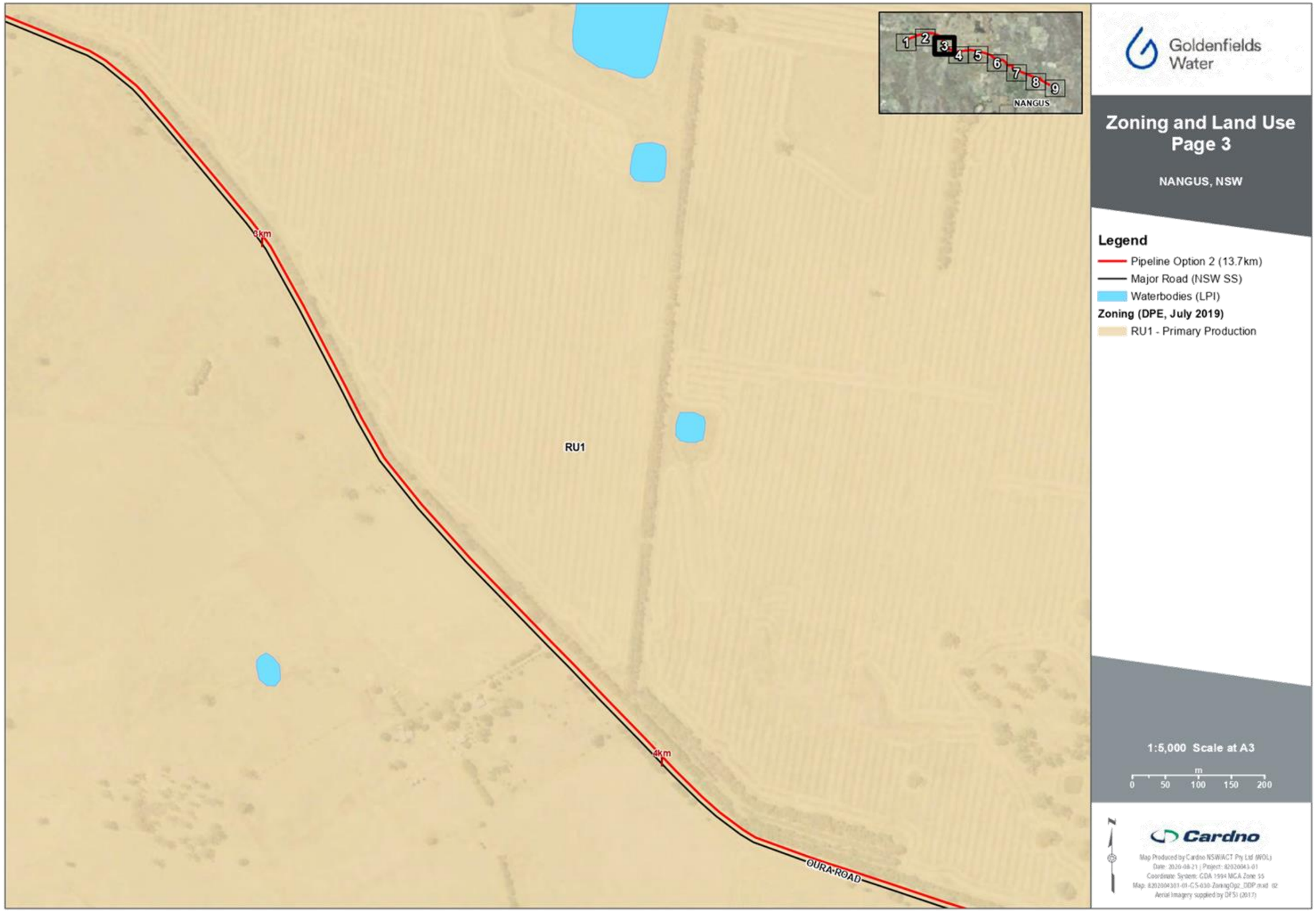
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Goldenfields Water
Zoning and Land Use Page 3
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-08-21 | Project: 82020043-01
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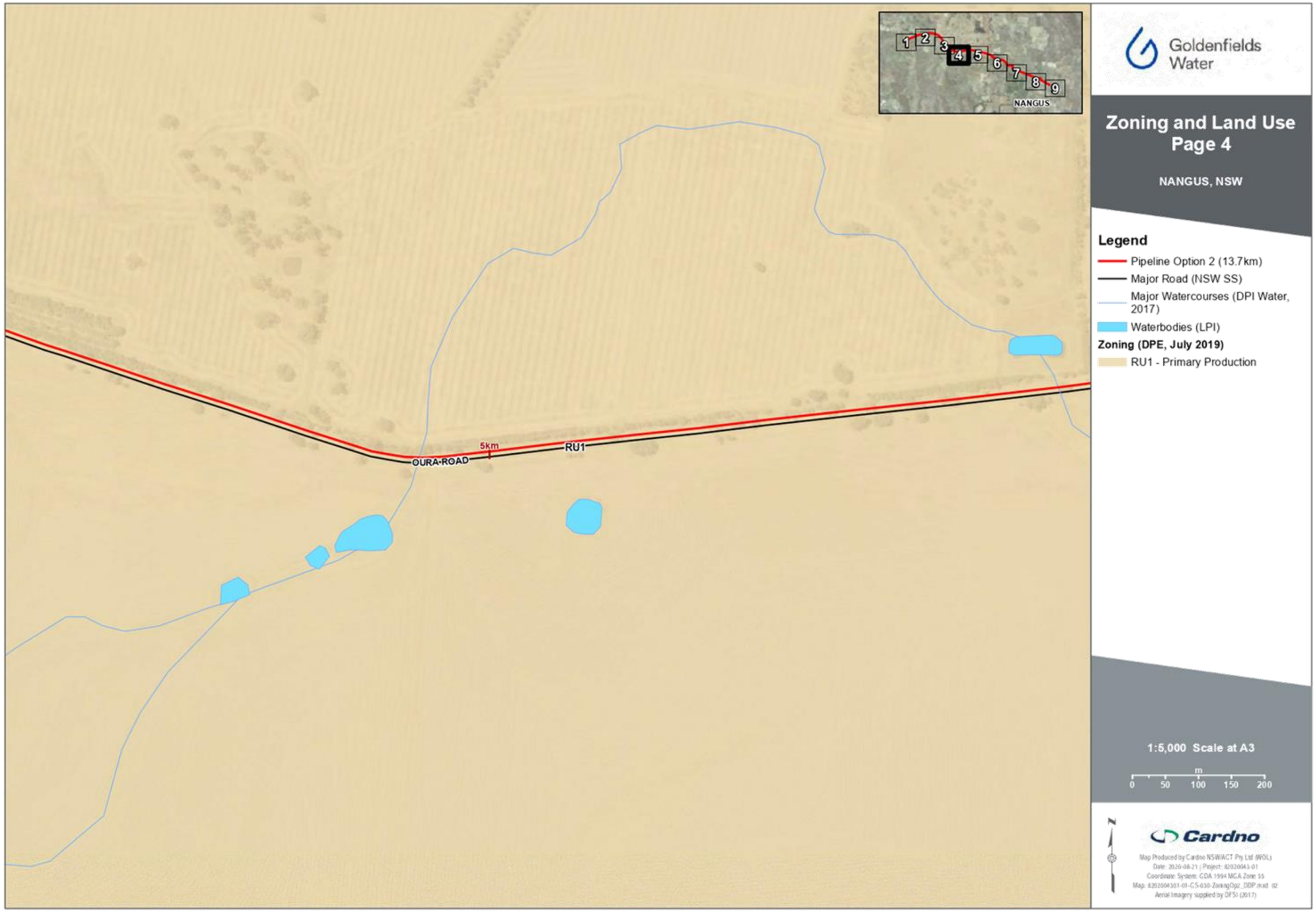
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RU1
Goldenfields Water
Zoning and Land Use Page 4
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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Cardno
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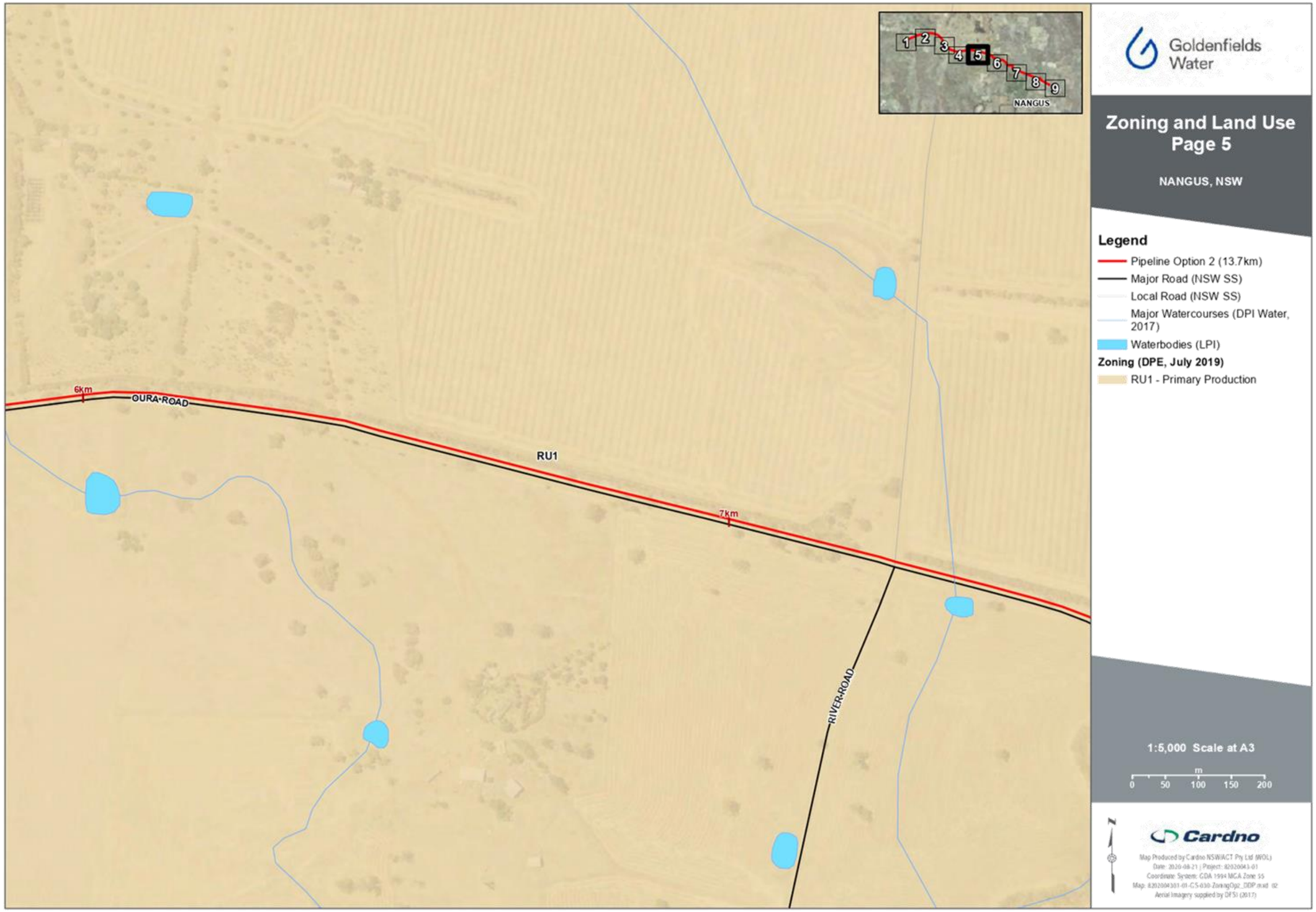
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NANGUS
6km
OURA-ROAD
RU1
7km
RIVER-ROAD
Goldenfields Water
Zoning and Land Use Page 5
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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Cardno
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Coordinate System: GDA 1994 MGA Zone 55
Aerial Imagery supplied by DFSI (2017)


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NANGUS
BILLABONG CREEK
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OURA ROAD
RU1
9km
Goldenfields Water
Zoning and Land Use
Page 6
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Major Watercourses (DPI Water, 2017)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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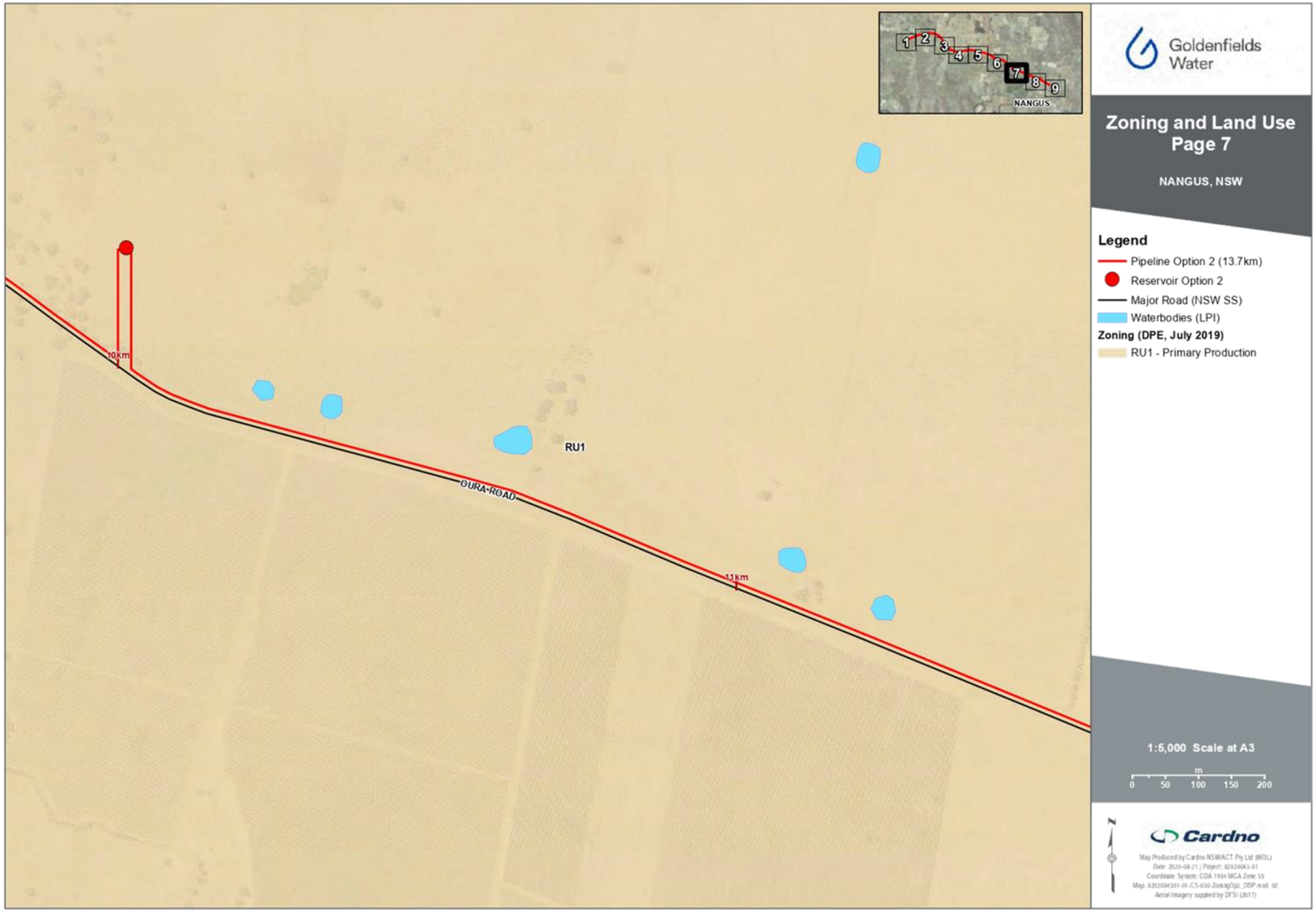
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NANGUS
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OURA ROAD
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Goldenfields Water
Zoning and Land Use Page 7
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Reservoir Option 2
Major Road (NSW SS)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
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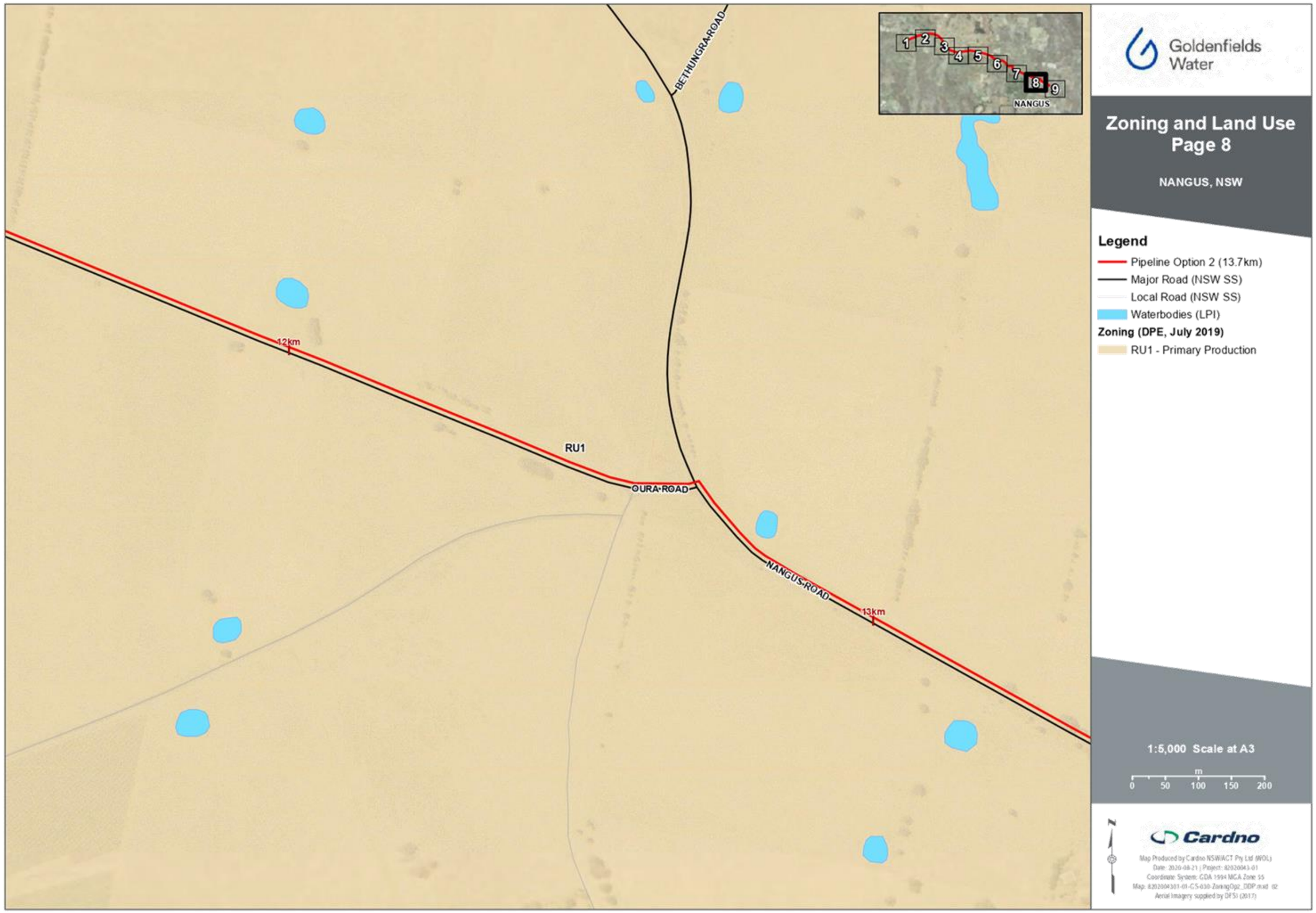
BETHUNGRA ROAD
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12km
RU1
OURA ROAD
NANGUS ROAD
13km
Goldenfields Water
Zoning and Land Use Page 8
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
1:5,000 Scale at A3
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Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
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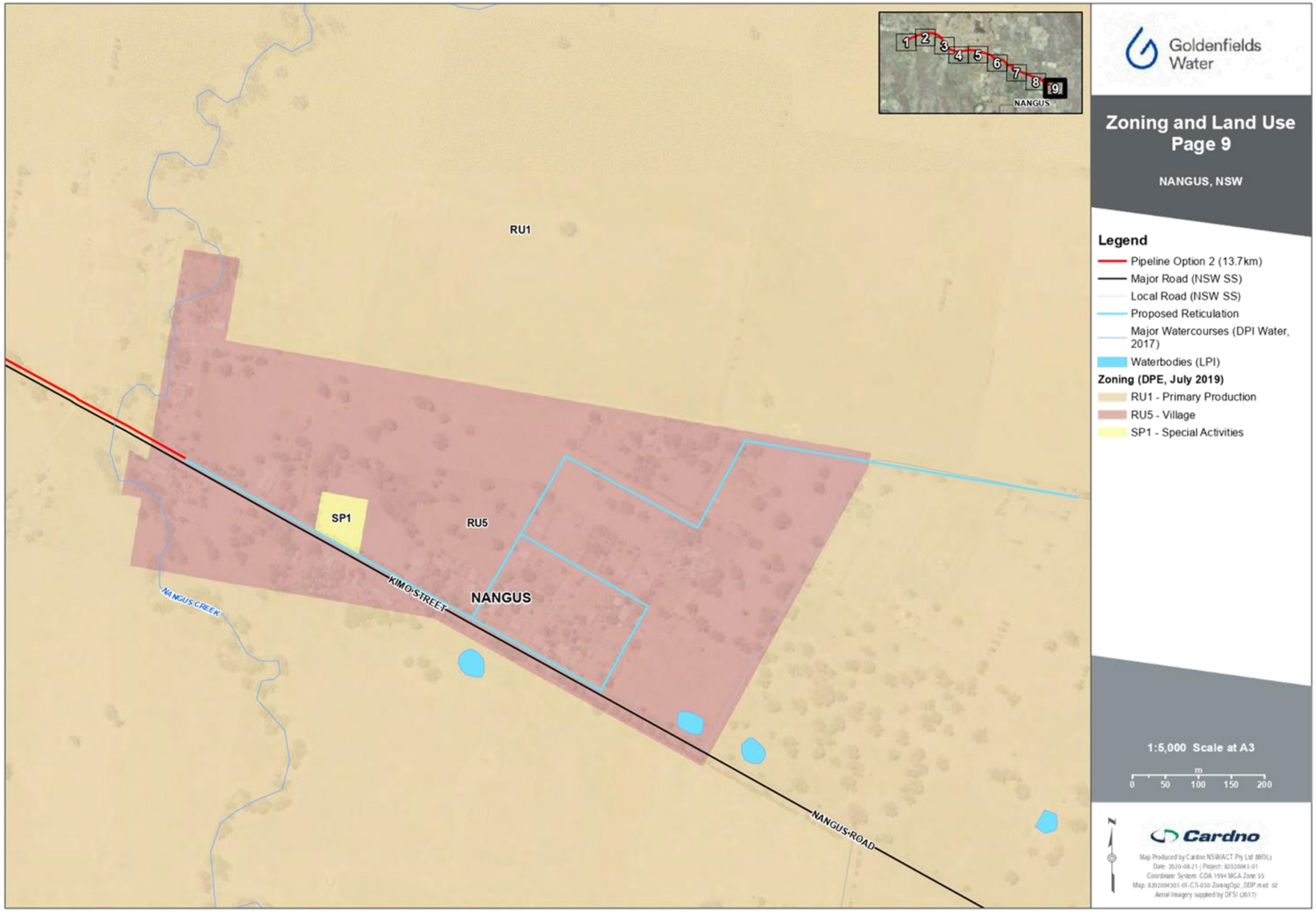
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NANGUS
RU1
SP1
RU5
NANGUS
KIMO STREET
NANGUS ROAD
NANGUS CREEK
Goldenfields Water
Zoning and Land Use Page 9
NANGUS, NSW
Legend
Pipeline Option 2 (13.7km)
Major Road (NSW SS)
Local Road (NSW SS)
Proposed Reticulation
Major Watercourses (DPI Water, 2017)
Waterbodies (LPI)
Zoning (DPE, July 2019)
RU1 - Primary Production
RU5 - Village
SP1 - Special Activities
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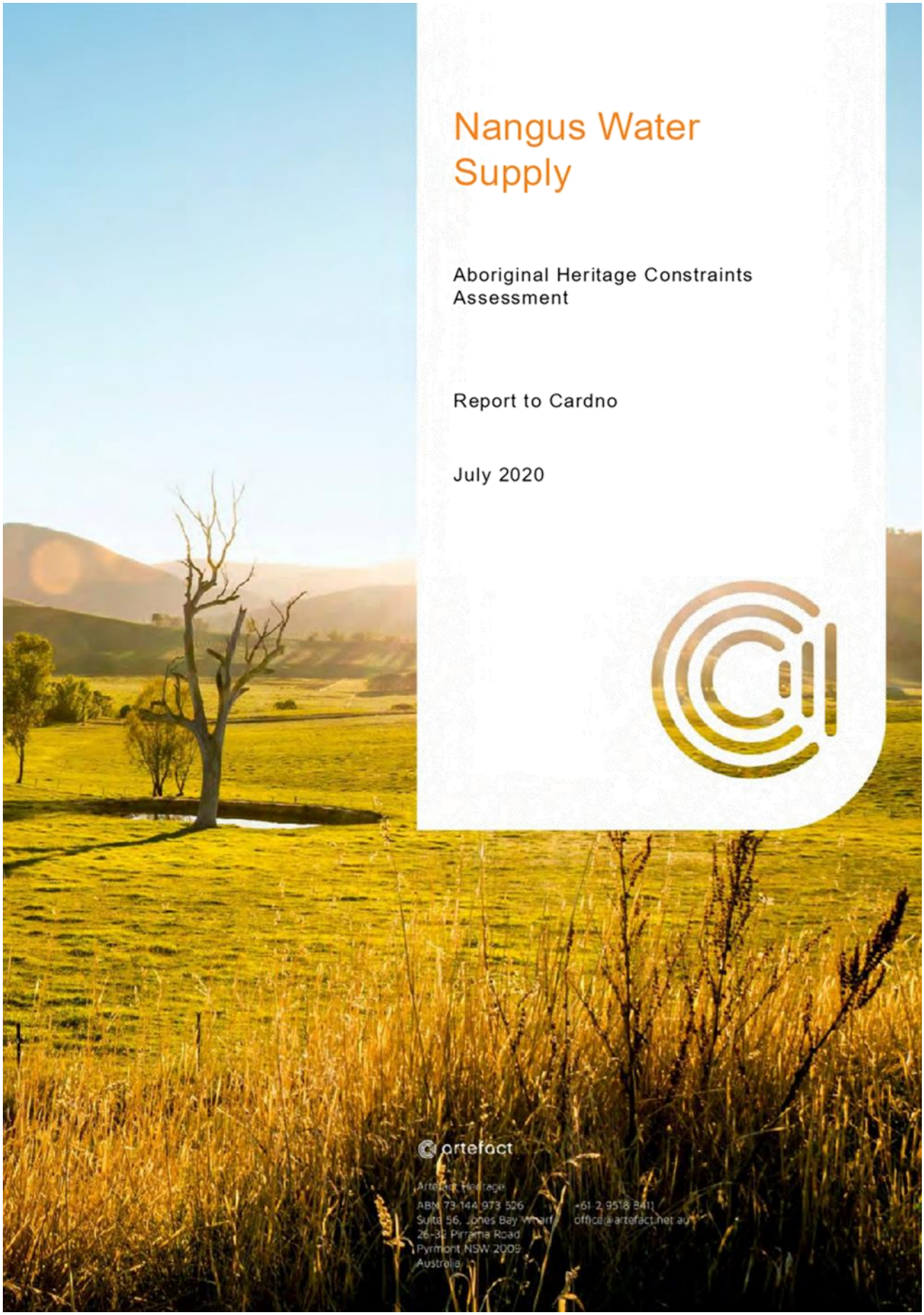
Aerial Imagery supplied by DFSI (2017)

