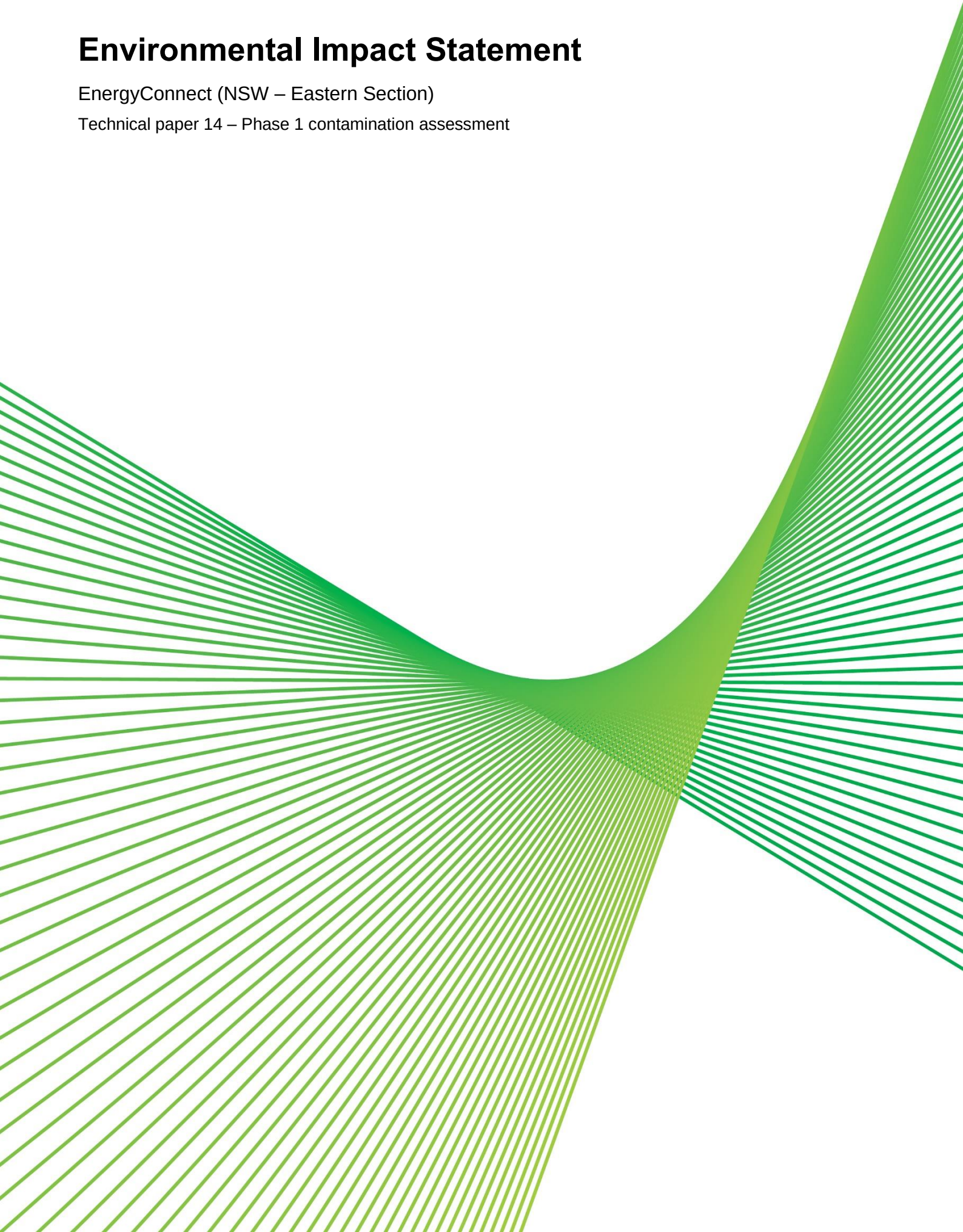


Environmental Impact Statement

EnergyConnect (NSW – Eastern Section)

Technical paper 14 – Phase 1 contamination assessment



Transgrid

EnergyConnect (NSW – Eastern Section)

Technical Paper 14 –
Contaminated Land Management
Impact Assessment

DECEMBER 2021





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Glossary

Aeolian	Sediments deposited by the action of wind, such as dunes.
Alluvial	Sediments deposited by flowing water.
Alluvium	A general term for unconsolidated deposits of inorganic materials (clay, silt, sand, gravel, boulders) deposited by flowing water.
Aquifer	Rock or sediment in a formation, group of formations or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.
Bore	Artificially constructed or improved groundwater cavity used for the purpose of accessing or recharging water from an aquifer. Interchangeable with borehole, piezometer.
Borehole	Includes a well, excavation, or other artificially constructed or improved groundwater cavity which can be used for the purpose of intercepting, collecting or storing water from an aquifer; observing or collecting data and information on water in an aquifer; or recharging an aquifer. Interchangeable with bore, well, piezometer.
Clay	Deposit of particles with a diameter of less than 0.002 mm, typically contains variable amounts of water within the mineral structure and exhibits high plasticity.
Conceptual model	A simplified and idealised representation of the physical contamination setting and the understanding of the contamination pathways of the system.
Confined aquifer	An aquifer bounded above and below by impervious (confining) layers. In a <i>confined aquifer</i> , the water is under sufficient pressure so that when wells are drilled into the aquifer, measured water levels rise above the top of the aquifer.
Construction impact area	Refers to the area that would be directly impacted by construction of the proposal comprising the following: — Construction of all proposal infrastructure elements (including the proposed transmission line alignment, transmission line easement, substation site works (at both the proposed Dinawan 330kV and upgraded and expanded Wagga Wagga substations), optical repeater infrastructure, and other ancillary works). — Locations for construction elements such as construction compounds and accommodation camps, access tracks (excluding public roads proposed to be used for access routes), site access points, water supply points, laydown and staging areas, concrete batching plants, brake/winches sites and site offices. The area is identified based on realistic project component locations and areas however it is indicative at this stage. The area would be confirmed during finalisation of the design and construction methodology and would be developed as part of the consideration of avoidance and impact minimisation. This area includes the operational impact area (including areas required for maintenance) (refer definition below).

Contamination study area	The study area for this EIS, which comprises a one kilometre wide corridor between the Buronga substation and the Wagga Wagga substation. The contamination study area has been applied to identify the constraints nearby to the proposal which may or may not be indirectly impacted by the proposal. Access tracks could be located within the contamination study area. The study area also includes a number of accommodation/laydown areas: — Balranald construction compound — Cobb Highway construction compound and accommodation camp — Dinawan construction compound and accommodation camp — Lockhart construction compound and accommodation camp, and — Wagga Wagga construction compound. A series of water fill points (both potable and non-potable) are also included in the study area which are required for construction activities such as concrete batching and dust-suppression. These have been detailed further in the report.
Disturbance area A	Refers to an area at and around the transmission line towers, areas for brake and winch sites and for new/upgraded access tracks in which vegetation would be removed during construction. The area also includes the proposed Dinawan substation site, the existing Wagga Wagga substation site and each of the main construction compounds and accommodation camps at Balranald, the Cobb Highway, Dinawan (Kidman Way), Lockhart and Wagga Wagga. It would include vegetation (including tree) removal and potential sub-surface impacts through construction activities such as grading, excavation, and full tree removal (i.e. root ball removal). Except in areas where only temporary disturbance is required (i.e. temporary access tracks and brake and winch sites), this area would also be subject to ongoing maintenance during operation (i.e. removal to ground level) for operational and safety requirements (including bushfire). This zone is a subset to the construction impact area (see definition above).
Disturbance area A (centreline)	Refers to a centreline area between the proposed transmission line towers in which all vegetation (including trees) would be removed during construction to ground level. In areas of known or potential heritage subsurface sensitivity (i.e. potential archaeological deposits (PADs)) sub-surface impacts in these areas would be avoided. In these areas vegetation would be cut to ground level and root balls would be retained as necessary to avoid subsurface impacts. This area would also be subject to ongoing maintenance during operation (i.e. removal to maintain vegetation clearance requirements) for operational and safety requirements (including bushfire). This zone is a subset to the construction impact area (see definition above).

Disturbance area B	Refers to an area between transmission line towers in the easement in which removal of vegetation (including trees) would be undertaken where they have the potential to exceed vegetation clearance heights. This removal may result in temporary ground disturbance. Vegetation clearance heights are set by Transgrid for operational and safety requirements, including bushfire risk management. This area would also be subject to ongoing maintenance during operation. This zone is a subset to the construction impact area (see definition above).
Discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second. Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving (e.g. metres per second).
Draw-down	The change in groundwater level in a bore, or the change in water table elevation in an unconfined groundwater system, due to the extraction of groundwater.
Earthworks	All operations involved in loosening, excavating, placing, shaping and compacting soil or rock.
Fluvial	Synonymous with alluvial. Refer to alluvial for definition.
Formation	A general term used to describe a sequence of soil or rock layers.
Groundwater	Water found in the subsurface in the saturated zone below the water table or piezometric surface, i.e. the water table marks the upper surface of groundwater systems.
Groundwater flow	The movement of water through openings and pore spaces in rocks below the water table, i.e. in the saturated zone.
Groundwater resource	Groundwater available for beneficial use, including human usage, aquatic ecosystems and the greater environment.
Hydrogeology	The study of the interrelationships of geological materials and processes with water, especially groundwater.
Impact	An event that disrupts ecosystem, community, or population structure and alters the physical environment, directly or indirectly.
Monitoring bore	A bore used to monitor groundwater levels or quality.
Operational impact area	Refers to the area that would be directly impacted by permanent components of the proposal, including all proposed infrastructure elements such as the proposed transmission line easement, transmission line and transmission towers, any new or upgraded substation infrastructure and permanent access tracks.
Permeability	The ease with which a fluid can pass through a porous medium and is defined as the volume of fluid discharged from a unit area of an aquifer under unit hydraulic gradient in unit time (metres per day).
Preliminary alignment corridor	A 10 kilometre corridor identified during the initial assessment of transmission line corridor options which is generally based on desktop assessments only.

Proponent, the	The proposal is proposed to be undertaken by NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (referred to as Transgrid). Transgrid is the operator and manager of the main high voltage (HV) transmission network in NSW and the Australian Capital Territory (ACT), and is the Authorised Network Operator (ANO) for the purpose of an electricity transmission or distribution network under the provisions of the <i>Electricity Network Assets (Authorised Transactions) Act 2015</i> .
Proposal, the	The proposal is known as 'EnergyConnect (NSW – Eastern Section)' as described in Chapter 5 and Chapter 6 of the main Environmental Impact Statement.
Recharge	<i>Recharge</i> is defined as the process by which water is added from outside to the zone of saturation of an aquifer, either directly into a formation, or indirectly by way of another formation.
Run-off	All surface and subsurface flow from a catchment, but in practice refers to the flow in a river, i.e. excludes groundwater not discharged into a river.
Semi-confined aquifer	An aquifer that is partly confined by layers of lower permeability material through which recharge and discharge may occur also referred to as a leaky aquifer.
Sensitive receivers	Land uses landscape features and activities that are sensitive to changes in the environment such as water quality and quantity, noise, vibration, air and visual impacts. Sensitive receivers may include aquatic ecosystems, aquaculture areas, residential dwellings, schools and recreation areas.
Standing water level	The height to which groundwater rises in a bore after it is drilled and completed, and after a period of pumping when levels return to natural atmospheric or confined pressure levels.
Transmission line easement	An area surrounding and including the transmission lines, which is a legal right allowing for construction of the transmission line, along with ongoing access and maintenance of the lines and will be acquired from landholders either by agreement or pursuant to compulsory acquisition process. The easement width would be 80 metres wide.
Water table	The surface in an unconfined aquifer or confining bed at which the pore water pressure is atmospheric; it can be measured by installing shallow wells extending a few feet into the zone of saturation and then measuring the water level in those wells.

Abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
BOM	Bureau of Meteorology
COC	Chain of Custody
CEMP	Construction and Environment Management Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DO	Dissolved Oxygen
EC	Electrical Conductivity
EIS	Environmental impact statement
ESCP	Erosion and salinity control plan
EPL	Environment Protection Licence
GIS	Graphical information systems
HSL	Health Screening Level
LDL	Laboratory Detection Limits
LOR	Limit of Reporting
µg	Micrograms
mBGL	Meters below ground level
mg	Milligrams
MW	Monitoring Well
MLDRR	Murray and Lower Darling Regulated Rivers
MDBA	Murray Darling Basin Authority
MDBPR	Murray Darling Basin Porous Rock
NATA	National Association of Testing Authorities
NGIS	National groundwater information system
NSW EPA	New South Wales Environmental Protection Agency
ORP	Oxygen Reducing Potential
PFAS	Per- and Poly-fluorinated Alkyl Substances
PFHxS	Perfluorohexanoic Acid

PFOS	Perfluorooctane Sulfonate
PFOA	Perfluorooctanoic Acid
PSH	Phase Separated Hydrocarbons
PAH	Polycyclic Aromatic Hydrocarbons
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
TOC	Top of Case (of monitoring well)
TRH	Total Recoverable Hydrocarbons
pH	Unit of measurement for acidity and alkalinity
vTRH	Volatile Total Recoverable Hydrocarbons (C ₆ to C ₁₀)
WSP	WSP Australia

Executive summary

EnergyConnect (NSW – Eastern Section)

Transgrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north-west Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

The proposal, focusing on the eastern section of EnergyConnect in NSW, would include the construction and operation of new 330kV transmission lines between the existing Buronga substation and existing Wagga Wagga substation, a new 330kV substation (referred to as the proposed Dinawan 330kV substation), upgrade and expansion of the existing Wagga Wagga 330kV substation as well as other ancillary infrastructure.

Overview of environmental assessment results

Construction

The contamination study area has been largely used as agricultural land with no significant development modification observed, and it is unlikely to undergo significant modification during the period of proposed construction of the proposal. Agricultural land uses dominate the contamination study area with over 60 per cent of the contamination study area being native undisturbed vegetation utilised for grazing which poses a very low risk of contamination. There is no evidence to suggest that gross contamination would be identified in soils and groundwater across the contamination study area.

Potential contamination sources were identified on-site and in the vicinity of the contamination study area, and where identified are limited to the proposed Dinawan 330kV and existing Wagga Wagga substations, existing transmission infrastructure, cleared agricultural land, farm dams and a potential quarry. The majority of these area of concern have been assessed to pose a low risk during construction, with areas of cleared agricultural land and a potential quarry assigned a medium risk.

Identified off-site sources of contamination located within the contamination study area include services station sites and PFAS investigation sites. Given the expected depth to groundwater the minimal volumes of groundwater expected to interact with proposal infrastructure features during construction the potential for significant groundwater contamination beneath the site is also considered to be low. If groundwater interaction is anticipated further investigation is recommended to be carried out at the water fill locations potentially impacted by PFAS.

While dryland salinity has been identified as posing a potential issue to the construction and management of the proposal, these are not expected to result in a high risk to the proposal. The probability of encountering acid sulfate soils (ASS) within most of the contamination study area is low. However low-lying areas surrounding former lakes and river beds are mapped as having a high probability of acid sulfate soil occurrence and if encountered subsurface material may pose an acid generation risk if exposed to oxygen during redevelopment. This potential issue would need to be addressed, if identified on site, through an appropriate management plan (developed with reference to the Acid Sulfate Soils Management Advisory Committee (ASSMAC) Assessment Guidelines (1998), with active on-going management through the construction phase as prescribed within the plan (as required).

The proposal has the potential to create contamination and other soil impacts on the surrounding environment if not managed appropriately. The construction environmental management plan (CEMP) would specify measures to minimise these potential impacts. Measures would relate to minimising the potential for spills and leaks from materials, plant and equipment, protocols for responding to incidents, erosion and sediment controls, and unexpected contamination finds procedure.

Operation

Operation of the proposal is not expected to result in exposure of the surrounding environment and users (e.g. maintenance workers or farmers) to potentially contaminated soil or groundwater. Soil disturbance activities required under the general maintenance procedures would be limited to removal of regrowth if present along sections of the easement.

The operational impacts related to the proposal would be potential hydrocarbon (fuels, diesel, oils) contamination of soil, surface water and groundwater arising from incidents involving vehicle accidents, leaks and spills in the transmission line easement or at the proposed Dinawan 330kV and existing Wagga Wagga substations. Spill volumes from such incidents would be expected to be minor; however, the potential for hydrocarbon fuel to migrate off-site cannot be discounted. Spill containment facilities would be used on maintenance work sites and at the proposed Dinawan 330kV and existing Wagga Wagga substations and incident response procedures would be developed to manage the risk from these occurrences.

Conclusion

The risks associated with the proposal are considered to be low subject to the implementation of the mitigation measures, as detailed in this report, which would ameliorate or minimise any expected impacts to generally acceptable levels. Any residual risk would be managed through CEMP measures and management controls during site development. An unexpected contamination finds protocol has been identified for construction and post-construction management should contamination issues be identified during further investigation or uncovered during construction. Operational phase contamination risk management would be manageable with appropriate spill containment measures and incident response.

1 Introduction

1.1 Proposal context and overview

Transgrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity transmission operator in South Australia (SA)) are seeking regulatory and environmental planning approval for the construction and operation of a new High Voltage (HV) interconnector between NSW and SA, with an added connection to north west Victoria. Collectively, the proposed interconnector is known as EnergyConnect.

EnergyConnect aims to reduce the cost of providing secure and reliable electricity transmission between NSW and SA in the near term, while facilitating the longer-term transition of the energy sector across the National Electricity Market (NEM) to low emission energy sources.

EnergyConnect has been identified as a priority transmission project in the NSW Transmission Infrastructure Strategy (NSW Department of Planning and Environment (DPE), 2018), linking the SA and NSW energy markets and would assist in transporting energy from the South-West Renewable Energy Zone to major demand centres.

EnergyConnect comprises of several sections (shown on Figure 1-1) that would be subject to separate environmental planning approvals under the relevant jurisdictions. It includes:

- NSW sections including:
 - Western Section, which would extend from:
 - the SA/NSW border (near Chowilla in SA) to Transgrid's existing Buronga substation
 - Buronga substation to the NSW/Victoria border at Monak (near Red Cliffs in Victoria)
 - Eastern Section, which would extend from the Buronga substation to the existing Wagga Wagga substation
- a Victorian Section, which would extend from the NSW/Victoria border to Red Cliffs substation
- a SA Section, which would extend from Robertstown to the SA/NSW border.

Transgrid is currently seeking planning approval for the NSW – Eastern Section (the proposal), which is the subject of this EIS.

Transgrid has previously sought and received separate environmental planning approvals for the NSW – Western Section of EnergyConnect and Victorian Section. ElectraNet is responsible for obtaining environmental planning approval for the section of EnergyConnect located in SA.

1.1.1 *Proposal objectives*

The primary objective for EnergyConnect (which the proposal comprises an extensive component of) is to reduce the cost of electricity by providing secure electricity transmission between NSW and SA in the near term and facilitate the longer-term transition of the energy sector across the NEM to low emission energy generation sources. More specifically, EnergyConnect (including the proposal) aims to:

- lower power prices
- improve energy security
- increase economic activity
- support the transition to a lower carbon emission energy system
- support a greater mix of renewable energy in the NEM.



Figure 1-1 Overview of EnergyConnect

1.2 The proposal

Transgrid is seeking approval under Division 5.2, Part 5 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) to construct and operate the proposal. The proposal has been declared as Critical State significant infrastructure under Section 5.13 of the EP&A Act.

The proposal was also declared a controlled action on 30 September 2020 and requires a separate approval under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act 1999*. The proposal is subject to the bilateral assessment process that has been established between the Australian and NSW governments.

1.3 Proposal overview

1.3.1 Key proposal features

The key components of the proposal include:

- about 375 kilometres of new 330 kilovolt (kV) double circuit transmission line and associated infrastructure between the Buronga substation and the proposed Dinawan 330kV substation
- connection of the proposed transmission lines to the existing Buronga 330kV substation
- construction of a new 330kV substation around 30 kilometres south of Coleambally, referred to as the proposed Dinawan 330kV substation
- connection of the proposed transmission lines to the proposed Dinawan substation
- about 162 kilometres of new 500 kilovolt (kV) double circuit transmission line and associated infrastructure between the proposed Dinawan substation and the existing Wagga Wagga substation at Wagga Wagga, NSW

- upgrade and expansion of the Wagga Wagga substation to accommodate the new transmission line connections including the installation of three new line bays, relocation and upgrade of existing two reallocated bays and associated electrical and civil works (road, kerb, gutter, drainage works and earthworks)
- provision of three optical repeater structures and associated connections to existing local electrical supplies
- new and/or upgrade of access tracks as required
- ancillary works required to facilitate the construction of the proposal (e.g. laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps).

An overview of the proposal is provided in Figure 1-2. Further detail on the key infrastructure components of the proposal and construction activities are provided in Chapter 5 and Chapter 6 of the main environmental impact assessment respectively.

1.3.2 Construction

1.3.2.1 Key construction works

Key construction works for the proposal would typically include (but not be limited to):

- site establishment works, which may include (but not be limited to):
 - establishment of construction compound and accommodation sites, access tracks and service relocations
 - vegetation clearance
 - transportation of equipment such as steelwork, high voltage plant and switchgear between dock and site as part of the construction works
- ancillary works to facilitate the construction of the proposal (e.g. intermediate laydown and staging areas, concrete batching plants, brake/winch sites, site offices and accommodation camps)
- construction of the proposed transmission lines, which would include (but not be limited to):
 - access tracks to accommodate safe access of construction machinery and materials to each transmission line tower site
 - earthworks (including establishment of construction pads) and the construction of footings and foundations for each transmission line tower
 - erection of the new transmission line towers using crane(s) and or helicopter(s)
 - stringing of the conductors and overhead earth wires and optical ground wire
 - installation of earthing conductors
 - testing and commissioning of the transmission lines
- construction of the proposed Dinawan 330kV substation, which would include (but not be limited to):
 - civil construction works including earthworks
 - slab construction at the new substation site
 - electrical fit out with new substation equipment
 - testing and commissioning of the new substation equipment
- upgrade and expansion of the existing Wagga Wagga substation to enable the proposed connection and operation of the new transmission lines which would include (but not be limited to):
 - civil construction works including earthworks and slab construction at the expanded substation site
 - electrical fit out with new substation equipment
 - testing and commissioning of the new substation equipment
- connection of the proposed transmission lines to the Buronga substation
- demobilisation and remediation of areas disturbed by construction activities.

A detailed description of construction works for the proposal is further described in Chapter 6 of the Environmental Impact Statement (EIS).

1.3.2.2 Construction program

Construction of the proposal would commence in late-2022 (enabling works phase), subject to NSW Government and Commonwealth planning approvals.

The construction of the transmission lines and substation facilities would take around 18 months. The upgraded and expanded Wagga Wagga substation and new Dinawan 330kV substation are expected to be operational by late-2024. Site decommissioning and remediation would extend around six months beyond the commissioning (operational) phase, with estimated completion in mid-2025.

The final program would be confirmed as part of finalisation of the proposal infrastructure following approval of the proposal.

1.3.2.3 Indicative duration of transmission line construction activities

Construction at each transmission line tower would be intermittent and construction activities would not occur for the full duration at any one location. Figure 1-3 presents an indicative duration of construction activities associated with the transmission line towers. These durations could vary and breaks between activities may be shorter which may lead to longer inactive periods in subsequent stages of construction at an individual transmission line tower. Durations of any particular construction activity, and respite periods, may vary for a number of reasons including (but not limited to), multiple work fronts, resource and engineering constraints, works sequencing and location.

These activities would also have multiple work fronts, therefore (for example) foundation works or tower erection would be occurring in several locations along the easement at the same time.

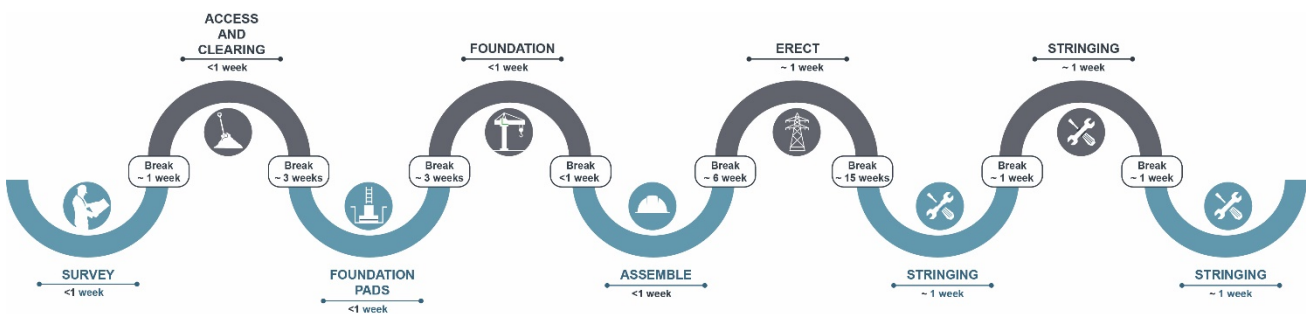


Figure 1-3 Indicative duration of construction activities at transmission line towers

1.4 Purpose of this technical report

This technical paper is one of a number of technical papers that form part of the EIS for the proposal.

The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to contaminated land management. It responds directly to the Secretary's environmental assessment requirements (SEARs) (refer to Section 1.4.1). This technical paper:

- identifies areas of environmental concern (AEC) which have the potential to impact on the proposal with respect to contamination
- identifies areas of acid sulfate soils (ASS), saline soil or naturally occurring asbestos which may be disturbed during the project
- outlines mitigation and management measures for potential impacts
- assesses the impacts of constructing and operating the proposal on human health and environmental receivers
- documents how to undertake further assessment (if required) in accordance with current guidelines.

This assessment comprises a preliminary (also referred to as Phase 1) investigation which assesses the potential for contamination to exist based on a desktop study.

1.4.1 Secretary's environmental assessment requirements

The NSW Department of Planning, Industry and Environment (DPIE) has SEARs for the EIS. The requirements specific to this assessment and where these aspects are addressed in this technical report are outlined in Table 1-1.

Table 1-1 Summary of key components of the proposal

REFERENCE	SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	WHERE ADDRESSED
Key issues	An assessment of the risk of soil contamination and disturbance of land associated with naturally occurring asbestos in the vicinity of the site.	Chapter 5 and Chapter 6

1.5 Structure of this report

The structure and content of this report is as follows:

- *Chapter 1 – Introduction:* Outlines the background and need for the proposal, and the purpose of this report.
- *Chapter 2 – Legislative and policy context:* Provides an outline of the key legislative requirements and policy guidelines relating to the proposal.
- *Chapter 3 – Methodology:* Provides an outline of the methodology used for the preparation of this report.
- *Chapter 4 – Existing environment:* Describes the existing environment with reference to the potential for contaminated land and groundwater.
- *Chapter 5 – Assessment of construction impacts:* Describes the potential construction impacts associated with the proposal.
- *Chapter 6 – Assessment of operational impacts:* Describes the potential operational impacts associated with the proposal.
- *Chapter 7 – Cumulative impacts:* Outlines the potential cumulative impacts with respect to other known developments within the vicinity of the proposal.
- *Chapter 8 – Mitigation measures:* Outlines the proposed mitigation measures for the proposal.
- *Chapter 9 – Conclusion:* Provides a conclusion of the potential impacts of the proposal with reference to the potential for contaminated land and groundwater.
- *Chapter 10 – Limitations:* Identifies the general limitations considered in the preparation of this report.
- *Chapter 11 – References:* Identifies the key reports and documents used to generate this report.

The appendix to this report is as follows:

- *Appendix A – Unexpected Finds Procedure.*

1.6 Limitations

The assessment is based on a model developed by specialist contaminated land consultants from WSP and data from the accompanying WSP Create, an online system. No physical site inspection or survey has been carried out. Therefore, the assessment is based on datasets which were available at the date of the assessment and findings from available investigations. These datasets are continually updated as more information becomes available, and additional data obtained in the future may change the outcome of the assessment. As such, no expressed warranty is given by WSP in relation to the accuracy or completeness of the data reported, the actual state or condition of the property, or the suitability of the site for any current or proposed use.

The datasets in the WSP Create portal were selected to provide an indication of the presence of contamination on and surrounding the site. However, they may not identify all historical uses and activities which may have caused the site and/or its surrounds to become contaminated. In particular, many sites are impacted by the presence of asbestos in fill material from unknown sources usually associated with poor demolition practices, for which a dataset is not available.

The assessment provides an indication of the likelihood of contamination to be present at, or impact, the site. It does not constitute advice as to the value of the site, or the suitability of the site for purposes other than the proposal. It also does not consider any environmental investigations or remediation works which may have been undertaken across the contamination study area as this information was not available to WSP during the phase 1 investigation.