Preliminary Design

APPENDIX B

DESKTOP HERITAGE ASSESSMENT


Nangus Water Supply
Aboriginal Heritage Constraints Assessment
Report to Cardno
July 2020
artefact
Artefact Heritage
ABN 73 144 973 526
Suite 56, Jones Bay Wharf
26-32 Pirrama Road
Pyrmont NSW 2009
Australia
+61 2 9518 8411
office@artefact.net.au

CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

1.1 Background

The township of Nangus is located in the Cootamundra Gundergai Regional Council (CGRC) Local Government Area (LGA) within the Riverina region of NSW. The town does not currently have a reticulated water supply and residents provide their own water, sourced from roof water, bottled water, bore water or water carting.

CGRC requested that Goldenfields Water County Council (GWCC) investigate the provision of a reticulated town water supply to Nangus. GWCC engaged Cardno to undertake the Nangus Water Supply Feasibility Study. Cardno further engaged Artefact Heritage Services Pty Ltd (Artefact) to prepare a preliminary constraints assessment to investigate the potential Aboriginal heritage constraints of the proposed reticulated water supply and the preferred water source option identified during the preliminary options assessment. This constraints assessment has been prepared in advance of the Review of Environment Factors (REF) for the chosen option.

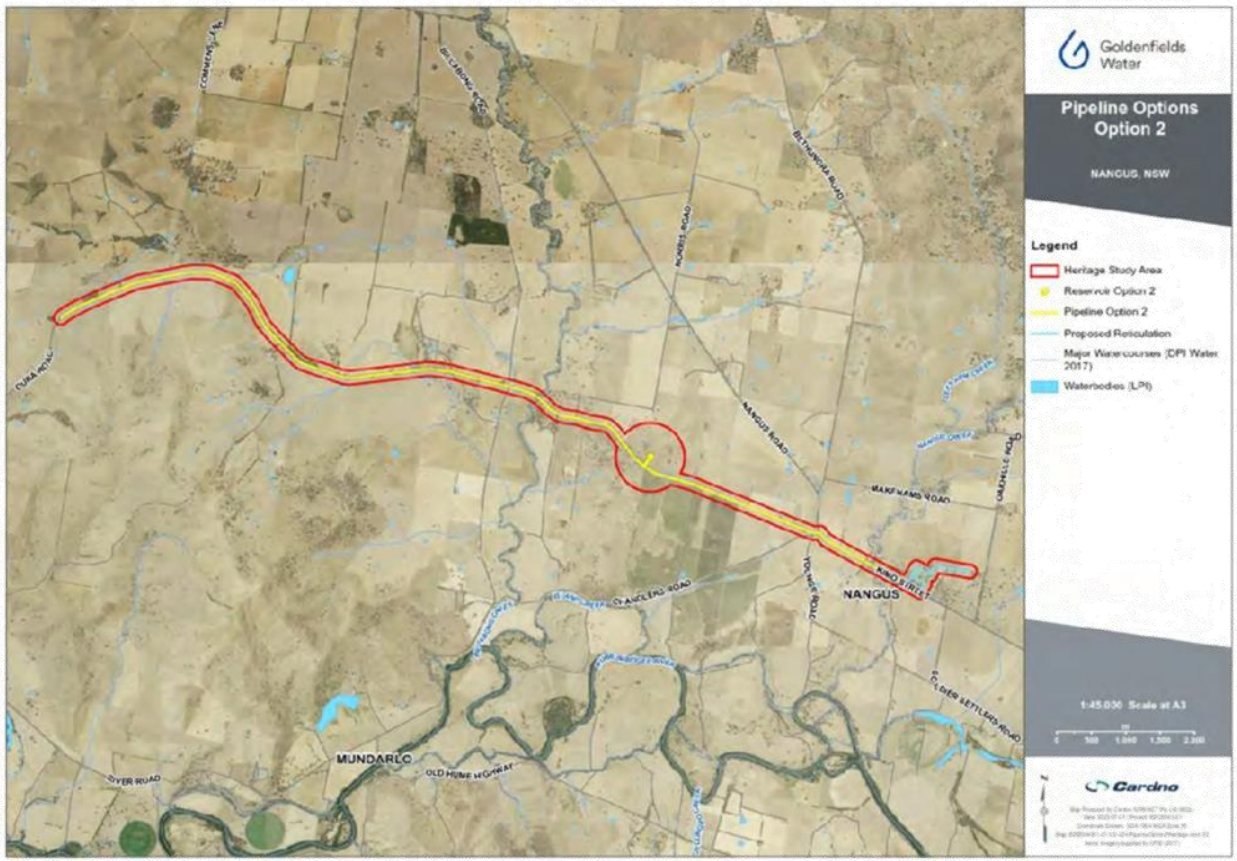
1.2 Preferred option

This constraints assessment investigates the potential heritage constraints associated with the proposed reticulated water supply and preferred supply option identified during preliminary scoping phases of the project (Figure 1).

Option 2 – Pipeline from GWCC water supply – from Oura Road

Under Option 2 water would be piped along Oura Road from an existing DN300 CI watermain to the township of Nangus. A concrete reservoir would be constructed approximately 4 kilometres (km) west of Nangus to provide for storage and chlorine dosing. The proposed water reticulation system would be constructed within the township of Nangus, with a preference for the pipeline to be placed on private property.

Figure 1: Assessment area with pipeline route – Option 2 (Cardno)



1.3 Assessment areas

The Option 2 assessment area consists of a 13.7 km pipeline alignment along Oura Road, and the proposed extent of the reticulated water supply within the township of Nangus. The assessment area covers the existing township and extends west approximately 13.7 km along Oura Road. It is located within the parishes of Nangus and Tenandra, and the county of Clarendon.

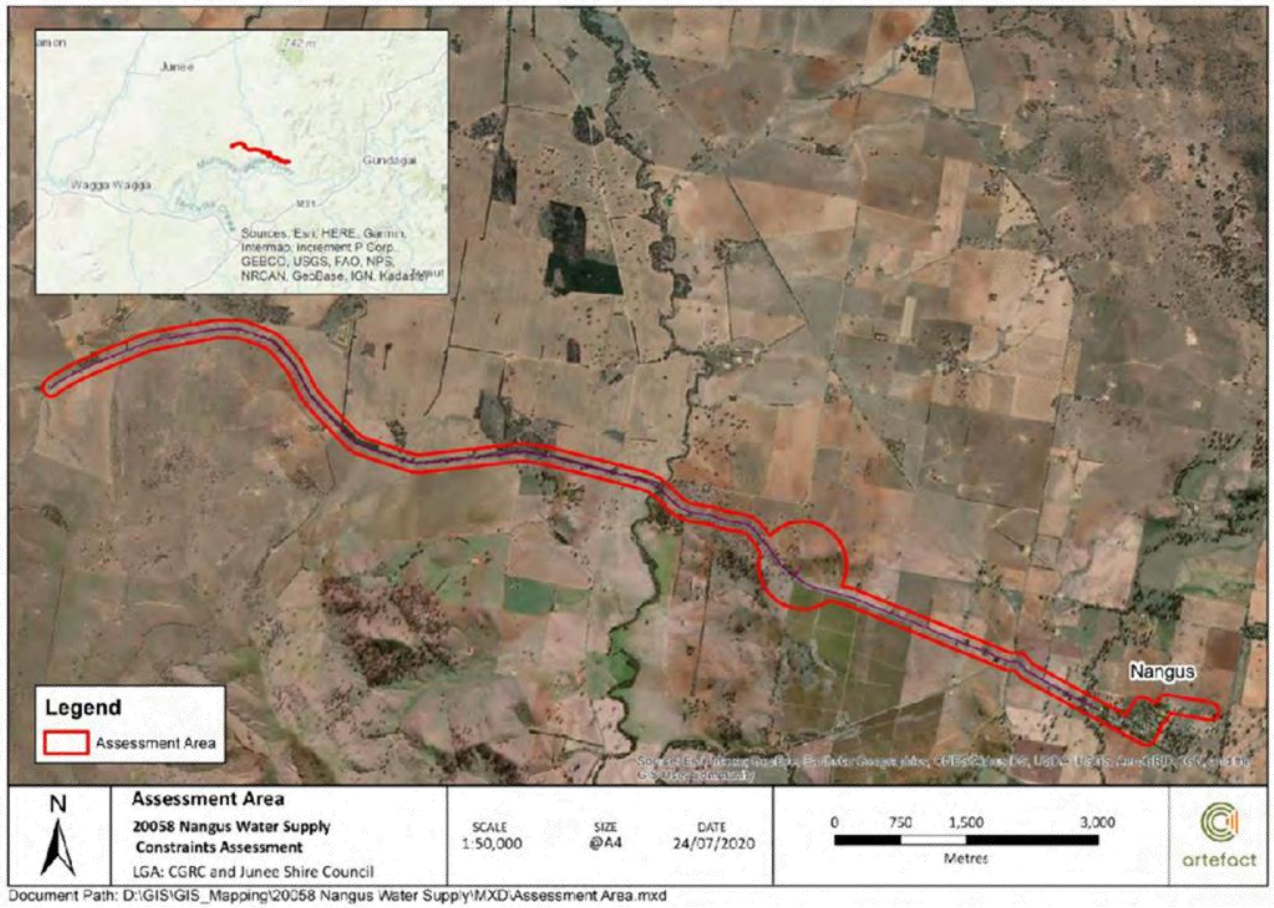
The assessment area is located within the CGRC and Junee Shire Councils LGAs. The assessment area is shown in Figure 2.

1.4 Report limitations

This report is a preliminary constraints assessment, completed as a desktop assessment only. This assessment is intended to provide initial advice on the location of registered Aboriginal sites and a preliminary assessment of areas of archaeological sensitivity within the assessment area.

This assessment does not meet the requirements of the 'Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales' (Due Diligence Code of Practice) (Office of Environment and Heritage (OEH) 2010). Further detailed assessment undertaken in accordance with the *National Parks and Wildlife Act* 1974, the *National Parks and Wildlife Regulation 2019*, and relevant guidelines must be undertaken for any future projects within the assessment area.

Figure 2: Assessment area



2.0 LEGISLATIVE CONTEXT

2.1 National Parks and Wildlife Act

The *National Parks and Wildlife Act 1974* provides statutory protection to all Aboriginal Places and objects. An Aboriginal object is defined by the *National Parks and Wildlife Act 1974* as:

> *any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.*

An Aboriginal Place is declared by the Minister for Energy and Environment, under Section 86 of the *National Parks and Wildlife Act 1974*, in recognition of its special significance with respect to Aboriginal culture. However, areas are only gazetted as Aboriginal Places if the Minister is satisfied that sufficient evidence exists to demonstrate that the location was and/or is of special significance to Aboriginal culture.

The protection provided to Aboriginal objects applies irrespective of the level of their significance or issues of land tenure. Aboriginal objects and places are afforded automatic statutory protection in NSW whereby it is an offence to knowingly or unknowingly harm or desecrate an Aboriginal object or Aboriginal Place under Section 86 of the *National Parks and Wildlife Act 1974*.

In accordance with Section 89A any person who is aware of the location of an Aboriginal object must in the prescribed manner, notify the Chief Executive within a reasonable time after the person first becomes aware of that object. The prescribed manner is to complete an Aboriginal Heritage Information Management System (AHIMS) Site Recording Form (OEH 2010).

In order to undertake a proposed activity which is likely to involve harm to an Aboriginal Place or object, it is necessary to apply to Heritage NSW – Department of Premier and Cabinet (DPC) for an Aboriginal Heritage Impact Permit (AHIP). AHIPs are issued by Heritage NSW - DPC under Section 90 of the *National Parks and Wildlife Act 1974*, and permit harm to certain Aboriginal objects or Aboriginal Places.

There are no registered Aboriginal Places within the assessment area.

2.2 Native Title Act 1994

The *Native Title Act 1994* was introduced to work in conjunction with the Commonwealth *Native Title Act 1993*. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

A search of the National Native Title *Native Title Vision* mapping service was completed on 24 July 2020. No Native Title Claims were identified within the vicinity of the assessment area.

2.3 Aboriginal Land Right Act 1983

The *Aboriginal Land Rights Act 1983* established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the *Aboriginal Land Rights Act 1983* to:

(a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and

(b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

Option 2 is located within the boundaries of the Wagga Wagga Local Aboriginal Land Council (LALC) and the Brungle – Tumut LALC.

3.0 ENVIRONMENTAL CONTEXT

3.1 Geology

The assessment area is located within part of the Eastern Uplands of southeast Australia (Jennings and Mabbut 1977). The Eastern Uplands comprises a wide plateau extending from the eastern coastal escarpment to western slopes, with a generally low relative relief. Slopes are commonly less than five degrees, with approximately 20% of the area containing steeper hills and ranges (Jennings and Mabbut 1977).

The assessment area is characterised by Quaternary alluvial deposits, with areas of Silurian sedimentary rocks such as sandstone and siltstone that have been metamorphosed into slate and quartzite with some volcanic inclusions such as dacite and airfall tuffs. The easternmost section of the assessment area contains Cainozoic sedimentary material, predominantly unconsolidated mud, silt, sand and gravel of an indeterminate age and origin ('NSWGeologyPlus' 2015).

3.2 Soils

Soils in the vicinity of the assessment area comprise grey brown podzolic soils over brown clay (OEH 2012). In the surrounding area the Lloyd, Yarragundry and Tarcutta soil landscapes are predominant, all three soil landscapes comprise well drained brown and red podzolic soils, of varying depth between shallow on the tops of ridges to deep within the drainage lines. The Lloyd soil landscape includes thin Lithosols present on the crests, ridges and upper slopes. The Tarcutta and Lloyd soil landscapes are predominantly colluvial in nature with the Yarragundry landscape being primarily alluvial (OEH 2014).

3.3 Hydrology

The assessment area traverses the catchments of Nangus Creek and Billabong Creek, both of which are tributaries of the Murrumbidgee River. The assessment area also encompasses a large number of minor creeks that feed into Nangus Creek and Billabong Creek.

3.4 Vegetation

The assessment area is within the south western slopes bioregion. Prior to European occupation vegetation across the assessment area would have included Blakely's Red Gum open woodlands on the slopes and grassland and swaps on the valley floors. The Eucalypt species occurring on the slopes would have included *Eucalyptus albens* (white box), *E. blakelyi* (Blakely's red gum), *E. melliodora* (yellow box) with *E. camaldulensis* (river red gum) occurs along creeklines (NSW National Parks and Wildlife Service 2003).

4.2 Previous archaeological studies

A number of Aboriginal archaeological projects have been undertaken in the wider region and have informed the constraints assessment. These studies are discussed below:

Kelleher Nightingale Consulting Pty Ltd (2008)

In 2008 Kelleher Nightingale Consulting Pty Ltd (KNC) completed an Aboriginal Cultural Heritage Assessment Report (ACHAR) as part of the Wagga Wagga Local Environmental Study. While the report is focussed on the immediate area of Wagga Wagga, 35 km west of the assessment area, discussion of the wider region was included.

KNC highlighted the importance of the Murrumbidgee River and associated floodplain to the Aboriginal archaeological potential of the wider Wagga Wagga area. The Murrumbidgee River provided an important source of water and subsistence resources. The predictive model developed by KNC also identified access to lithic raw material as being an important factor in identifying areas of Aboriginal archaeological sensitivity. KNC identified that within the assessment area outcrops of lithic material could be identified within the underlying granite geology along crests and ridges as well as within alluvial or colluvial deposits as a result of erosional processes (KNC 2008).

AECOM Australia Pty Ltd (2009)

In 2009, AECOM Australia Pty Ltd (AECOM) undertook an environmental assessment for a pipeline between Young and Wagga Wagga located approximately 20 km north west of the current assessment area. The AHIMS search area completed for the project covered an area of 331 km^2 including a 1 km wide buffer zone around the pipeline route. A total of 20 sites were identified within the Stage 1 assessment area, the majority of which were identified as open camps (n=14, 70%). The assessment found that Aboriginal archaeological sites were most commonly associated with reliable water sources.