2 Legislative and policy context

The following section provides an overview of the legislative and policy context relevant to the proposal.

2.1 Protection of the Environment Operation Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legislative framework for the protection and enhancement of the environment in NSW. Its primary objectives are to reduce risks to harmless levels through pollution prevention, cleaner production, application of waste management hierarchy, continual environmental improvement and environmental monitoring.

2.2 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) is part of the management framework for contaminated land in NSW. The act enables the NSW Environment Protection Authority (the EPA) to respond to and manage site contamination when it considers that contamination is significant enough to require regulation. Site contamination requires regulation under the CLM Act when a site is declared ‘significantly contaminated land’ (defined as land described in a notice having effect under section 11 of the CLM Act) or when land is subject to a management order or an approved voluntary management proposal. Lands within the contamination study area have not been declared ‘significantly contaminated’ and are not subject to a management order.

Section 105 of the CLM Act allows the EPA to make or approve guidelines for the purposes connected with the objectives of the CLM Act.

Contaminated sites not regulated by the EPA can be managed through the planning process by the relevant planning consent authority.

2.3 State Environmental Planning Policy 55 – Remediation of Land

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55) pertains to, and aims to, promote the remediation of contaminated land. Through the development application process, planning authorities (local councils, in particular) are required to assess the contamination status of land prior to granting development consent. SEPP 55 lists remediation work that may be undertaken without the consent of the consent authority.

In accordance with clause 7(1) of SEPP 55, a consent authority must not consent to carrying out development on land unless it has considered whether the land is contaminated. Sections of the proposed work would occur within or adjacent to an existing transmission corridor and existing substation facility. Based on the potential for contamination from the existing land uses the development approval needs to be able to consider if the existing information is sufficient to make planning decisions. This report has been undertaken to determine the potential for contamination and provide a recommendation on next steps in relation to contamination (if any).

2.4 National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended in 2013

The *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended in 2013 (NEPM 2013) is made under the *National Environment Protection Council Act 1994* and is given effect by individual legislation and guidelines in each state and territory. The NEPM 2013 is approved by the EPA under section 105 of the CLM Act. The purpose of the measure is to establish a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices by the community, which includes regulators, site assessors, environmental auditors, landowners, developers and industry.

The desired environmental outcome for this measure is to provide adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

Authorities (at local and state government level) that consent to development or changes in land use consider the land's suitability for its intended use. To determine if a site is suitable, a site's history of use and whether it is indicative of potential contamination should be considered.

Under the NEPM 2013, site contamination assessment is generally carried out in stages involving progressively more detailed levels of data collection and analysis, such as preliminary (Phase 1) site investigations, detailed site investigations and site-specific risk assessment. This technical report is a preliminary (Phase 1) investigation, which assesses the potential for contamination to exist based on a desktop study and review of previous reports/assessments undertaken within the contamination study area.

In general, as per the guidance in the NEPM 2013, to achieve the desired environmental outcome, the process of the assessment of site contamination should be placed within the context of the broader site assessment and management process. In assessing the contamination, the site assessor (if required) and others should consider the preferred hierarchy of options for site clean-up and/or management which is outlined in Table 2-1.

Table 2-1 Hierarchy of clean-up options (NEPM 2013)

PREFERENCE	OPTION
1	On-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level.
2	Off-site treatment of excavated soil, so that the contamination is destroyed, or the associated risk is reduced to an acceptable level, after which soil is returned to the site.
If the above is not practicable:	
3	Consolidation and isolation of the soil on-site by containment with a properly designed barrier.
4	Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material.
Where the assessment indicates that remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy is required.	

When deciding which option to choose, the sustainability (environmental, economic and social) of each option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option.

2.5 National Water Quality Management Strategy

The *National Water Quality Management Strategy* (NWQMS) (Australian Government, 2018) aims to protect the nation's water resources by improving water quality while supporting the businesses, industry, environment and communities that depend on water for their continued development. The main policy objective of the NWQMS is to achieve sustainable use of water resources, by protecting and enhancing their quality, while maintaining economic and social development.

The NWQMS includes water quality guidelines that define desirable ranges and maximum levels for specific parameters that can be allowed (based on scientific evidence and judgement) for specific uses of waters for protection of specific values. They are generally set at a low level of contamination to offer long-term protection of environmental values. The NWQMS water quality guidelines include the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) and the *Australian Drinking Water Guidelines* (NHMRC, 2011).

2.6 Australian and New Zealand Guidelines for Fresh and Marine Water Quality

The *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) have been prepared as part of the NWQMS. The guidelines provide a process for developing water quality objectives required to sustain current or likely future environmental values for natural and semi-natural water resources. The process involves the following:

- identifying the environmental values that are to be protected in a particular water body
- identifying management goals and selecting the relevant water quality guidelines for measuring performance
- developing statistical performance criteria to evaluate the results of the monitoring programs (e.g. statistical decision criteria for determining whether the water quality objectives have been exceeded or not)
- developing tactical monitoring programs focusing on the water quality objectives
- initiating appropriate management responses to attain (or maintain if already achieved) the water quality objectives.

Environmental values (sometimes referred to as beneficial uses) are particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and which require protection from the effects of pollution, waste discharges and deposits. The following environmental values are recognised in the water quality guidelines:

- aquatic ecosystems
- primary industries (irrigation and general water uses, stock drinking water, aquaculture and human consumption of aquatic foods)
- recreation and aesthetics
- drinking water
- industrial water
- cultural and spiritual values.

Default guideline values (DGVs) are presented in the guidelines as a starting point for assessment. DGVs are numerical concentration limits recommended to support and maintain a designated water use.

The *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality* are a revision from the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines, published in 2000. The current guideline provides DGVs for varying toxicants, which are the same as the ANZECC guidelines.

The *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Water Quality* establish a guide for setting water quality objectives for surface water resources required to sustain environmental values and the guideline values represent target concentrations within the surface water resource (or surface water body).

2.7 Acid Sulfate Soil Manual

Acid sulfate soils (ASS) are naturally occurring soils, sediments or organic substrates (e.g. peat) that are formed under waterlogged conditions. These soils contain iron sulphide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soils are benign. However, if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulphides react with oxygen to form sulfuric acid.

The management of ASS is coordinated by the NSW Acid Sulfate Soil Management Advisory Committee (NSW ASSMAC). This Committee is made up of representatives from various government organisations and other affected parties. The Committee published the *Acid Sulfate Soil Manual* (ASSMAC, 1998) to provide best practice guidance in the assessment and management of projects in areas potentially affected by ASS in NSW.

The manual set out a process (refer to Figure 2-1) to decide whether ASS is present on-site and how to mitigate potential impacts.

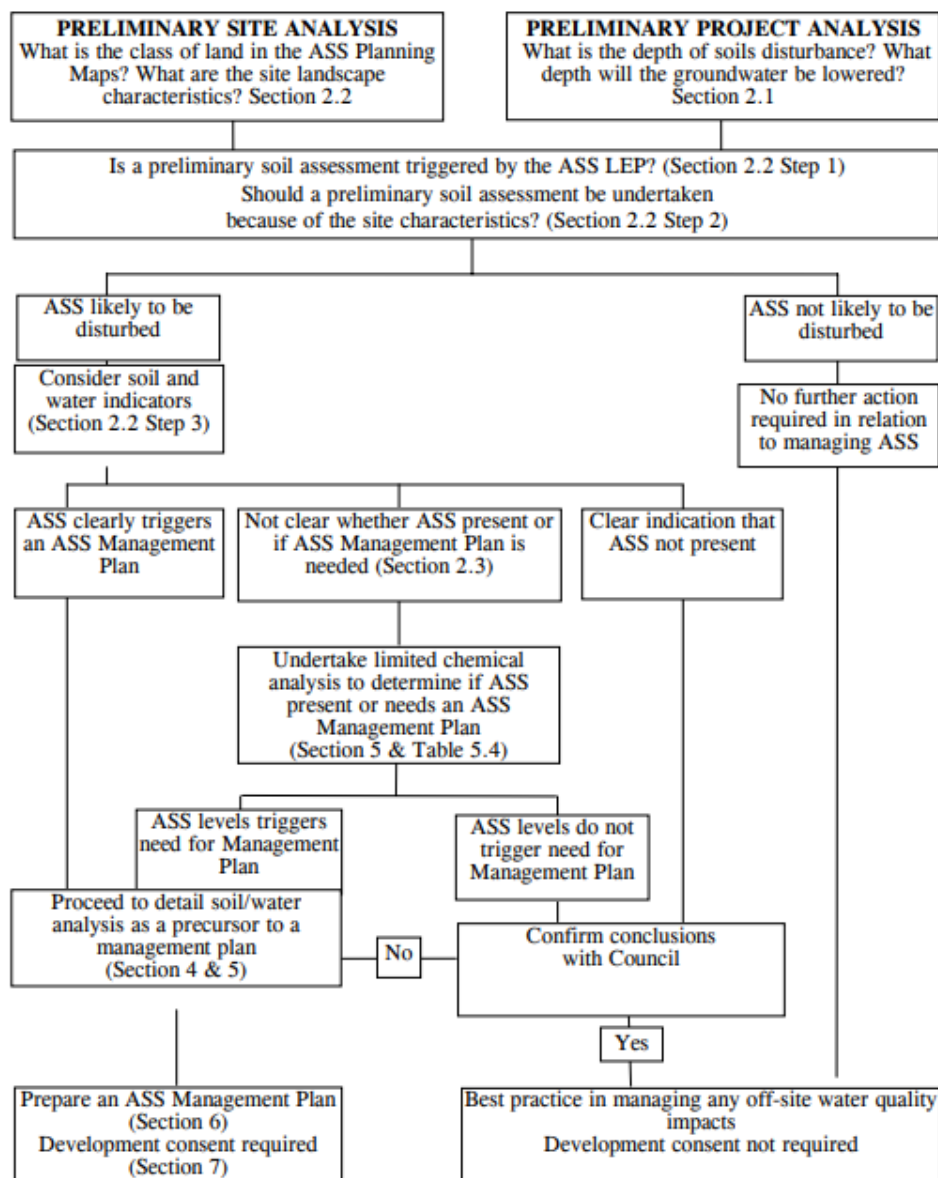


Figure 2-1 Preliminary assessment phase from the Acid Sulfate Soil Manual (*New South Wales – Acid Sulfate Soil Management Advisory Committee, 1998*)

When works involving the disturbance of soil or a change in groundwater levels are proposed in coastal areas, a preliminary assessment should be undertaken to determine whether acid sulfate soils are present and if the proposed works are likely to disturb these soils. The purpose of the preliminary assessment is:

- to establish the characteristics of the proposed works
- to establish whether ASS is present on the site and if they are at such concentrations to warrant the preparation of an acid sulfate soil management plan (ASSMP)
- to provide information to assist in designing a soil and water assessment program.

2.8 Managing asbestos in or on soil

The *Managing Asbestos in or on Soil* guide (SafeWork NSW, 2014) provides general guidance on the Assessment of Asbestos in soil. Managing Asbestos in soil has implications for the current and future occupants of the land/or any worker employed on the site. The principles underlying the guidance in this document are those endorsed by the NSW Heads of Asbestos Coordination Authorities (HACA) and contained in the NSW Asbestos Blueprint (SafeWork NSW 2017). Work health and safety, land use planning and environmental legislation, and the amended NEPM 2013 are referenced where they apply.

The NEPM 2013 emphasises that the assessment and management of asbestos contamination should take into account the condition of the asbestos materials, the potential for damage, and the resulting release of asbestos fibres. Bonded Asbestos in sound condition represents a low risk to human health. However, both friable and fibrous asbestos materials have a significantly higher potential to generate, or be associated with, free asbestos fibres, and may represent a significant human health risk if disturbed and fibres are made airborne.

The objective of the approach outlined in *Managing Asbestos in or on Soil* guide is to ensure that proportionate and practicable controls are applied per regulatory requirements and a manner commensurate with actual risk.

2.9 Other guidelines

A number of other guidelines, which are relevant to the management of contamination, were considered in the preparation of this technical report and presented in Table 2-2.

Table 2-2 Other guidelines

GUIDELINE	CONSIDERATION IN THIS REPORT
<i>Guidelines for the Assessment, Remediation and Management of Asbestos – Contaminated Sites in Western Australia</i> (WA Department of Health, 2009)	The guidelines provide a framework and best practice for the assessment, remediation and management of asbestos-contaminated sites. The guidelines would need to be considered if the preparation of the asbestos management plan for the proposal is identified as being required as a result of an unexpected find during construction works.
<i>Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997</i> (EPA, 2015)	The guidelines detail circumstances in which contamination at a site triggers the requirement to notify the NSW EPA. The guidelines are made under Section 105 of the CLM Act. The duty to report lies with landowners and those responsible for the contamination. The triggers would need to be considered if contamination is encountered within the contamination study area.

GUIDELINE	CONSIDERATION IN THIS REPORT
<i>Guidelines for the NSW Site Auditor Scheme (3rd edition)</i> (EPA, 2017)	The guidelines describe the obligations of accredited site auditors undertaking site audits in NSW. The guidelines are made under Section 105 of the CLM Act. These guidelines would need to be considered if reports are required to be prepared that may be reviewed by site-auditor (e.g. investigation report or remediation action plan). This would only occur as a result of certain unexpected find incidents and the need be determined at that time.
<i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004)	The guidelines provide best practice guidance on erosion controls that need to be implemented during construction. The guidelines would need to be considered during the preparation of the Construction Environmental Management Plan (CEMP) and associated Soil and Water Management Plan (SWMP) for the proposal.

3 Methodology

3.1 Approach

3.1.1 Contamination study area

The contamination study area comprises a one kilometre wide corridor between the Buronga substation and the Wagga Wagga substation. It traverses around 540 kilometres in total. It has been applied to identify the constraints nearby to the proposal which may or may not be indirectly impacted by the proposal from a potential contamination perspective. Proposed access tracks (outside of those that propose to utilise public roads) would generally be located within the contamination study area.

The contamination study area also includes a number of accommodation/laydown areas:

- Balranald construction compound (and potential accommodation camp)
- Cobb Highway construction compound and accommodation camp
- Dinawan construction compound and accommodation camp
- Lockhart construction compound and accommodation camp
- Wagga Wagga construction compound.

A series of water fill points (both potable and non-potable) are also included in the study area which are required for construction activities such as concrete batching and dust-suppression. These have been detailed further in the report.

The contamination study area is located in regional western NSW across a number of Local Government Areas (LGAs), comprising of the following: Wentworth; Balranald; Murray River; Edward River; Hay; Murrumbidgee; Federation; Lockhart Shire; and Wagga Wagga LGAs.

3.1.2 Assessment methodology

The assessment methodology generally followed the framework for the assessment of site contamination outlined in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended) (the NEPM).

The NEPM 2013 states that ‘the preliminary investigation and initial assessment of site contamination should consider the possibility of all forms of potential contamination based on past use. The preliminary investigation should be sufficient to identify whether contamination exists on the site. Depending on the proposed use and the results of initial site history investigations, the assessment of a site may involve both preliminary and detailed investigations. Many site investigations proceed in multiple stages due to the complexity of the site and the discovery of unexpected contamination.

For the purpose of this technical paper, the staged process presented in NEPM 2013 is summarised in Figure 3-1.

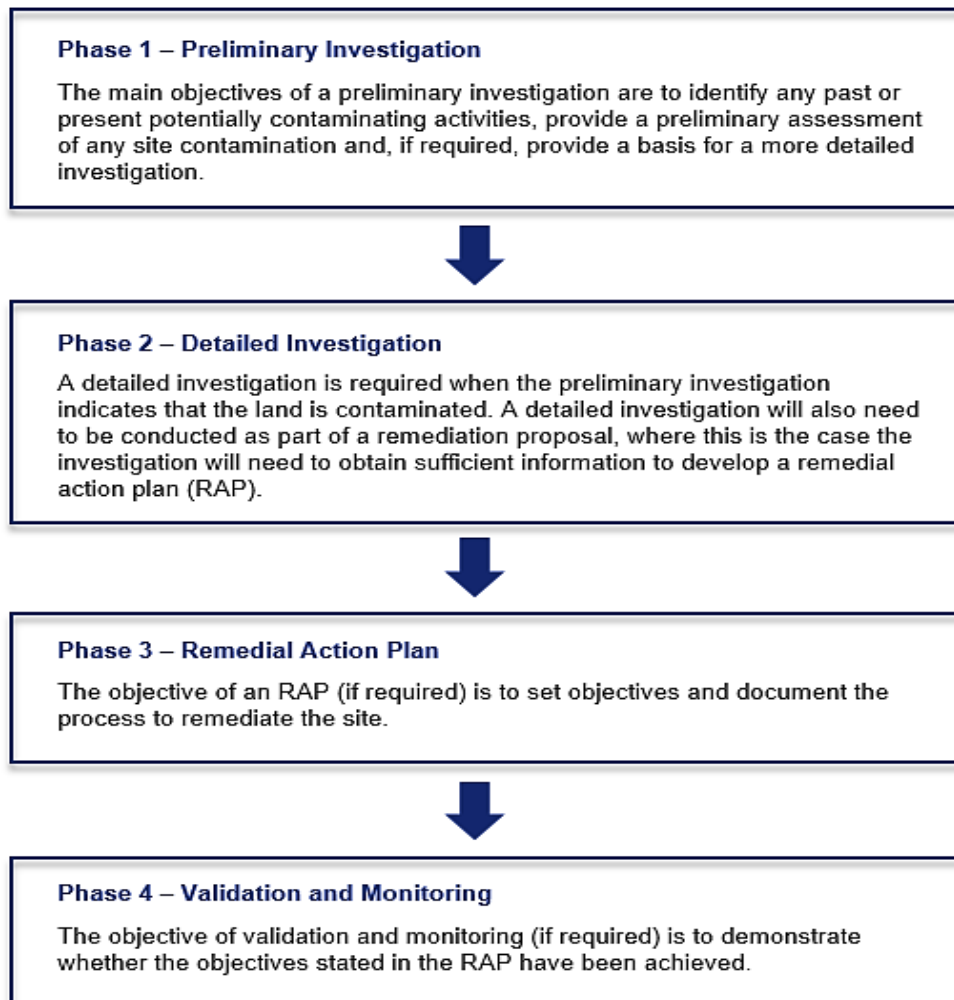


Figure 3-1 Staged site investigation process

This report comprises a preliminary (also referred to as Phase 1) investigation which assesses the potential for contamination to exist based on a desktop study (accessed during August 2021) and review of previous detailed site investigation (also referred to as Phase 2) reports and assessments.

The contamination assessment comprised the following:

- a review of previous investigation reports undertaken within the proposal site
- identification of potential areas of ASS, soil salinity and naturally occurring asbestos which may be disturbed by the proposal
- a review of available information to identify potentially current or historical contaminating land uses and subsequent identification of potential areas of environmental concern (AECs)
- identification and assess pollution linkages associated with the construction and operation of the proposal to inform the impact assessment of the proposal
- a construction phase impact assessment which identifies potential contamination impacts based on the current understanding of the likely construction methodology. A qualitative risk ranking is used to identify the potential severity of the impact
- an operational phase impact assessment which identifies whether any long-term operational or maintenance activities have the potential to impact on land suitability
- proposal of mitigation measures to minimise, mitigate and manage potential impacts, as relevant.

In preparing this technical working paper, the following sources of information were reviewed:

- Databases (accessed August 2021) to identify areas of known and potential contamination, including:
 - Department of Defence database for unexploded ordnance
 - Department of Primary Industries register of cattle dip sites
 - NSW EPA PFAS investigation database
 - NSW EPA register of contaminated sites and list of notified sites, under sections 58 and 60 of the CLM Act, for sites located within two kilometres of the contamination study area
 - NSW EPA's environment protection licence records under section 308 of the POEO Act
 - NSW Government database of former gasworks sites.
- Publicly available data and web-based information searches, accessed August 2021, background information relevant to the study area, survey data, and topography including:
 - historical aerial photographs from the NSW Government Land and Property Information website (where available)
 - Australian Soil Resource Information System (maintained by the Commonwealth Scientific and Industrial Research Organisation (CSIRO))
 - geology of the proposed study area
 - NSW Soil and Land Information System
 - NSW Government acid sulfate soils risk mapping
 - NSW Government's Heads of Asbestos Coordination Authorities naturally occurring asbestos risk mapping
 - maps published by the Geological Survey of NSW, former Department of Conservation and Land Management, and Australian Soils Resource Information System.

3.2 Risks identified

Potential environmental risks were identified associated with construction and operation, and rating the potential risks according to likelihood, consequence and overall level of risk, in general accordance with:

- AS/NZS ISO 31000:2009 Risk management – Principles and guidelines.

Potential impacts associated with contamination and soils identified by the environmental risk assessment included:

- interaction with potentially contaminated soils and groundwater as a result of sub-surface disturbance during construction and operation, including disturbance and potential migration/mobilisation of contaminants
- release of potentially contaminated groundwater where construction activities such as piling may intercept groundwater and require de-watering
- management and disposal or discharge of contaminated groundwater potential encountered with de-watering activities and management and disposal of contaminated soils encountered during construction in areas where existing contamination is present
- contamination of soils and groundwater due to spills or leaks of fuels, oils or other hazardous substances during construction and operation
- direct contact and inhalation of contaminated soil and groundwater by site workers where construction and operational activities result in the exposure of existing contamination.

3.3 Qualitative risk ranking

The assessment includes a preliminary contamination risk evaluation (considering the potential for risks without the implementation of appropriate controls or remediation) to understand the potential risk of the identified areas of contamination concern. The risk ranking has been based on the likelihood of encountering contamination on the assessment of current regulated activities, and historical land uses/activities at the subject site as described in Table 3-1.

Table 3-1 Qualitative risk rankings

RISK RANKING	LIKELIHOOD THAT THE SITE MAY BE AFFECTED BY CONTAMINATION	BASIS FOR RISK RANKING
High	Likely contamination source identified	The available information indicates that the subject site: Is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator or has been the subject of an activity which is frequently associated with contamination.
Medium	Possible contamination source identified	The available information indicates that the subject site: — is or has been the subject of an activity which in some circumstances is known to be associated with contamination — has been historically filled with imported material, the origin of which is unknown; and/or — has groundwater records indicating the potential for contamination. The available information indicates that land within 500 m of the contamination study area: — is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator — is or has been the subject of an activity which is in some circumstances known to be associated with contamination. Has groundwater records indicating the potential for contamination.
Low	No contamination sources identified	The available information does not indicate that the subject site, or land within 500 m of the subject site: — is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator — is or has been the subject of an activity which is frequently associated with contamination — has been historically filled with imported material, the origin of which is unknown. Has groundwater records indicating the potential for contamination.

4 Existing environment

4.1 Topography

The topography of the contamination study area is largely flat rising to the east. The topography ranges from approximately 50 metres Australian Height Datum (AHD) at the western extent of the alignment to around 250 metres at the eastern extent of the alignment. The topography at the western extent is undulating between around 60 metres and 80 metres AHD for around 400 kilometres travelling east. Continuing east, the topography increases from 100 metres to 250 metres over 200 kilometres, significantly increasing as the alignment approaches Wagga Wagga.

4.2 Soils and geology

4.2.1 Geology

Published geological mapping data from NSW Seamless Geology Project (2019) indicates that a range of geological units cover the proposed study area. These soils have been deposited in alluvial flood plains, dune sands and swamp or lake deposits. The geological unit, origin and their corresponding dominant soil type are listed in Table 4-1.

Table 4-1 Dominant regional geology within the proposal investigation area

NSW SEAMLESS GEOLOGY CODE	GEOLOGICAL UNIT	DOMINANT SOIL TYPE
Qrc	Colluvium	Colluvium and/or residual deposits, talus, scree, sheet wash; boulder, gravel, sand, may include minor alluvial or sand plain deposits.
Sgkf	Mount Flankey Granite	Felsic, fractionated granite.
Qa	Alluvium	Channel and flood plain alluvium; gravel, sand, silt, clay.
Osw	Wagga Group	Quartzose, siltstone, sandstone, quartz-mica, schist, phyllite, chert, locally metamorphosed, minor quartzite, graphitic schist, hornfels.
Czsws	Shepparton Formation	Shepparton Formation (Czsws): Unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine grained sand and gravel; includes, intercalated red-brown paleosols. Forms extensive flat alluvial floodplains.
Cza	Alluvium	Alluvium (Cza): Channel and flood plain alluvium; gravel, sand, silt, clay; may be incised by present day drainage.
Qdwr	Woorinen Formation	Woorinen Formation (Qdwr): Unconsolidated red-brown medium to fine silty sand, red calcareous silt clay, sandy clay, clay pallet aggregate, forms extensive dune fields of east-west oriented dunes with subdued crests and flakes separated by swales and sand plains.
QHw	Woorinen Formation	Woorinen Formation (QHw): Fossil dunefields of openly spaced, east- west linear dunes; red-brown to light brown humic, clayey to silty, fine- to medium-grained sand with red clay cutans, silty clay at depth; abundant regolithic and pedogenic carbonate; modified by pedogenesis.
Qath	Alluvial terrace deposits	Alluvial terrace deposits (Qath): Silt, clay, polymictic gravel, (fluvially-deposited) fine- to medium-grained quartz-lithic sand.

Around 70 per cent (about 300 kilometres) of the contamination study area is covered in aeolian sediments of the Shepparton Formation, comprising unconsolidated-poorly consolidated mottled variegated clay-silty clays, coarse to fine sand and gravel and is known to form extensive flat alluvial floodplains.

4.2.2 *Soil types*

The soils along the contamination study area are mapped as primarily vertosols according to Australian Soil Classification (CSIRO, 2016) found along the main watercourses sand and alluvial plains in proximity to the Murrumbidgee, Darling, and Darling – Anabranch Rivers. Published soil mapping along the alignment indicates that the regional geology and soils are expected to be predominantly transported Quaternary-aged sediments deposited in alluvial flood plains, and dune. The predominant soil types are typically sand and clay or a mixture of the two.

4.2.3 *Soil salinity*

Dryland salinity is the accumulation of salts in the soil surface and groundwater in non-irrigated areas. Salinity is commonly caused by the mobilisation of salts in the soil profile by surface water or groundwater. The broad processes for groundwater mobilisation include groundwater recharge (or deep drainage), groundwater movement or groundwater discharge.

Dryland salinity may also be caused by the exposure of naturally saline soils such as hypersaline clays. It can be associated with sodic soils (soils with an exchangeable sodium percentage (ESP) of more than six per cent).

Almost all of the contamination study area is mapped as having low salinity potential (broad scale state mapping). A minor area north of Wagga Wagga which has been identified as having high salinity potential is not within the vicinity of the contamination study area. This portion of the contamination study area with high salinity is shown in Figure 4-1, the remaining contamination area is not shown on the figure as there is no salinity risk.

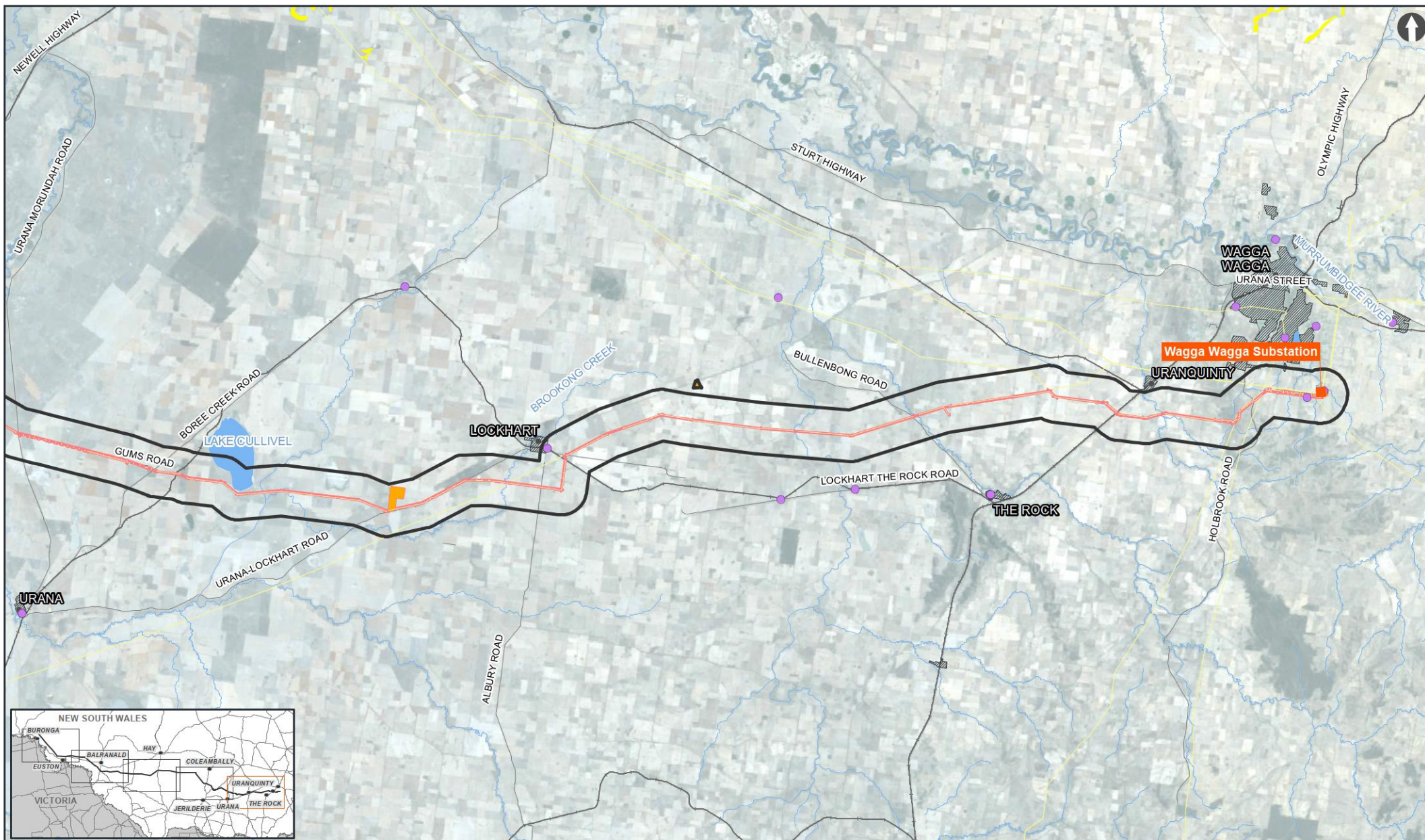
Soil conductivity testing undertaken by SMEC 2020 however did indicate some variable salinity across the contamination study area with some soil results indicating moderately saline and very saline soil conditions. An assessment of soil aggressivity undertaken by (SMEC, 2020) with reference to AS2159-2009 indicated that the soils are highly alkaline, with high levels of sodicity.