In their predictive model AECOM identified five landforms that provided the greatest potential for Aboriginal archaeological material, these were:

- *The banks of major rivers;*
- *The banks and floodplains of major and minor water courses;*
- *Areas of lower, mid and upper slopes where these slopes are in close proximity to water courses;*
- *The crests of low ridges or spurs in close proximity to water courses; and*
- *Elevated areas adjacent to natural water bodies (e.g. swamps, billabongs and water holes).(AECOM Australia Pty Ltd 2009)*

Charles Dearling, Archaeological and Cultural Heritage Consultants (2007)

Charles Dearling, Archaeological and Cultural Heritage Consultants, undertook an Aboriginal Heritage Study ahead of proposed track upgrades and transmission line maintenance approximately 27 km north of the current assessment area.

The study area was located in a transition zone between multiple different ecological zones, with permanent water in the form of small streams fed by springs which drain into Billabong Creek. During the salvage collection a total of 1,495 artefacts were collected, and it was determined that a single large continuous site covered the valley floor.

The study highlighted the importance of both water sources and the transitional areas between ecological zones. In addition, it demonstrates the survival of Aboriginal archaeological material despite high levels of disturbance, exposures present on the side of the track were key locations for the recovery of Aboriginal artefacts (Charles 2007).

4.3 Aboriginal Heritage Information Management System (AHIMS) Search

The locations and details of Aboriginal sites are considered culturally sensitive information. It is recommended that this information, including the AHIMS data and GIS imagery, is removed from this report if it is to enter the public domain.

An extensive search of the AHIMS database was undertaken on 24 July 2020 (Client ID: 522709).

The search contained an area of approximately 33 km (east-west) by 25 km (north-south). The AHIMS search provides archaeological context for the area and identifies whether any previously recorded Aboriginal sites are located within or near the assessment area. The parameters of the searches were as follows:

GDA 1994 MGA 55	560101 – 593531 mE 6110363 – 6135135 mS
Buffer	56 m
Number of sites	73
AHIMS Search ID	522709

The distribution of recorded sites within the AHIMS search area is shown in Figure 3. Heritage NSW lists 20 standard site features that can be used to describe a site registered with AHIMS, and more than one feature can be used for each site. The frequency of recorded site types for both searches are summarised in Table 1 below. A total of 73 distinct sites were identified within the search area with 5 different combinations of site features recorded. The majority of recorded sites are Modified Tree (Carved or Scarred) (n= 52) followed by Artefact (n=12).

Table 1: Frequency of recorded site types

Site Feature	Frequency	Percentage (%)
Artefact	12	16.44
Modified Tree (Carved or Scarred)	52	71.23
Artefact, Hearth, Non-Human Bone and Organic Material, Shell	1	1.37
Grinding Groove	6	8.22
Earth Mound	2	2.74
Total	**73**	**100**

The nature and location of the registered sites is a reflection of the past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. Certain site types, such as culturally modified

trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient.

The most frequent site type is Modified Trees (Carved or Scarred), which are only likely to be identified in areas in which vegetation remains largely intact and/or where isolated mature trees remains, as European land clearing would remove or damage trees prior to their identification.

Artefact sites are the second most frequently recorded site type in the AHIMS search area. This site feature is likely to consist largely of flaked stone artefacts, identified on the ground surface. The predominance of this type of evidence is likely to be related to a number of factors: the production of a large number of items (both tools and waste) in the production, maintenance and use of flaked stone artefacts; the robust nature of the material; and the destruction of other types of evidence, through natural processes such as decomposition and European land-use practices such as vegetation clearance.

The distribution of registered sites is shown in Figure 3 to Figure 6. A large number of the registered sites are located in close proximity to water. This is likely to be at least partly the result of Aboriginal land use, indicating a preference for repeated and/or long-term occupation of areas close to water and associated resources.

There are two previously recorded Aboriginal sites within the assessment area, with four sites in close proximity. These sites are discussed below:

4.3.1 Sites within the assessment area:

Billabong TSR Scar Tree 3 (AHIMS ID 56-02-0220)

Billabong TSR Scar Tree 3 (AHIMS ID 56-02-0220) is located in open woodland within the assessment area. A single scar tree was identified on the south of Oura Road, consisting of an occluded scar on a box tree.

Billabong TSR Scar Tree 4 (AHIMS ID 56-02-0219)

Billabong TSR Scar Tree 4 (AHIMS ID 56-02-0219) is located in open woodland within the assessment area. A single scar tree was identified on the south of Oura Road, consisting of a shield scar on a red gum tree.

4.3.2 Sites in close proximity to the assessment area:

Billabong TSR Scar Tree 1 (AHIMS ID 56-02-0222)

Billabong TSR Scar Tree 1 (AHIMS ID 56-02-0222) is located in open woodland 125 meters (m) north of the assessment area. A single scar tree was identified on the north of Oura Road, consisting of a fire scar on a box tree.

Billabong TSR Scar Tree 2 (AHIMS ID 56-02-0221)

Billabong TSR Scar Tree 2 (AHIMS ID 56-02-0221) is located in open woodland 75 m north of the assessment area. A single scar tree was identified on the north of Oura Road, consisting of a canoe scar on a box tree.

Billabong TSR Rock Core 1 (AHIMS ID 56-02-0225)

Billabong TSR Rock Core 1 (AHIMS ID 56-02-0225) is located in open woodland 50 m north of the assessment area. Comprised of a single rock core, made from river stone, the site is located in an open woodland and is considered to be in a disturbed condition.

Illabo-Tumut Pipeline site IT5 (AHIMS ID 56-02-0006)

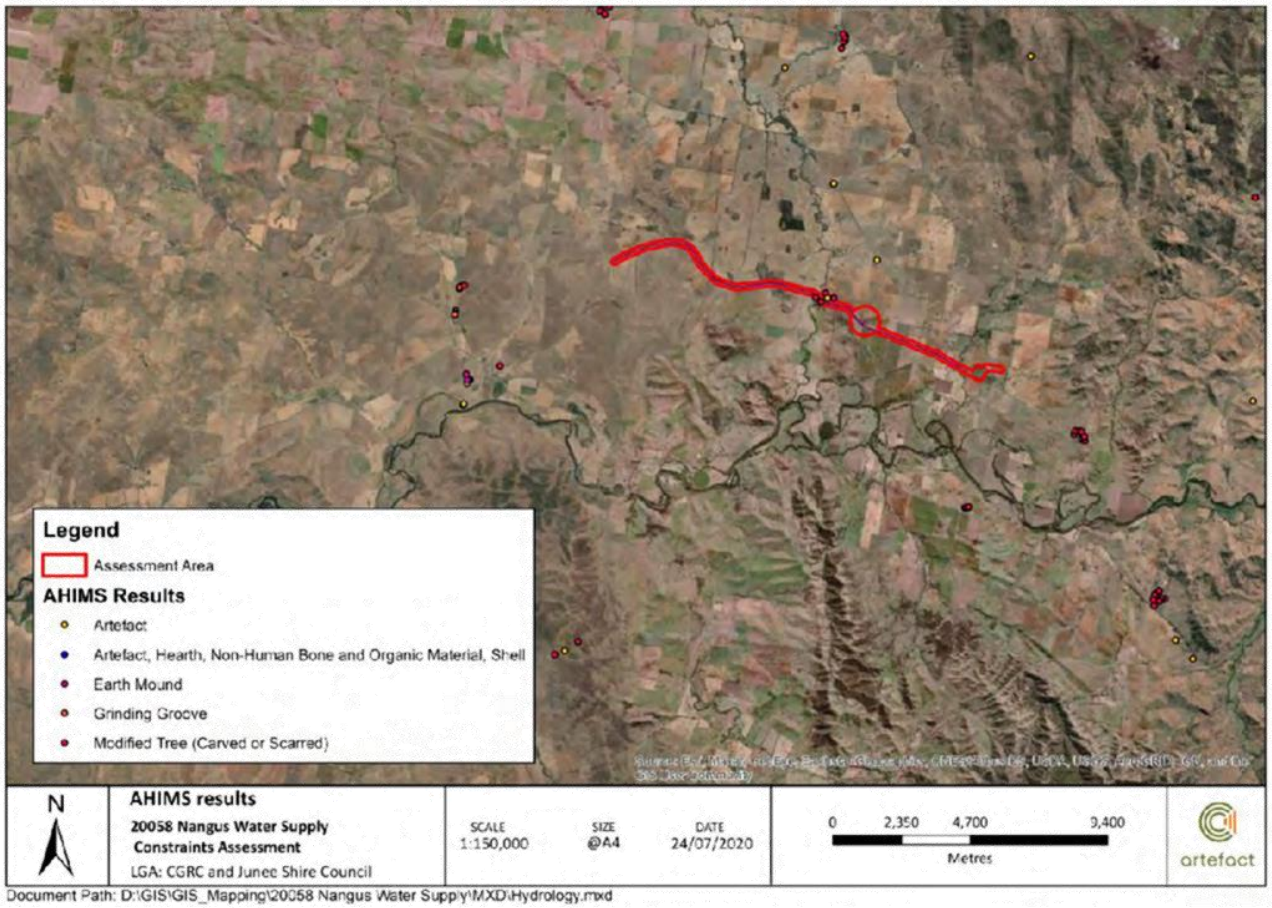
Illabo-Tumut Pipeline site IT5 (AHIMS ID 56-02-0006) is located 1.5 km north of the assessment area, an artefact scatter, approximately 30 m in length was identified in an erosion scar. Comprising 10 artefacts, mostly quartz and chert in two concentrations either side of fragments of burnt clay representing a potential hearth. The site was located 50 m from an ephemeral drainage line within an erosion scar and was considered to be in good condition.

4.3.3 Summary

Overall, the AHIMS results indicate the presence of widespread archaeological evidence of past Aboriginal occupation across the landscape, particularly surface artefact scatters and modified trees.

It should be noted that the distribution of recorded Aboriginal sites is largely demonstrative of the location of previous archaeological investigations and not entirely representative of the actual sites that may have once existed across the landscape.

Figure 3: Extensive AHIMS search



Document Path: D:\GIS\GIS_Mapping\20058 Nangus Water Supply\MXD\Hydrology.mxd

Figure 4: Extensive AHIMS search showing association with creek lines

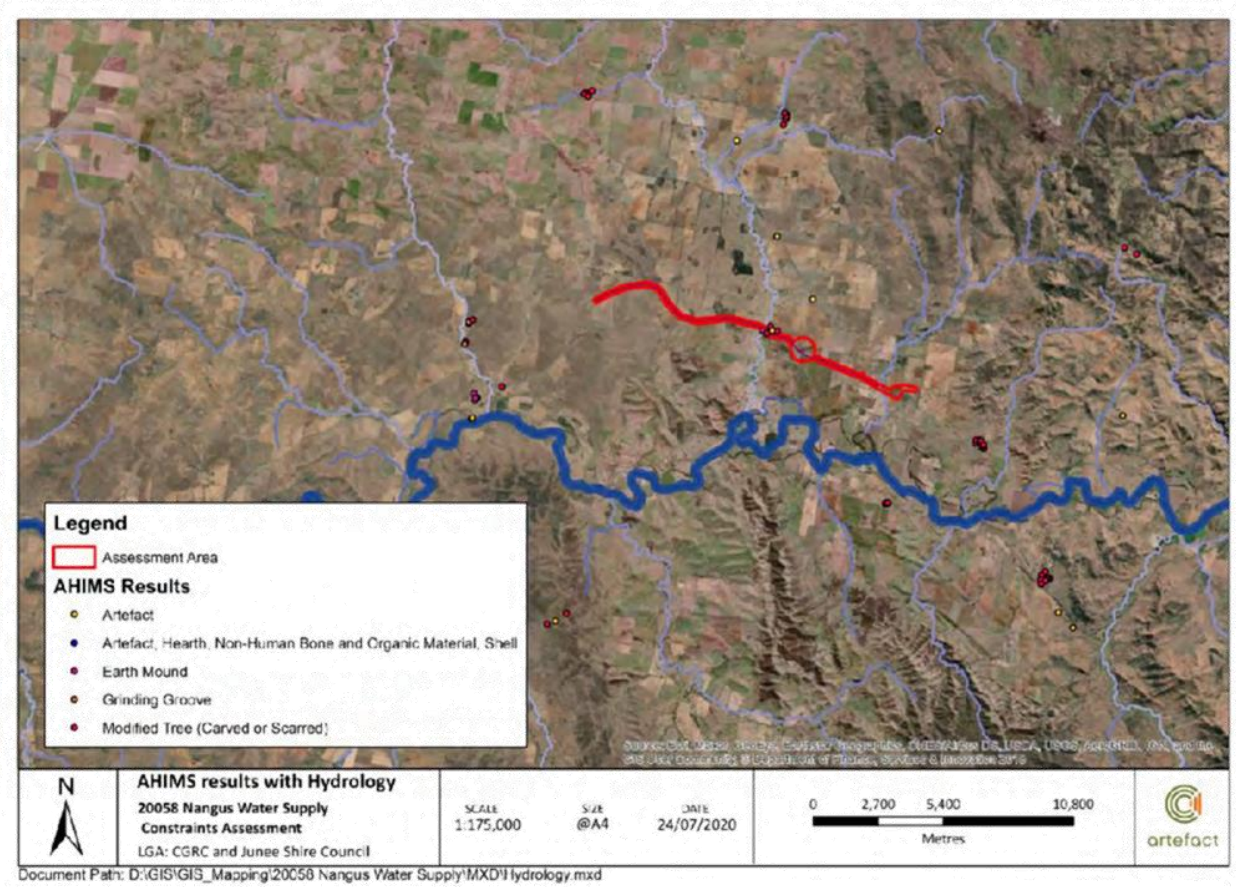


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Figure 5: AHIMS site in proximity of the assessment area

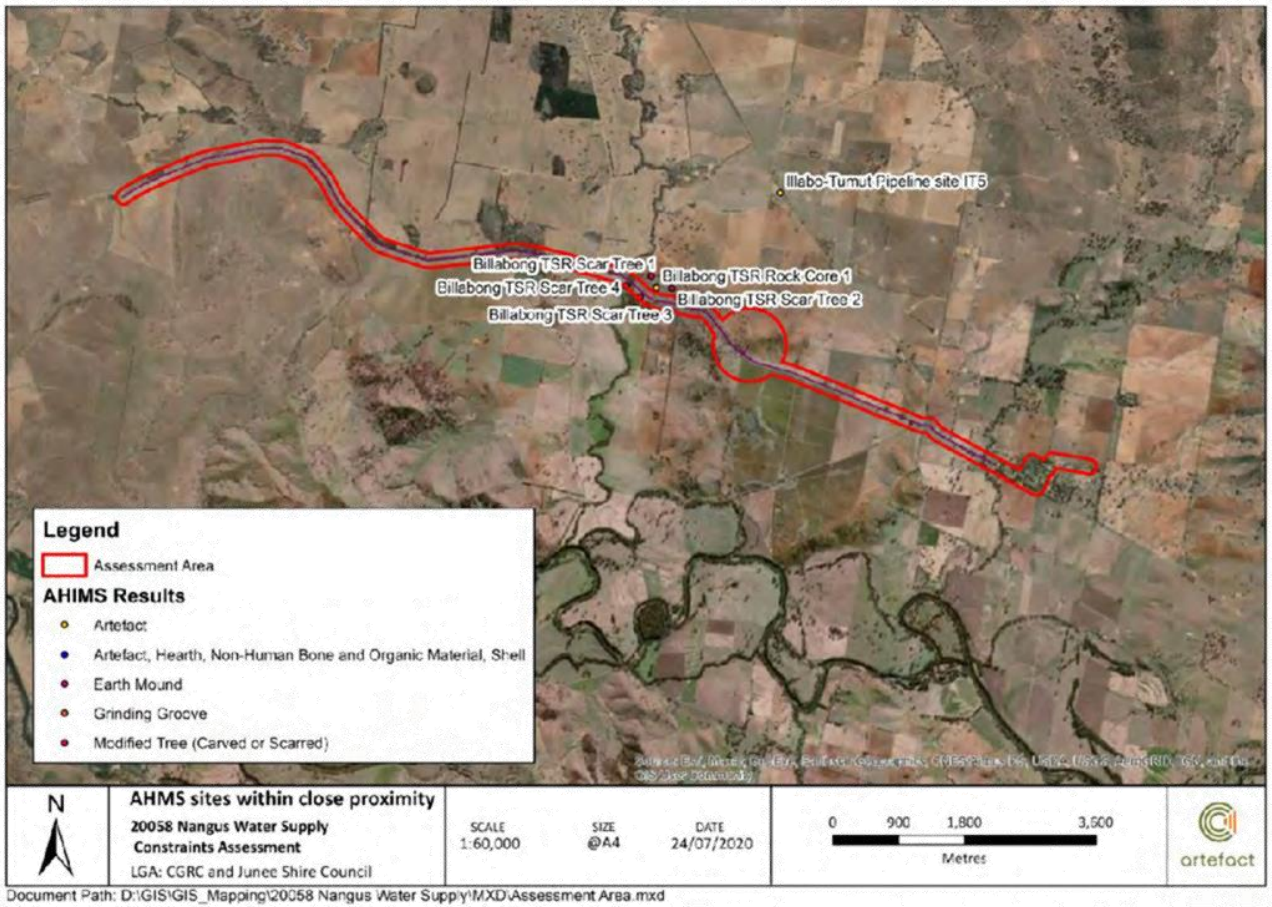
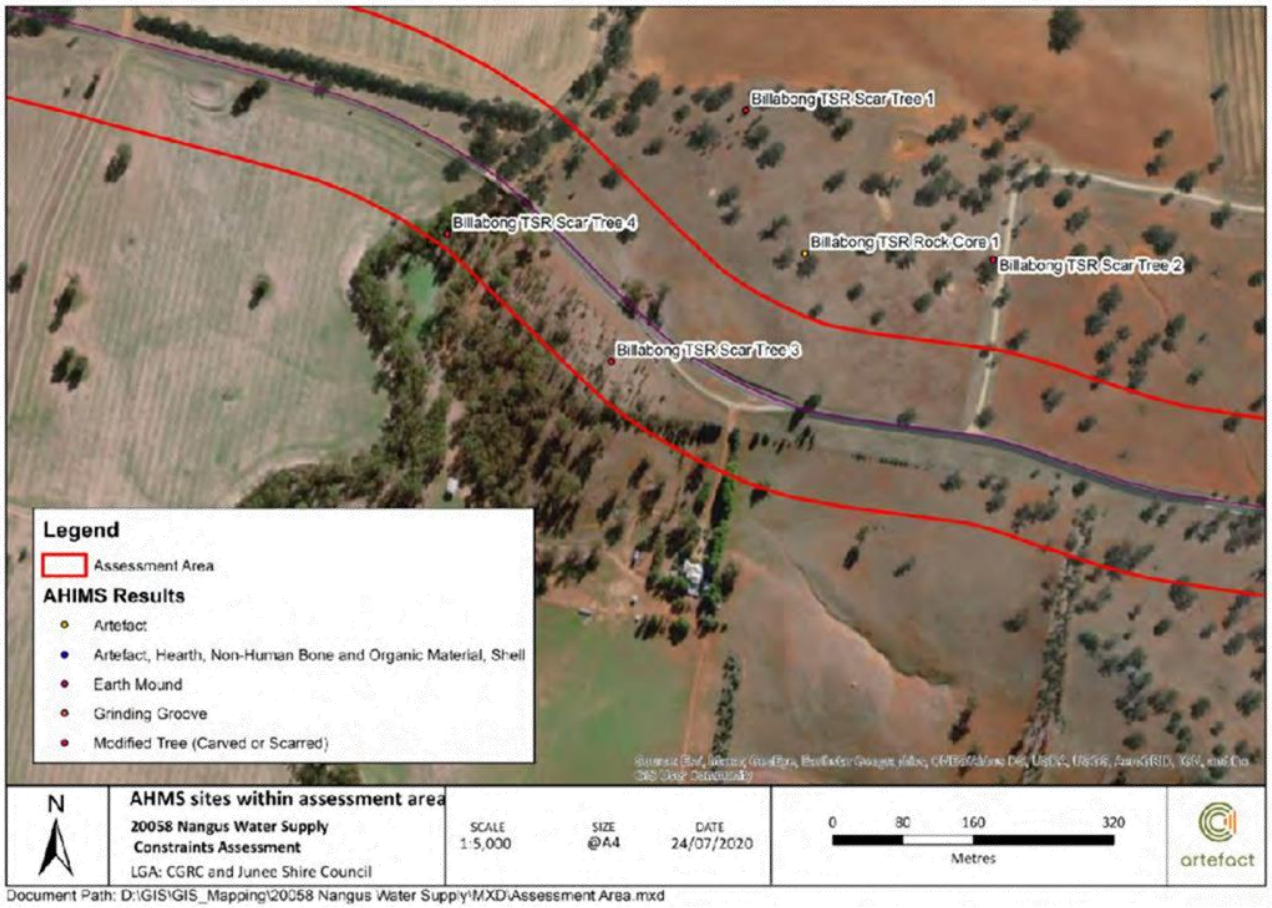


Figure 6: AHIMS sites within the assessment area



5.0 ABORIGINAL ARCHAEOLOGICAL SENSITIVITY

5.1 Predictive model

Based on the results from the AHIMS search, environmental context and the previous archaeological studies conducted within the region, the following predictions can be made regarding the archaeology sensitivity of the assessment areas:

- Artefacts will mostly likely occur close to permanent water sources, or in low densities along gentle slopes and hill crests
- Culturally modified scar trees will most likely occur in remnant native vegetation along waterways or in areas less widely cleared such as existing road reserves.

5.2 Evidence of disturbance

Archaeological sensitivity is closely related to observed levels of ground disturbance. The assessment area is largely situated within the road reserve of Oura Road and the adjacent pastural land which has been ploughed and grazed. While scar trees are susceptible to destruction through land clearance stone artefacts are more durable and are unlikely to have been destroyed through ploughing and grazing. Stands of trees do remain throughout the assessment area and surrounding landscape, and scar trees have been identified within them. While construction of Oura Road may have resulted in substantial disturbance within the road corridor, exposures present on the edges of the road corridor retain the potential for Aboriginal material.

A site inspection would be required to further delineate areas of disturbance across the assessment area.