4.2.4 *Acid Sulfate Soils*

Acid sulfate soils (ASS) and potential acid sulfate soils (PASS) are naturally occurring soils containing iron sulphides. On exposure to air, iron sulphides oxidise and create sulfuric acid. This increase in acidity can result in the mobilisation of aluminium, iron and manganese from the soils. Acid sulfate soil risk mapping is shown in Figure 4-2 which shows acid sulfate risk classifications for land within and in the vicinity of the contamination study area. The risk classifications are based on the NSW Government acid sulfate soil risk mapping. The published digital GIS and The CSIRO Australian Soil Resource Information System indicates that there is an extremely low probability of acid sulfate soils within most of the contamination study area, except for low lying areas surrounding former lakes and river beds, which are mapped as having a high probability of acid sulfate soil occurrence.

Acid sulfate soil risk mapping is shown in Figure 4-2 shows there are four waterbodies with a high risk of acid sulfate soils that fall within the construction impact area.

Soil assessments undertaken by SMEC 2020 indicate groundwater was observed at between 2–20 mBGL in all borehole locations, as a result interaction between groundwater and any potential acid sulphate soils was considered a low likelihood.



Contaminated Land Management - Figure 4-1

Project Components

Construction Impact Area

Main Construction Compounds and Accommodation Sites

Access Tracks

Water Fill Point

Existing Transmission Line Infrastructure

Existing Substation

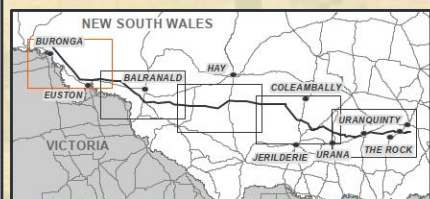
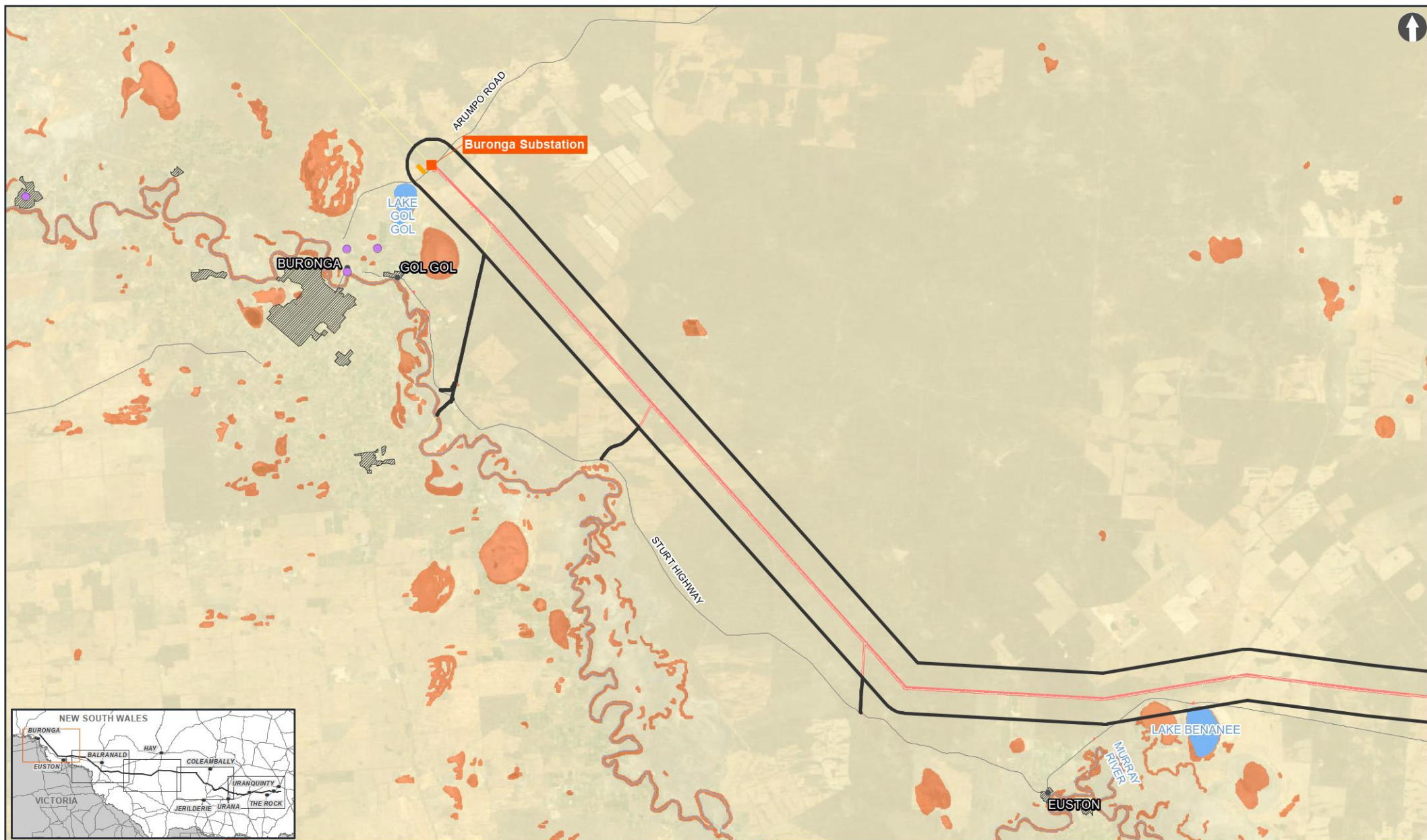
Existing Railway

Contaminated Land Study Area

Built Up Areas

Soil Salinity Risk

Soil Salinity Risk Mapping



0 10 20 KM

Project Components

- Eastern Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

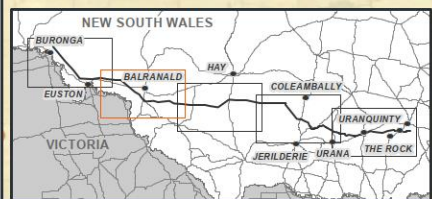
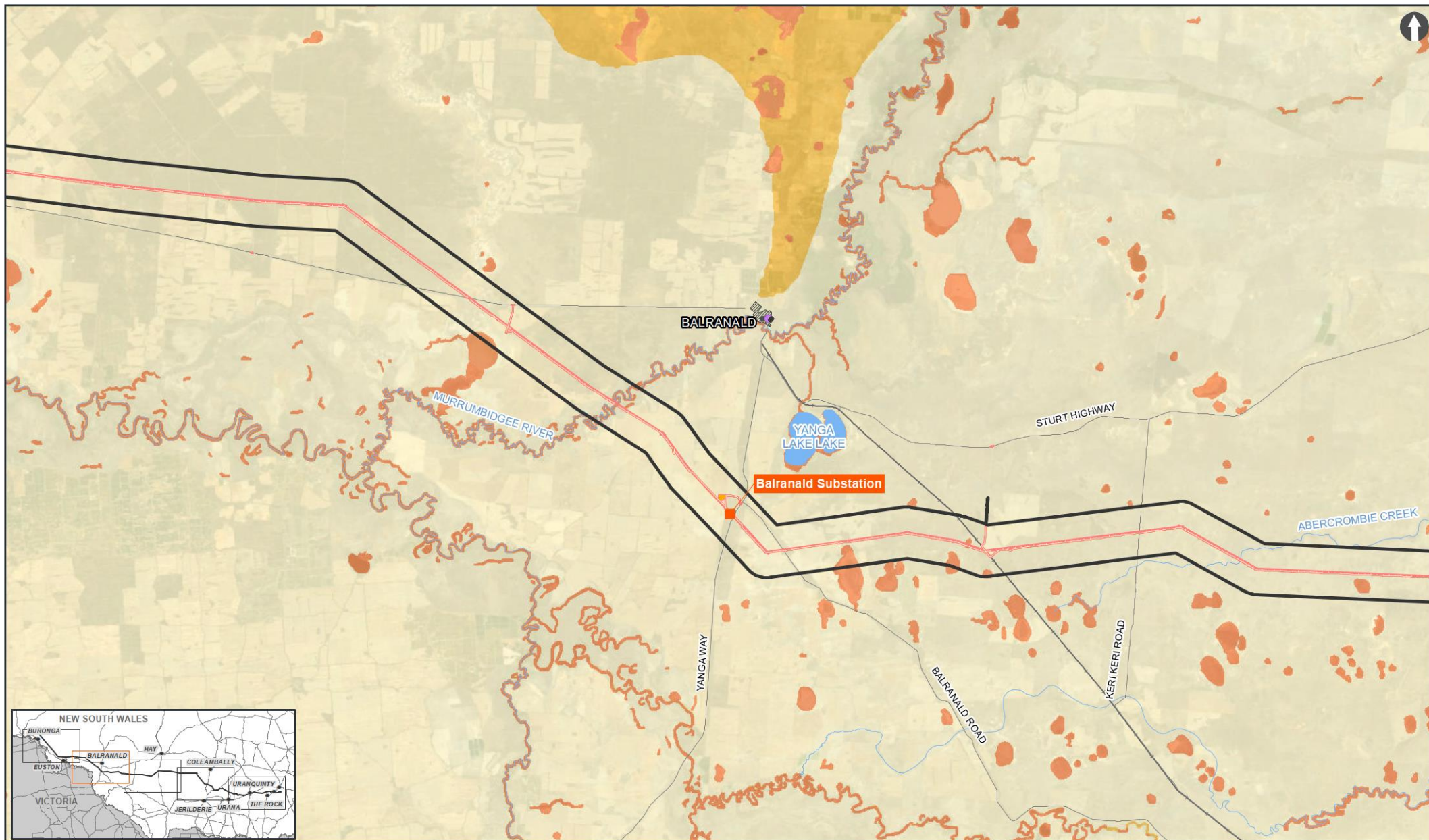
Atlas of Acid Sulfate Soils

- High Probability of Occurrence (>70% chance of occurrence)
- Low Probability of Occurrence (6-70% chance of occurrence)
- Extremely Low Probability of Occurrence (1-5% chance of occurrence with occurrences in small localised areas)

Contaminated Land Management - Figure 4-2

Probability of Occurrence of Acid Sulfate Soils in the Study Area

Sheet 1 of 5



0 10 20 KM

Project Components

- Eastern Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

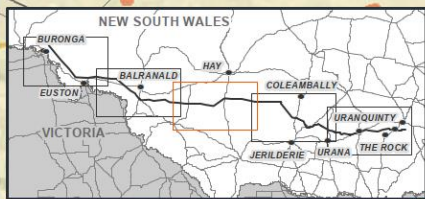
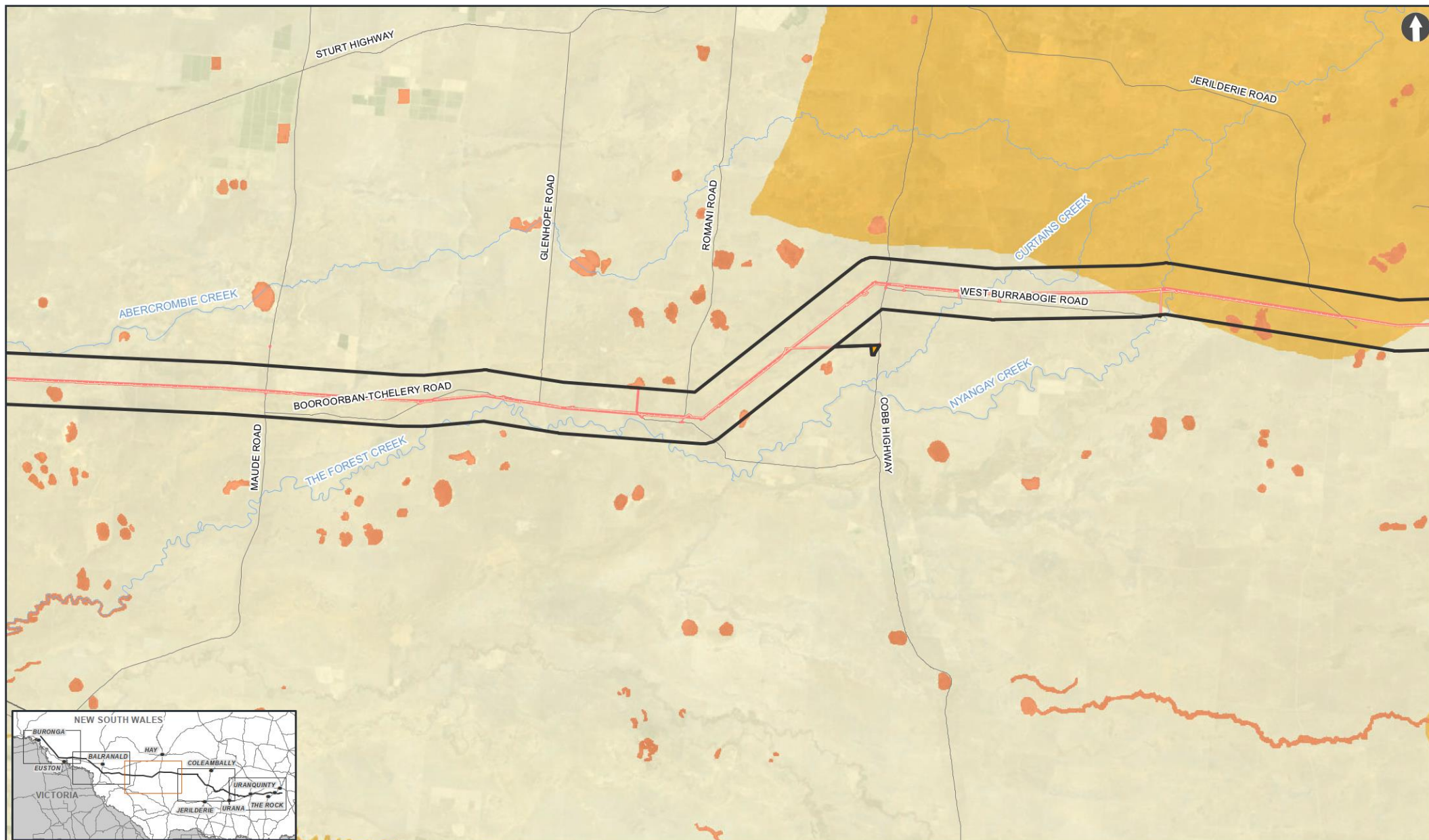
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Atlas of Acid Sulfate Soils

- High Probability of Occurrence (>70% chance of occurrence)
- Low Probability of Occurrence (6-70% chance of occurrence)
- Extremely Low Probability of Occurrence (1-5% chance of occurrence with occurrences in small localised areas)

Contaminated Land Management - Figure 4-2

Probability of Occurrence of Acid Sulfate Soils in the Study Area



0 10 20 KM

Project Components

- Eastern Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

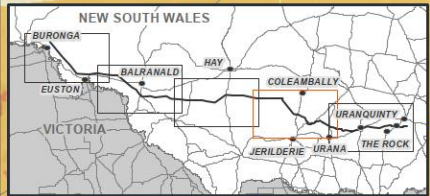
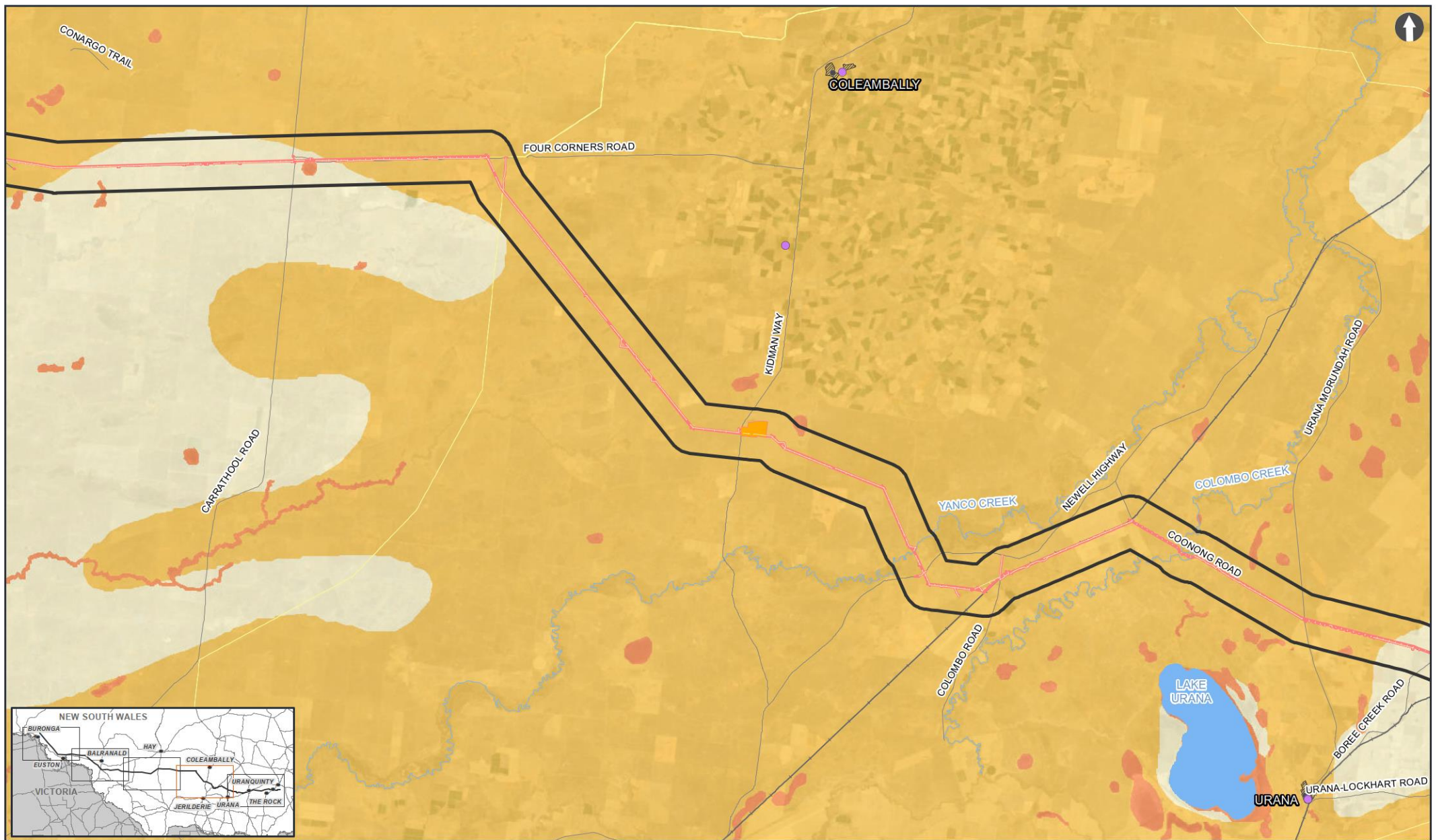
Atlas of Acid Sulfate Soils

- High Probability of Occurrence (>70% chance of occurrence)
- Low Probability of Occurrence (6-70% chance of occurrence)
- Extremely Low Probability of Occurrence (1-5% chance of occurrence with occurrences in small localised areas)

Contaminated Land Management - Figure 4-2

Probability of Occurrence of Acid Sulfate Soils in the Study Area

Sheet 3 of 5



0 10 20 KM

Project Components

- Eastern Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

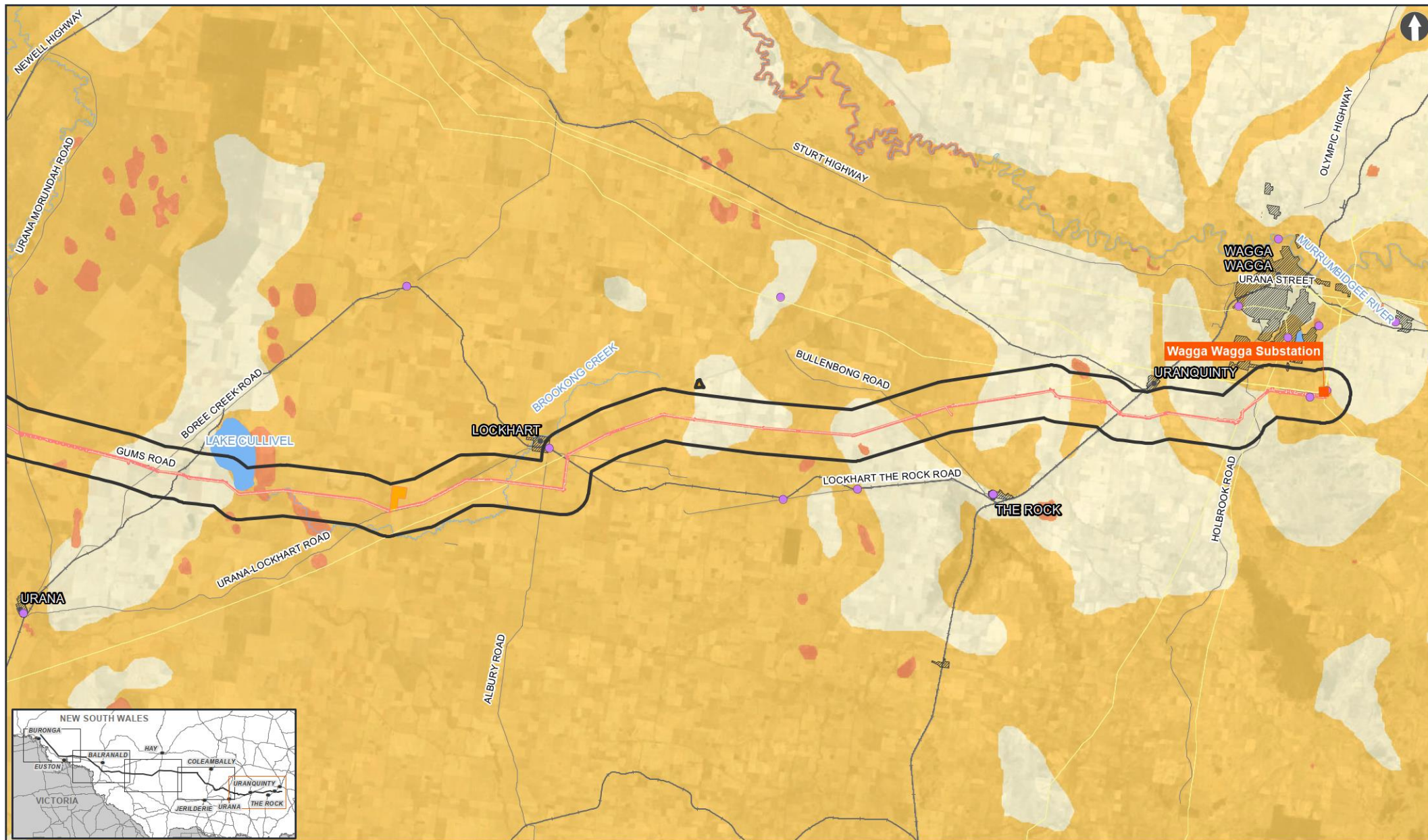
Atlas of Acid Sulfate Soils

- High Probability of Occurrence (>70% chance of occurrence)
- Low Probability of Occurrence (6-70% chance of occurrence)
- Extremely Low Probability of Occurrence (1-5% chance of occurrence with occurrences in small localised areas)

Contaminated Land Management - Figure 4-2

Probability of Occurrence of Acid Sulfate Soils in the Study Area

Sheet 4 of 5



Project Components

- Eastern Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Atlas of Acid Sulfate Soils

- High Probability of Occurrence (>70% chance of occurrence)
- Low Probability of Occurrence (6-70% chance of occurrence)
- Extremely Low Probability of Occurrence (1-5% chance of occurrence with occurrences in small localised areas)

Contaminated Land Management - Figure 4-2

Probability of Occurrence of Acid Sulfate Soils in the Study Area

Sheet 5 of 5

4.2.5 *Naturally occurring asbestos*

The term ‘naturally occurring asbestos’ refers to the mineral as a natural component of soils or rocks as opposed to asbestos in commercial products, mining or processing operations. Naturally, occurring Asbestos can be released from rocks or soils by routine human activities, such as construction, or natural weathering processes. If naturally occurring asbestos is not disturbed, and fibres are not released into the air, then it is not a health risk. Asbestos is a commercial and industrial term describing a group of specific silicate minerals that forms bundles of long, very thin mineral fibres. The form and structure of these fibres are called asbestiform. In addition to asbestos, there are additional minerals that are asbestiform, including winchite and richterite that are not technically considered asbestos.

Asbestos is most commonly found in three rock types: serpentinites, altered ultramafic rocks, and some mafic rocks. The NSW government’s Heads of Asbestos Coordination Authorities (HACA) has published digital GIS data on naturally occurring Asbestos. Depending on the probability of naturally occurring Asbestos being present, NSW has been mapped into low, medium, or high potential regions. The published digital GIS data (Figure 4-3) does not show any occurrences of expected naturally occurring asbestos minerals or serpentine and amphibole occurrence within the contamination study area.



Contaminated Land Management - Figure 4-3

Project Components

Construction Impact Area

Main Construction Compounds and Accommodation Sites

Access Tracks

Water Fill Point

Existing Transmission Line Infrastructure

Existing Substation

Existing Railway

Built Up Areas

Waterbody

Naturally Occurring Asbestos

Naturally Occurring Asbestos Potential

4.3 Hydrogeology

4.3.1 Geology

The groundwater study area occurs within the MDB and its associated sediments. A summary of the MDB stratigraphy and mapped outcropping sediments is provided in the following subsections.

4.3.1.1 Murray-Darling Basin stratigraphy

The underlying regional geology of the MDB can be separated into three distinct groups based on age (Brown, 1985) that extend up to 600 metres in thickness (Evans & Kellet, 1989). The Geological groups are summarised below (in decreasing age):

- The Renmark Group is at the base of the MDB, comprising of a sequence of unconsolidated medium to coarse quartz sands overlain by a widely distributed sequence of unconsolidated carbonaceous sand, silt, clay and peaty coal. The Renmark Group is approximately 35 to 60 million years old.
- Overlying the Renmark Group is the Murray Group, a sequence of deposited marl, limestone and clay that exists within the western portion of the MDB and is 12 to 30 million years old. The Murray Group includes the Ettrick Formation, Geera Clay and Winnambool Formation of marls and clay.
- The third distinct group consists of the:
 - Bookpurnong Formation that consists of clays and occasional sandy, silty and calcareous beds
 - overlying the Bookpurnong Formation is the Loxton-Parilla Sands (sands) and the Calivil Formation (coarse grain sands) that occur in the eastern portion of the MDB
 - overlying the Loxton-Parilla Sands in the west is a broad sequence of clay known as the Blanchetown Clay
 - where the Blanchetown Clay does not outcrop, it can be overlain by the fluvial sediments of the Shepparton Formation which underlie a sequence of aeolian dunes that dominate the western MDB geology, known as the Woorinen Formation
 - recent alluvial deposits restricted to proximity to the major rivers within the region comprise the Coonambidgal Formation as well as scattered gypsum (calcrete) of the Yamba Formation and clay lunettes.

Within the Lower Murrumbidgee and along the proposal alignment, the basin sediments are estimated to reach a maximum thickness of 400 metres near Balranald (DPIE, 2019b).

4.3.2 Hydrogeology

4.3.2.1 Hydrostratigraphy

This section describes the hydrostratigraphic units (HSUs) which underlie the groundwater study area and have been adopted for this assessment. HSUs are defined as geological material of similar hydrogeological properties. HSUs are generally based on stratigraphic units, although units of similar groundwater storage and transmissive properties are often classified together as a single HSU.

For the groundwater study area, HSUs are delineated as per groundwater sources listed within the water sharing plans as this provides a consistent classification approach for the groundwater impact assessment. Details on the HSUs, taken from the groundwater resource descriptions (DPIE, 2019a, 2019b & 2019c), within the groundwater study area are provided in Table 4-2 and their relationship to the MDB sediments identified. Note, the Lachlan Fold Belt MDB groundwater source is henceforth referred to as 'Lachlan fractured rock' and the NSW Murray-Darling Basin Porous Rock Groundwater Sources as 'Porous rock'.

Table 4-2 Hydrostratigraphic units within the groundwater study area and their thickness, depths and characteristics (DPIE, 2019a; 2019b & 2019c)

HSU	AQUIFER	ESTIMATED THICKNESS (m)	ENCOUNTERED DEPTH (mBGL)	CORRESPONDING MDB GEOLOGY	CHARACTERISTICS
Murrumbidgee Alluvium	Shallow	40–60	0 (surface)	Shepparton Formation	— Typically unconfined consisting of clay and silt sediments interbedded with water bearing sand layers. — Recharge occurs through leakage from the Murrumbidgee River and its various tributaries and anabranches, infiltration from rainfall and irrigation activity. — Groundwater flow is generally east to west.
	Deep	40–400	40+	Calivil Formation and Renmark Group	— Typically confined to semi-confined where sediments of the Calivil Formation consist of fluvial paleo-drainage paths of water bearing sand and gravel layers up to 12 metres thick and the Renmark Group is dominated by water bearing sand layers. — Recharge to the system is primarily through connectivity between groundwater sources and leakage from the overlying shallow aquifer. — Groundwater flow is generally east to west. — Bore yields vary but have been reported to be as high as 350 litres per second (L/s).

HSU	AQUIFER	ESTIMATED THICKNESS (m)	ENCOUNTERED DEPTH (mBGL)	CORRESPONDING MDB GEOLOGY	CHARACTERISTICS
Porous rock	Shallow	10–90	Variable, dependent on aeolian cover.	Pliocene sands (Loxton Parilla and Calivil Formation)	— Semi-confined aquifer where groundwater flow is governed by both primary porosity (movement of water around rock grains) and secondary porosity (water movement through fractures). — Groundwater flow is strongly influenced by the degree of weathering of the rock mass. — Recharge to the system is primarily through infiltration from rainfall, runoff, surface water within outcropping areas and groundwater flow from connected groundwater sources. — Bore yields are highly variable, ranging between 0.5–100 L/s, but commonly greater than 10 L/s. — Groundwater flow is generally east to west.
	Deep	10–330	40+	Renmark Group	— Confined water bearing sands of the Renmark Group. — Recharge to the system is primarily through connectivity between groundwater sources and leakage from the overlying shallow aquifer. — Bore yields typically range between 0.5–50 L/s, but can occasionally be greater than 50 L/s. — Groundwater flow is generally east to west, but influenced by the underlying Lachlan fractured rock topography.

HSU	AQUIFER	ESTIMATED THICKNESS (m)	ENCOUNTERED DEPTH (mBGL)	CORRESPONDING MDB GEOLOGY	CHARACTERISTICS
Lachlan fractured rock	Shallow	0–30	Can significantly vary	Pre-Cainozoic Basement	— Unconfined to confined aquifer depending on location and overlying geology. — Groundwater is stored and moves through fractures, joints, bedding plains, faults and cavities within the rock mass or weathered zone (for the shallow aquifer). — Groundwater flow is generally controlled by topography but will be influenced by localised fracture systems and regional geological structures. — Hydraulic connectivity between surface water features, other overlying aquifers and between the shallow and deep fractured rock aquifers is limited to the degree of fracturing extending between the aquifers or the bed of the surface water features. — The fractured rock aquifers are considered to generally contain low hydraulic connection with overlying aquifers and surface water features throughout the groundwater study area.

The encountered depth listed corresponds to the HSU and not exact groundwater levels. For the purpose of this assessment the depth distinction between the shallow and deep aquifers of the corresponding HSUs have been simplified to:

- Murrumbidgee Alluvium
 - Shallow: includes all water bearing zones up to 40 mBGL
 - Deep: includes all water bearing zones deeper than 40 mBGL
- porous rock
 - Shallow: includes all water bearing zones up to 50 mBGL
 - Deep: includes all water bearing zones deeper than 50 mBGL
- Lachlan fractured rock
 - Shallow: includes all water bearing zones up to 30 mBGL
 - Deep: includes all water bearing zones deeper than 30 mBGL.

4.3.2.2 Groundwater levels

Groundwater level information was collated from relevant regional studies, available local information (such as registered bores) and site-specific data are provided in the following subsections.

4.3.2.3 Published regional groundwater levels

Murrumbidgee Alluvium

The regional groundwater level contour map generated from 2015–2016 government data (DPIE, 2019a) is shown in Figure 4-4. Based on the contour map, groundwater levels are anticipated to be approximately 115–120 mAHD along the eastern boundary of the HSU and decreasing to 55 mAHD at Balranald. This is indicatively 5–10 mBGL at the eastern HSU boundary and 10 mBGL at Balranald.

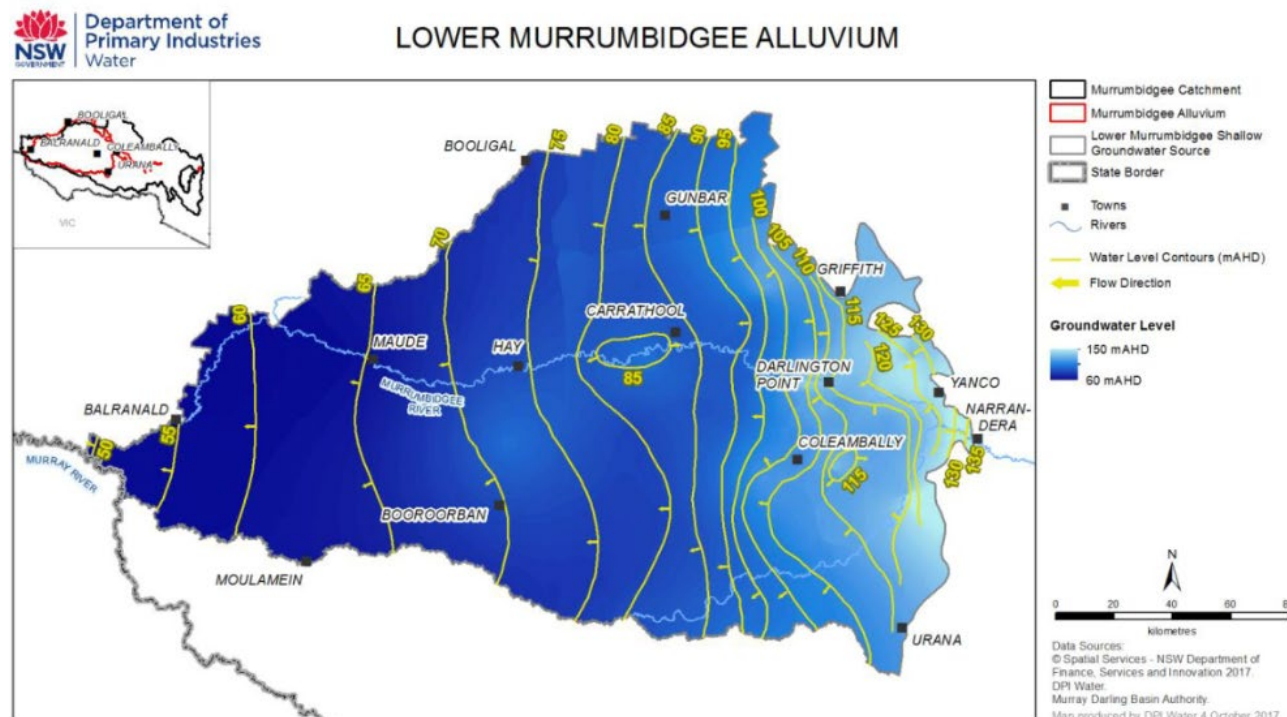


Figure 4-4 Murrumbidgee Alluvium HSU groundwater contour map 2015/2016 (DPIE, 2019a)

Porous rock

There are no available regional groundwater contour maps or proximal groundwater level information published within the DPIE (2019b) water resource description report for the corresponding Porous rock HSU.

Lachlan fractured rock

There are no available regional groundwater contour maps or proximal groundwater level information published within the DPIE (2019c) water resource description report for the corresponding Lachlan fractured rock HSU.

4.3.2.4 Groundwater levels from registered bores

Table 4-3 summarises the available groundwater level records from reviewed registered bore data within the groundwater study area. The location and additional registered bore details, such as the registered purposes and functions of identified registered bores is shown in Figure 4-5.

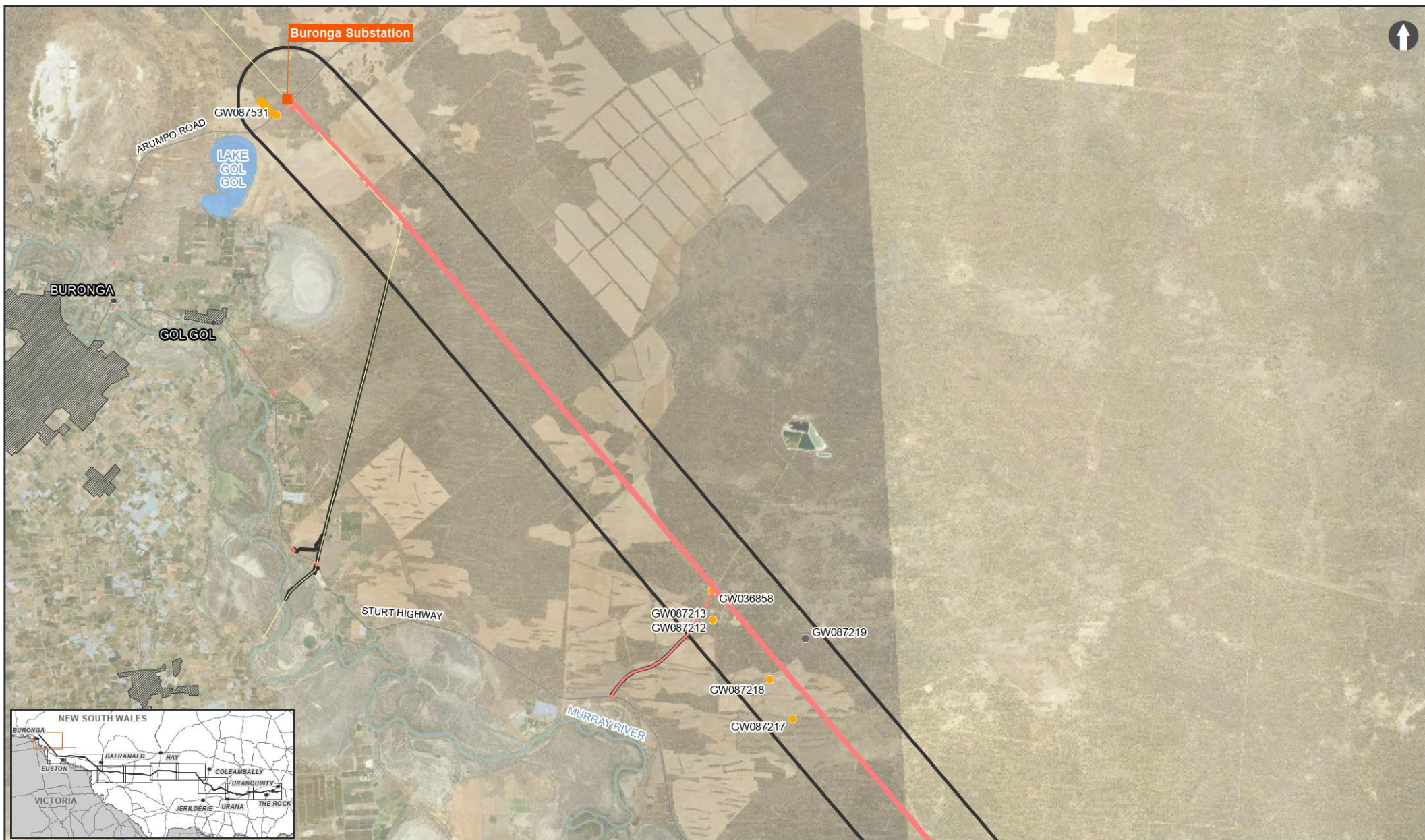
Table 4-3 Registered groundwater bores and their groundwater level statistics (WaterNSW, 2021).

INFERRED HSU	AQUIFER	GROUNDWATER LEVEL (mBTC) ¹				
		Count ²	Minimum SWL ³	Maximum SWL	Average SWL	Median SWL
Murrumbidgee Alluvium	Shallow	28	9.0	24.0	17.4	17.8
	Deep	11	15.8	27.0	22.0	22.7
Porous rock	Shallow	15	7.1	21.9	17.0	17.0
	Deep	6	9.0	30.8	16.7	15.1
Lachlan fractured rock	Shallow	5	2.0	7.6	4.0	3.0
	Deep	17	27.4	61.0	41.0	39.9

(1) mBTC = metres below top of casing (as recorded in WaterNSW (2021))

(2) Number of unique groundwater level measurements used to determine statistics

(3) SWL = Standing water level



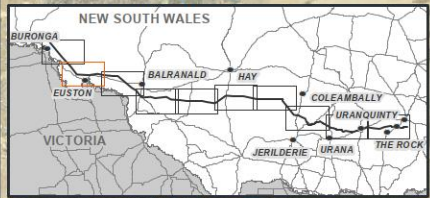
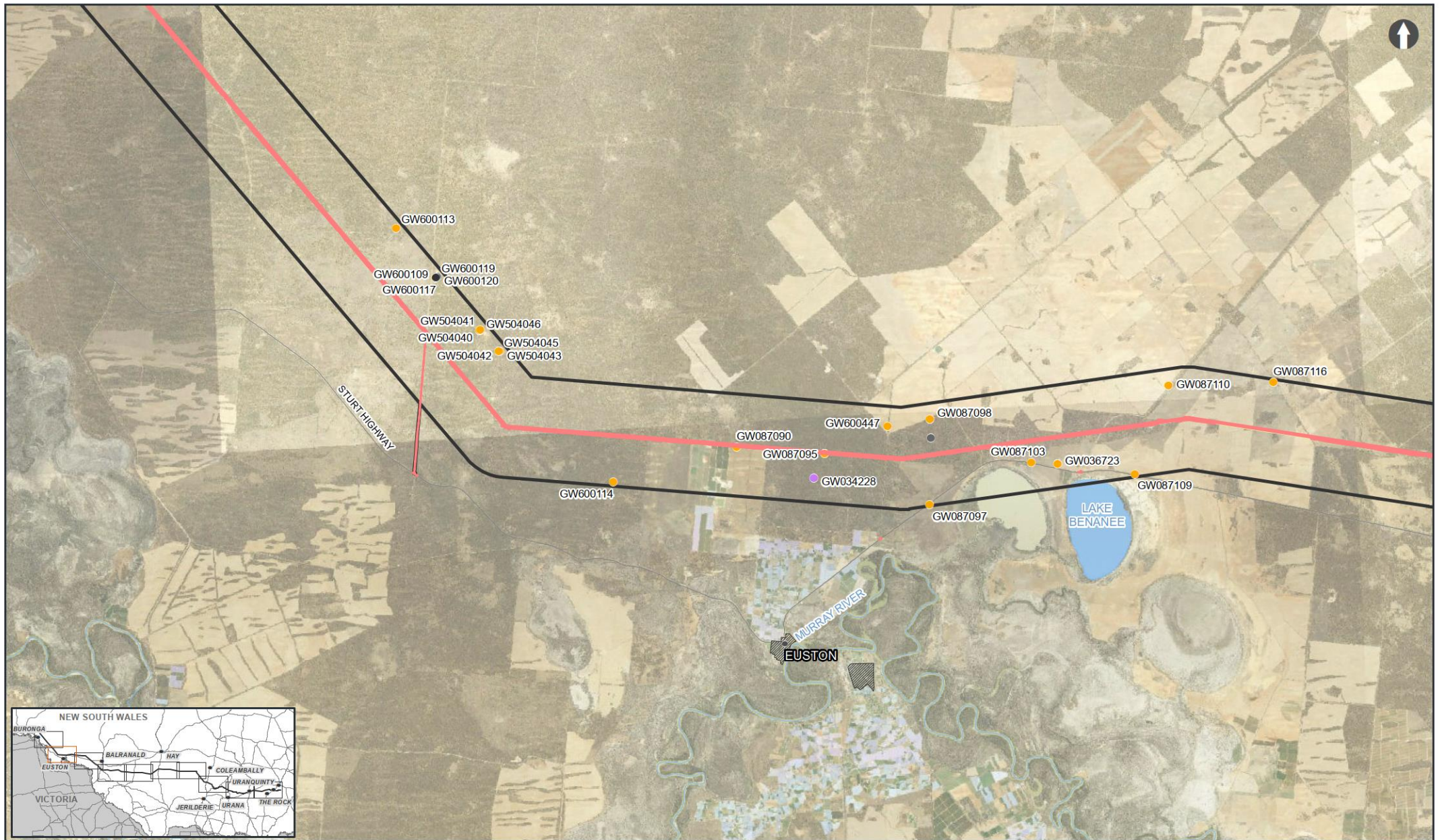
Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

- Groundwater Monitoring Bore Function**
- Monitoring (8)
 - Unknown (1)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



0 5 10 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

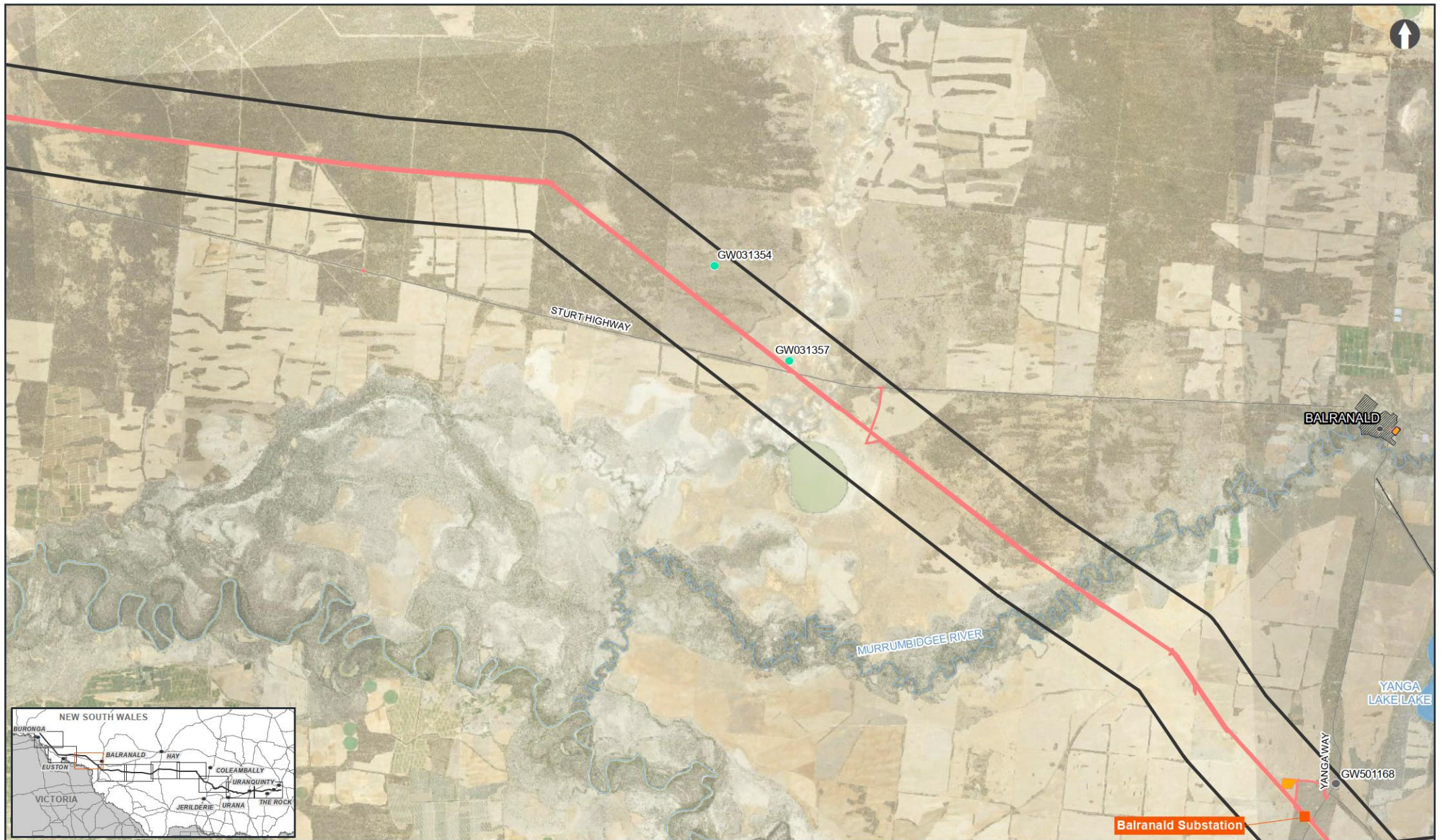
Groundwater Monitoring Bore Function

- Drainage - Groundwater (3)
- Household (1)

Monitoring / Mining Activities

- Monitoring (19)
- Unknown (6)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



0 5 10 KM

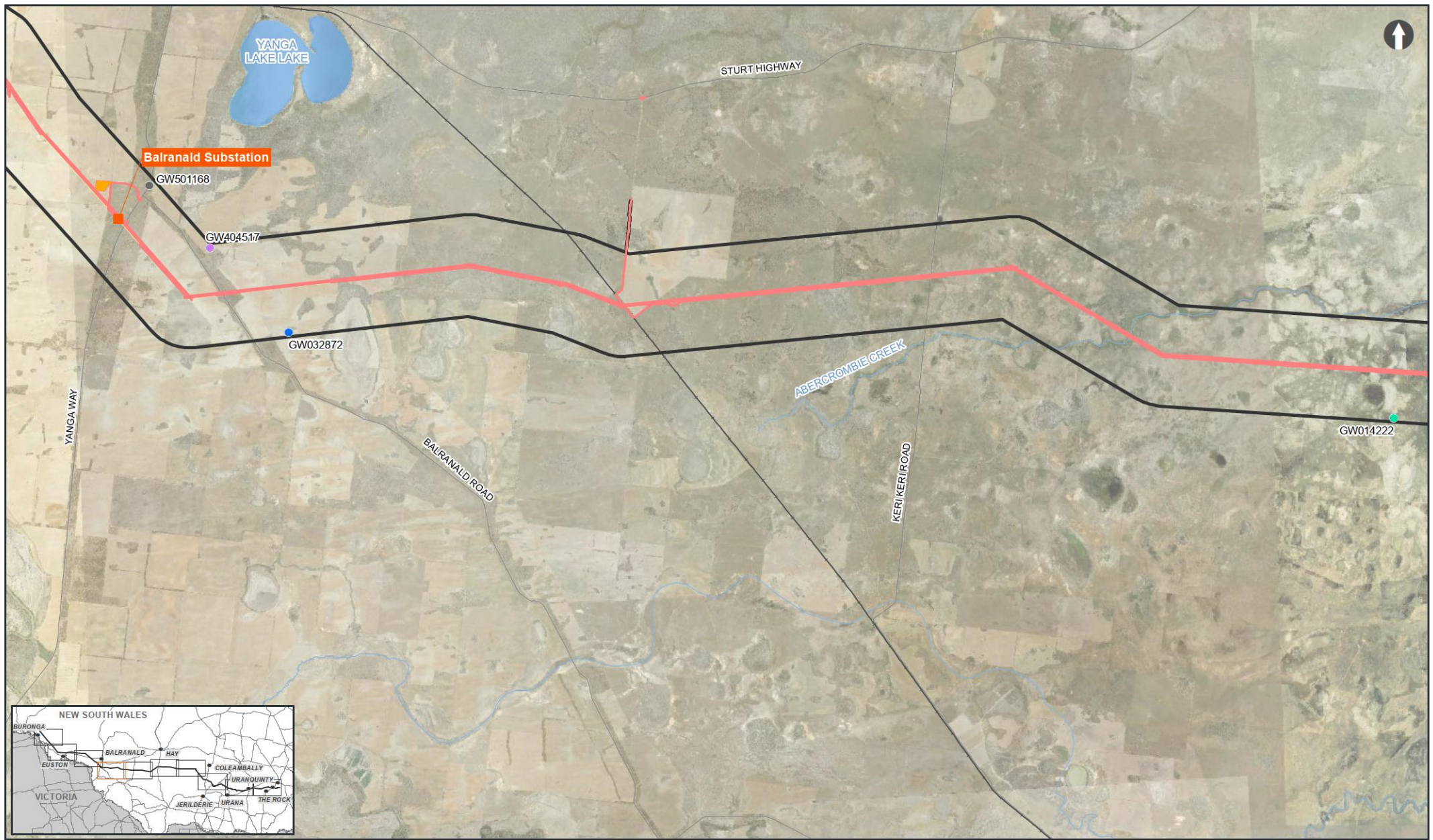
Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

- Groundwater Monitoring Bore Function
- Water Supply for Livestock (2)
- Unknown (1)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



0 5 10 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

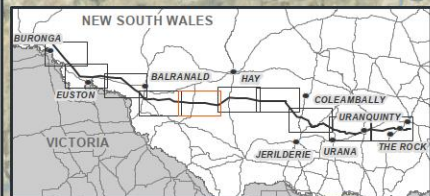
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Groundwater Monitoring Bore Function

- Household (1)
- Water Supply for Livestock (1)

- Unknown (1)
- Water Supply (1)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



0 5 10 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

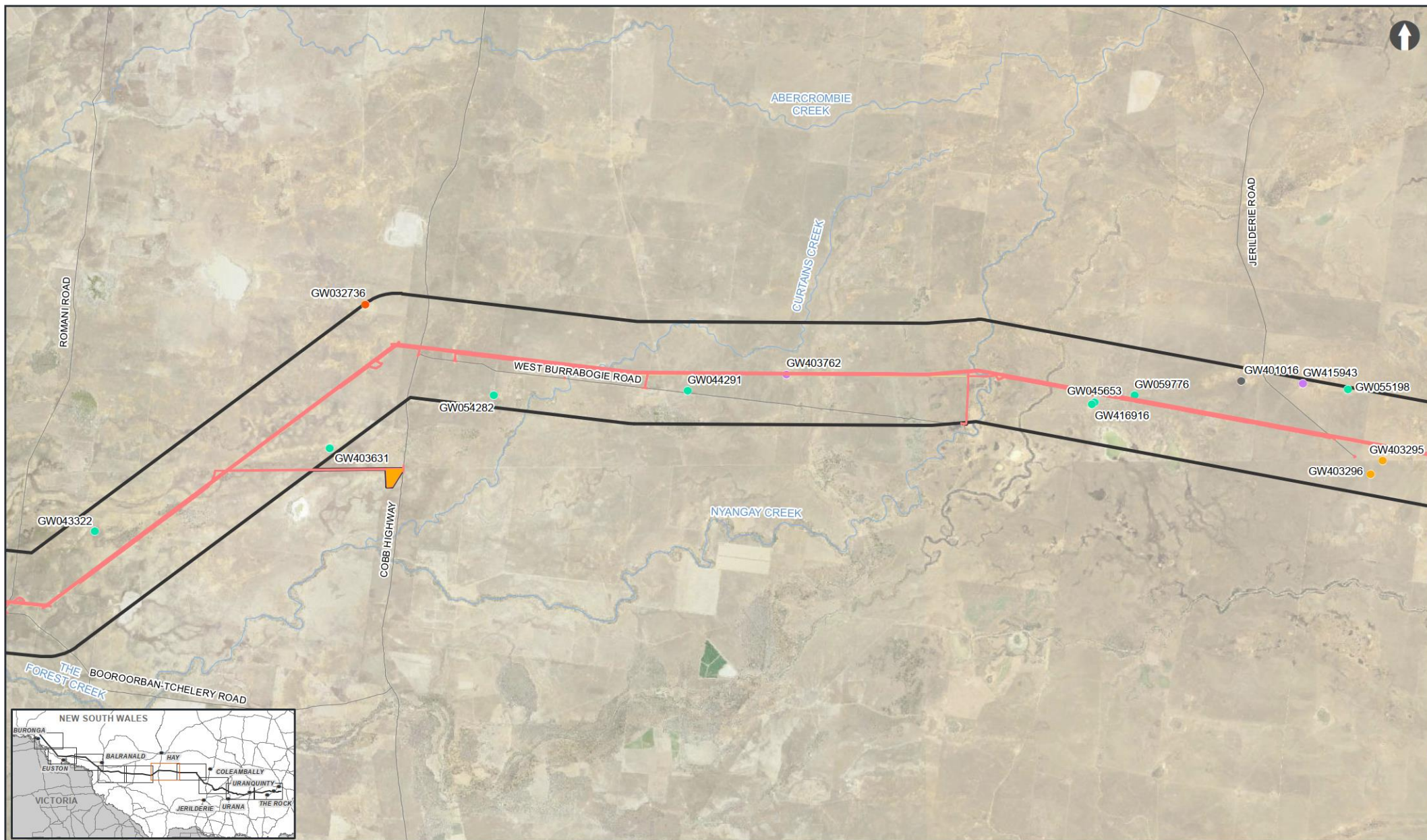
Groundwater Monitoring Bore Function

- Household (2)
- Monitoring (3)