5.3 Aboriginal archaeological sensitivity mapping

The assessment area is located within an undulating landscape which includes numerous small watercourses and ridge features. The undulating landscape would likely have originally consisted of open woodlands and localised riverine and creek resource zones. Within this landform context, areas of archaeological sensitivity are likely to be associated with distinct landform features such as crests, ridgelines and terraces. These may have been more intensively used, particularly if near to waterbodies. Based on the high proportion of scar trees located across the wider AHIMS search area, areas of old growth woodland are also considered to be archaeologically sensitive, as well as any isolated mature trees remaining in paddocks and road corridors.

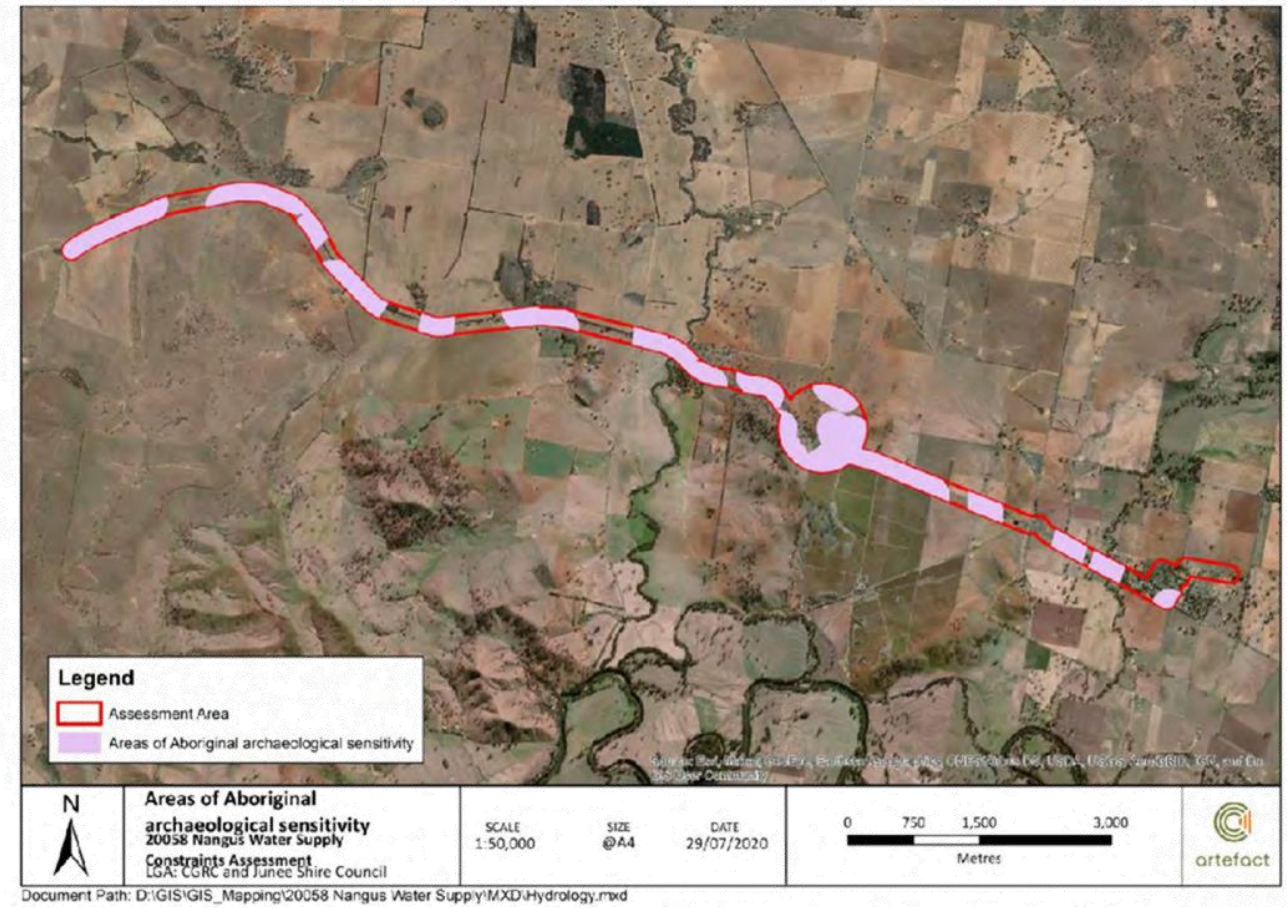
The Due Diligence Code of Practice (Environment 2010) lists five archaeologically sensitive landforms:

- Within 200 m of waters (the whole or any part of: any river, stream, lake, lagoon, swamp, wetlands, natural watercourse, tidal waters)
- Within a sand dune system
- On a ridge top, ridge line or headland
- Within 200 m below or above a cliff face
- Within 20 m of or in a cave, rock shelter, or a cave mouth.

There is limited ability to delineate potentially sensitive landforms with the assessment areas based on desktop assessment alone. A site inspection would be required to delineate specific areas of archaeological sensitivity and assess surface features including areas of remnant vegetation and exposed ground surfaces. However, the current assessment has identified that proximity to water and presence of remnant woodlands is a strong predictive factor in the location of Aboriginal sites in the region.

To aid in the identification of potential sensitive landforms and focus future assessment, a desktop based assessment identifying landforms within 200 m of watercourses and prominent stands of trees have been prepared (Figure 7). This mapping does not capture all potentially sensitive landform features, such as crest landforms and raw material sources.

Figure 7: Aboriginal archaeological sensitivity



6.0 ABORIGINAL ARCHAEOLOGICAL CONSTRAINTS

This constraints report is intended to provide a preliminary and desktop based identification of potential Aboriginal archaeological constraints within the assessment area. An overview of identified Aboriginal archaeological constraints within the assessment area is outlined below.

6.1 Registered Aboriginal sites or Aboriginal Places

There are two recorded AHIMS sites within the assessment area, both comprising modified trees (carved or scarred). There are no registered Aboriginal Places within the assessment area.

Identified AHIMS sites in close proximity to the assessment areas are largely comprised of modified trees (carved or scarred) and Artefact sites.

6.2 Areas of potential Aboriginal sensitivity modelled from existing studies or information

Based on the consideration of landform contexts, information from the AHIMS site register, and review of previous archaeological investigations, there are multiple landforms across the assessment area with archaeological sensitivity. Due to its linear nature, the assessment area traverses multiple areas of archaeological sensitivity, such as watercourses and stands of trees.

Potential sensitive landforms identified within the assessment area include:

- Crest and ridgeline landforms
- Areas where old growth trees may remain, such as stands of remnant vegetation, isolated old growth trees remaining in pastoral paddocks
- Areas in proximity to watercourses
- Other areas that require further investigation, such as raw material resources and other salient features of the landscape were not identified in this preliminary desktop assessment.

Sensitivity mapping created for the current options has identified areas within close proximity to watercourses and prominent stands of trees as having Aboriginal archaeological sensitivity (Figure 7). While these areas of sensitivity are considered more likely to contain Aboriginal objects it is noted that some sensitive landform types cannot be accurately delineated during desktop assessment. These include areas of crest, smaller stands of trees and potential resource gathering zones not directly associated with watercourses. Identification of these potential areas of sensitivity would require more detailed investigation, including site inspection. As such, sensitivity mapping completed as part of the current investigation should be used as a preliminary indication of potential areas of archaeological sensitivity only.

6.3 Further investigation

Registered Aboriginal sites and areas of Aboriginal archaeological sensitivity have been identified within the assessment area.

Further archaeological investigation and Aboriginal stakeholder consultation must be undertaken for the project. In the first instance, further assessment may consist of a site inspection, further desktop assessment, and consultation with the LALC(s) for the preferred option in accordance with the Due

Diligence Code of Practice. The site inspection undertaken for the due diligence assessment should ground-truth the preliminary identification of areas of archaeological sensitivity identified in this report, as well as targeted inspection of the remainder of the preferred option to investigate other potentially sensitive areas.

The due diligence assessment would identify what further steps would be required as part of the approvals process, such as comprehensive consultation with Aboriginal stakeholders, further more detailed archaeological fieldwork and reporting, and potentially a permit(s) application under the *National Parks and Wildlife Act 1974*.

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About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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ROAD SAFETY PROGRAM GUIDELINES

Revised March 2021 v0.4

Contents

1. INTRODUCTION

1.1 Overview

Under the $110 billion Infrastructure Investment Program, the Australian Government is making funding available to retrofit lifesaving road safety upgrades and improvements to regional roads and urban/peri-urban roads where a greater than moderate risk is present. The funding is available for proactive and reactive road safety treatments to prevent fatal and serious injury road crashes.

Under the Road Safety Program (RSP), the Australian Government will provide up to 80 per cent of the total cost of eligible projects that meet the program objectives. Proposals will be assessed against the Program criteria, with a total funding pool of $2 billion over two financial years (2020-21 and 2021-22) delivered through three, six month tranches.

The funding will see the fast roll out of lifesaving road safety treatments on rural and regional roads and protection for vulnerable road users in urban/peri-urban areas. Funding will be prioritised for civil construction projects already developed and designed, and at the 'construction delivery' stage. All projects will require a co-contribution from the state or territory as per clause 28a of the National Partnership Agreement on Land Transport Infrastructure Projects (Infrastructure NPA). The Australian Government will apply a policy of 80/20 funding for regional projects and 50/50 funding for urban projects.

The Department will use the information provided in the Project Proposal Report to check eligibility and assess proposals for funding recommendation to the Minister responsible for Infrastructure and Transport who has powers to approve a project under Part 3 (Investment Projects) of the *National Land Transport Act 2014* (NLT Act).

These Program Guidelines (the Guidelines) apply to all proposals seeking funding under the RSP. The Guidelines outline the objectives and desired outcomes of the RSP, eligibility and assessment requirements, the submission of proposals process, the assessment process, funding arrangements, and roles and responsibilities of the proponent and the Department.

1.2 Legislative and funding authority

These Guidelines must be read in conjunction with *Part 3 of the National Land Transport Act 2014 (NLT Act)*, and the National Partnership Agreement on Land Transport Infrastructure Projects (Infrastructure NPA).

If any inconsistencies arise between the terms and conditions contained in the Guidelines, the terms and conditions contained in the Infrastructure NPA will prevail.

The Program is funded from the Infrastructure Investment Program and payments facilitated under the Infrastructure NPA and under the provisions of the *COAG Reform Fund Act 2008*. Program 1.9: National Partnership Payments to the States, as set out in the Department of Treasury Portfolio Budget statements 2020-21 refers.

1.3 Program objectives and outcomes

The objectives of the Program are to provide lifesaving road safety treatments on rural and regional roads and increase protection for vulnerable road users in urban/peri-urban areas. Proposals for rural and regional roads must target road network safety gaps and raise the standards, preferably to a minimum of 'three star' on high-risk highways and arterial roads. Urban and peri-urban projects must target the protection of vulnerable road users. All proposals must identify the safety outcomes to be achieved.

To achieve both the economic and the safety benefits, the proposals must:

- be in addition to works already funded so that Australian Government funding is not being used to substitute planned works; and
- provide for the engagement of local employment and Indigenous participation consistent with the objectives in the Infrastructure NPA.

The RSP is only open to state and territory governments as eligible funding recipients under the NLT Act and parties to the Infrastructure NPA.

The Infrastructure NPA outlines that the Australian and state governments must have regard for safe system principles and road safety treatments when considering investment proposals.

The program will be delivered in three tranches of six months on a 'use it or lose it' basis and proponents must agree to report on the road safety outcomes to the new Australian Government National Road Safety Data Hub. The amount of funding that can be sought by each proponent is set out in Section 3.2. The program is exempt from Horizontal Fiscal Equalisation calculations.

2. KEY DATES

EVENT	SCHEDULE
Program opens	**October 2020**
Final submission of PPR for Tranche 2	**7 April 2021**
Final submission of PPR for Tranche 3	**30 September 2021**
Program closes	**30 June 2022**

3. HOW TO APPLY

3.1 Proposal period

Proponents are encouraged to nominate as many projects as they can deliver within the program timeframes in the first instance. Further projects or adjustments may be submitted up until 30 calendar days before the commencement of the Tranche in which they will be commenced. Acceptance of projects and adjustments outside of this time period will be considered on a case-by-case basis at the discretion of the Australian Government. Variations to projects approved under a tranche will only be considered through formal ministerial correspondence.

3.2 Funding available

Available Australian Government funding is $1 billion in 2020-21 and $1 billion in 2021-22.

Funding is nominally allocated to the jurisdictions on a proportionate share based on an existing formula that determines the maintenance funding for the National Land Transport Network in the jurisdiction weighted by traffic volume.

Notional funding by jurisdiction for the program is:

	Tranche 1 funding $m	Total notional funding for Tranches 2 &3 $m	Total notional funding $m
ACT	3.00	3.00	**6.00**
NSW	300.00	240.00	**540.00**
NT	33.30	62.70	**96.00**
QLD	226.70	295.30	**522.00**
SA	83.70	84.30	**168.00**
TAS	33.30	10.70	**44.00**
VIC	193.30	146.70	**340.00**
WA	126.70	157.30	**284.00**
Total	**1,000.00**	**1,000.00**	**2,000.00**

Small-scale works would be delivered, typically valued between $0.5 million and $5.0 million, which require minimal planning and approval processes.

Total actual funding is dependent on project delivery performance by the jurisdictions on a 'use it or lose it' basis.

3.3 Construction Period / Use It or Lose It

Construction activity should take place between 1 January 2021 and 30 June 2022 with expenditure in accordance with the following schedule:

- Projects funded under Tranche 1 –1 January 2021 to 30 June 2021
- Projects funded under Tranche 2 - 1 July 2021 to 31 December 2021
- Projects funded under Tranche 3 - 1 January 2022 to 30 June 2022

Unless in exceptional circumstances (such as COVID outbreak or extreme weather conditions), if construction activity cannot be completed during the timeframe nominated for the funding tranche, a jurisdiction that does not spend their allocation in the timeframe will have their future allocation reduced in proportion to the underspend. The resulting unallocated funds will be placed in a pool, with jurisdictions who spend their allocation able to seek further funds, to a maximum calculated based on their proportion of Australian population, from this pool.

Example:

State X has the following nominal program allocation:

- Tranche 1 - $100m
- Tranche 2- $50m
- Tranche 3 - $50m

State X only spends $80m in Tranche 1. State X's allocation for Tranche 2 is reduced pro rata (in this case Tranche 2 nominal allocation for $50m will be reduced by 20%). Tranche 2 allocation for State X is now $40m, and the $10m balance is placed into the funding pool, to fund projects nominated by other states or territories.

All other states and territories that spend their allocation are entitled to a percentage of the funding pool ($10m) based on their percentage share of the Australian population.

In Tranche 2, if State X spends its entire reduced funding allocation of $40m, State X is entitled to $50m for Tranche 3 and can seek further funds from the funding pool.

3.4 Proposal requirements

Proponents must provide all information relating to the funding request in the Project Proposal Report. Incomplete proposals may be deemed ineligible.

Only completed proposals submitted by an authorised state/territory officer (e.g. Chief Executive Officer, Director of Engineering) of the organisation will be accepted and assessed.

Jurisdictions will make submissions for funding within their total program allocation and programmed in accordance with the three funding tranches.

Consistent with clause 28(b) of the Infrastructure NPA; it is a requirement of the RSP that all proposals be accompanied by:

- List of projects in priority order using the template provided
- Network Safety Plan developed using the process outlined in the Austroads publication "Network Design for Road Safety (Stereotypes for Cross-sections and Intersections): User Guide" or ANRAM analysis that provides a change in the risk rating with the application of treatments (this information will be used to assess which projects will be funded)
- Evidence the project/s can be started immediately
- Certification the nominated projects are additional to existing work plans for 2020-21 and 2021-22
- Demonstration of local employment creation opportunities
- Agreement to the reporting of the following data:
  - Traffic volume and mix - the number of each type of vehicle on the upgraded road before and after works – reported on commencement and bi-annually thereafter;
  - A death from an on-road (traffic) crash on a public road within 30 days of the event;
  - A serious injury – as per the national definition being persons admitted to a hospital (inpatient) - from an on-road (traffic) crash on a public road within 30 days of the event; and

- Risk profile across the road network – measured by the number of kilometres with safety attributes, and the change in the risk profile as safety measures are applied - reported on commencement and bi-annually thereafter.

- An Indigenous Participation Plan as per the Indigenous Employment and Supplier-use Infrastructure Framework agreed under the Infrastructure NPA. State-based Indigenous Participation Plans will be considered for the RSF – for more information on meeting this requirement email Indigenousparticipationplans@infrastructure.gov.au
- A signage and recognition plan as per clause 29 of the Infrastructure NPA, and consistent Schedule E, Clause 26 of the Intergovernmental Agreement on Federal Financial Relations around publicity and recognition for Commonwealth funding
- Per Clause 29 of the Infrastructure NPA, the signage and recognition plan will:
    - (a) recognise the Commonwealth's funding contribution to Projects in all publications, promotional and advertising materials, including Project signage, and public announcements and activities in relation to a Project as appropriate, and must consult the Commonwealth prior to release of all promotional-related materials concerning projects funded through this program;
    - (b) provide reasonable opportunity for the Commonwealth to contribute to developing communications strategies for Projects with a Commonwealth funding contribution;
    - (c) provide the Commonwealth with equal access to products that they obtain for use in the development of promotional material including but not limited to Project data, footage and images; and
    - (d) where the Commonwealth is a majority funder of a Project, promotional material and public recognition should provide major prominence to the Commonwealth's contribution, with the Parties to agree the content and timing.

- A report on milestones will be required detailing what benefits have been achieved over the program.

3.5 How to submit a proposal

Proposals must be submitted by email to roadsafetyprogram@infrastructure.gov.au. To support timely evaluation and approval, the proponent must ensure that all information provided within the template is complete and accurate.

3.6 Confirmation of submission

A confirmation receipt for each proposal submitted will be sent via email. If you do not receive a receipt for your submission, please contact the Department at officeofroadsafety@infrastructure.gov.au attention Mark Ellis.

Please note that lodgment of the proposal signifies confirmation/acceptance that all information provided by the proponent is true and accurate.

4. ELIGIBILITY

4.1 Eligibility

To be eligible under the Road Safety Program:

- the Proponent must be a state eligible for funding under Part 3 of the National Land Transport 2014;
- a Party to the Infrastructure NPA; and

- agreed to a Schedule to the NPA which includes the Road Safety Program.

4.2 Projects eligible for funding under the Road Safety Program

For funding under the RSP, and consistent with Section 10 and 11 of the NLT Act, small-scale road safety infrastructure works would be delivered which require minimal planning and approval processes. Examples of road safety projects are:

- Regional areas:
  - The retrofitting of safety treatments, including shoulder sealing;
  - Installation of audio tactile line marking;
  - Physical barriers to prevent run-off-road crashes;
  - Median treatments to prevent head-on vehicle collisions; and
  - Integrated speed management treatments such as intersection activated variable speed warning signs.

- Urban and peri-urban areas:
  - Separation of cyclists from vehicles and pedestrians; and
  - Low cost treatments, such as tactile line making, raised pedestrian intersections and other traffic calming infrastructure.

Road safety treatments for regional roads would preferably raise the roads to a 'three star' safety rating.

Further, for a project to be considered for funding:

- Proponents must agree to a co-contribution, with the Australian Government providing 80 percent of the funding for regional projects and 50 percent of the funding for urban and peri-urban projects;
- Projects need to be additional to existing work plans for 2020-21 and 2021-22;
- Projects that have been brought forward from post-2021-22 work plans will be considered additional;
- Work must not have commenced, or be due to commence, and tenders must not have been awarded. Work means actual on ground works at the project site and/or the fabrication of major components off-site;
- Work prior to Departmental advice that your project can commence may result in funding for the project being withdrawn by the Department; and
- Work must be completed no later than the Tranche end period in which it commenced.

4.3 What is ineligible for funding?

- Projects currently listed on the jurisdiction's 2020-21 and 2021-22 work plans;
- Projects which substitute the Road Safety Program funds for the jurisdiction's funding or other sources of funding;
- Planning and design only proposals (planning and design can be included as a small portion in a capital expenditure proposal, but construction work must commence and complete within the tranche the planning and design relates and the proposal must clearly identify what new jobs will be created through the planning and design component);
- Projects for the installation of or upgrading of enforcement technology;
- Inspections and structural assessments; and

- Maintenance programs and works.

5. ASSESSMENT CRITERIA

The Department will assess each state and territory's projects against the program criteria to develop an assessment score. The assessment score will be used to prioritise projects within each state and territory's proposal only, **not** to compare state and territory's proposals against each other. The Department will make recommendations to the Minister who has powers to approve a project under as an Investment Project under Section 9 of the NLT Act, but only if the Minister is satisfied the project is eligible for approval under Section 10 and consider the project appropriate to approve under Section 11 of the Act. Approval of the provision of funding (project instrument) is provided under Section 17.

The value for money assessment and recommendations to the Minister may take account of the overall mix and funding source of proposals.

Projects will be appraised equally against each of the following assessment criteria:

- Assessment Criterion 1 – Road Safety Outcomes;
- Assessment Criterion 2 – Evidence of Economic Benefits;
- Assessment Criterion 3 – Construction Readiness and Risk
-

6. COMPLETING THE PROJECT PROPOSAL REPORT

Please ensure you read all the notes in the Project Proposal Report first before commencing your response.

6.1 Criteria

Criterion 1 – Road Safety Outcomes

The degree to which the upgraded road will be improved. Improvements can be demonstrated by the provision of:

- For regional roads: a 'Network Safety Plan' developed using the process outlined in the Austroads publication 'Network Design for Road Safety (Stereotypes for Cross-sections and Intersections): User Guide' or ANRAM analysis that provides a change in the risk rating with the application of treatments; or

- For Urban/Peri-urban roads: a description of how the works will target the protection of vulnerable road users and what the safety outcomes are expected to be achieved.

Claims against this criterion should be specific and measurable identifying the expected reductions in both fatal and serious injury road crashes as the result of projects.

Criterion 2 – Evidence of Economic Benefits

The economic benefits of the project including evidence to support these claims.

Benefits should include (but are not limited to):

- Local employment opportunities which will be created;

- Indigenous employment or supplier-use opportunities via the submission of an Indigenous Participation Plan; and
- Local businesses engaged through the construction period.