Water Supply for Livestock (8)

- Water Supply for Livestock (8)
- Unknown (3)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

Existing Infrastructure

- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Groundwater Monitoring Bore Function

- Household (2)
- Irrigated Agriculture

- Monitoring (2)
- Water Supply for Livestock (8)
- Unknown (1)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

Existing Infrastructure

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

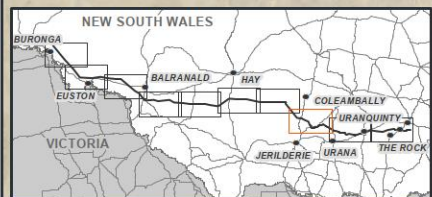
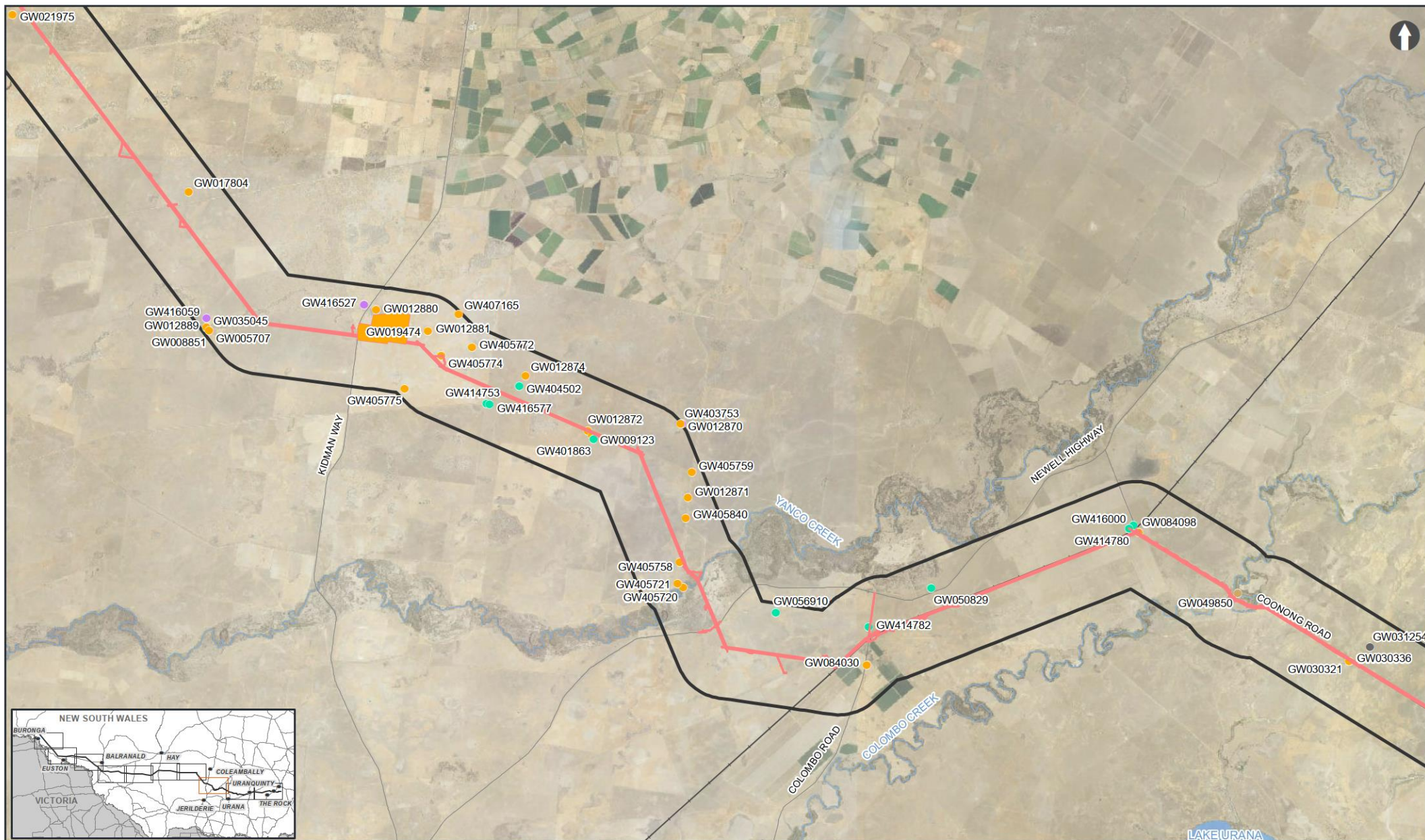
Groundwater Monitoring Bore Function

- Household (1)
- Monitoring (8)

Water Supply for Livestock (8)

- Water Supply for Livestock (8)
- Unknown (2)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area



Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites

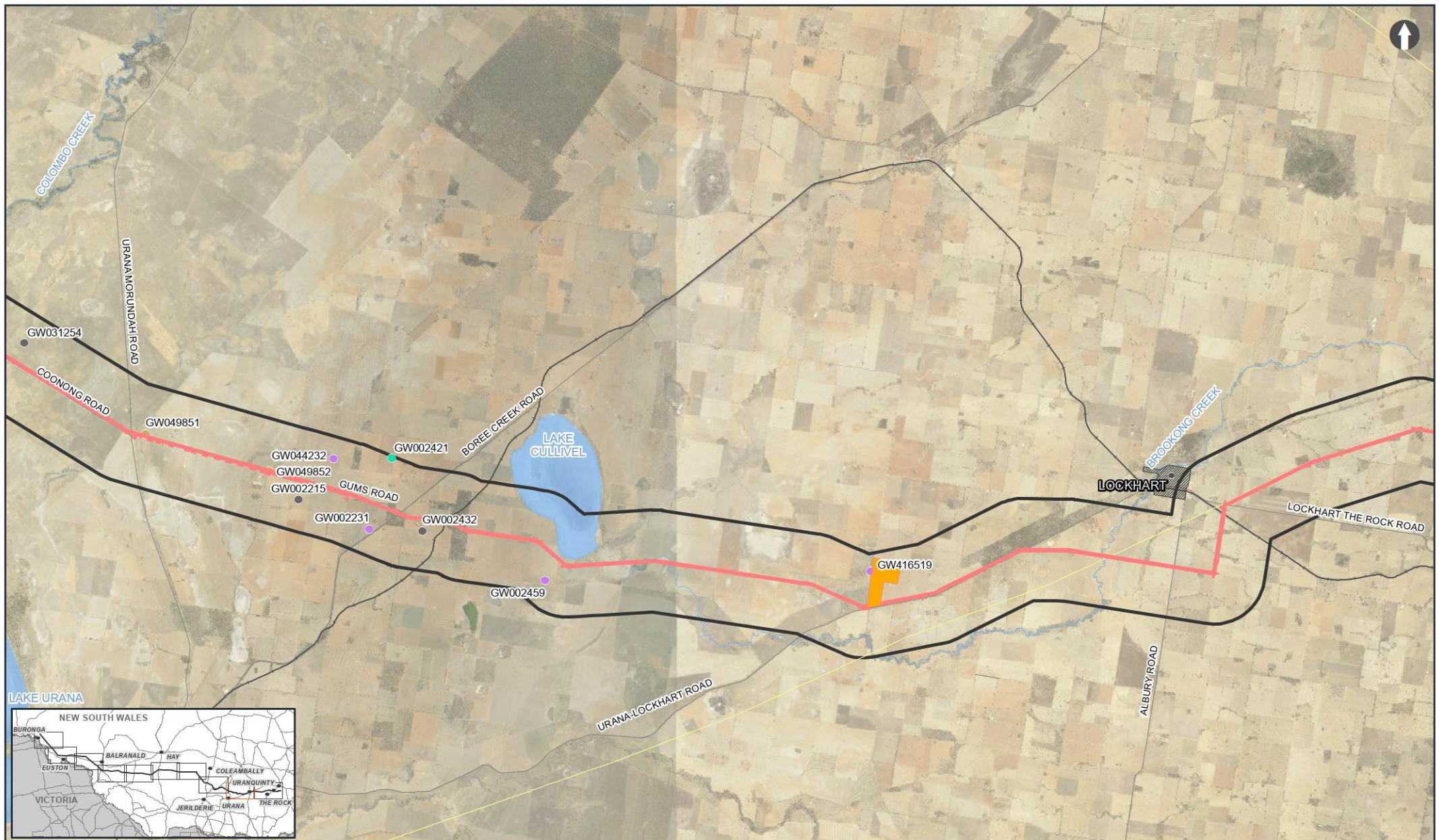
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

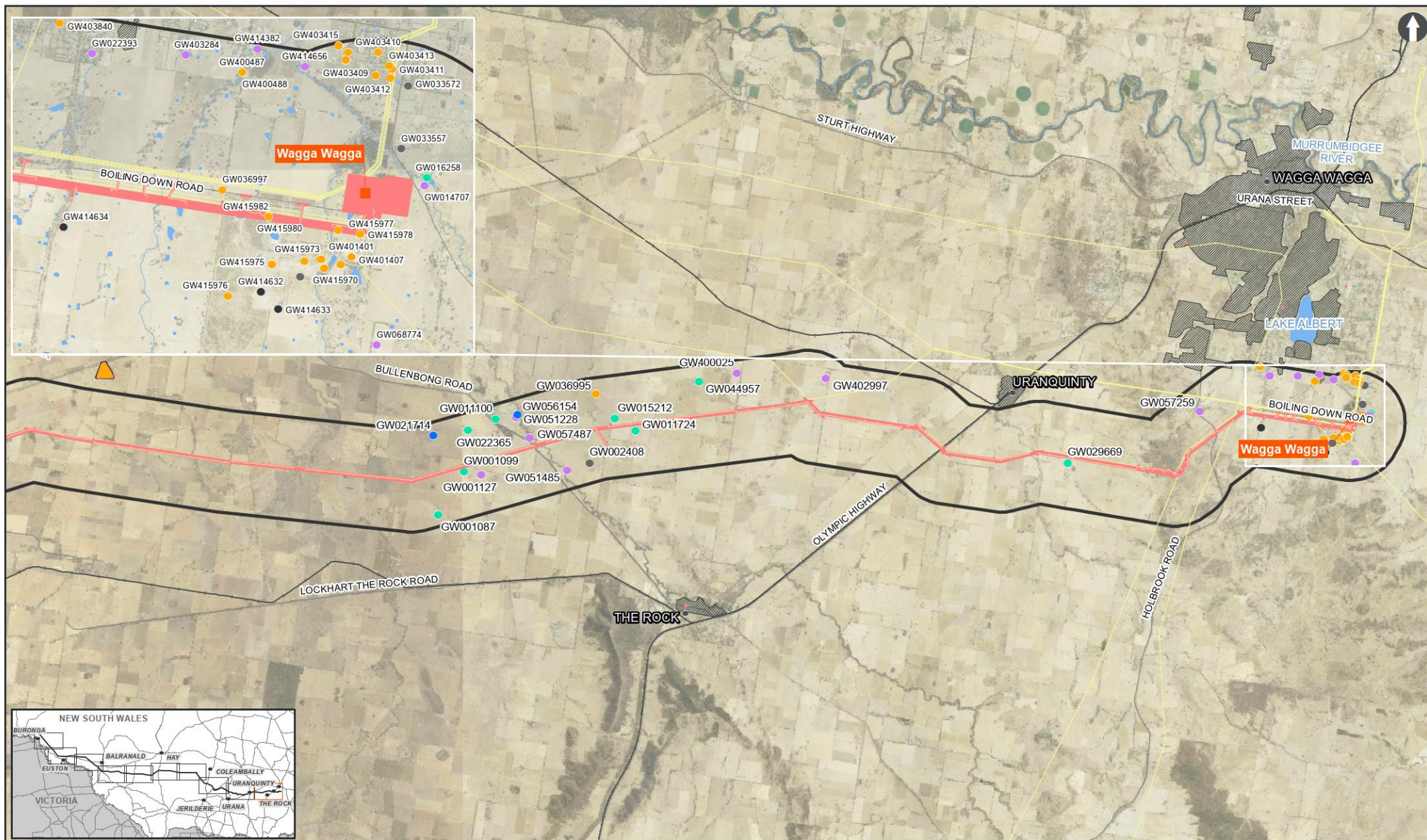
Groundwater Monitoring Bore Function

- Exploration / Mining Activities
- Household (3)

- Monitoring (27)
- Water Supply for Livestock (9)
- Unknown (1)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area





Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Groundwater Monitoring Bore Function

- Drainage - Groundwater (3)
- Household (13)
- Monitoring (54)

Water Supply for Livestock (9)

- Water Supply for Livestock (9)
- Unknown (4)
- Water Supply (2)

Contaminated Land - Figure 4-5
Registered Bores Within the Groundwater Study Area

4.3.2.5 Site specific groundwater levels

Table 4-4 lists the groundwater observations by DP (2020a and 2020b) and SMEC (2020a, 2020b & 2020c) with a summary provided in Table 4-5. It is inferred due to the maximum depth of investigations that groundwater observations relate to shallow aquifers or perched groundwater.

Table 4-4 Locations of observed groundwater inflow during field investigations (DP, 2020a & 2020b; SMEC, 2020a, 2020b & 2020c)

GEOTECHNICAL LOCATION ID	INFERRED HSU	OBSERVED GROUNDWATER LEVEL (mBGL) ¹
BH1-10	Lachlan fractured rock	7.8
BH12-338	Murrumbidgee Alluvium	12.5
BH1-255	Murrumbidgee Alluvium	8.2
BH-2-549	Murrumbidgee Alluvium	10
BH-2-561	Murrumbidgee Alluvium	7
BH-2-574	Porous rock	8.5
BH-2-614	Porous rock	12.5
BH-2-646	Porous rock	5.5
BH-2-729	Porous rock	10.3
BH-LA-02	Murrumbidgee Alluvium	6.9
BH-LA-06	Murrumbidgee Alluvium	10.2
BH-LA-25	Porous rock	11
CPT-22	Porous rock	7.9
CPT2-232	Murrumbidgee Alluvium	18.1
CPT2-387	Murrumbidgee Alluvium	7.6
CPT2-519	Murrumbidgee Alluvium	7.5
CPT-2-564A	Porous rock	7.3
CPT-2-594	Porous rock	7.6
CPT-31	Murrumbidgee Alluvium	10.2
CPT-37	Porous rock	4.5
CPT-382	Murrumbidgee Alluvium	7.7
R2-BH 01	Lachlan fractured rock	12
R2-BH 08	Murrumbidgee Alluvium	8
R2-BH 09b	Murrumbidgee Alluvium	14
R2-BH 14	Murrumbidgee Alluvium	8.3
R2-BH 24	Lachlan fractured rock	7.8

(1) mBGL = metres below ground level.

(2) N/A = not applicable. mAHD could not be determined as no surveyed elevation details provided.

Table 4-5 Minimum and maximum groundwater level observations from site investigations per HSU (excludes site locations where groundwater was not encountered)

INFERRED HSU	AQUIFER	GROUNDWATER LEVEL (mBGL) ¹		
		Count ²	Minimum SWL	Maximum SWL
Murrumbidgee Alluvium	Shallow	14	4.5	18.1
Porous rock	Shallow	9	4.5	12.5
Lachlan fractured rock	Shallow	3	7.8	12.0

(1) mBGL = metres below ground level

(2) Only includes locations where groundwater was observed.

4.3.3 Groundwater quality

Groundwater quality, considering relevant regional studies and available local information (such as registered bores) is provided in the following subsections. No groundwater quality samples were collected during geotechnical site investigations.

4.3.3.1 Regional groundwater quality

The typical regional quality of the groundwater based on the groundwater resource descriptions published by DPIE (2019a, 2019b & 2019c) is provided in Table 4-6.

Table 4-6 Indicative regional groundwater quality (DPIE, 2019a, 2019b & 2019c)

HSU	AQUIFER	GROUNDWATER QUALITY AND SALINITY (EC)
Murrumbidgee Alluvium	Shallow	Groundwater quality can significantly vary both laterally and vertically within the shallow aquifer from fresh (585 $\mu\text{S}/\text{cm}$) to saline (32,800 $\mu\text{S}/\text{cm}$). Average salinity recorded is 8,314 $\mu\text{S}/\text{cm}$.
	Deep	Groundwater quality ranges from 364 to 8,930 $\mu\text{S}/\text{cm}$ (fresh to brackish) with a mean of 1,300 $\mu\text{S}/\text{cm}$.
Porous rock	Shallow	Groundwater quality ranges from fresh through to saline (greater than 50,000 $\mu\text{S}/\text{cm}$).
	Deep	
Lachlan fractured rock	Shallow	Groundwater quality significantly varies from fresh to saline based on rock type, fracture density, aquifer depth and climate.
	Deep	

4.3.3.2 Groundwater quality from registered bores

Key statistics of available and relevant groundwater quality records obtained from the registered bore search (BOM, 2021) are listed in Table 4-7. No qualitative groundwater quality records were available for the Porous rock (deep) HSU in the groundwater study area.

Table 4-7 Registered bores with quantitative groundwater quality records

INFERRED HSU (AQUIFER)	NUMBER OF REGISTERED BORES ¹	GROUNDWATER QUALITY – SALINITY (EC $\mu\text{S}/\text{cm}$) ²			
		Minimum	Maximum	Average ³	Classification ⁴
Murrumbidgee Alluvium (shallow)	3	1,500–4,475	4,475–10,450	5,971	Marginal to moderately saline
Murrumbidgee Alluvium (deep)	11	0–750	4,475–10,450	2,346	Fresh to moderately saline
Porous rock (shallow)	10	8,365	75,360	41,358	Slightly saline to hyper saline
Lachlan fractured rock (shallow)	1	0–750			Fresh
Lachlan fractured rock (deep)	1	750–1,500			Fresh to marginal

- (1) Excludes proposed or planned bores, bores with no quantitative groundwater quality record within the groundwater study area.
- (2) Values recorded as total dissolved solids (TDS) or parts per million (ppm) were converted to microSiemens per centimetre ($\mu\text{S}/\text{cm}$) using a factor of 0.67.
- (3) Where an EC range was provided, the average was used for calculations.
- (4) Based on the classification ranges provided in Hounslow (1995).

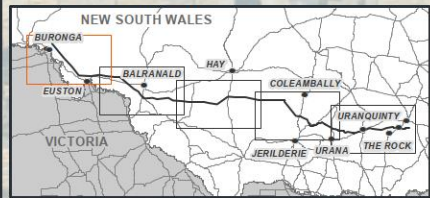
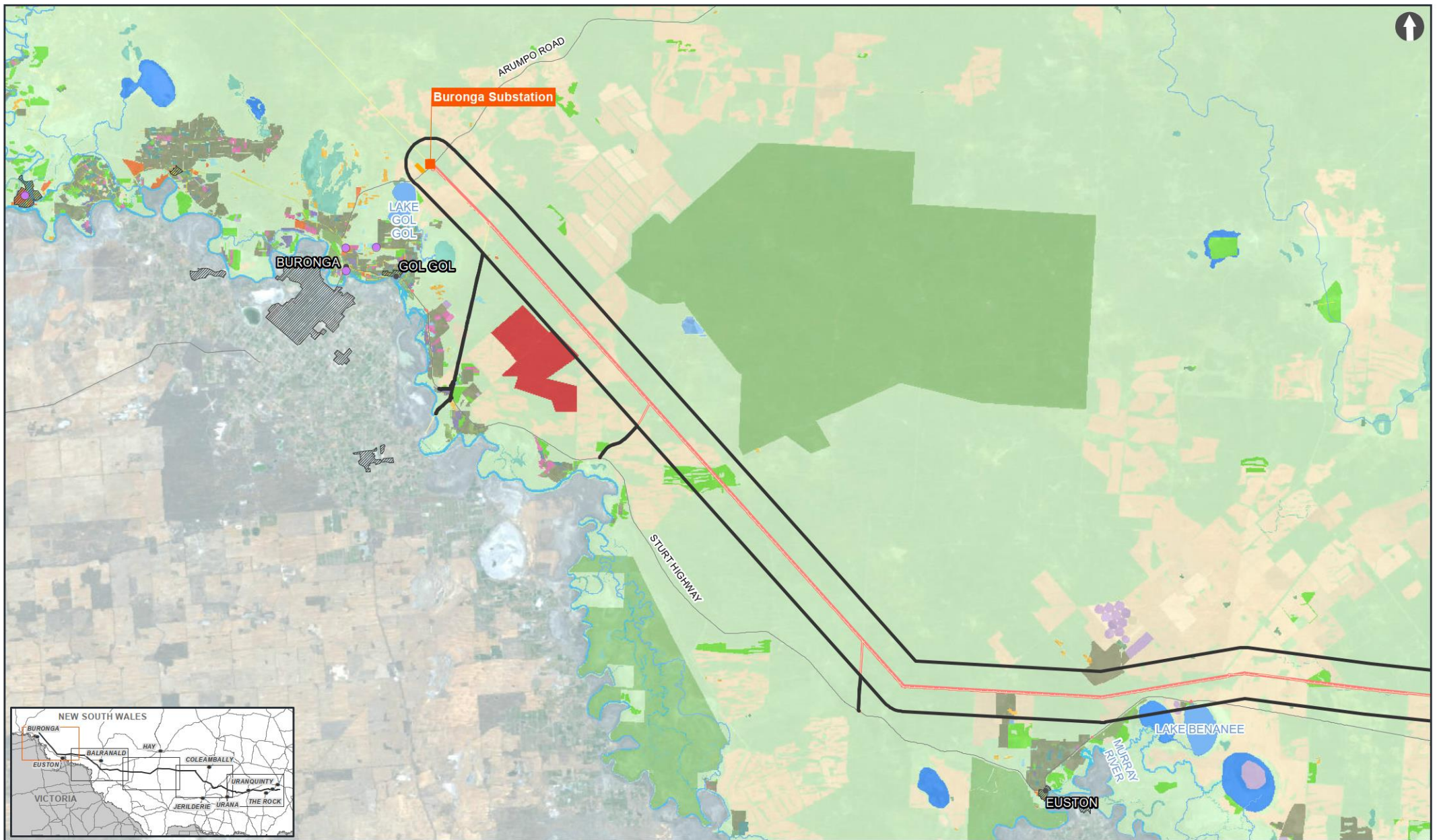
4.4 General site land use

Most of the contamination study area and surrounding areas are used for grazing native vegetation and is classified as such in mapping completed by the former NSW Office of Environment and Heritage, *NSW Land Use* 2013 (OEH, 2013a). Grazing of goats, cattle and sheep (for wool and meat) is common. Much smaller proportions are classified as cropping or grazing modified pastures by OEH (2013a).

A map of land use across the construction impact area has been included within Figure 4-6.

Table 4-8 Summary of land use in the construction impact area

LAND USE	AREA (ha)	PROPORTION (%)
1 Conservation and natural environments	192	3.8%
2.1.0 Grazing native vegetation	3,237	64.3%
2.2.0 Production native forestry	32	0.6%
3.2.0 Grazing modified pastures	145	2.9%
3.3.0 Cropping	1,249	24.8%
4.3.0 Irrigated cropping	62	1.2%
4.4.0 Irrigated perennial horticulture	0	0.0%
5.4.0 Residential and farm infrastructure	5	0.1%
5 Other intensive uses (mining, transport, etc.)	34	0.7%
6 Water (lakes, rivers, etc.)	75	1.5%
Grand Total	5,031	100.00



0 10 20 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

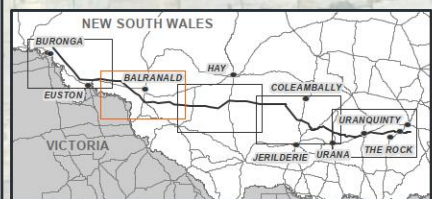
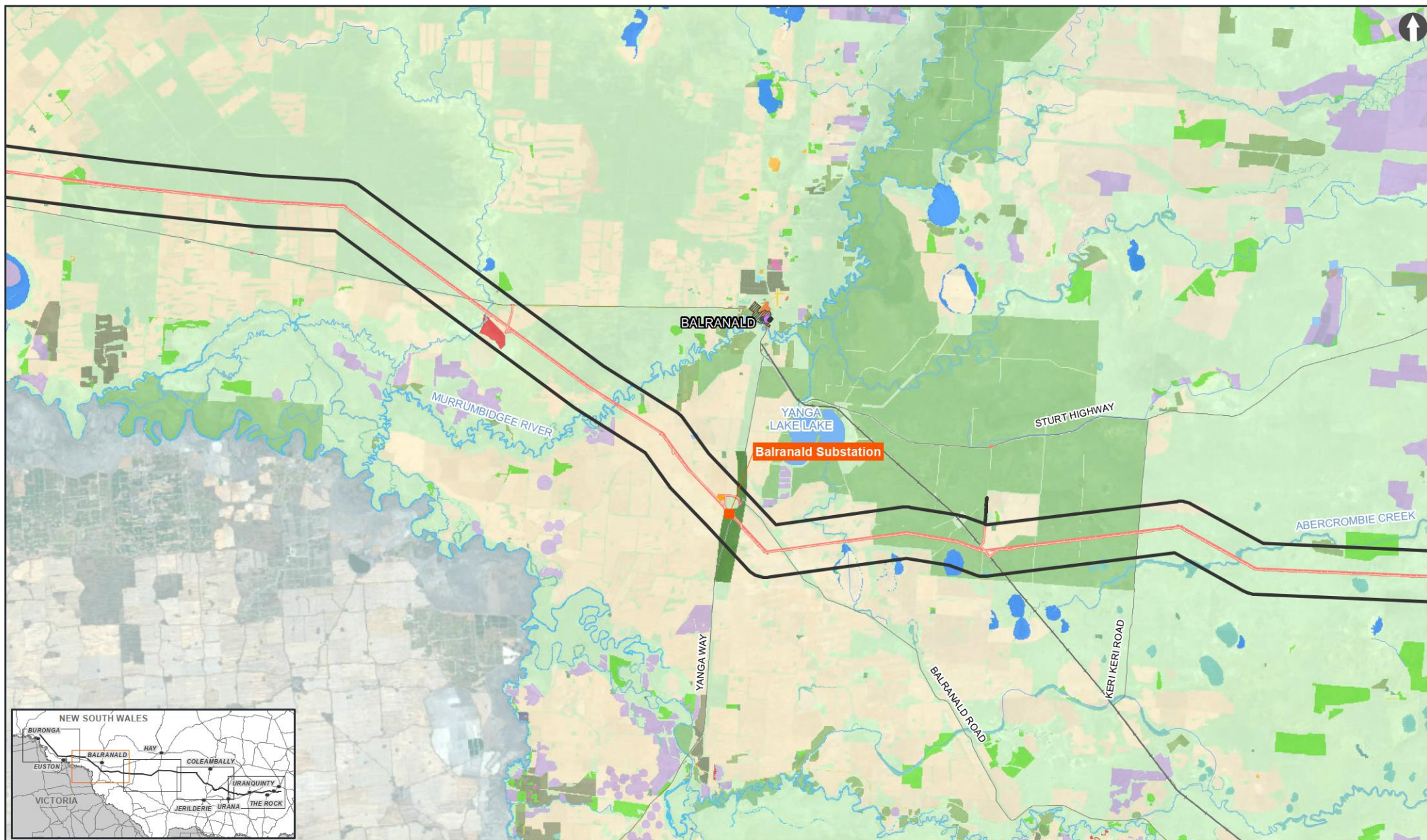
Land Use (2017)