Criterion 3 – Construction Readiness and Risk

The ability of the proponent to undertake the project, including potential risks and proposed mitigating actions should the project proceed.

This may include:

- Past experience in delivering similar proposals within the required timeframes;
- Confirmation of other funding sources; or
- Risks have been adequately considered and mitigating actions identified.
- Evidence could include but is not limited to:
  - Planning or design work that has been undertaken, including if final designs have been completed;
  - The progress of approvals and when all approvals are expected to be completed; or
  - Project costings and how these costings were obtained.

6.2 Key Data

The National Partnership Agreement on Land Transport Infrastructure Projects outlines that the Commonwealth and states must have regard for safe system principles and road safety treatments when considering road infrastructure investment proposals. Consistent with clauses 28, 30 and 36 of the Infrastructure NPA, states are required to report against four metrics on a regular basis, including their current baseline data of road safety risk:

- Traffic volume and mix - the number of each type of vehicle on the upgraded road before and after works – reported on commencement and bi-annually thereafter;
- A death from an on-road (traffic) crash on a public road within 30 days of the event;
- A serious injury – as per the national definition being persons admitted to a hospital (inpatient) - from an on-road (traffic) crash on a public road within 30 days of the event; and
- Risk profile across the road network – measured by the number of kilometres with safety attributes, and the change in the risk profile as safety measures are applied - reported on commencement and bi-annually thereafter.

Reporting is required to continue for the life of the new National Road Safety Strategy 2021-2030.

The improvements in road safety will be measured by the expected reductions in both fatal and serious injury road crashes as the result of projects, and the data will be used in the assessment of future road safety mass action programs and individual road infrastructure projects which have a road safety benefit. Data will also be provided to the newly established National Road Safety Data Hub to support delivery of the National Road Safety Strategy 2021-2030.

7. ASSESSMENT OF PROPOSALS

As proposals are received, they will be checked for eligibility. Once the eligibility checks are completed, individual projects submitted in the proposal will be assessed against the criteria. Eligible projects will be scored against each criterion and totaled to give an overall score. Proposals will be subject to a Quality Assurance (QA) process to ensure all proposals have been assessed correctly according to the information

received. Following QA, a consolidated list of eligible projects, including scores and assessments, will be recommended to the Minister for approval of funding.

8. DECISIONS

8.1 Decisions on proposals to be funded

Proposals recommended to receive funding are presented to the Minister for funding consideration.

If the Minister's approves the projects, the Department will contact all proponents to inform them of the outcome of their proposals.

Throughout the duration of the Proposal period, the Department will conduct eligibility checks and assessments of proposals as they are received. If the Department requires any further information, it may contact proponents in relation to details provided in the Project Proposal Report, to seek further information or clarification.

Upon completion of proposal assessments, the Department will make recommendations to the Minister on proposals that are eligible for funding. A list of successful proposals will be available from the Department's website at www.infrastructure.gov.au.

9. CONTACT DETAILS

General enquiries can be emailed to roadsafetyprogram@infrastructure.gov.au attention Mark Ellis.

COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL

Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689

MUTTAMA ROAD SAFETY IMPROVEMENT

CH 0+000 (COOLAC) TO CH37+300 (COOTAMUNDRA)

GUNDAGAI, NSW 2722

COVER SHEET, LOCALITY PLAN AND DRAWINGS LIST

SEP-2020

LOCALITY PLAN

SCHEDULE OF DRAWINGS	
DRAWING No.	DESCRIPTION
2020-21-0002-PROP-1000	COVER SHEET, LOCALITY PLAN & DRAWINGS LIST
2020-21-0002-PROP-1005	GENERAL NOTES AND TYPICAL SECTIONS
2020-21-0002-PROP-1010	GENERAL ARRANGEMENT PLAN AT/LM SHEET 1 OF 34
2020-21-0002-PROP-1011	GENERAL ARRANGEMENT PLAN AT/LM SHEET 2 OF 34
2020-21-0002-PROP-1012	GENERAL ARRANGEMENT PLAN AT/LM SHEET 3 OF 34
2020-21-0002-PROP-1013	GENERAL ARRANGEMENT PLAN AT/LM SHEET 4 OF 34
2020-21-0002-PROP-1014	GENERAL ARRANGEMENT PLAN AT/LM SHEET 5 OF 34
2020-21-0002-PROP-1015	GENERAL ARRANGEMENT PLAN AT/LM SHEET 6 OF 34
2020-21-0002-PROP-1016	GENERAL ARRANGEMENT PLAN AT/LM SHEET 7 OF 34
2020-21-0002-PROP-1017	GENERAL ARRANGEMENT PLAN AT/LM SHEET 8 OF 34
2020-21-0002-PROP-1018	GENERAL ARRANGEMENT PLAN AT/LM SHEET 9 OF 34
2020-21-0002-PROP-1019	GENERAL ARRANGEMENT PLAN AT/LM SHEET 10 OF 34
2020-21-0002-PROP-1020	GENERAL ARRANGEMENT PLAN AT/LM SHEET 11 OF 34
2020-21-0002-PROP-1021	GENERAL ARRANGEMENT PLAN AT/LM SHEET 12 OF 34
2020-21-0002-PROP-1022	GENERAL ARRANGEMENT PLAN AT/LM SHEET 13 OF 34
2020-21-0002-PROP-1023	GENERAL ARRANGEMENT PLAN AT/LM SHEET 14 OF 34
2020-21-0002-PROP-1024	GENERAL ARRANGEMENT PLAN AT/LM SHEET 15 OF 34
2020-21-0002-PROP-1025	GENERAL ARRANGEMENT PLAN AT/LM SHEET 16 OF 34
2020-21-0002-PROP-1026	GENERAL ARRANGEMENT PLAN AT/LM SHEET 17 OF 34
2020-21-0002-PROP-1027	GENERAL ARRANGEMENT PLAN AT/LM SHEET 18 OF 34
2020-21-0002-PROP-1028	GENERAL ARRANGEMENT PLAN AT/LM SHEET 19 OF 34
2020-21-0002-PROP-1029	GENERAL ARRANGEMENT PLAN AT/LM SHEET 20 OF 34
2020-21-0002-PROP-1030	GENERAL ARRANGEMENT PLAN AT/LM SHEET 21 OF 34
2020-21-0002-PROP-1031	GENERAL ARRANGEMENT PLAN AT/LM SHEET 22 OF 34
2020-21-0002-PROP-1032	GENERAL ARRANGEMENT PLAN AT/LM SHEET 23 OF 34
2020-21-0002-PROP-1033	GENERAL ARRANGEMENT PLAN AT/LM SHEET 24 OF 34
2020-21-0002-PROP-1034	GENERAL ARRANGEMENT PLAN AT/LM SHEET 25 OF 34
2020-21-0002-PROP-1035	GENERAL ARRANGEMENT PLAN AT/LM SHEET 26 OF 34
2020-21-0002-PROP-1036	GENERAL ARRANGEMENT PLAN AT/LM SHEET 27 OF 34
2020-21-0002-PROP-1037	GENERAL ARRANGEMENT PLAN AT/LM SHEET 28 OF 34
2020-21-0002-PROP-1038	GENERAL ARRANGEMENT PLAN AT/LM SHEET 29 OF 34
2020-21-0002-PROP-1039	GENERAL ARRANGEMENT PLAN AT/LM SHEET 30 OF 34
2020-21-0002-PROP-1040	GENERAL ARRANGEMENT PLAN AT/LM SHEET 31 OF 34
2020-21-0002-PROP-1041	GENERAL ARRANGEMENT PLAN AT/LM SHEET 32 OF 34
2020-21-0002-PROP-1042	GENERAL ARRANGEMENT PLAN AT/LM SHEET 33 OF 34
2020-21-0002-PROP-1043	GENERAL ARRANGEMENT PLAN AT/LM SHEET 34 OF 34

DATE PLOTTED: 3 September 2020 3:31 PM BY: GULAM HOSSAIN
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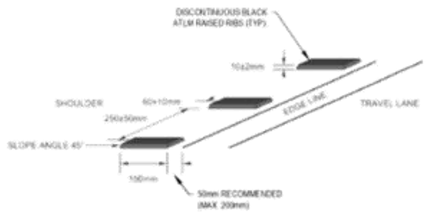
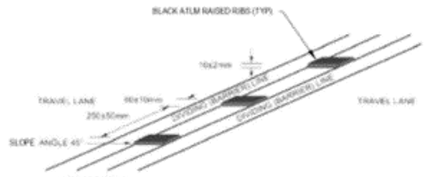
Drawing Number Revision



AUDIO TACTILE EDGE LINE MARKING

SCALE N.T.S



AUDIO TACTILE CENTRE LINE MARKING

SCALE N.T.S

NOTES:

1. AUDIO TACTILE LINEMARKING (ATLM) NOT TO BE INSTALLED WITHIN 200m RADIUS OF ANY RESIDENTIAL PROPERTY. THESE AREAS OF EXCLUSION IS SHOWN BY THE 200m RADIUS CIRCLES ON THE GENERAL ARRANGEMENT PLANS 2020-21-0002-PROP-1010 TO 1043.
2. ATLM TO BE INSTALLED AS PER THE DETAILS ABOVE AND NSW GOVERNMENTS TECHNICAL DIRECTION TETD 2019/01 RMS. 19.1204 AND MANUFACTURERS SPECIFICATIONS.
3. FOR THE INSTALLATION OF ATLM ON EDGE LINES,NSW GOVERNMENTS TECHNICAL DIRECTION TETD 2019/01 RMS. 19.1204 STATES THE REQUIREMENT OF A MINIMUM OF 1m SHOULDER WIDTH WHICH MAY NOT ALWAYS BE ACHIEVABLE THROUGHOUT THE WHOLE LENGTH OF THE ROAD. HOWEVER, CONSIDERING THE SAFETY BENEFIT OF THE ATLMs ON EDGE LINES, AN AVERAGE OF 500mm WIDE SEALED SHOULDER IS ASSUMED TO COMPLIED WITH THE WIDTH REQUIREMENT.
4. IT IS THE CONTRACTORS RESPONSIBILITY TO CARRYOUT SOME PRELIMINARY CLEAN-UPS AND DRESSING OF THE SHOULDERS BEFORE INSTALLATION OF THE ATLMs.

EZY-GUARD STEEL RAIL SAFETY BARRIER

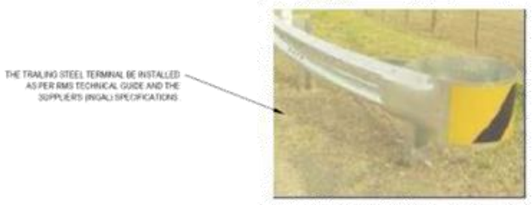
SCALE N.T.S

QUANTITY OF ITEMS:

ROAD SAFETY BARRIER SYSTEM AND LINE MARKING		
Road Safety Barrier- Ezy Guard(Crash Site)	m	2892.00
Road Safety Barrier- Ezy Guard (Potential High Risk Site)	m	1406.00
Terminal Ends (Crash Site)	Number	28.00
Terminal Ends (Potential High Risk Site)	Number	20.00
ATLM Centre Line	m	30562.50
ATLM Edge Line	m	61125.00

ET - SS TERMINAL (APPROACHING)

SCALE N.T.S



TRAILING STEEL RAIL TERMINAL

SCALE N.T.S

SCALE: N.T.S

Rev	Date	Description	Drn	Ver'f	Appr
A	27/08/2020	PRELIMINARY DESIGN INFORMATION	GH	MS	MS

Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689

COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL

Designed By: GH
Checked By: MS
Drawn By: GH
Approved By: MS

Ref: Transport for NSW
Project: MUTTAMA ROAD SAFETY IMPROVEMENT
Title: GENERAL NOTES AND TYPICAL SECTIONS SHEET 01 OF 01

Status: FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum | Grid & Zone | Scale: N.T.S | Size: A1
Drawing Number: 2020-21-0002-PROP-1005 | Revision: A

DATE PLOTTED: 3 September 2020 4:46 PM BY : GOLAM HOSSAIN

XREF's
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LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
109.0m
113.0m
110.0m
80 km/h
0
100
200
300
400
500
600
700
800
900
1000
1100
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1011
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Cootamundra-Gundagai Regional Council
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Gundagai NSW-2722
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COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 01 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
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Revision A
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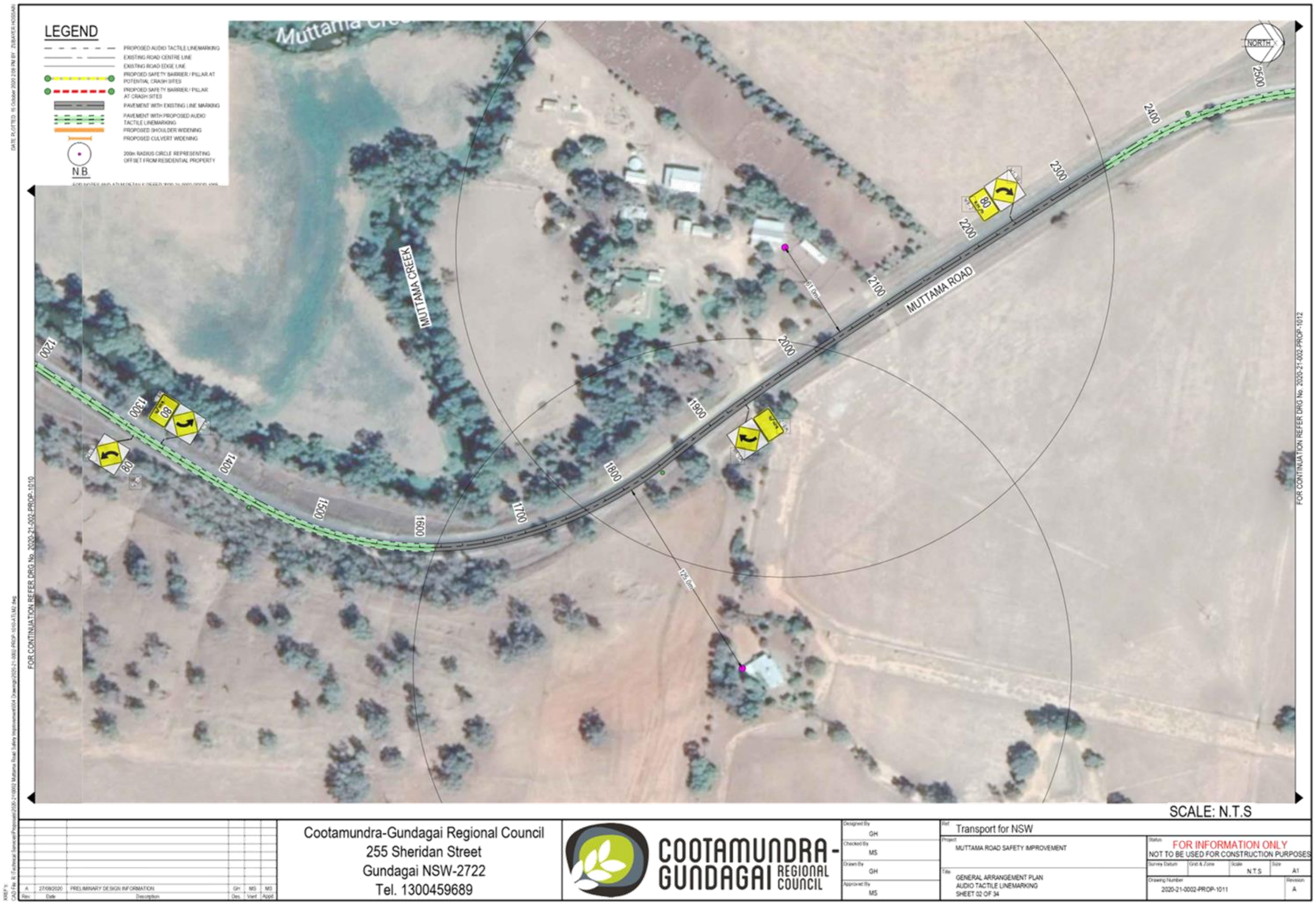
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PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
NB
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
2400
2500
80
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1010
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1012
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Cootamundra-Gundagai Regional Council
255 Sheridan Street
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COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 02 OF 34
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Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1011
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Vert Appd


MUTTAMA CREEK
NORTH
ARMOURS ROAD
MUTTAMA ROAD
HEAD ON COLLISION
NO- 1056743
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
152.0m
Mooney Mooney Creek
TABERS LN
HOARES LN
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1011
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1013
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 03 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
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Drawing Number 2020-21-0002-PROP-1012
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Vsnf Appd


FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1014
NORTH
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
4900
4800
4700
4600
4500
4400
4300
MUTTAMA CREEK
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1012
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 04 OF 34
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Revision A
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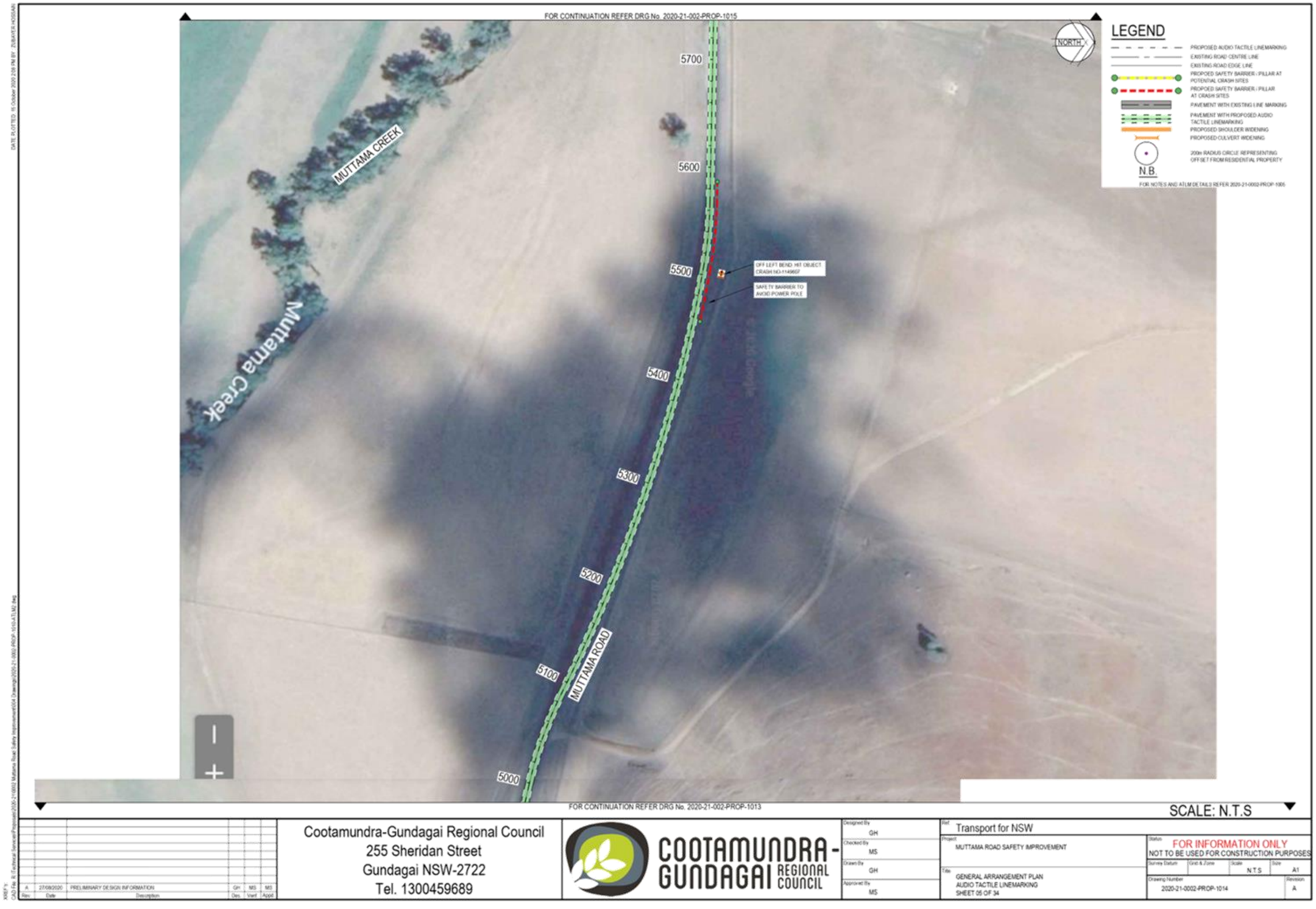
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NORTH
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
MUTTAMA CREEK
Muttama Creek
5700
5600
5500
5400
5300
5200
5100
5000
MUTTAMA ROAD
OFF LEFT BEND HIT OBJECT CRASH NO-1149667
SAFETY BARRIER TO AVOID POWER POLE
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1013
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 05 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
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Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
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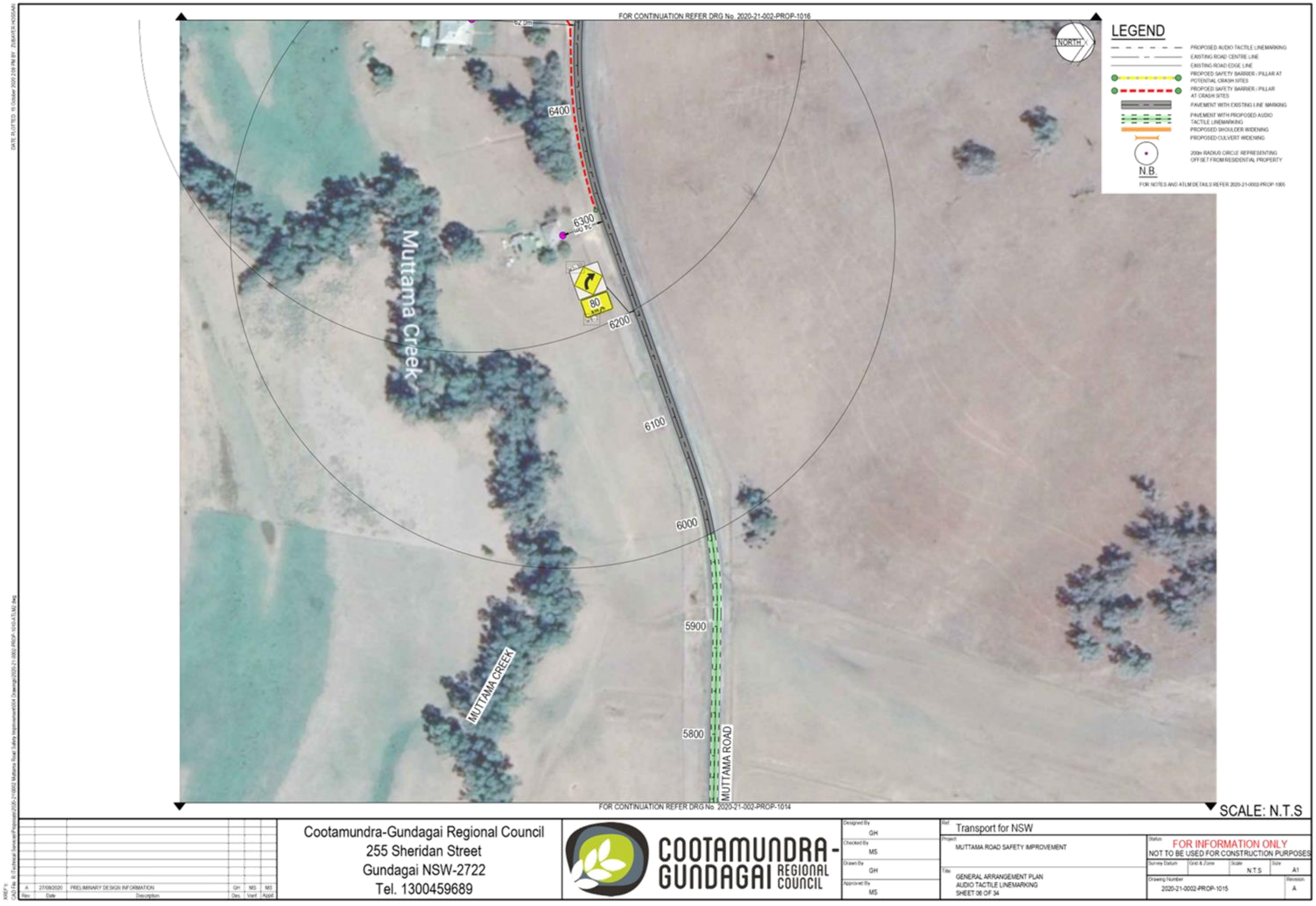
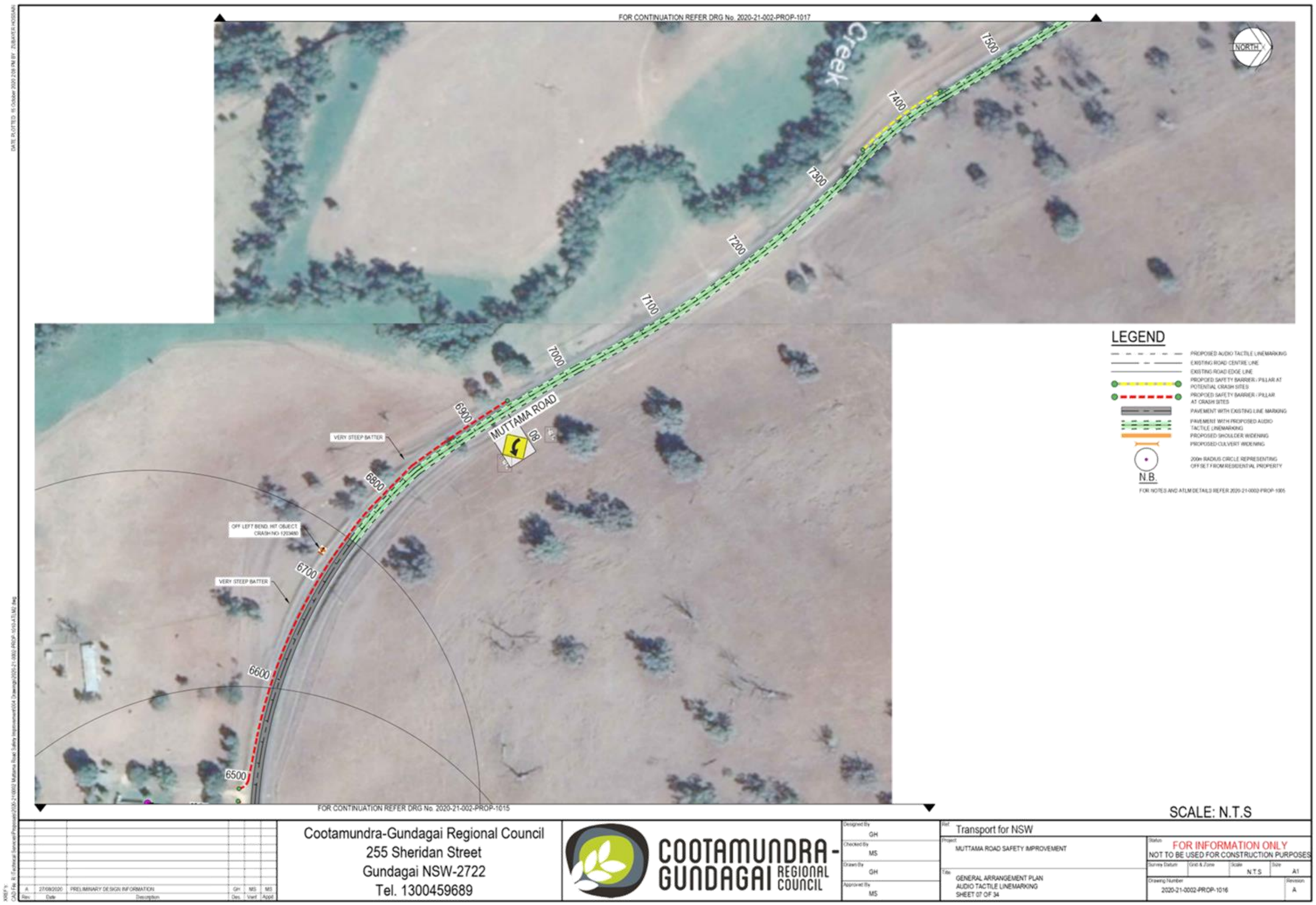

FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1016
NORTH
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
6400
6300
6200
6100
6000
5900
5800
80
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1014
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 06 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1015
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd


FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1017
NORTH
Creek
7500
7400
7300
7200
7100
7000
6900
6800
6700
6600
6500
MUTTAMA ROAD
08
VERY STEEP BATTER
OFF LEFT BEND. HIT OBJECT
CRASH NO 1203480
VERY STEEP BATTER
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1015
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 07 OF 34
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1016
Revision A

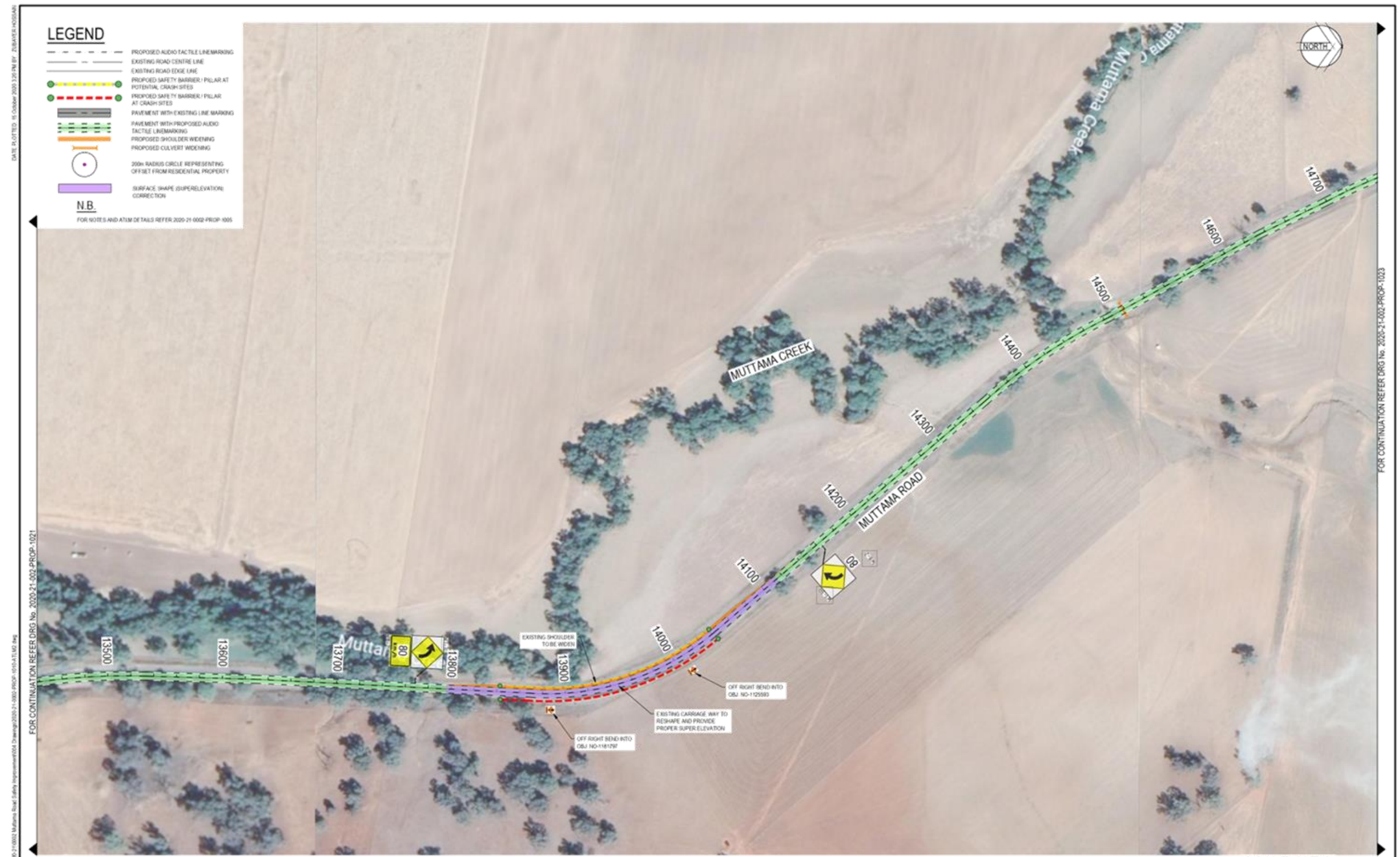

Burra Creek
MUTTAMA CREEK
MUTTAMA ROAD
Muttama
LEGEND
NORTH
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
7600
7700
7800
7900
8000
8100
8200
8300
8400
8500
8600
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1018
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1018
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 08 OF 34
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1017
Revision A


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
8700
8800
8900
9000
9100
9200
9300
9400
9500
9600
9700
9800
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1017
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1019
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 09 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1018
Revision A


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
MUTTAMA CREEK
Muttama Creek
WAMBIDGEE RD
MUTTAMA ROAD
9900
10000
10100
10200
10300
10400
10500
10600
10700
10800
10900
11000
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1018
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1020
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 10 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1019
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.


LEGEND
NORTH
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
MUTTAMA CREEK
Muttama Creek
MUTTAMA ROAD
11100
11200
11300
11400
11500
11600
11700
11800
11900
12000
12100
12200
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1019
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1021
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Transport for NSW
MUTTAMA ROAD SAFETY IMPROVEMENT
GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 11 OF 34
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
N.T.S
A1
2020-21-0002-PROP-1020
A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
Muttama Creek
MUTTAMA ROAD
MUTTAMA CREEK
12300
12400
12500
12600
12700
12800
12900
13000
13100
13200
13300
13400
EXISTING SHOULDER TO BE WIDEN
EXISTING CULVERT TO BE WIDEN
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1020
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1022
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 12 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1021
Revision B
B 15/10/2020 INFORMATION ADDED GH MS MS
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Vert. Appd.



Rev	Date	Description	Des	Vrfd	Appd
B	15/10/2020	INFORMATION ADDED	GH	MS	MS
A	27/08/2020	PRELIMINARY DESIGN INFORMATION	GH	MS	MS

Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689

COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL

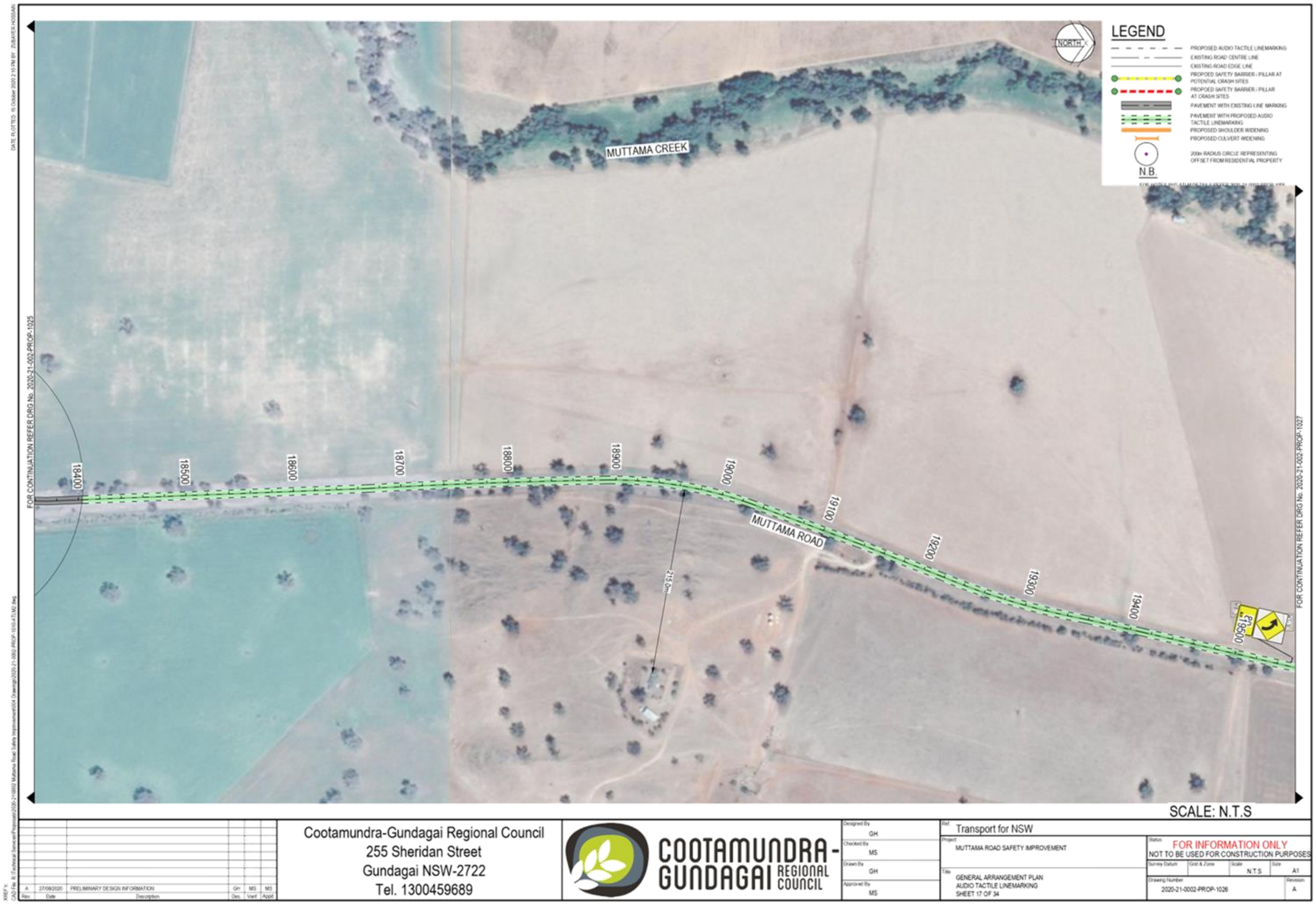
Designed By: GH
Checked By: MS
Drawn By: GH
Approved By: MS

Ref: Transport for NSW
Project: MUTTAMA ROAD SAFETY IMPROVEMENT
Title: GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 13 OF 34
Status: FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum | Grid & Zone | Scale: N.T.S | Size: A1
Drawing Number: 2020-21-0002-PROP-1022
Revision: B

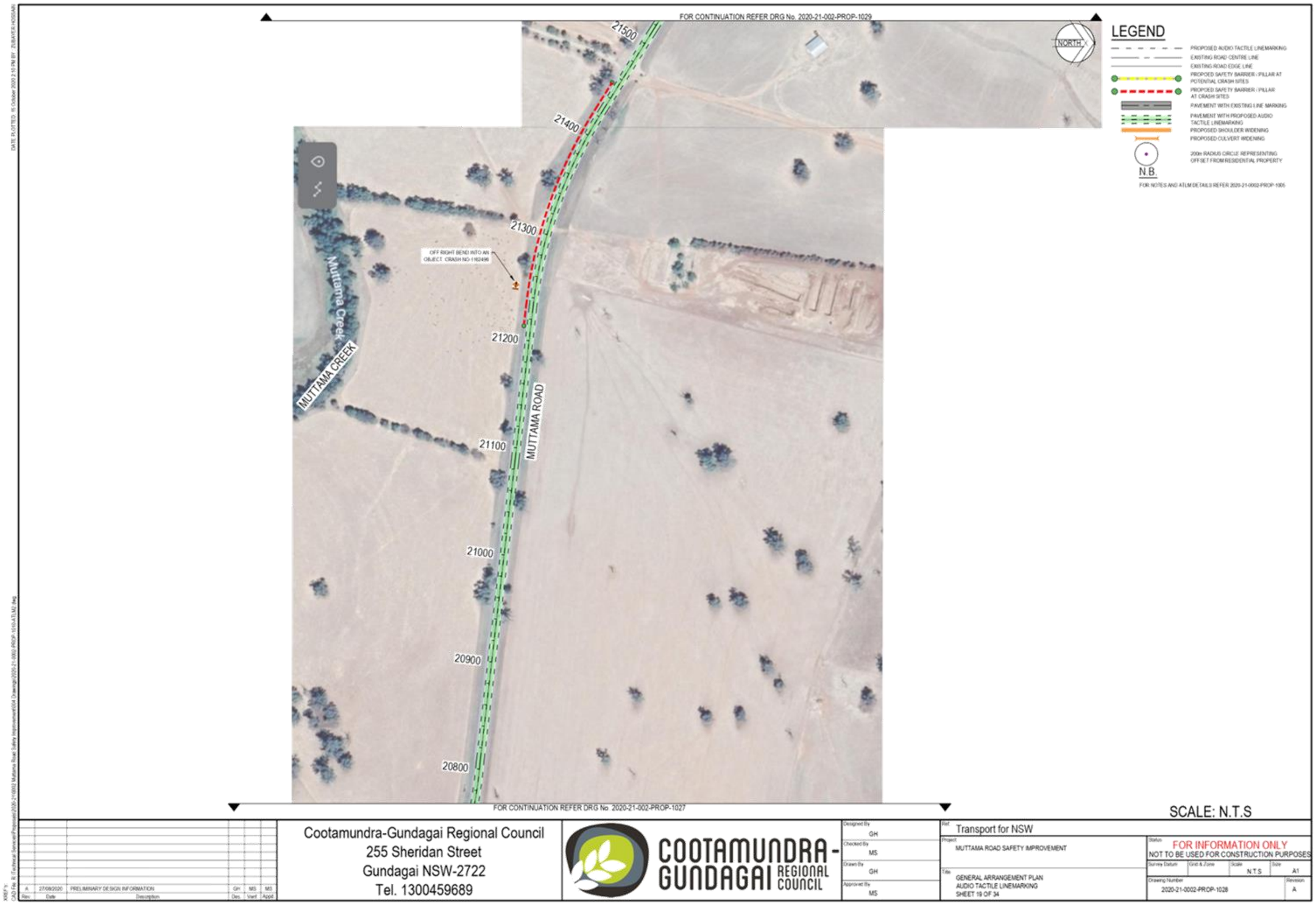

LEGEND
NORTH
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
CAULDERWOOD RD
Stony Creek
231.0m
227.3m
14800
14900
15000
15100
15200
15300
15400
15500
15600
15700
15800
15900
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1022
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1024
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 14 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1023
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.