- | | | | |
|-----------------------------------|---|--|---|
| 1.1.0 Nature conservation | 3.2.0 Grazing modified pastures | 4.4.0 Irrigated perennial horticulture | 5.4.0 Residential and farm infrastructure |
| 1.2.0 Managed resource protection | 3.3.0 Cropping | 4.5.0 Irrigated seasonal horticulture | 5.5.0 Services |
| 1.3.0 Other minimal use | 3.6.0 Land in transition | 4.6.0 Irrigated land in transition | 5.6.0 Utilities |
| 2.1.0 Grazing native vegetation | 4.1.0 Irrigated plantation forests | 5.1.0 Intensive horticulture | 5.7.0 Transport and communication |
| 3.1.0 Plantation forests | 4.2.0 Grazing irrigated modified pastures | 5.2.0 Intensive animal production | 5.8.0 Mining |
| | 4.3.0 Irrigated cropping | 5.3.0 Manufacturing and industrial | 5.9.0 Waste treatment and disposal |

Contaminated Land Management - Figure 4-6

Land Uses in the Study Area

Sheet 1 of 5



0 10 20 KM

Project Components

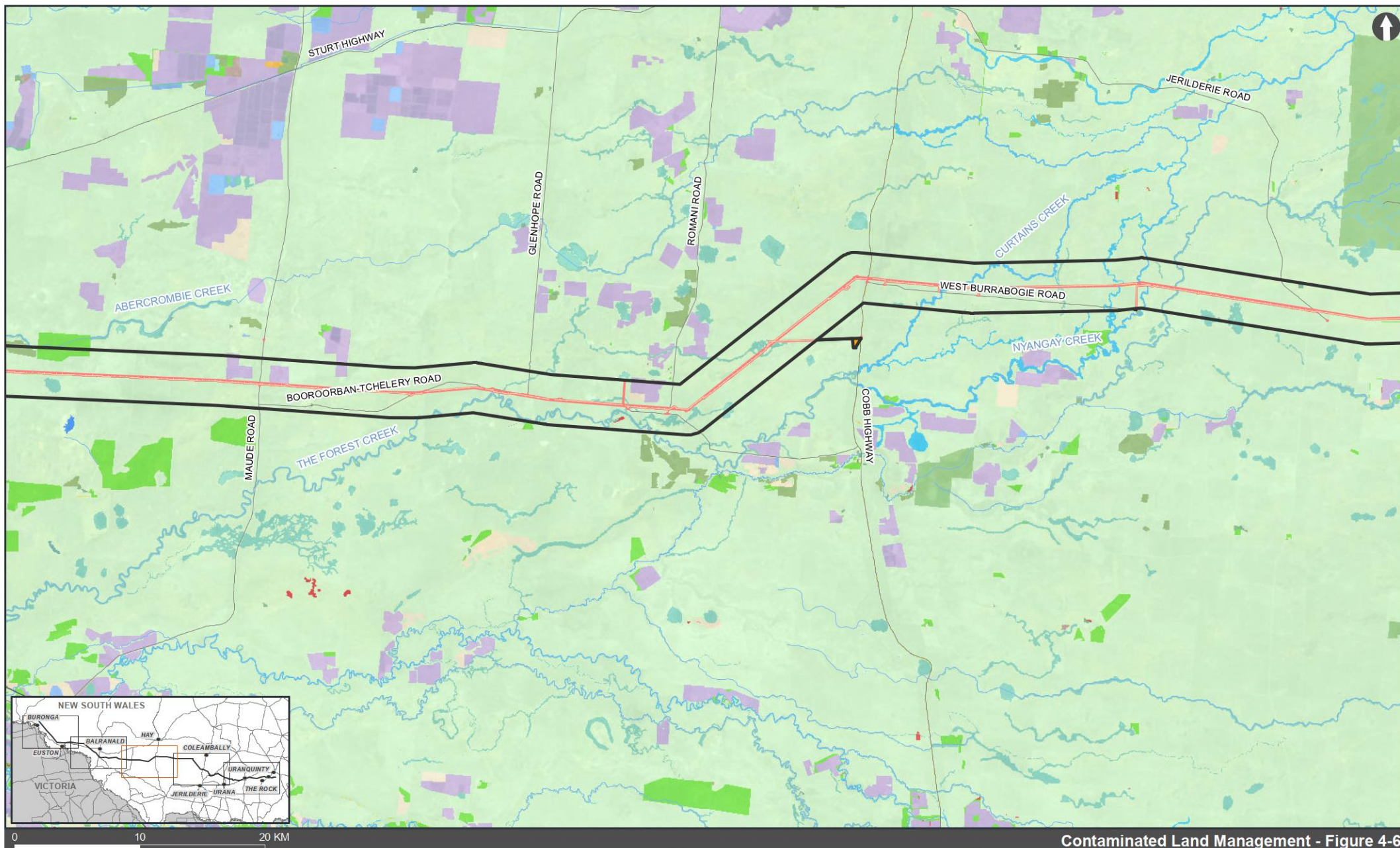
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

- Land Use (2017)
- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forestry
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 3.6.0 Land in transition
- 4.2.0 Grazing irrigated modified pastures
- 4.3.0 Irrigated cropping
- 4.4.0 Irrigated perennial horticulture
- 4.5.0 Irrigated seasonal horticulture
- 4.6.0 Irrigated land in transition
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.4.0 Channel/aqueduct
- 6.5.0 Marsh/wetland

Contaminated Land Management - Figure 4-6

Land Uses in the Study Area

Sheet 2 of 5



Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Land Use (2017)

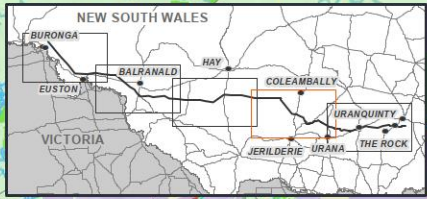
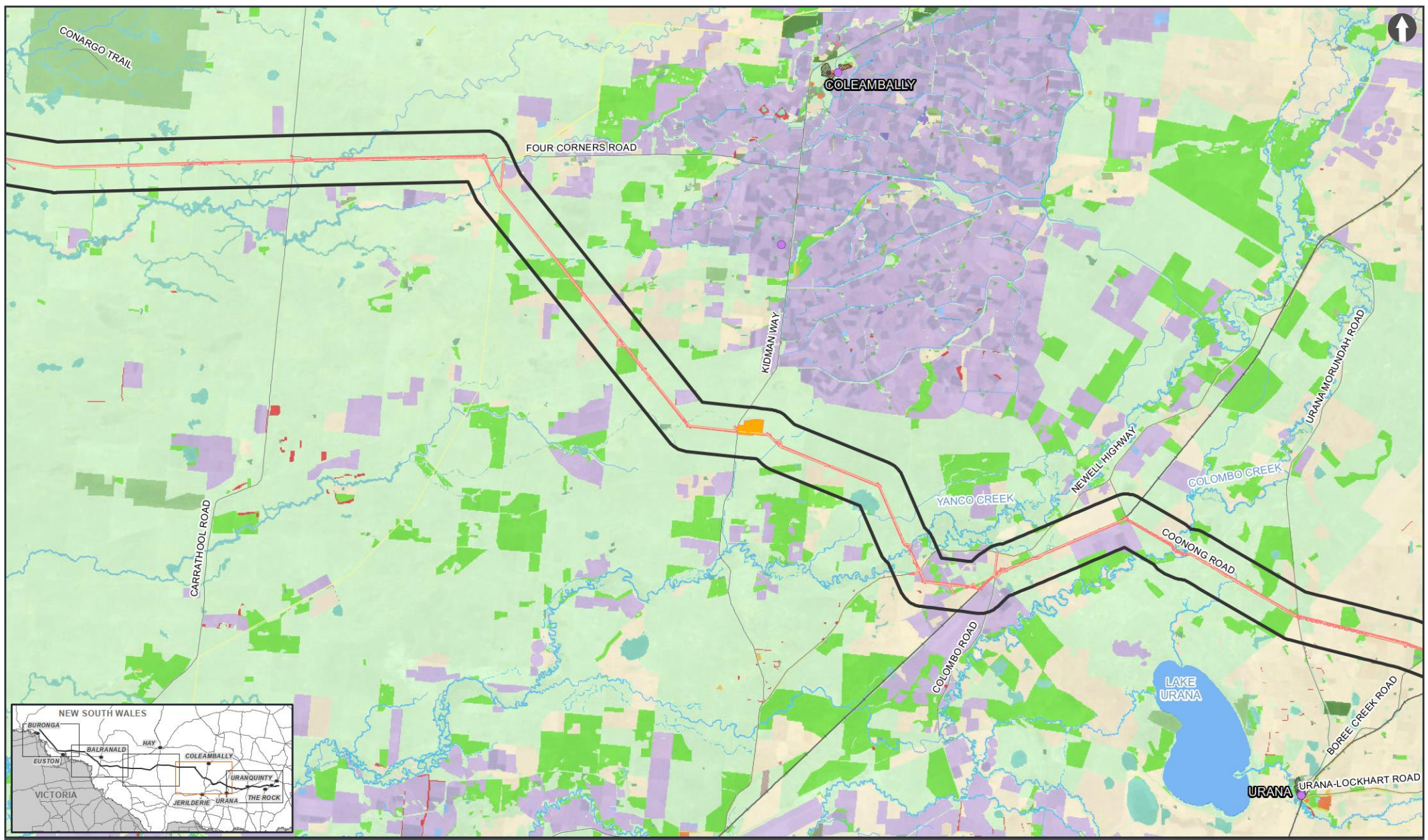
- | | | |
|--|---|--|
| ■ 1.1.0 Nature conservation | ■ 3.3.0 Cropping | ■ 5.4.0 Residential and farm infrastructure |
| ■ 1.2.0 Managed resource protection | ■ 3.6.0 Land in transition | ■ 5.5.0 Services |
| ■ 1.3.0 Other minimal use | ■ 4.2.0 Grazing irrigated modified pastures | ■ 5.6.0 Utilities |
| ■ 2.1.0 Grazing native vegetation | ■ 4.3.0 Irrigated cropping | ■ 5.7.0 Transport and communication |
| ■ 3.2.0 Grazing modified pastures | ■ 5.2.0 Intensive animal production | ■ 5.8.0 Mining |
| | ■ 5.3.0 Manufacturing and industrial | ■ 5.9.0 Waste treatment and disposal |

- | |
|--|
| ■ 6.1.0 Lake |
| ■ 6.2.0 Reservoir/dam |
| ■ 6.3.0 River |
| ■ 6.4.0 Channel/aqueduct |
| ■ 6.5.0 Marsh/wetland |

Contaminated Land Management - Figure 4-6

Land Uses in the Study Area

Sheet 3 of 5



0 10 20 KM

Project Components

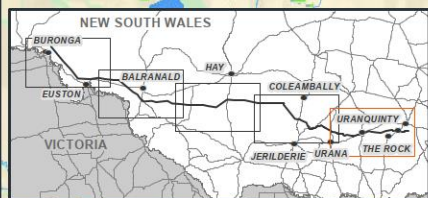
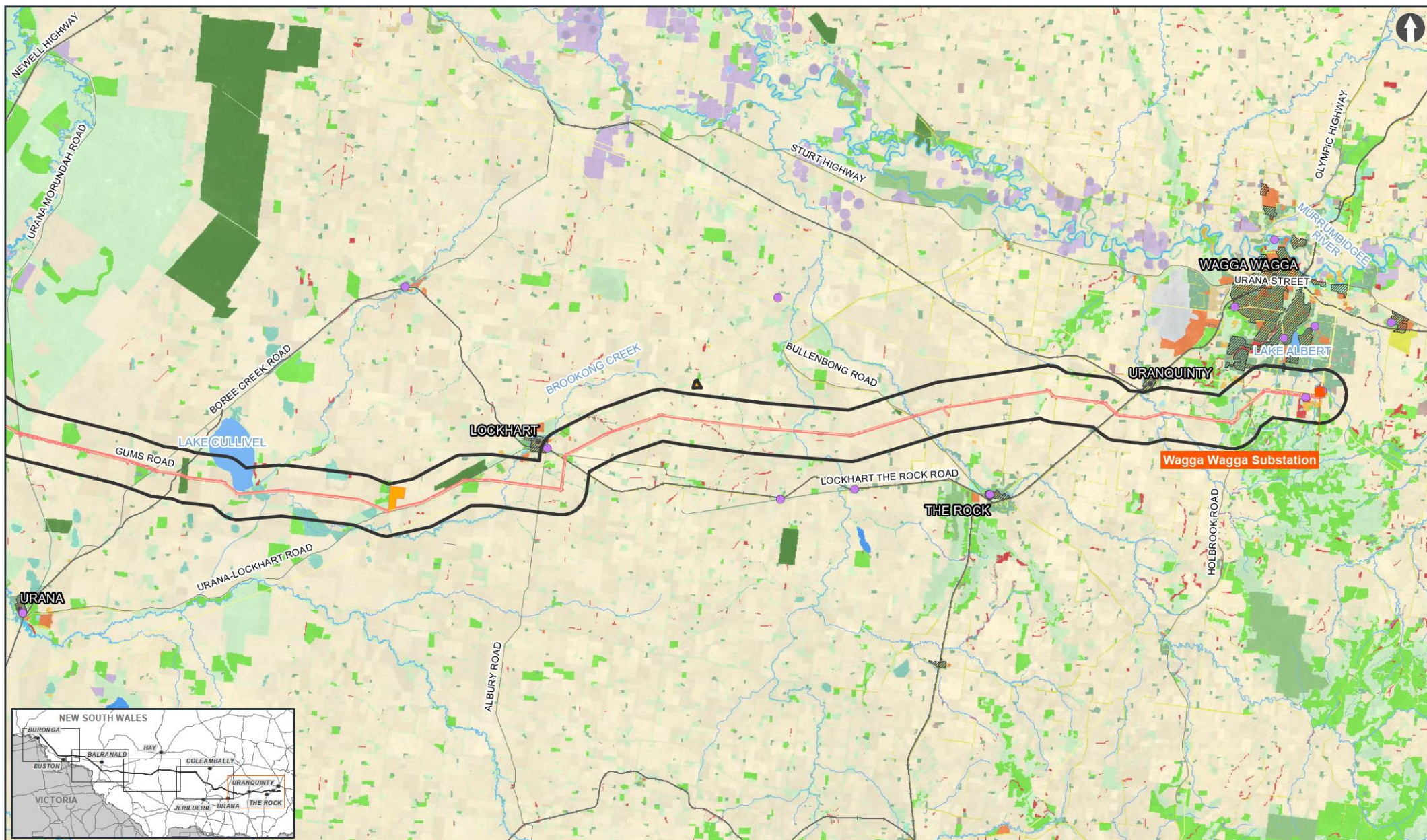
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

Land Use (2017)

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forestry
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 4.1.0 Irrigated plantation forests
- 4.2.0 Grazing irrigated modified pastures
- 4.3.0 Irrigated cropping
- 4.4.0 Irrigated perennial horticulture
- 4.5.0 Irrigated seasonal horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.4.0 Channel/aqueduct
- 6.5.0 Marsh/wetland

Contaminated Land Management - Figure 4-6

Land Uses in the Study Area



0 10 20 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas

- 1.1.0 Nature conservation
- 1.2.0 Managed resource protection
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 2.2.0 Production native forestry
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 4.1.0 Irrigated plantation forests
- 4.2.0 Grazing irrigated modified pastures
- 4.3.0 Irrigated cropping
- 4.4.0 Irrigated perennial horticulture
- 4.5.0 Irrigated seasonal horticulture
- 5.1.0 Intensive horticulture
- 5.2.0 Intensive animal production
- 5.3.0 Manufacturing and industrial
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.6.0 Utilities
- 5.7.0 Transport and communication
- 5.8.0 Mining
- 5.9.0 Waste treatment and disposal
- 6.1.0 Lake
- 6.2.0 Reservoir/dam
- 6.3.0 River
- 6.5.0 Marsh/wetland

Contaminated Land Management - Figure 4-6

Land Uses in the Study Area

Sheet 5 of 5

4.5 Zoning

The contamination study area is zoned RU1 Primary Production under the *Wentworth Local Environmental Plan 2011*, the *Balranald Local Environmental Plan 2010*, the *Wakool Local Environmental Plan 2013*, the *Conargo Local Environmental Plan 2013*, the *Hay Local Environmental Plan 2011*, the *Jerilderie Local Environmental Plan 2012*, the *Urana Local Environmental Plan 2011*, the *Lockhart Local Environmental Plan 2012* and the *Wagga Wagga Local Environmental Plan 2010*. The contamination study area also passes through two smaller zoning areas, zoned as E1 National Parks and Nature Reserves under the *Wakool Local Environmental Plan 2013*, and E2 Environmental Conservation under the *Wentworth Local Environmental Plan 2011*.

The objectives of the RU1 zone are as follows:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- to encourage diversity in primary industry enterprises and systems appropriate for the area.
- to minimise the fragmentation and alienation of resource lands.
- to minimise conflict between land uses within this zone and land uses within adjoining zones.
- to ensure the protection of both mixed dryland and irrigation agricultural land uses that together form the distinctive rural character
- to ensure land is available for intensive plant agricultural activities.
- to encourage diversity and promote employment opportunities related to primary industry enterprises, including those that require smaller holdings or are more intensive in nature.

The objectives of the E1 zone are as follows:

- to enable the management and appropriate use of land that is reserved under the *National Parks and Wildlife Act 1974* or that is acquired under Part 11 of that Act
- to enable uses authorised under the *National Parks and Wildlife Act 1974*
- to identify land that is to be reserved under the *National Parks and Wildlife Act 1974* and to protect the environmental significance of that land.

4.6 Database search of potential current and former contaminant sources

A review of a database search of potential current and former contaminant sources in the vicinity of the site is presented in Table 4-9. The following distances from the proposed transmission line have been selected for corresponding searches:

- 2 km – NSW contaminated sites notified to EPA, current and/or former NSW EPA licensed activities, clean up notices, national waste management site database, unexploded ordinance (UXO) database and cattle dips
- 5 km – Gasworks
- 10 km – PFAS impacted locations.

The wide search corridor from the proposed transmission line was selected for the contaminated database search to capture all potential sources. Items highlighted in bold within Table 4-9 are identified as potential areas of environmental concern within the contamination study area and are discussed in further detail in Section 5.1.

Further explanation on UXO categories is provided within Section 4.6.1.

Table 4-9 Database search of potential current and former contaminant sources

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Main transmission line easement – 80 metre wide corridor between the Buronga substation and the Wagga Wagga substation.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	The main transmission line (alignment) crosses the Urana (NSW) UXO area (Category: Other) . The study area also crosses the Oak Plains (NSW) UXO area south-east of the Buronga substation (Category: Substantial). There are no other mapped UXO areas within the study area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Balranald construction compound (and potential accommodation camp)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES² (2 km search area)	CLEAN UP NOTICES³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE⁴ (5 km search area)	UNEXPLODED ORDNANCE (UXO) DATABASE⁵ (2 km search area)	CATTLE DIPS⁶ (2 km search area)	GASWORKS⁷ (5 km search area)	PFAS⁸ (10 km search area)
Cobb Highway/ Booroban Camp	No sites within search area.	No sites within search area	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area
Dinawan Camp and laydown area	No sites within search area.	No sites within search area	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area
Lockhart Camp laydown and accommodation	No sites within search area.	No sites within search area	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area
Wagga Wagga Camp and laydown area	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Three known PFAS sites within 10 km of the site: — Forest Hill Sewage Treatment Plant (approx. 7.5 km north-east) — Wagga Wagga RAAF Base (approx. 8.5 km north-east) — Wagga Wagga Council Sewerage Treatment Plants (approx. 8.8 km north).

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 23 (147.382, -35.204)	No sites within search area.	No sites within search area	No sites within search area.	Water fill point 23 is located within the Gregadoo Waste Management Centre . Water from this site is considered non-potable, and will be used for dust suppression.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Two known PFAS sites within 10 km of the site: — Forest Hill Sewage Treatment Plant (approx. 8.5 km north-east) — Wagga Wagga RAAF Base (approx. 9.5 km north-east).

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 100 (147.357, -35.092)	Three sites located within 2 km identified: — Former Wiradjuri landfill – currently under assessment (500 m south-east). — Former dry cleaning facility (1.5 km south-east) – currently regulated under the CLM Act. — Caltex Service Station (1.55 km south-east) – Regulation under CLM Act not required.	One site within 2 km identified as having a current POEO license: Burgess Earthmoving Pty Ltd – approx. 1.5 km south of water fill point 100.	No sites within search area.	Water fill point 100 is located next to the Narrung Street Sewage Treatment Plant . Water from this site is considered non-potable, and will be used for dust suppression	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Three known PFAS sites within 10 km of the site: — Wagga Wagga Council Sewerage Treatment Plants (two sites), (approx. 100 m south and 4 km south-east) — Forest Hill Sewage Treatment Plant (approx. 7.5 km north-east).

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 102 (147.391, -35.154)	One site within 2 km identified: — Caltex Service Station – Koorinal (2 km north-west). Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	Water fill point 102 is located within the Koorinal Sewage Treatment Plant . Water from this site is only to be used for earthworks at Wagga Wagga substation.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Four known PFAS sites within 10 km of the site: — Forest Hill Sewage Treatment Plant (approx. 4.5 km north-east) — Wagga Wagga RAAF Base (approx. 7 km east) — Wagga Wagga Council Sewerage Treatment Plants (approx. 3.3 km and 7.3 km north-west).
Water fill point 103 (147.396, -35.199)	No sites within search area.	No sites within search area.	No sites within search area.	Water fill point 103 is located approx. 1 km north-east of the Gregadoo Waste Management Centre.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Three known PFAS sites within 10 km of the site: — Wagga Wagga Council Sewerage Treatment Plants (approx. 7.5 km north) — Forest Hill Sewage Treatment Plant (approx. 7.5 km north-east) — Wagga Wagga RAAF Base (approx. 8.4 km north-east).

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 104 (147.322, -35.138)	One site within 2 km identified: — Ashmont Autoport – Service Station (1.7 km north). Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Two known PFAS sites within 10 km of the site: — Wagga Wagga Council Sewerage Treatment Plants (approx. 5.5 km north and 6km north-east) — Kapooka training facility/Blamey Barracks (located approx. 1 km west of water fill point 104).
Water fill point 105 (147.364, -35.161)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Four known PFAS sites within 10 km of the site: — Forest Hill Sewage Treatment Plant (approx. 7.3 km north-east) — Wagga Wagga RAAF Base (approx. 9.5 km east) — Wagga Wagga Council Sewerage Treatment Plants (approx. 5.4 km and 7.5 km north).

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 107 (147.457, -35.152)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	Three known PFAS sites within 10 km of the site: — Wagga Wagga RAAF Base (approx. 1 km north-east) — Forest Hill Sewage Treatment Plant (approx. 2 km north-west) — Wagga Wagga Council Sewerage Treatment Plants (approx. 7.2 km north-west).
Water fill point 108 (147.107, -35.267)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 114 (147.107, -35.268)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 201 (146.726, -35.227)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 202 (146.990, -35.261)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES² (2 km search area)	CLEAN UP NOTICES³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE⁵ (2 km search area)	CATTLE DIPS⁶ (2 km search area)	GASWORKS⁷ (5 km search area)	PFAS⁸ (10 km search area)
Water fill point 203 (146.926, -35.267)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 204 (146.269, -35.312)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 205 (146.607, -35.109)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	Water fill point 205 is located within the Defence Communications Facility buffer	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 206 (146.928, -35.124)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 300 (145.836, -34.927)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 301 (145.890, -34.805)	One site within 2 km of water fill point 301 identified: — Former Mobil Coleambally Depot (500 m north-east). Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 302 (145.734, -35.358)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

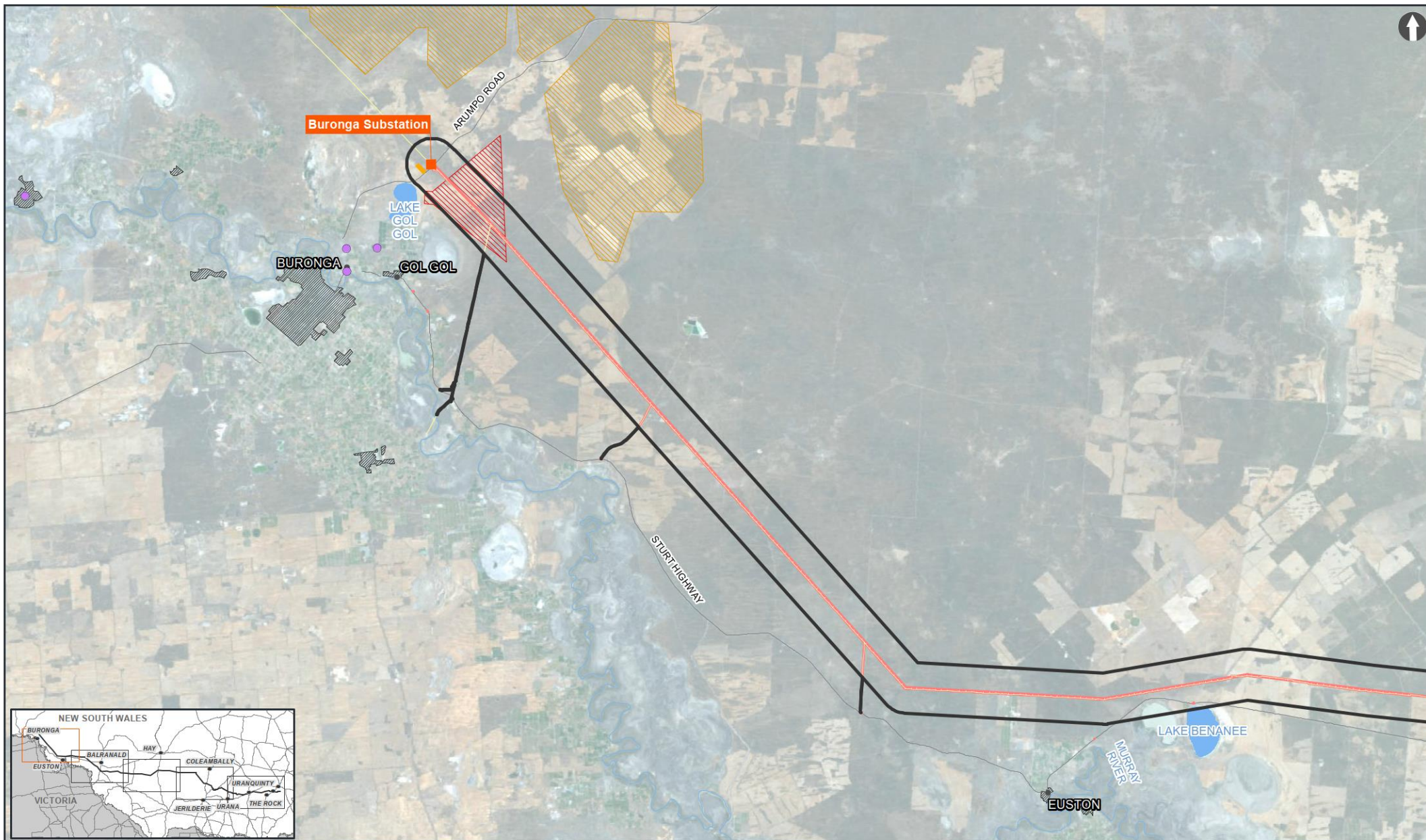
STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 401 (144.840, -34.513)	Several sites within 2 km of water fill point 401 identified: — Caltex Service Station – Hay South (780 m south). — State Rail Authority Land (Other Industry, 1.45 km north). — Former Mobil Depot – Hay (1.5 km north). — Former Shell Depot – Hay (1.5 km north). None of the sites are currently regulated under the CLM Act.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES² (2 km search area)	CLEAN UP NOTICES³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE⁵ (2 km search area)	CATTLE DIPS⁶ (2 km search area)	GASWORKS⁷ (5 km search area)	PFAS⁸ (10 km search area)
Water fill point 402 (144.855, -34.506)	Several sites within 2 km of water fill point 401 identified: — SRA Land (Other Industry, 1.4 km north-west). — Former Mobil Depot – Hay (1 km north-west). — Former Shell Depot – Hay (960 m north-west). None of the sites are currently regulated under the CLM Act.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 407 (144.816, -35.212)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 501 (143.568, -34.640)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDINANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 601 (142.209, -34.158)	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 602 (142.182, -34.174)	One site within 2 km of water fill point 602 identified: — Caltex Service Station (350 m north) Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.
Water fill point 603 (141.914, -34.104)	One site within 2 km of water fill point 603 identified: — Caltex Service Station – Wentworth (200 m north-east) Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

STUDY AREA LOCATION (Search area)	NSW CONTAMINATED SITES NOTIFIED TO EPA ¹ (2 km search area)	CURRENT OR FORMER NSW EPA LICENSED ACTIVITIES ² (2 km search area)	CLEAN UP NOTICES ³ (2 km search area)	NATIONAL WASTE MANAGEMENT SITE DATABASE ⁴ (5 km search area)	UNEXPLODED ORDNANCE (UXO) DATABASE ⁵ (2 km search area)	CATTLE DIPS ⁶ (2 km search area)	GASWORKS ⁷ (5 km search area)	PFAS ⁸ (10 km search area)
Water fill point 604 (142.182, -34.157)	One site within 2 km of water fill point 604 identified: — Caltex Service Station (1,450 m south) Regulation under the CLM Act not required.	No sites within search area.	No sites within search area.	No sites within search area.	No sites within search area.	No known cattle dips within search area.	No known gasworks sites within search area.	No known PFAS sites within search area.