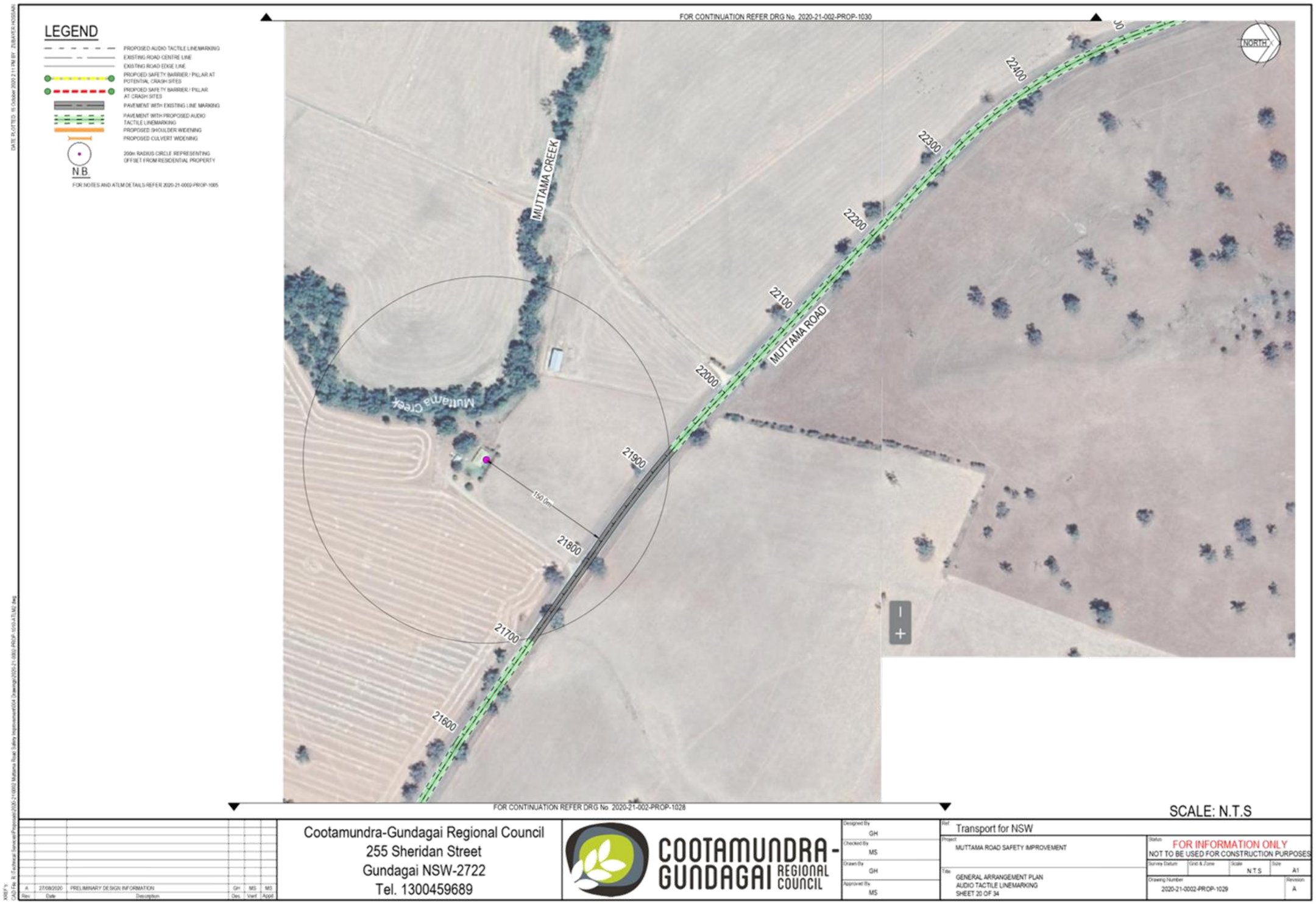

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
Muttama Creek
MUTTAMA ROAD
16000
16100
16200
16300
16400
16500
16600
16700
16800
16900
17000
17100
290.5m
27.0m
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1023
FOR CONTINUATION REFER DRG No. 2020-21-0002-PROP-1025
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 15 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1024
Revision A


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
BRIDGE STREET
MUTTAMA ROAD
REEF CREEK ROAD
Muttama Reef Creek
17200
17300
17400
17500
17600
17700
17800
17900
18000
18100
18200
18300
80
60
210.0m
50.0m
35.0m
15.0m
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1024
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1026
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 16 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1025
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS

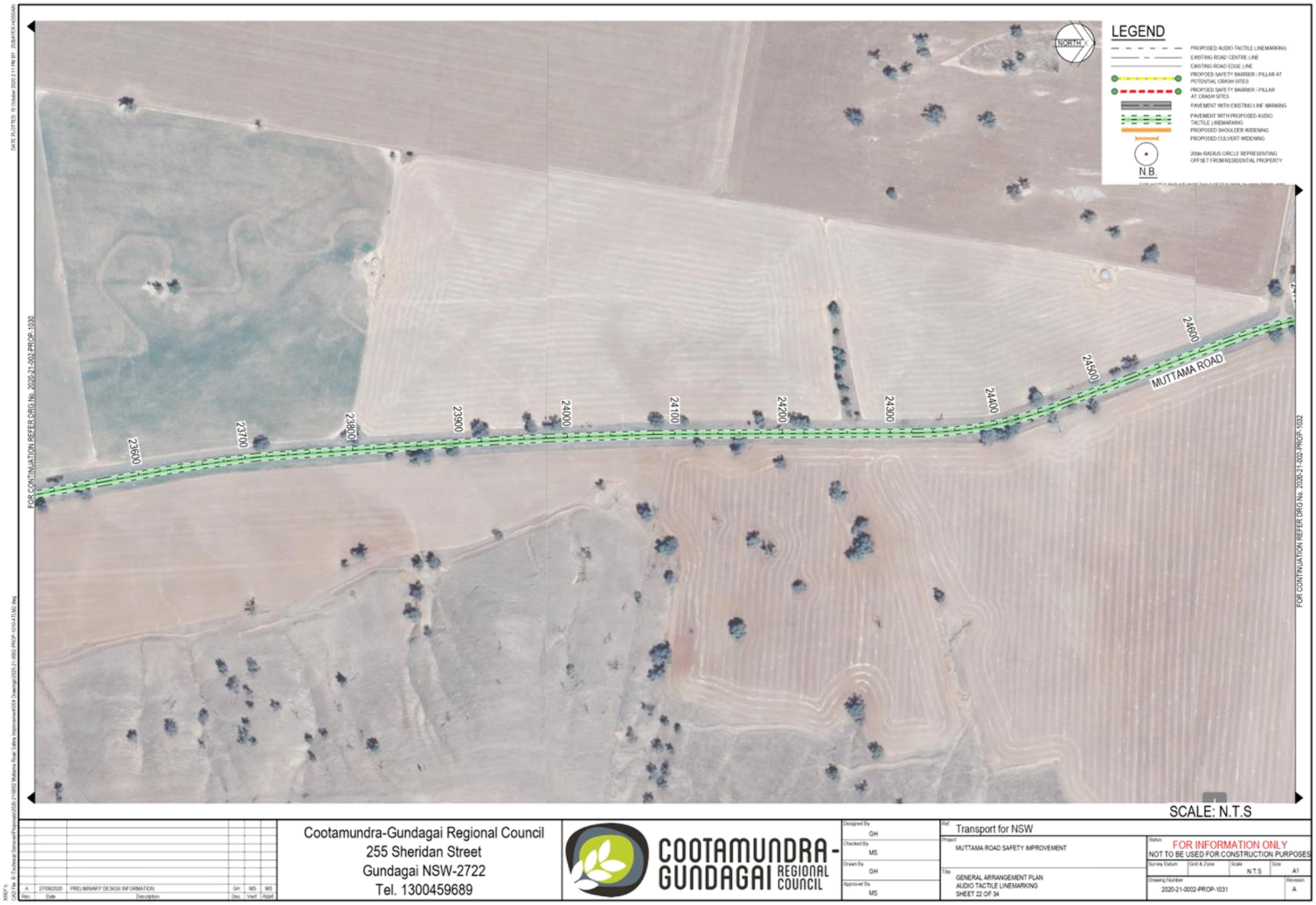

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
18400
18500
18600
18700
18800
18900
19000
19100
19200
19300
19400
215.0m
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1025
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1027
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 17 OF 34
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1026
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER - PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER - PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
NORTH
MUTTAMA CREEK
Muttama Creek
MUTTAMA ROAD
RAWILLA ROAD
20700
20600
20500
20400
20300
20200
20100
20000
19900
19800
19700
19600
08
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1026
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1028
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Transport for NSW
MUTTAMA ROAD SAFETY IMPROVEMENT
GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 18 OF 34
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
N.T.S
A1
2020-21-0002-PROP-1027
A
27/08/2020
PRELIMINARY DESIGN INFORMATION


FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1029
21500
21400
21300
21200
21100
21000
20900
20800
NORTH
OFF RIGHT BEND INTO AN OBJECT CRASH NO 192496
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1027
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 19 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1028
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.

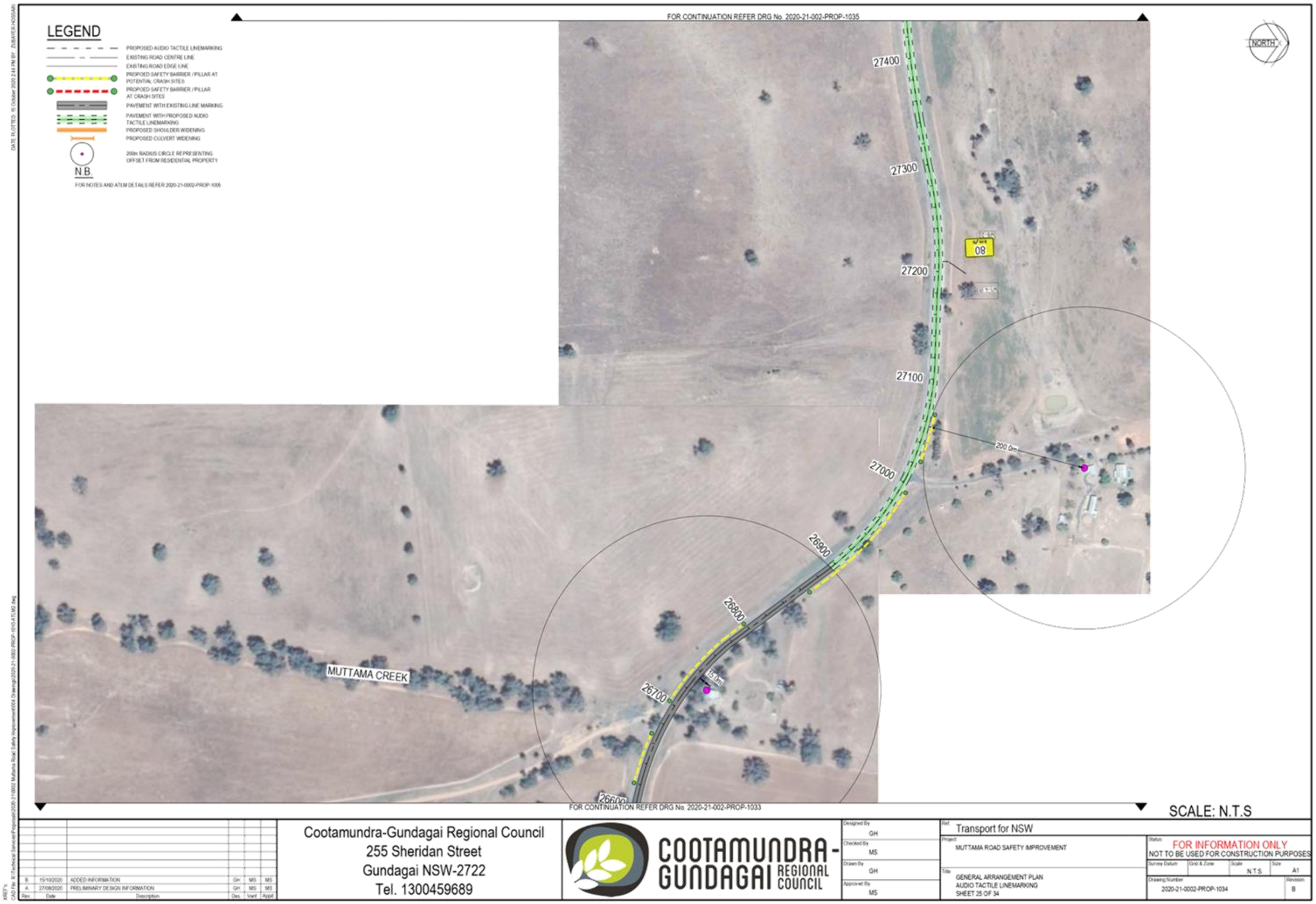

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
NB
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1030
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
22400
22300
22200
22100
22000
21900
21800
21700
21600
150.0m
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1028
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 20 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1029
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd

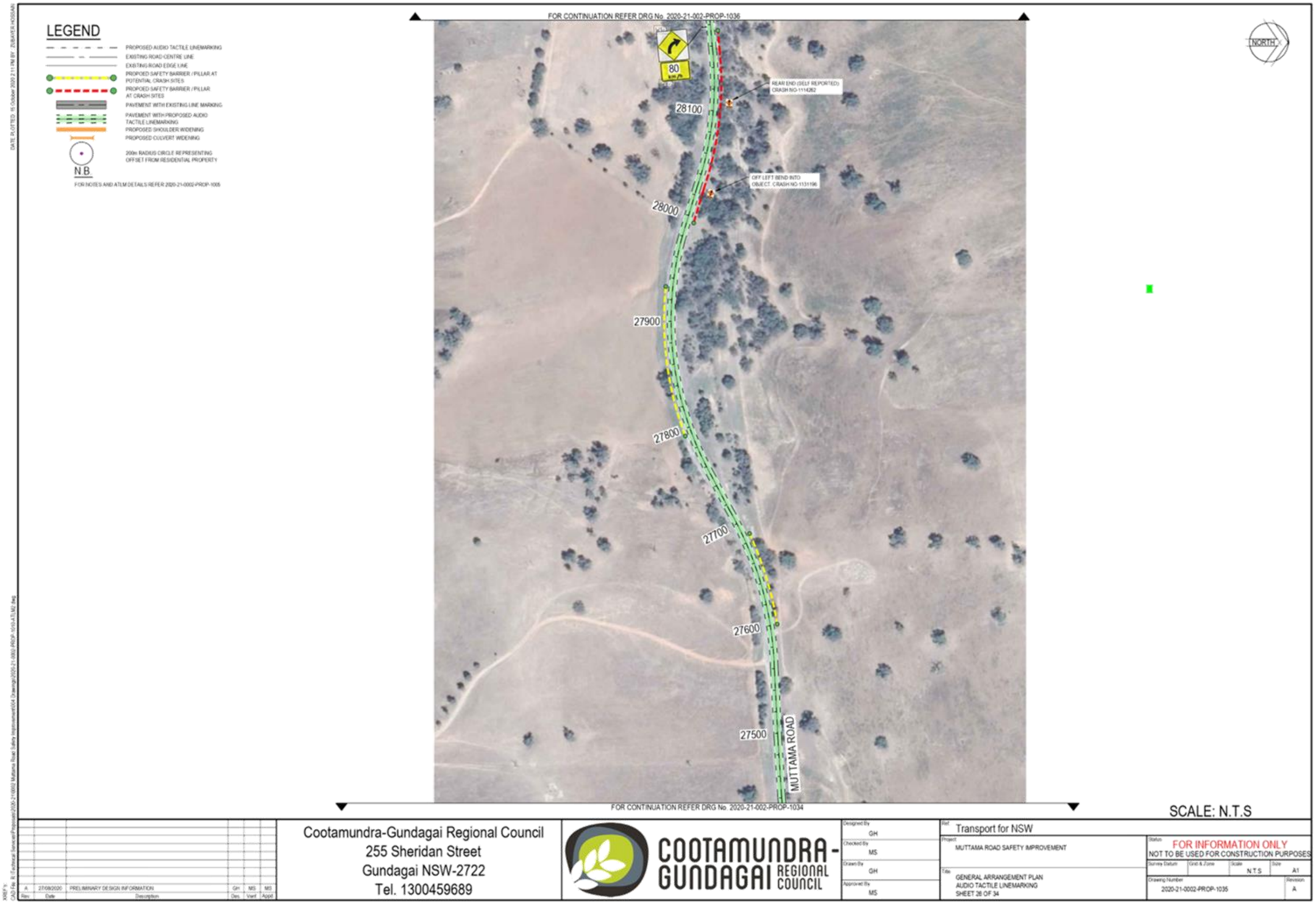

LEGEND
NORTH
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
MUTTAMA CREEK
Muttama Creek
MUTTAMA ROAD
22600
22700
22800
22900
23000
23100
23200
23300
23400
23500
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1029
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1031
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Vrwd Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 21 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum Grid & Zone Scale N.T.S Size A1
Drawing Number 2020-21-0002-PROP-1030 Revision A

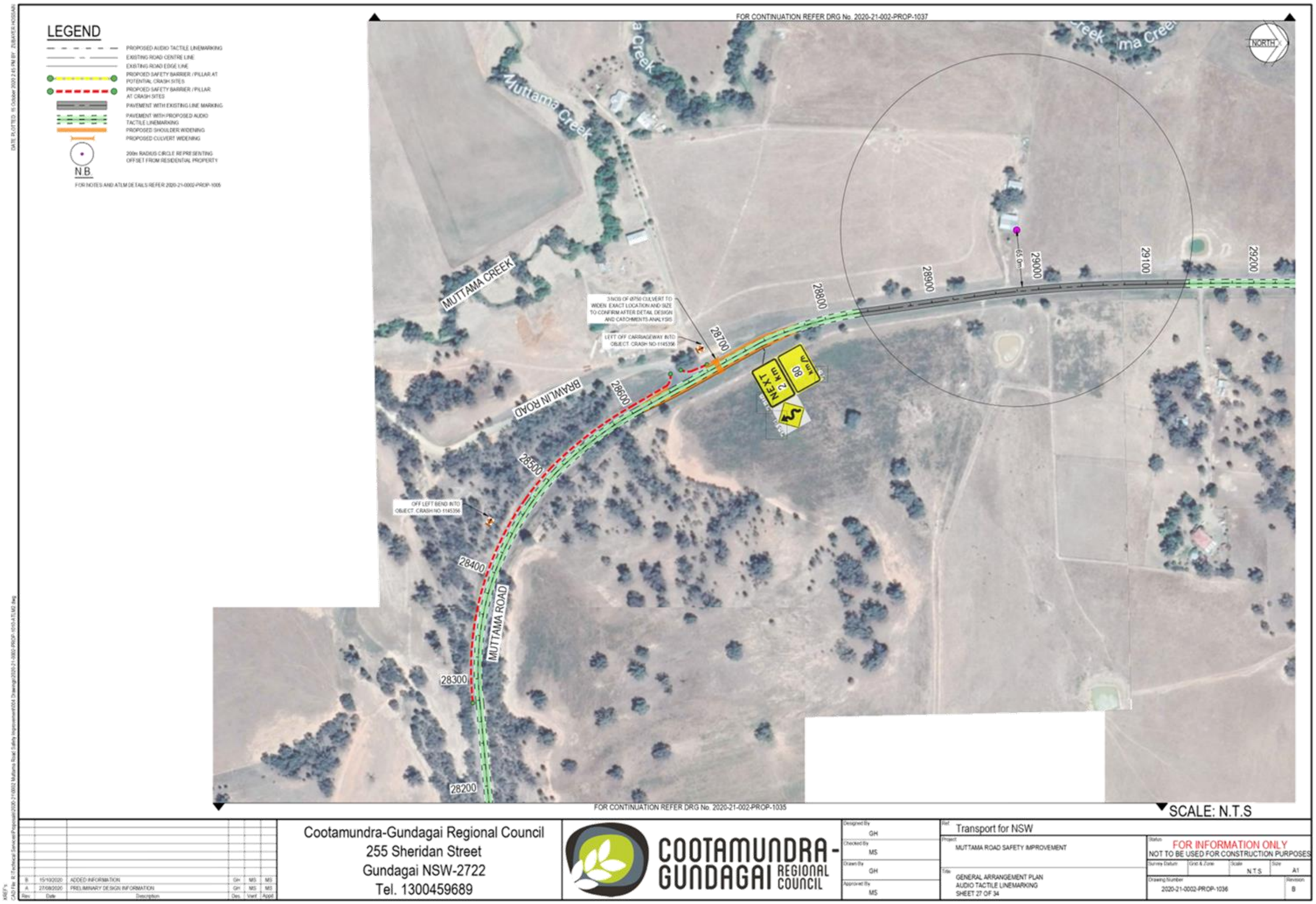

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER : PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER : PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA ROAD
23600
23700
23800
23900
24000
24100
24200
24300
24400
24500
24600
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1030
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1032
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Vert Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 22 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1031
Revision A

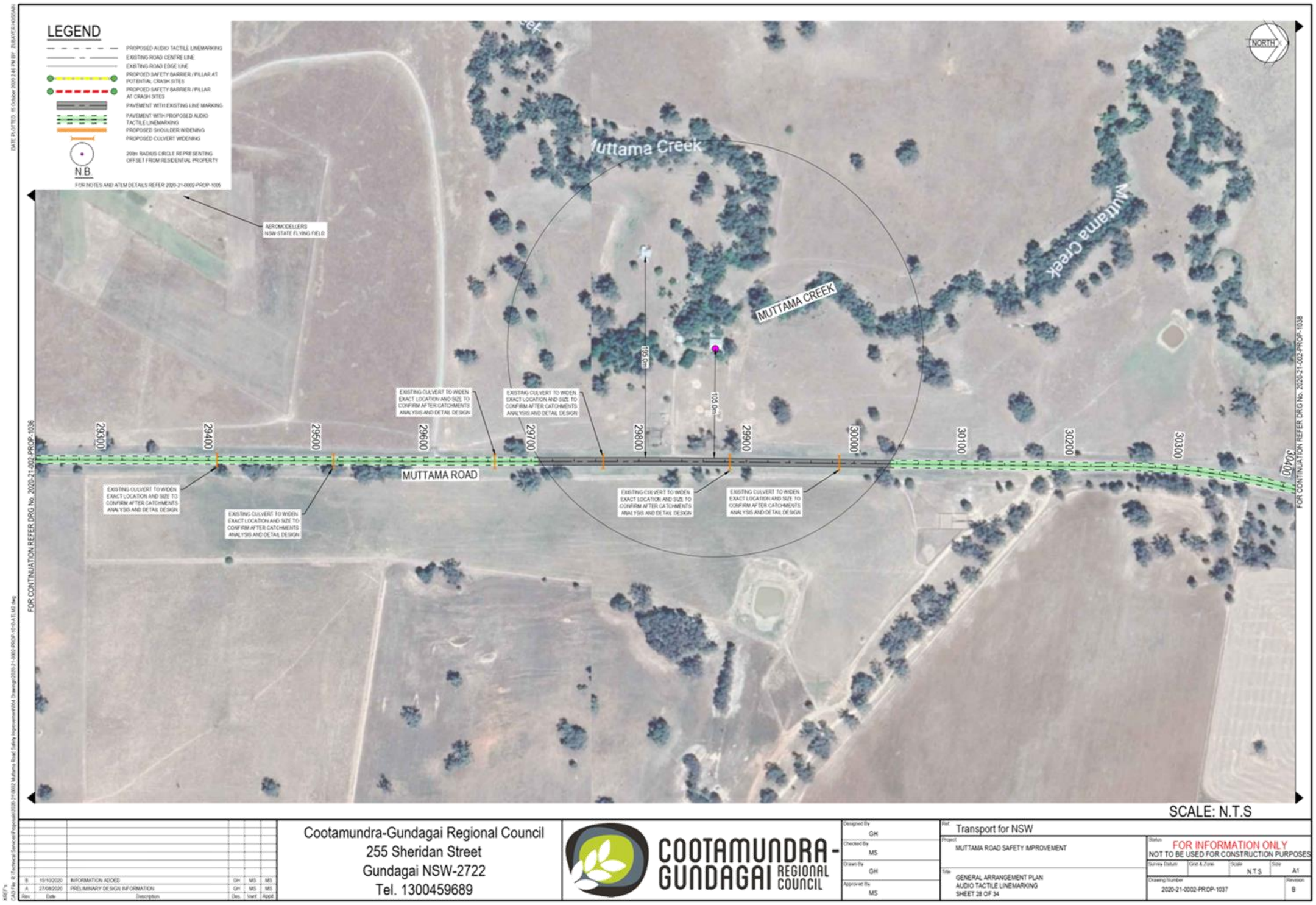

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1033
NORTH
OLD GUNDAGAI ROAD
OFF CWAY RIGHT BEND
CRASH NO-1112059
80
24700
24800
24900
25000
25100
25200
25300
25400
25500
25600
25700
25800
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1031
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Vcert Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 23 OF 34
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum Grid & Zone Scale N.T.S Size A1
Drawing Number 2020-21-0002-PROP-1032 Revision A


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1034
NORTH
26500
NEXT 2 km
80 km/h
MUTTAMA ROAD
Cullinga Creek
26400
26300
26200
26100
MUTTAMA ROAD
26000
08
25900
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1032
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 24 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1033
Revision A

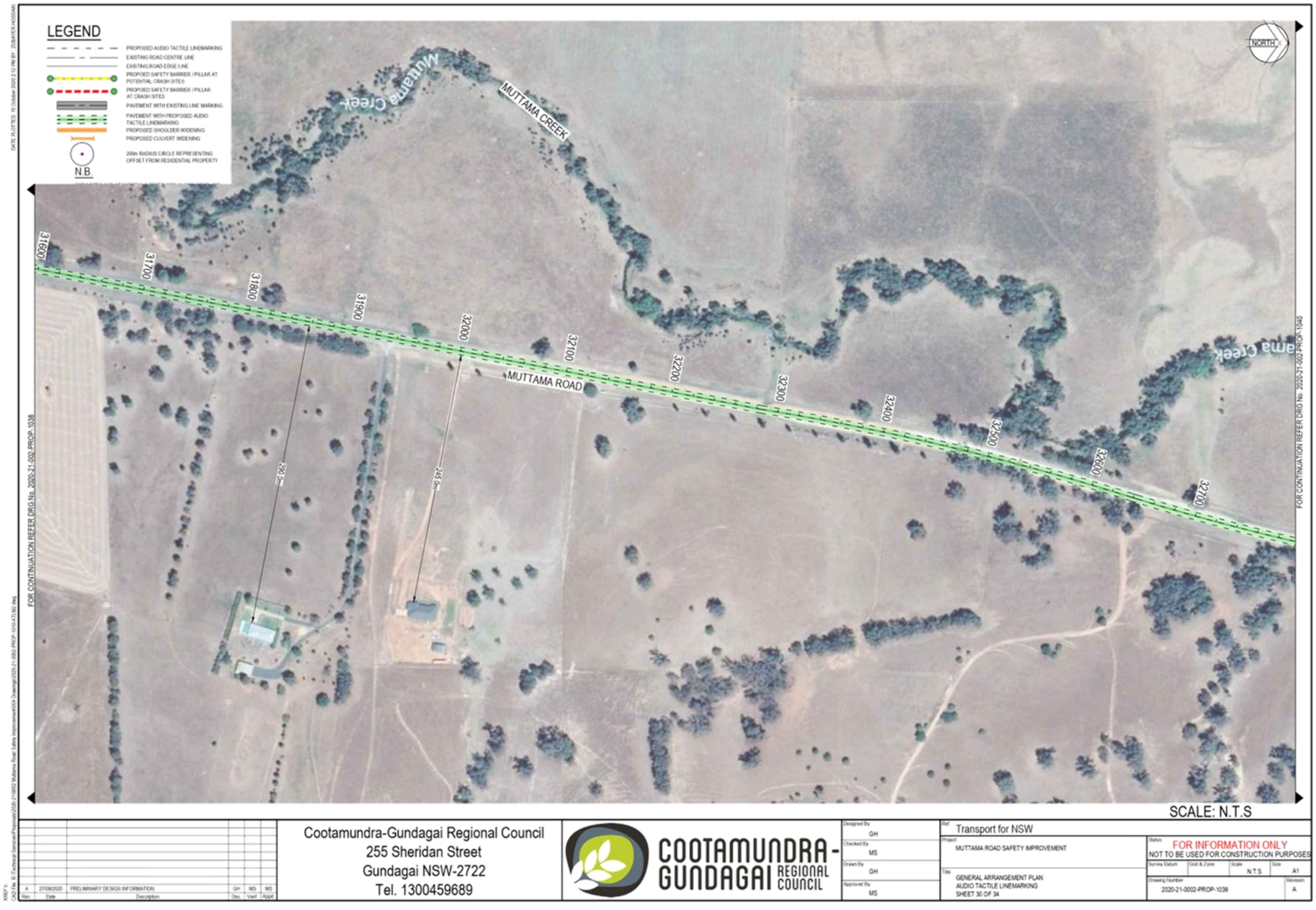

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1035
NORTH
27400
27300
27200
27100
27000
26900
26800
26700
26600
08
200.0m
151m
MUTTAMA CREEK
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1033
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 25 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1034
Revision B
B 15/10/2020 ADDED INFORMATION GH MS MS
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd

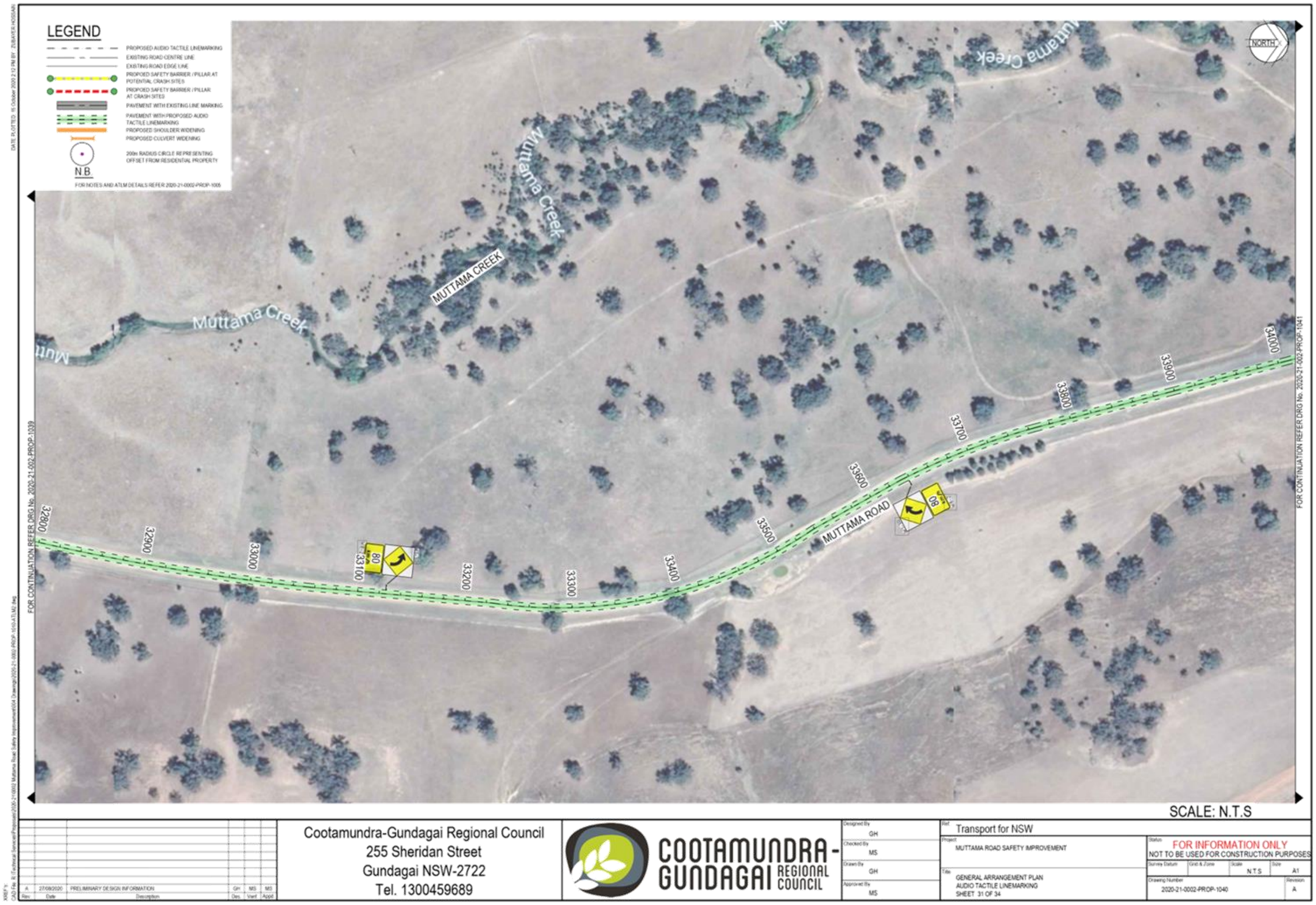

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1036
80
REAR END (SELF REPORTED) CRASH NO-1114282
OFF LEFT BEND INTO OBJECT. CRASH NO-1131196
28100
28000
27900
27800
27700
27600
27500
MUTTAMA ROAD
NORTH
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1034
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Vertf. Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 26 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum Grid & Zone Scale N.T.S Size A1
Drawing Number 2020-21-0002-PROP-1035 Revision A

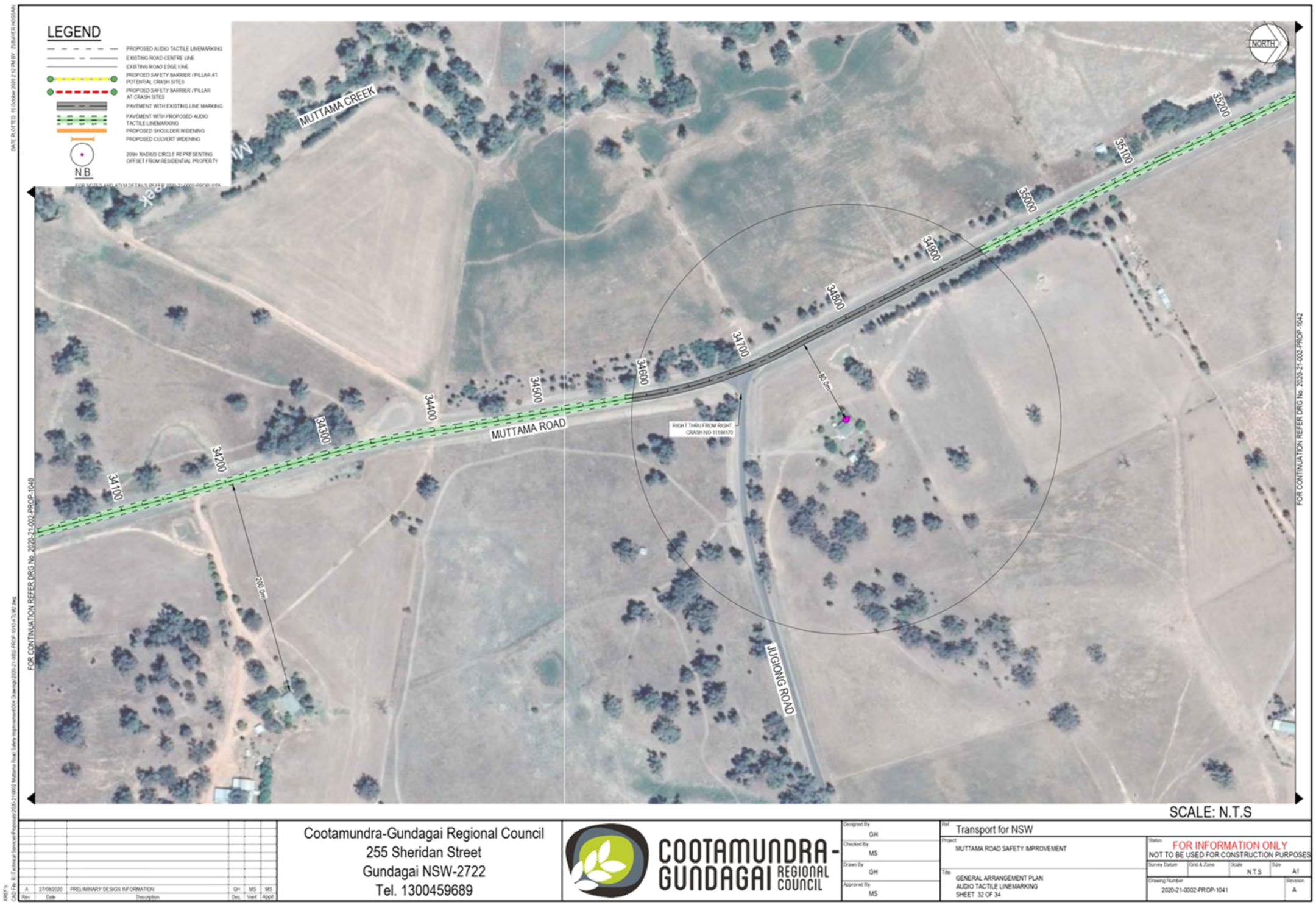

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOSED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1037
NORTH
MUTTAMA CREEK
Muttama Creek
BRAWLIN ROAD
MUTTAMA ROAD
28200
28300
28400
28500
28600
28700
28800
28900
29000
29100
29200
65.0m
3 NOS OF Ø750 CULVERT TO WIDEN. EXACT LOCATION AND SIZE TO CONFIRM AFTER DETAIL DESIGN AND CATCHMENTS ANALYSIS
LEFT OFF CARRIAGEWAY INTO OBJECT. CRASH NO-1145356
OFF LEFT BEND INTO OBJECT. CRASH NO-1145356
NEXT 2 km
80
km/h
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1035
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 27 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1036
Revision B
B 15/10/2020 ADDED INFORMATION GH MS MS
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Vert Appd

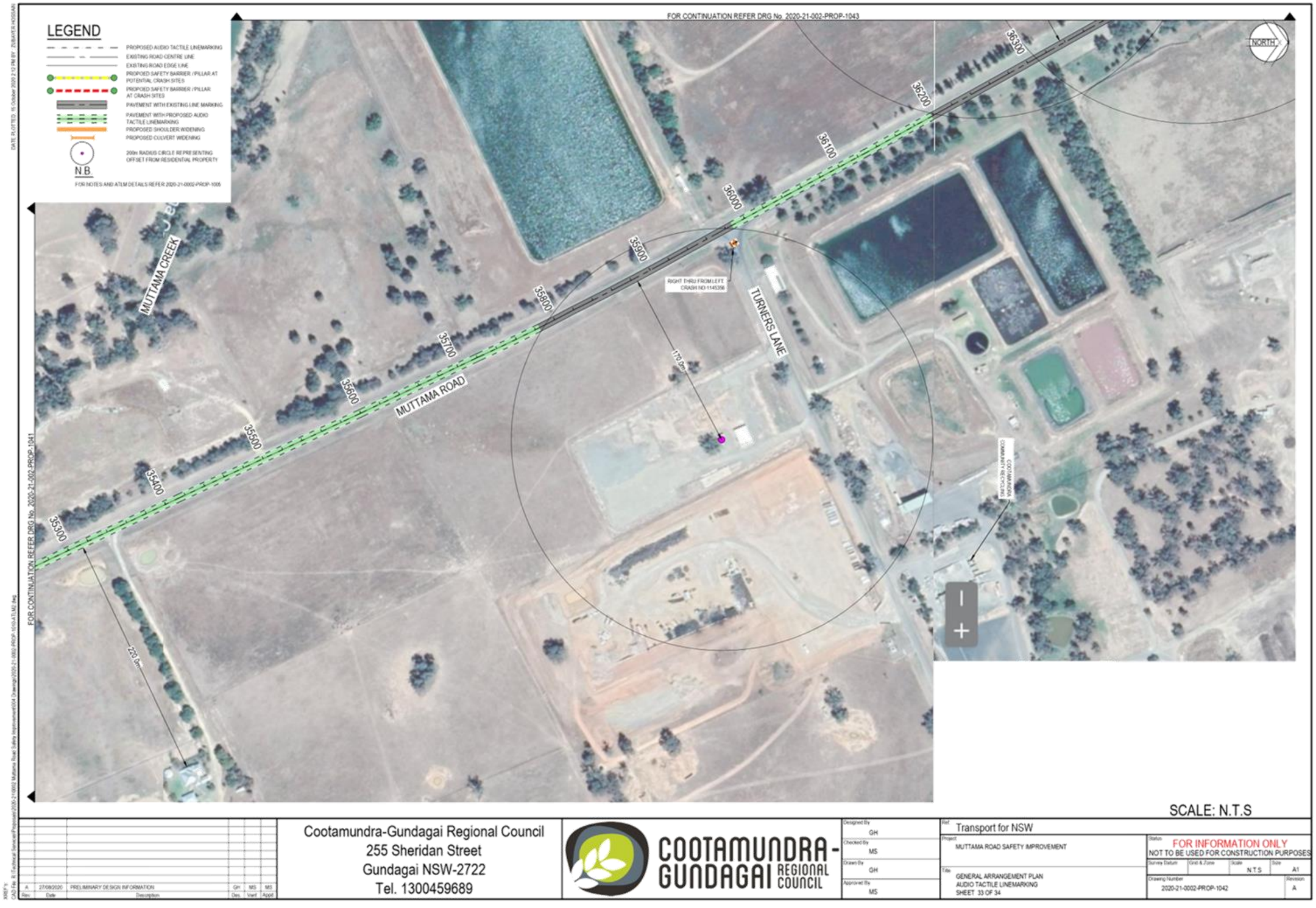

LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
AEROMODELLERS NSW STATE FLYING FIELD
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
195.0m
105.0m
EXISTING CULVERT TO WIDEN EXACT LOCATION AND SIZE TO CONFIRM AFTER CATCHMENTS ANALYSIS AND DETAIL DESIGN
29300
29400
29500
29600
29700
29800
29900
30000
30100
30200
30300
30400
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1036
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1038
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Transport for NSW
MUTTAMA ROAD SAFETY IMPROVEMENT
GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 28 OF 34
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
N.T.S
A1
2020-21-0002-PROP-1037
B
B 15/10/2020 INFORMATION ADDED GH MS MS
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
30500
30600
30700
30800
30900
31000
31100
31200
31300
31400
31500
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1037
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1039
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 29 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1038
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
Muttama Creek
MUTTAMA ROAD
31600
31700
31800
31900
32000
32100
32200
32300
32400
32500
32600
32700
230.0m
245.0m
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1038
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1040
SCALE: N.T.S
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 30 OF 34
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1039
Revision A


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
NORTH
Muttama Creek
MUTTAMA CREEK
MUTTAMA ROAD
32800
32900
33000
33100
33200
33300
33400
33500
33600
33700
33800
33900
34000
80
80
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1039
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1041
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 31 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1040
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
JUGIONG ROAD
34100
34200
34300
34400
34500
34600
34700
34800
34900
35000
35100
35200
200.0m
80.0m
RIGHT THRU FROM RIGHT
CRASH NO-11184170
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1040
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1042
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Transport for NSW
MUTTAMA ROAD SAFETY IMPROVEMENT
GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 32 OF 34
FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
N.T.S
A1
2020-21-0002-PROP-1041
A
27/08/2020
PRELIMINARY DESIGN INFORMATION


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1041
NORTH
MUTTAMA CREEK
MUTTAMA ROAD
TURNERS LANE
RIGHT THRU FROM LEFT CRASH NO 114536
179.9m
220.0m
35300
35400
35500
35600
35700
35800
35900
36000
36100
36200
36300
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Status FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
Title GENERAL ARRANGEMENT PLAN
AUDIO TACTILE LINEMARKING
SHEET 33 OF 34
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1042
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des. Verif. Appd.


LEGEND
PROPOSED AUDIO TACTILE LINEMARKING
EXISTING ROAD CENTRE LINE
EXISTING ROAD EDGE LINE
PROPOSED SAFETY BARRIER / PILLAR AT POTENTIAL CRASH SITES
PROPOED SAFETY BARRIER / PILLAR AT CRASH SITES
PAVEMENT WITH EXISTING LINE MARKING
PAVEMENT WITH PROPOSED AUDIO TACTILE LINEMARKING
PROPOSED SHOULDER WIDENING
PROPOSED CULVERT WIDENING
200m RADIUS CIRCLE REPRESENTING OFFSET FROM RESIDENTIAL PROPERTY
N.B.
FOR NOTES AND ATLM DETAILS REFER 2020-21-0002-PROP-1005
Select starting point
Muttama Creek
MUTTAMA CREEK
MASHS LN
MUTTAMA ROAD
COWCUMBLA ST
GUNDAGAI ROAD
OLD TREATMENT WORKS LN
BOXSELL TRANSPORT
NORTH
36400
36500
36600
36700
36800
36900
37000
37100
37200
37300
152.0m
45.0m
35.0m
150.0m
FOR CONTINUATION REFER DRG No. 2020-21-002-PROP-1042
SCALE: N.T.S
Cootamundra-Gundagai Regional Council
255 Sheridan Street
Gundagai NSW-2722
Tel. 1300459689
COOTAMUNDRA-GUNDAGAI REGIONAL COUNCIL
Designed By GH
Checked By MS
Drawn By GH
Approved By MS
Ref Transport for NSW
Project MUTTAMA ROAD SAFETY IMPROVEMENT
Title GENERAL ARRANGEMENT PLAN AUDIO TACTILE LINEMARKING SHEET 34 OF 34
Status FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES
Survey Datum
Grid & Zone
Scale N.T.S
Size A1
Drawing Number 2020-21-0002-PROP-1043
Revision A
A 27/08/2020 PRELIMINARY DESIGN INFORMATION GH MS MS
Rev Date Description Des Verif Appd