- (1) Source: List of NSW contaminated sites notified to EPA, New South Wales Environment Protection Authority <https://www.epa.nsw.gov.au/your-environment/contaminated-land/notification-policy/contaminated-sites-list> – Accessed August 2021
- (2) Source: POEO Public Register: Search for Licenses, New South Wales Environment Protection Authority <https://apps.epa.nsw.gov.au/prpocoapp/Detail.aspx> – Accessed August 2021.
- (3) Source: Contaminated Land: Records of Notice, New South Wales Environment Protection Authority <http://app.epa.nsw.gov.au/prclmapp/searchregister.aspx> – Accessed August 2021.
- (4) Source: Waste Management Facilities, Australian Government Geoscience Australia <https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search?node=srv#/metadata/a66ac3ca-5830-594b-e044-00144fdd4fa6> – Accessed August 2021.
- (5) Source: Department of Defence Unexploded Ordnance database, <http://52.65.9.125/> – Accessed August 2021.
- (6) Source: <https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/health-and-disease/parasitic-and-protozoal-diseases/ticks/cattle-dip-site-locator> Accessed August 2021.
- (7) Source: <https://www.epa.nsw.gov.au/your-environment/contaminated-land/other-contamination-issues/former-gasworks-sites> Accessed August 2021.
- (8) Source: List of PFAS investigation areas <https://www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program> Accessed August 2021.



Project Components

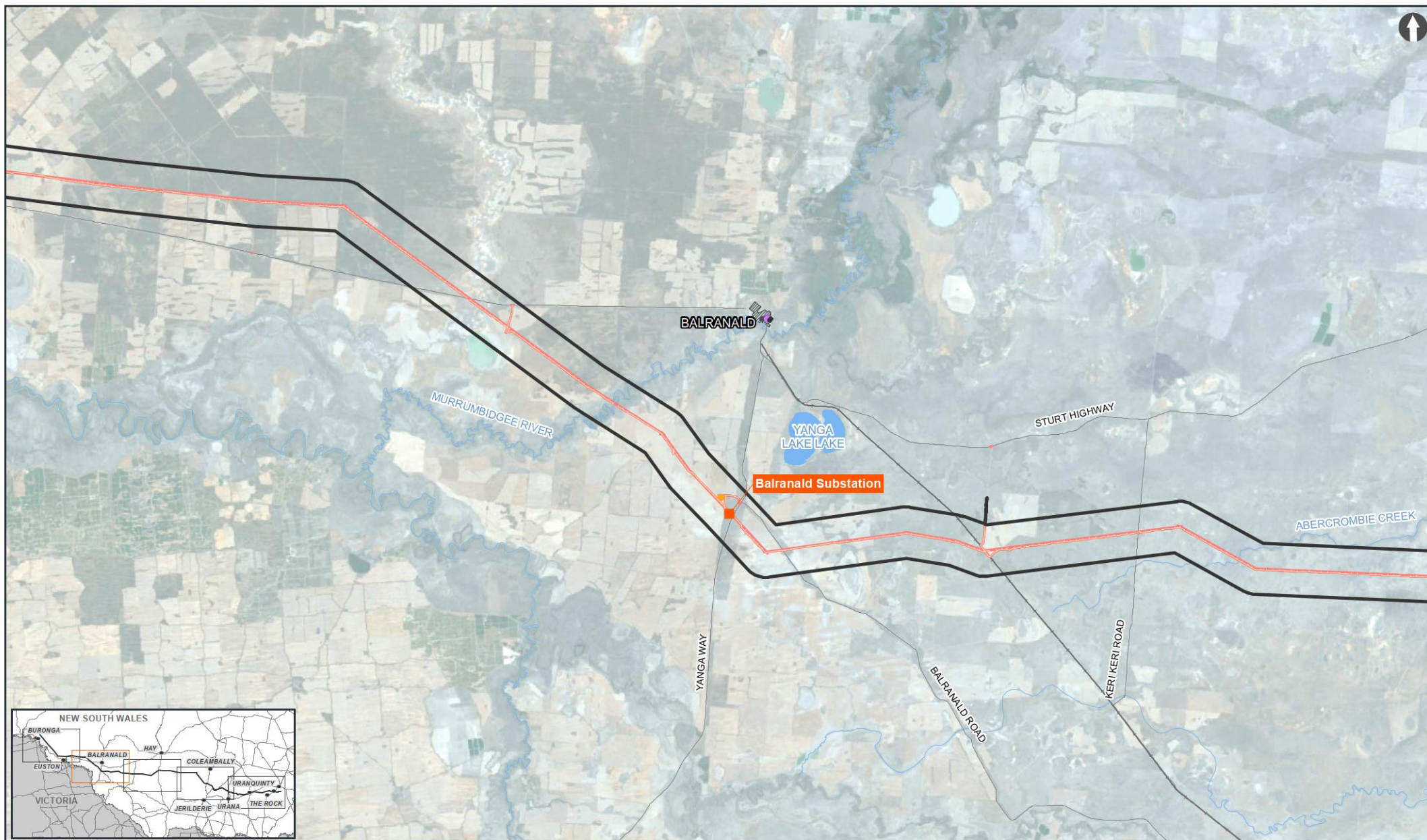
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas
- Substation Area of Unexploded Ordnance (UXO)
- Slight Area of Unexploded Ordnance (UXO)

Contaminated Land Management - Figure 4-7

Unexploded
Ordnances (UXO)

Sheet 1 of 5



0 10 20 KM

Project Components

Construction Impact Area

Main Construction Compounds and Accommodation Sites

Access Tracks

Water Fill Point

Existing Transmission Line Infrastructure

Existing Substation

Existing Railway

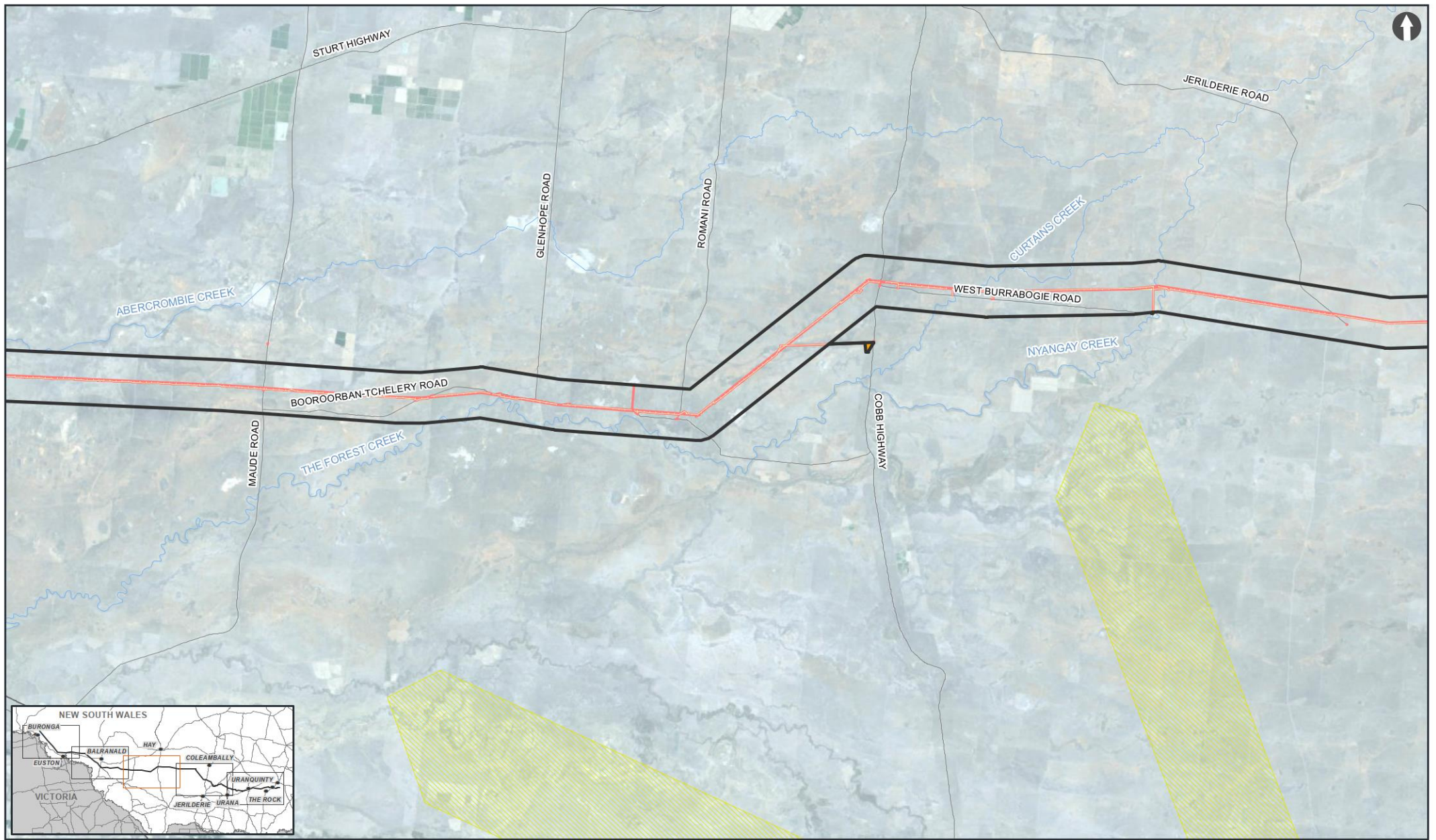
Contaminated Land Study Area

Built Up Areas

Contaminated Land Management - Figure 4-7

Unexploded
Ordnances (UXO)

Sheet 2 of 5



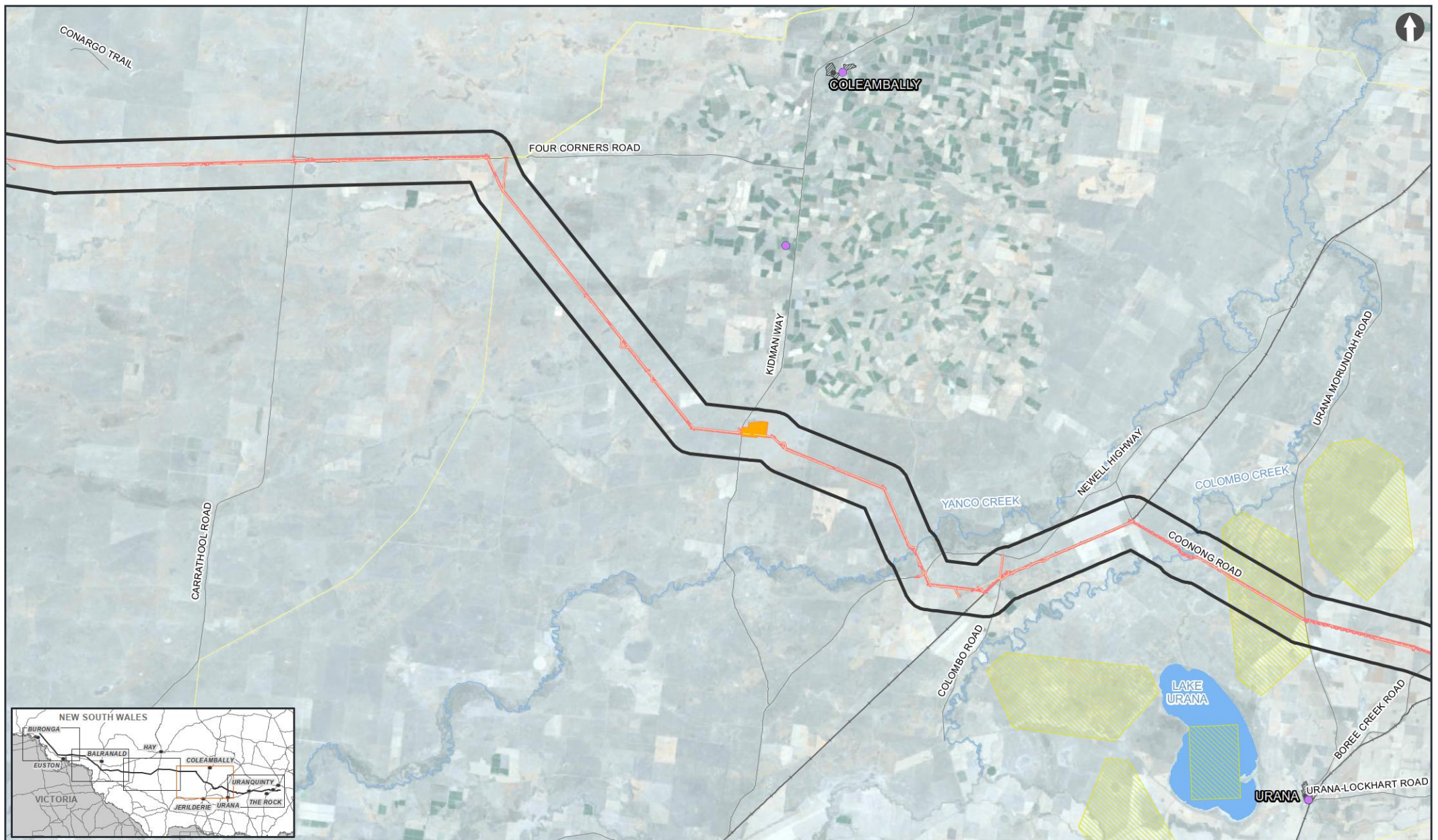
Contaminated Land Management - Figure 4-7

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas
- Other Area of Unexploded Ordnance (UXO)

Unexploded
Ordnances (UXO)

Sheet 3 of 5



0 10 20 KM

Project Components

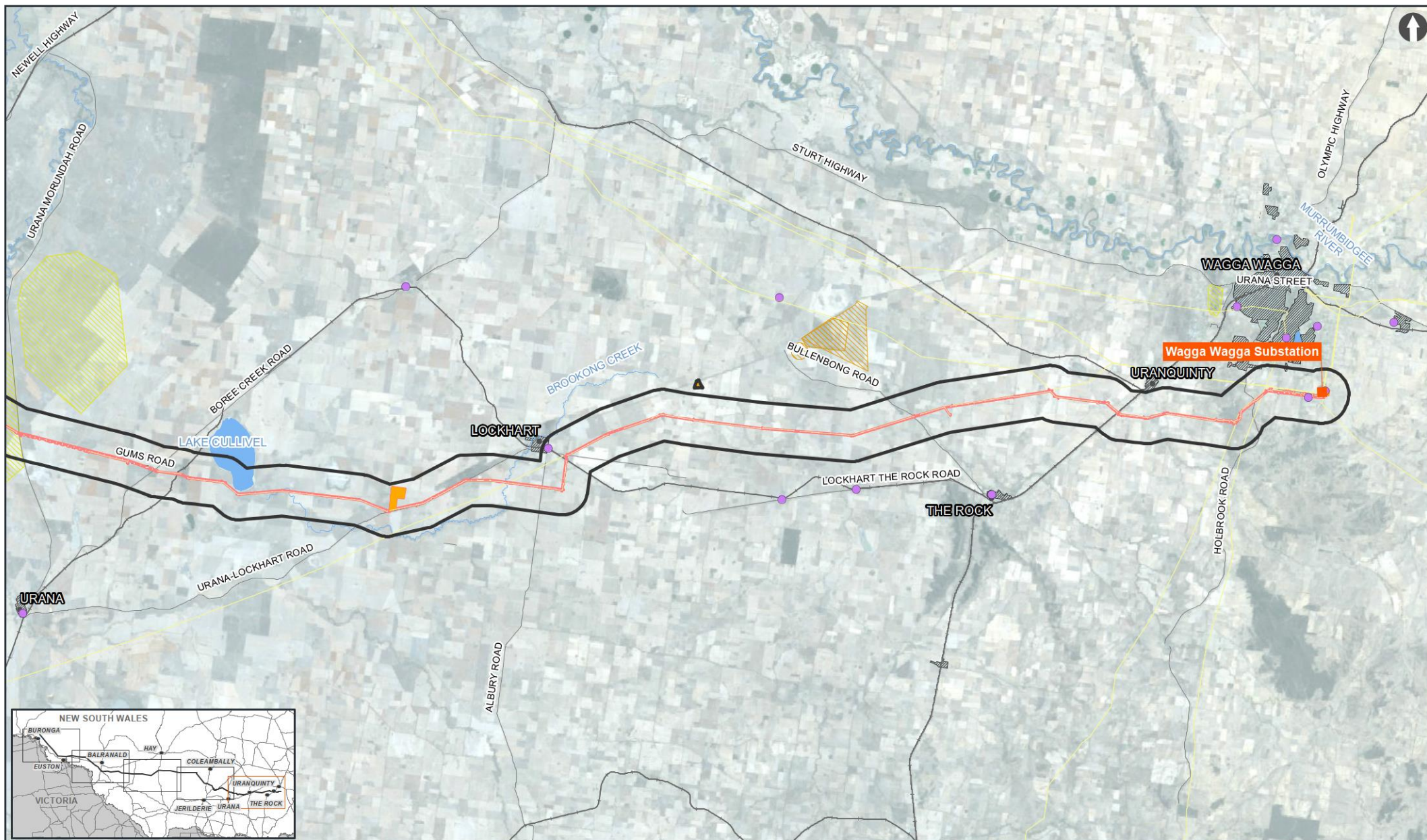
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas
- Other Area of Unexploded Ordnance (UXO)

Contaminated Land Management - Figure 4-7

Unexploded
Ordnances (UXO)

Sheet 4 of 5



Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contaminated Land Study Area
- Built Up Areas
- Slight Area of Unexploded Ordnance (UXO)
- Other Area of Unexploded Ordnance (UXO)

Contaminated Land Management - Figure 4-7

Unexploded
Ordnances (UXO)

Sheet 5 of 5

4.6.1 UXO classification

As identified in Table 4-9, the contamination study area crosses several UXO areas of various risk ratings. Department of Defence (DoD) have provided information regarding each category, including recommendations for conducting excavations or other intrusive investigations within listed UXO areas. UXO categories and corresponding DoD advice consist of the following:

- **Substantial:** Confirmed history of military activities, resulting in potential numerous residual hazardous munitions, components or constituents.

Advice: Whilst current land usage may continue without specific UXO search or remediation, Defence recommends that specialist advice is obtained. A detailed UXO Risk Assessment and UXO Management Plan should be developed as necessary. Defence recommends that any development, land usage re-zoning proposals or other significant changes in proposed activities for land parcels classified as Substantial should only proceed once an appropriate UXO Risk Assessment has been conducted by a suitable specialist and mitigations implemented to address the risks identified.

- **Slight:** Confirmed history of military activities, however where confirmed UXO affected areas cannot be defined.

Advice: Whilst current land use may continue without further UXO investigation or remediation, Defence recommends that consideration is given to obtaining specialist advice and undertaking a detailed UXO Risk Assessment and developing a UXO Management Plan as necessary. Defence recommends that any development, land usage re-zoning proposals or other significant changes in proposed activities for land parcels classified as Slight are preceded by an appropriate UXO Risk Assessment. A project- or activity-specific UXO Management Plan may be considered for ongoing activities and the possibility of encountering munitions should be adequately addressed in activity plans (e.g. construction site safety management plans).

- **Remote:** May have records which confirm the area was used for military purposes, however the activity is of a nature that makes it unlikely that UXO would exist.

Advice: All land usage and development, within these areas, may continue without further UXO investigation or remediation. If at any time UXO or related material is identified, consideration should be given to seeking specialist advice.

- **Other:** Defence records confirm that the area was used for military training, but do not confirm that the site was used for live firing.

Advice: These sites have been included for general information purposes only. Defence makes no recommendations in regards to this category.

4.6.2 PFAS information

Three PFAS impacted sites are located within the contamination study area, as indicated by bold highlighting within Table 4-9, they are:

- Wagga Wagga council sewerage treatment plant located approximately 100 m south of water fill point 100
- Kapooka training facility/Blamey Barracks located approximately 1 km west of water fill point 104
- Wagga Wagga RAAF Base located approximately 1 km north-east of water fill point 107.

All of these locations are outside of 1km from the proposed transmission line assessment corridor.

The Department of Defence has completed several environmental investigations to determine the extent of PFAS contamination resulting from historical use of firefighting foams on and in the vicinity of the Blamey Barracks and the Wagga Wagga RAAF Base. The findings of both investigation sites has been incorporated to develop a PFAS Management Area Plan (PMAP) for the sites and surrounding areas. The management areas defined in the PMAPs for Blamey Barracks and Wagga Wagga RAAF base are outside of the contamination study area and the construction impact area, including water fill point locations.

4.6.2.1 Kapooka – Blamey Barracks

The main PFAS pathway is from surface-water runoff from on-base sources into Kapooka Creek.

4.6.2.2 Wagga Wagga RAAF Base

Investigations at the RAAF Base suggest a PFAS plume could potentially impact consumers of Carp and Murray Cod in the Murrumbidgee River, as well as water from farm dams around the base, and/or groundwater from Gumly Gumly Wetland and surrounding areas being used for drinking water or irrigation of home consumed foods. (Fact sheet also mentions the Forest Hill Wastewater Treatment Plant).

Water fill point 107 is located within 100 metres of the designated PMAP.

4.6.2.3 Wagga Wagga Council Sewerage Treatment Plant

PFAS has been identified within the effluent of the Wagga Wagga council sewerage treatment plant. Limited information is available regarding the PFAS concentrations at the Wagga Wagga Council Sewerage Treatment Plant, although it is noted the likely source for PFAS within the effluent at the sewerage treatment plant site is the neighbouring Wagga Wagga RAAF base.

4.7 Historical aerial photography review

Available historical aerial photographs from (SMEC, 2020b) were reviewed for the contamination study area. Land uses in the contamination study area don't appear to have significantly changed from 2003–2020. A review of aerial photography of the contamination study area did not identify any areas of potential historical filling or stockpiling as would be indicated by large embankments or scarring. There do not appear to be any areas within the majority of the construction impact area, which included any major earthworks.

4.8 Previous investigations

This section provides a summary of previous environmental investigations undertaken within the site. The following reports have been reviewed for the contamination study area and are discussed further in the sections which follow:

- *Report on Geotechnical Investigation, Project EnergyConnect, South Australia Border to Balranald*, (Douglas Partners, 2020a).
- *Acid Sulfate Soils and Naturally Occurring Asbestos Desktop Study, Project EnergyConnect, South Australian Border to Wagga Wagga, South Australia*, (Douglas Partners, 2020b).
- *Electrical Resistivity Testing for Earthing, Project EnergyConnect – Geotechnical Field Investigation, South Australian Border to Balranald NSW* (Douglas Partners, 2020c).
- *Report on High-Level Preliminary Site (Contamination) Investigation, Project EnergyConnect South Australia Border to Balranald*, (Douglas Partners, 2020g).
- *Geotechnical Investigation Report, Transgrid Project EnergyConnect – Dinawan 330kV substation*, (SMEC, 2020a).
- *Limited Preliminary Site Investigation, Project EnergyConnect – Wagga Wagga to Balranald*, (SMEC, 2020b).
- *Geotechnical Investigation Report, Project EnergyConnect Phase 2 – Wagga Wagga to Balranald*, (SMEC, 2020c).
- *Limited Preliminary Site Investigation, Project EnergyConnect – Round Two*, (SMEC, 2020d).
- *Geotechnical Investigation Report, Project EnergyConnect Phase 2 – Round Two Wagga Wagga to south Australian Border*, (SMEC, 2020e).

4.8.1 *Douglas Partners (2020a), report on geotechnical investigation, South Australia Border to Balranald*

The Douglas Partners geotechnical investigation included 99 individual cone penetration tests (CPTs) and 25 individual boreholes at a total of 121 new transmission line tower locations along the proposed alignment. Laboratory testing was undertaken on select samples collected from the boreholes primarily for soil aggressivity and other geotechnical parameters. The information and laboratory analysis on soils for soil aggressivity can be used to make early conclusions as to the potential for soil salinity.

The fieldwork results indicate that the subsurface conditions vary along the proposed study area, particularly between the various geological formations through which the alignment is shown to pass. The results of the field investigation indicate that there is a general absence of a distinct ‘topsoil’ layer along the alignment, the upper 300 millimetres of soil typically contained some roots or rootlets from the surface vegetation throughout the landscapes. Emerson Crumb tests were completed on a few select samples, with the results indicating that the surface soils have a moderate to high potential for dispersion. An assessment of soil aggressivity undertaken by (DP, 2020a) with reference to AS2159-2009 indicated that the soils are highly alkaline, with high levels of sodicity.

Groundwater was observed during the investigation at 19 of the proposed transmission tower locations, encountered at depths between 2.8 and 12.5 metres below ground level. In many of the boreholes where groundwater was encountered, the water appeared to enter the borehole from confined aquifers possibly under pressure within ‘buried’ sand layers. Significant quantities of fill were not identified in any of the boreholes, or during the investigative works.

4.8.2 *Douglas Partners (2020B), Acid Sulfate Soils and Naturally Occurring Asbestos Desktop Study, South Australian Border to Wagga Wagga*

The Douglas Partners investigation included the desktop review of available mapping and preparation of two map sets to assess the likelihood of encountering ASS or naturally occurring asbestos (NOA) along the proposed study area. The information presented in the report was sourced from the above referenced CSIRO mapping and indicated an extremely low to very low probability of occurrence for acid sulfate soils along the alignment. The mappings suggest that there are small areas of high probability of ASS; these mapped areas are at a lower elevation to the surrounding landscape, in places with a higher recurrence of water standing.

The NOA mapping presented in the Douglas Partners (2020b) report uses data from the New South Wales Naturally Occurring Asbestos Potential Map, which identifies areas of low, medium and high potential for NOA. These maps indicate that the entire alignment is not within an area mapped as likely to contain naturally occurring asbestos. Furthermore, the alignment is generally underlain by a deep soil profile. NOA is not likely to be encountered, as it is generally only found in ultramafic (‘dark-coloured’ igneous and meta-igneous) rocks such as those of the serpentine and amphibole group.

4.8.3 *Douglas Partners (2020C), Electrical Resistivity Testing for Earthing, South Australian Border to Balranald NSW*

The Douglas Partners investigation primarily focused on soil geophysics and presented little to no contamination data. As part of the report, a series of 32 photographs of the site were included. Information pertaining to the potential for contamination and the site itself could be gained. The photographs confirmed assumptions made about the soil type from soil mapping, and the low potential for filling or gross contamination in the locations photographed.

4.8.4 *Douglas Partners (2020G), High Level Preliminary Site (Contamination) Investigation Project EnergyConnect South Australia Border to Balranald*

Douglas Partners undertook a high-level preliminary site investigation for the portion of the EnergyConnect spanning from the SA Border to Balranald, which covered the contamination study area and parts of the western section of the NSW components of EnergyConnect. The investigation included a site walkover of the study area, analysis of samples collected as part of the Douglas Partners (2020a) geotechnical investigation. It reported that the surrounding land use is generally cleared agricultural land and areas of more dense vegetation, rivers, lakes and water reservoirs. Douglas Partners concluded that there were no notices of contaminated land or licenses along the study area (main transmission line alignment) and there appears to be little historical activity which could potentially contaminate the site. Historical activity is likely limited to land clearing, agricultural practices and the development of associated residential dwellings, task-specific structures, roads and the transmission line.

The site walkover indicated that there was a section of existing transmission towers which potentially contain asbestos coatings with labelled warnings of asbestos (yellow labels) confirming this; these towers were observed between CPT-4-86 and BH-4-81 and just south-east of Buronga substation. There were no apparent visual or olfactory impacts (e.g. staining or odours) to suggest the presence of contamination within the fill soils or groundwater observed in the investigation. Analysis of the soil samples (65 in total including replicate samples, from 51 locations) reported concentrations of contaminants were below the adopted site assessment criteria within this proposal scope.

4.8.5 *SMEC (2020a), Geotechnical Investigation Report, Transgrid Project EnergyConnect – Dinawan 330kV substation*

Geotechnical investigations were carried out by SMEC on behalf of Transgrid, however at the time of the investigations, the exact footprint of the proposed Dinawan substation was yet to be confirmed. Scope included drilling/excavation of 24 boreholes and 12 test pits for geotechnical testing. Soil samples were collected from six test pits for analysis of a suite of potential contaminant of concern including heavy metals, PAHs, TRH, BTEX, pesticides, PCBs, OCP, OPP, phenol and asbestos.

A Review of the ASRIS Australia Atlas of Acid Sulfate Soils (ASS) categorized the site as having a ‘low probability of occurrence’, however, an area categorized as ‘high probability of occurrence’ was identified approximately 400m from the investigation area. During the investigations, it was reported that heavy rainfall occurred immediately prior to the investigations, and ponding /pooling of water was observed, taking several days to dry out, and allow sufficient light vehicle access. Dispersive and erodible soils were confirmed at the proposed Dinawan substation area, with recommendations including lime stabilization, and limited surface flows across site. A ESCP (erosion and sedimentation control plan) would be required for the site and potentially vehicle size/width would also need to be considered during construction operations. Groundwater was not encountered in any of the borehole locations during the investigations, and all soil analytical results were either non-detect, or below the adopted site criteria.

4.8.6 *SMEC (2020b), Limited Preliminary Site Investigation, Project EnergyConnect – Wagga Wagga to Balranald*

A high-level, preliminary desktop assessment of the likelihood to encounter contamination was conducted by SMEC, via limited intrusive investigations at 148 nominated locations across the contamination study area (120 CPT locations, and 28 borehole locations). The report assessed publicly available databases, site inspection observations and interpretation of available satellite imagery, no intrusive work was undertaken as part of this investigation. It is noted that the 148 sites are not indicative of the proposed pylon locations, and recommends further investigations to be carried out once finalised pylon locations have been confirmed.

Of the 148 sites, several potential areas of environmental concern (AEC) were identified, including agricultural activities such as pesticide use and operational farm dams, however only one was believed to present a viable source-pathway-receptor linkage (a series of small stockpiles of fill with unknown origin). Overall, the fill stockpiles were assessed as having a low risk of contamination (no visible signs of contamination or asbestos), however all works should be undertaken in accordance with site CEMP, CLMP and UFP. The remainder of sites were generally surrounded by grazing native vegetation, irrigated cropping and grazing modified pastures.

Groundwater was encountered at 10 of 28 borehole locations, and six of 120 CPT holes, with groundwater encountered between 5.0 – 18.1 metres below ground level (mBGL).

4.8.7 *SMEC (2020c), Geotechnical Investigation Report, Project EnergyConnect Phase 2 – Wagga Wagga to Balranald*

Geotechnical investigations were undertaken by SMEC along the proposed study area. The report indicated that the majority of the proposed study area is located in areas of ‘extremely low’ or ‘low probability’ of acid sulfate soil occurrence, with several areas of ‘high probability of occurrence’, primarily correlating with surface water (wetlands), creeks, interconnecting water bodies and farm dams.

Groundwater observations made during the investigations concluded that groundwater inflows are likely to occur at areas undergoing earthworks along the project alignment in low-lying terrain, near creeks and waterways. Piling works in such areas should utilise casing liners to ensure borehole integrity, particularly where granular material is encountered at depth.

Similar to investigations undertaken at the proposed Dinawan 330kV substation/laydown area (SMEC 2020a), dispersive/erodible soils were observed throughout the alignment, with recommendations consistent over both reports – minimise concentrated flows over unprotected soil surfaces, stabilise access tracks and trafficable surfaces (using lime or gypsum), and develop, implement and update erosion and sedimentation control plans as works are progressing.

4.8.8 *SMEC (2020d), Limited Preliminary Site Investigation, Project EnergyConnect – Round Two*

A second round of limited intrusive investigations was undertaken by SMEC, with a total of 84 sites with potential contaminants of concern (PCOC) based on desktop investigations including heavy metals, PAHs, TRH, BTEX, pesticides, PCBs, OCP, OPP and asbestos. Samples were collected from various depths, ranging from 0–4.5 mBGL. Of the 84 sites, six potential AEC’s were identified, with only one being assessed as having a medium risk for the likelihood of contamination (fill of unknown origin and quality within several small stockpiles) located on and immediately adjacent to sites R2-CPT 06 (Boyds Road), R2-BH 04 (Conllingulie Road) and R2-CPT 14 (adjacent Sturt Highway, approx. 17 kilometres south of Buronga Camp). The remaining AEC’s were assessed as having a low likelihood of contamination or not applicable. Soil analytical results were either below laboratory limits of detection or below the adopted assessment criteria.

Similar to previous rounds of investigation across the proposed study area (SMEC 2020a-2020c), acid sulfate soils (whilst largely mapped as ‘low probability of occurrence’) have a ‘high probability of occurrence’ in low lying water courses, wetlands and surface water bodies such as farm dams and lakes.

4.8.9 SMEC (2020e), *Geotechnical Investigation Report, Project EnergyConnect Phase 2 – Round Two Wagga Wagga to south Australian Border*

Transgrid engaged SMEC to carry out additional geotechnical investigations for the EnergyConnect project between Wagga Wagga and the south Australian Border.

Groundwater was not encountered in many of the boreholes and CPT's, however it is believed to be due to weather events, low permeability soils, or prolonged dry periods within the area. Groundwater inflows are considered likely to occur in low lying terrain, near creeks and waterways, as previously identified (SMEC 2020a and 2020c). Additionally, acid sulfate soils are likely to be present within these low-lying saturated soils adjacent or within waterways, creeks and farm dams, however observations conducive to acid sulfate soil presence (jarosite staining, sulphurous odours or the presence of shells etc) were not noted during intrusive investigations.

Soils were observed to be slightly less dispersive when compared to previous geotechnical investigations (SMEC 2020a and 2020c), however 'Pinhole Dispersion' results indicate construction conditions could result in the dispersion of soils.

4.9 Areas of contamination concern

Table 4-10 provides an overview of the areas of contamination concern, and the associated contaminants of concern at these sites, located within the construction impact area and the contamination study area. Additionally, Table 4-10 provides an overview of land within contamination study area which is currently identified as being contaminated on a public register of contaminated sites maintained by a regulator.

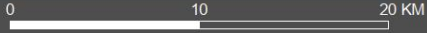
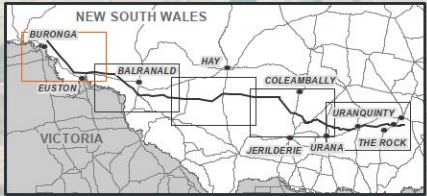
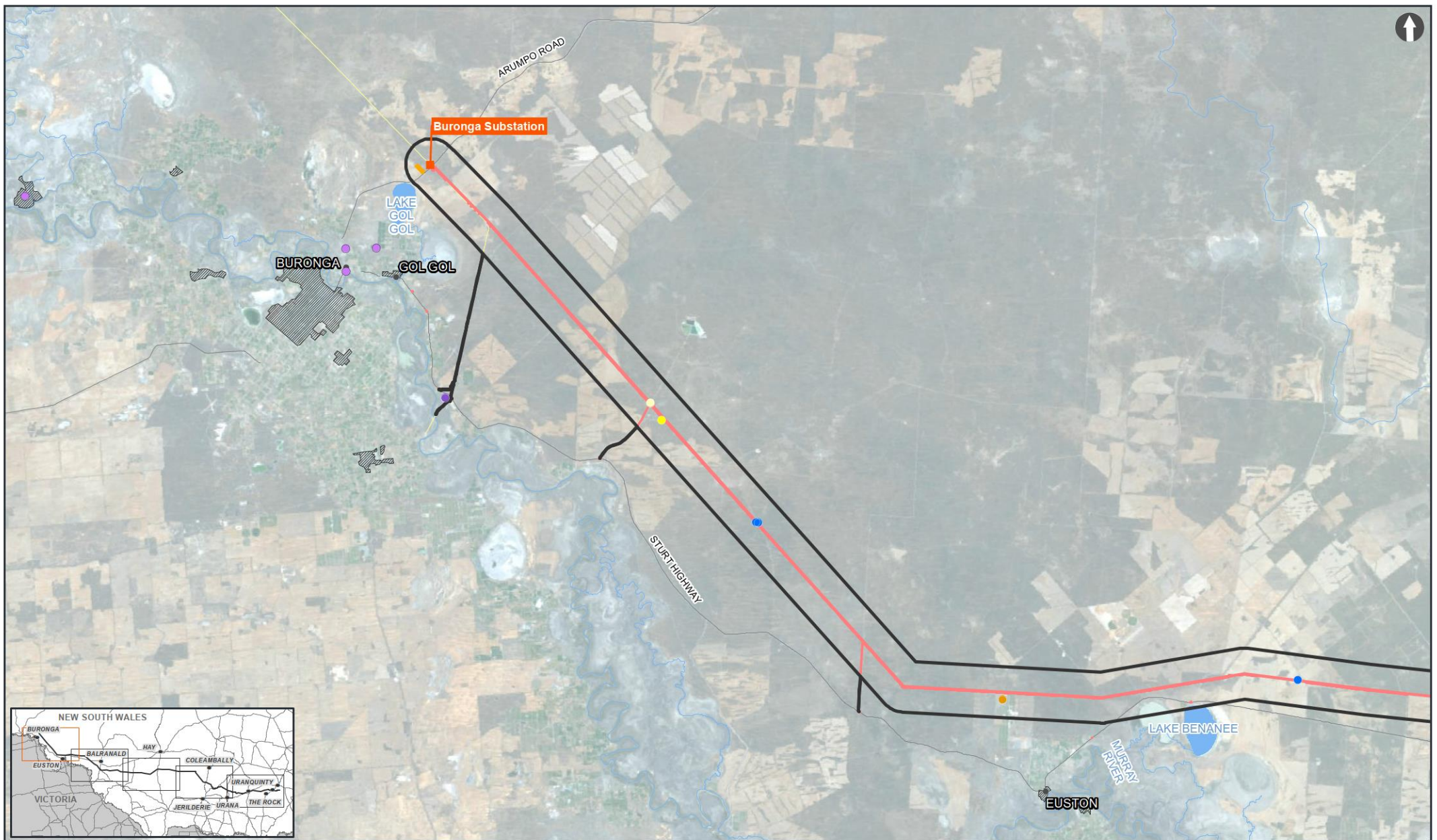
The identification of areas of contamination concern is based on existing land uses and the potential for contamination to occur. The locations of these areas of interest are shown within Table 4-10.

Table 4-10 Identified areas of contamination concern within the contamination study area

AREAS OF CONTAMINATION CONCERN AND RATIONALE FOR CONCERN		LOCATION	SENSITIVE RECEIVER	POTENTIAL CONTAMINANTS OF CONCERN
Areas within the construction impact area				
Existing transmission line infrastructure	Spills from maintenance activities on site, Asbestos paints on tower infrastructure.	Portions of the construction impact area, where existing infrastructure for transmission line is present (refer to yellow symbol in Figure 4-8).	— Terrestrial flora/fauna — Surface water features	— BTEXN — TRH — Asbestos
Cleared agricultural land	Historical use of pesticides, and foliants, large scale land use and the use of heavy machinery.	Portions of the construction impact area, where land is disturbed for agricultural cropping proposes (refer to Figure 4-8). This land makes up approximately 29.6% of the contamination study area in the form of grazing modified pastures, cropping and irrigated cropping.	— Current agricultural site users — Terrestrial flora/fauna — Surface water features, including farm dams	— Heavy metals — Organochlorine pesticides (OCP) — Organophosphorus pesticides (OPP)
Farm dams	Areas of potential contaminant sediment build-up.	Portions of the construction impact area, where construction impact area is adjacent to or intersecting a farm dam (refer to blue symbol in Figure 4-8).	— Adjacent residents (including locations where the water is applied) — Terrestrial flora/fauna — Surface water and groundwater receptors	— Heavy metals — OCP — OPP — Nutrients
UXO – Substantial Category	Confirmed historical military activities resulting in UXOs.	Oaks Plain located north east of Buronga. Between 142.272, -34.113 and 142.317, -34.159.	— Maintenance/construction workers — Terrestrial flora/fauna — Surface water	— BTEXN — TRH — OCPs — Heavy metals — PFAS

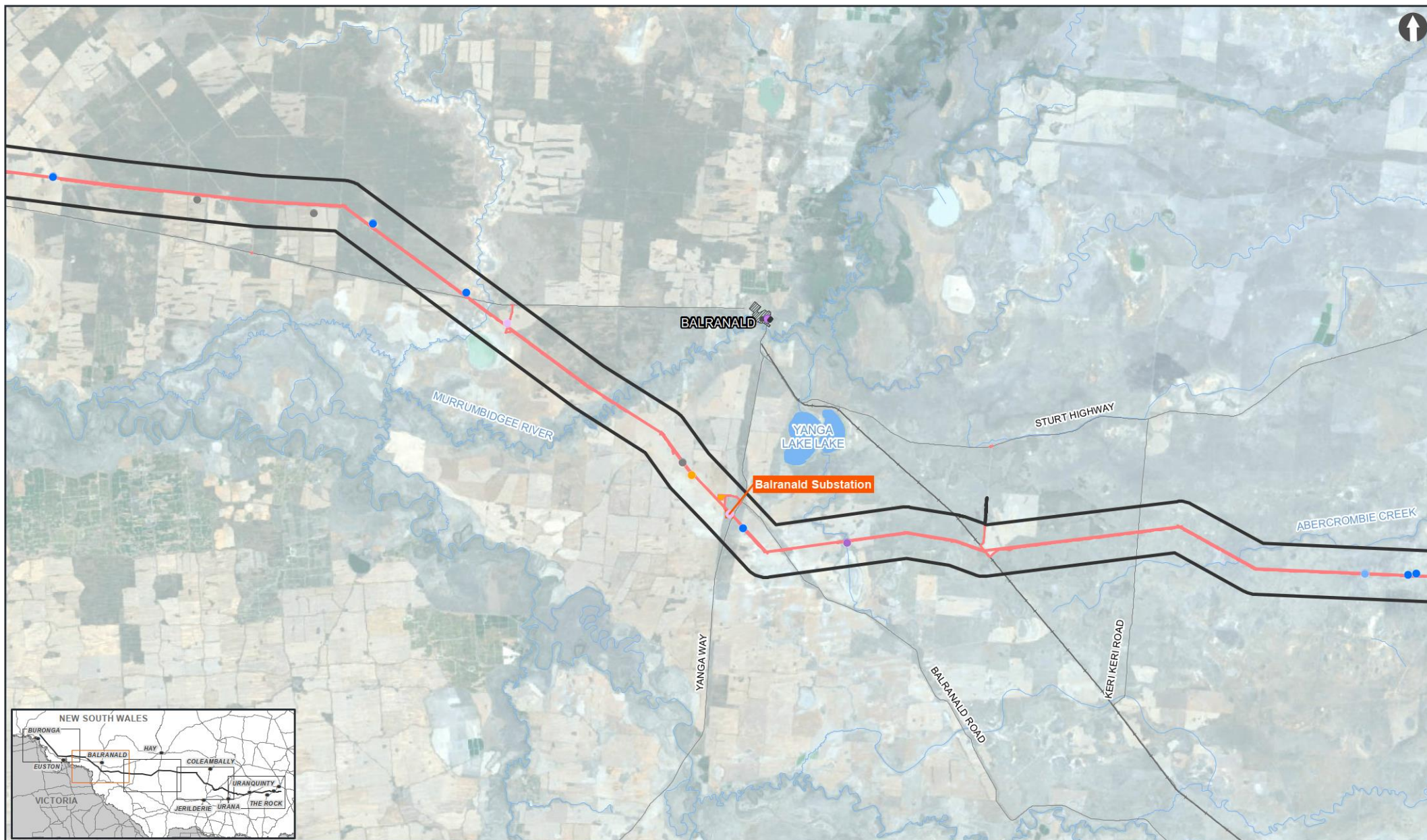
AREAS OF CONTAMINATION CONCERN AND RATIONALE FOR CONCERN		LOCATION	SENSITIVE RECEIVER	POTENTIAL CONTAMINANTS OF CONCERN
Potential scaring/earthworks sites	Areas of potential fill	Lot 26 DP836099 (142.440, -34.294)	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Surface water	— Heavy metals — BTEX — PAH — TRH — Asbestos
Areas within the contamination study area outside of construction impact area				
Potential quarries	Areas of potential fill	Lot 26 DP836099 (142.440, -34.294)	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Surface water	— Heavy metals — BTEX — PAH — TRH — Asbestos
Potential scaring/earthworks sites	Areas of potential fill	— Lot 2 DP1108316 – north east of Waldaira Lake (143.345, -34.632) — Lot 2 DP703764 (144.978, -34.819) — Lot 3 DP706781 (145.659, -34.954) — Lot 43 DP756399 (146.327, -35.220) — Adjacent to Urana-Lockhart Rd – Lot 1 DP722976 (146.667, -35.246) — Lot 100 DP1256996 - 132 Ashfors Rd, Gregadoo, NSW 2650 (147.387, -35.207) — Lot 26 DP836099 (142.440, -34.294)	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Surface water	— Heavy metals — BTEX — PAH — TRH — Asbestos
Stockpiled material (SMEC 2020)	Fill material of unknown origin and quality	— Lot 89 DP74555 (147.129, -35.198) — Lot 2 DP1004135 East of Boyds Rd (147.074, -35.203)	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Surface water	— Heavy metals — BTEX — PAH — TRH — Asbestos

AREAS OF CONTAMINATION CONCERN AND RATIONALE FOR CONCERN		LOCATION	SENSITIVE RECEIVER	POTENTIAL CONTAMINANTS OF CONCERN
Waste Management Facility (Wagga Wagga City Council)	Potential fill material of unknown origin and quality, potential leachate and landfill gas.	Lot 100 DP1256996 132 Ashfors Rd, Gregadoo, NSW 2650 147.379, -35.203	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Surface water and groundwater receptors	— Methane — Asbestos — Heavy metals — BTEX — PAH — TRH
Offsite impacts				
PFAS sites (one site located within 1 km of study area) – Wagga Wagga RAAF base PMAP.	Potential PFAS contamination of water fill point 100, 102, 104, 105 and 107.	— Water Fill Point 100 (147.357, -35.092) — Water Fill Point 102 (147.391, -35.154) — Water Fill Point 107 (147.457, -35.152)	— Adjacent residents (including locations where the water is applied) — Terrestrial flora/fauna — Surface water and groundwater receptors	— PFAS
Service Stations (three located within 500 m of the study area).	Potential petroleum hydrocarbon contamination of water fill points 301, 602 and 603.	— Bencubbin Ave, Coleambally NSW Lot 35 DP234758 (145.892, -34.803) — Two service stations along Adams St Water Fill Point 603 (141.914, -34.103)	— Adjacent residents (including locations where the water is applied) — Terrestrial flora/fauna — Surface water and groundwater receptors	— Heavy metals — BTEX — PAH — TRH
Former Wiradjuri landfill	Potential leachate and landfill gas (under assessment).	Lot 1 DP260462 Narrung Street, Wagga Wagga 147.362, -35.096	— Adjacent residents — Maintenance/construction workers — Terrestrial flora/fauna — Groundwater	— Methane — Asbestos — Heavy metals — BTEX — PAH — TRH



- | | | | |
|---|---|---|-----------------------------------|
| Project Components | — Existing Transmission Line Infrastructure | Potential Areas of Contamination | ● Scarring - Potential Quarry (1) |
| ■ Construction Impact Area | ■ Existing Substation | ● AEC - SMEC 2020d (1) | |
| ■ Main Construction Compounds and Accommodation Sites | — Existing Railway | ● Cleared Agricultural Land (1) | |
| — Access Tracks | ■ Contamination Study Area | ● Farm Dam (3) | |
| ● Water Supply Point | ■ Built Up Areas | ● Scarring (potential) (1) | |

Figure 4-8
Potential Areas of Contamination



Project Components

Construction Impact Area

Main Construction Compounds and Accommodation Sites

Access Tracks

Water Supply Point

Existing Transmission Line Infrastructure

Existing Substation

Existing Railway

Contamination Study Area

Built Up Areas

Potential Areas of Contamination

Farm Dam (6)

Farm Dam (potential) (1)

Farm Infrastructure (1)

Unknown (3)

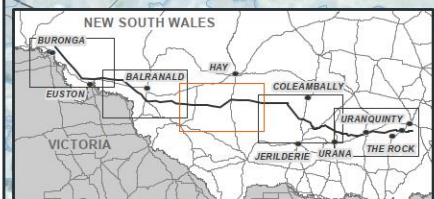
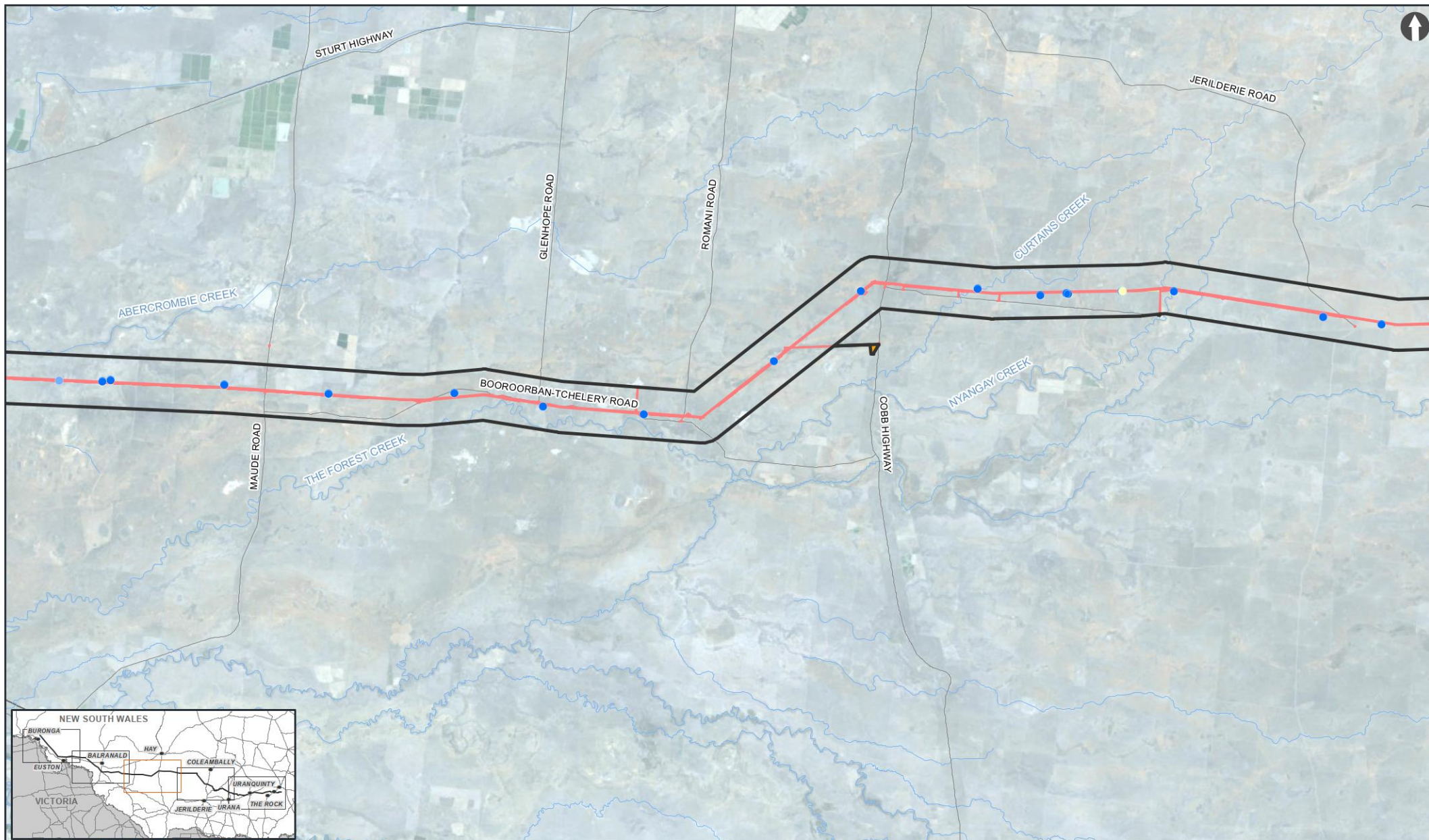
Unknown (infrastructure) (2)

Unknown (potential scarring) (1)

Figure 4-8

Potential Areas of Contamination

Sheet 2 of 5



Project Components

Construction Impact Area

Main Construction Compounds and Accommodation Sites

Access Tracks

Water Supply Point

Existing Transmission Line Infrastructure

Existing Substation

Existing Railway

Contamination Study Area

Built Up Areas

Potential Areas of Contamination

Farm Dam (18)

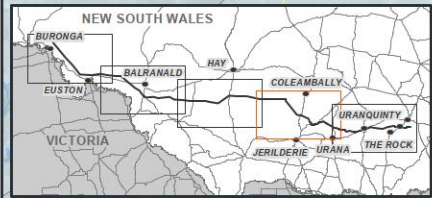
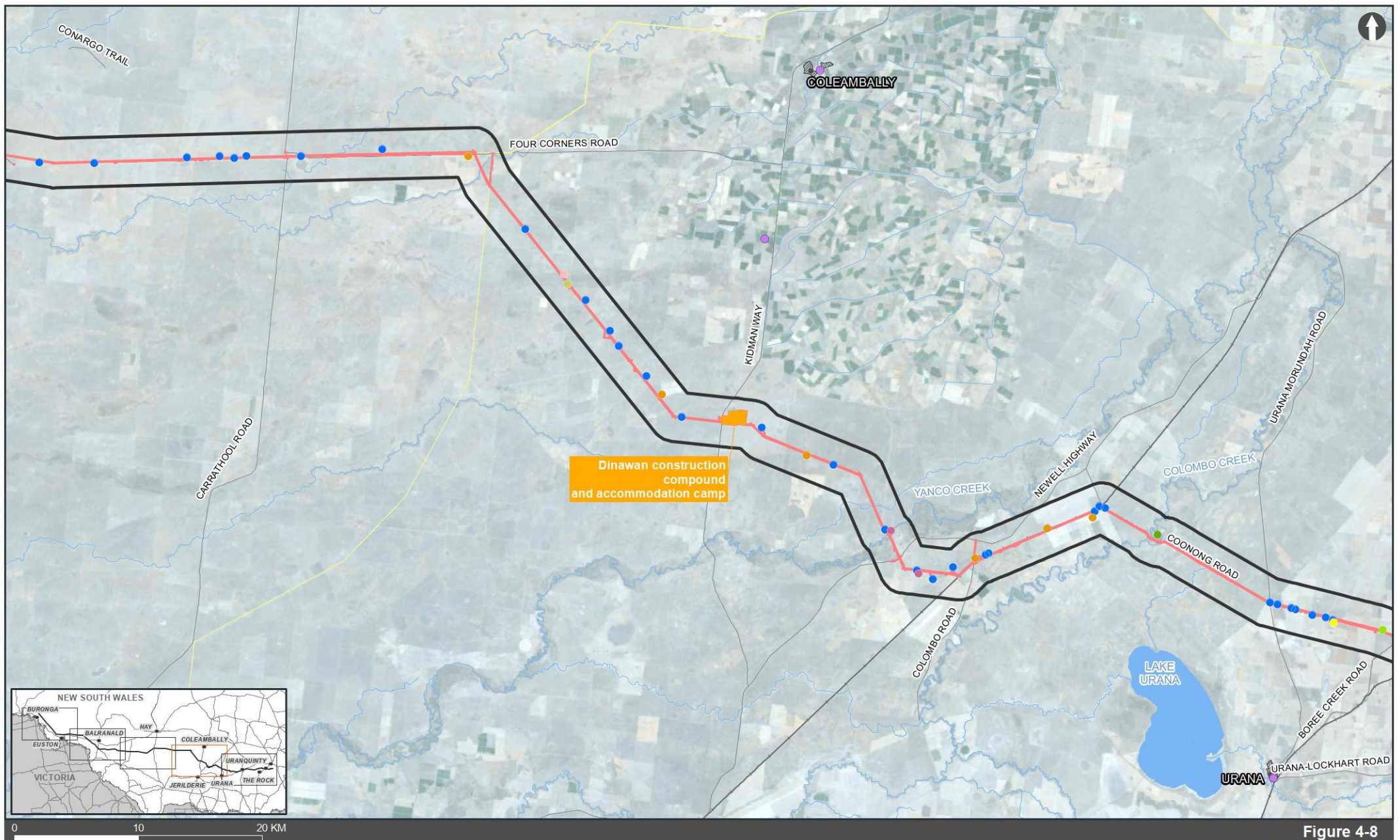
Farm Dam (potential) (1)

Scarring (potential) (1)

Figure 4-8

Potential Areas of Contamination

Sheet 3 of 5



Project Components

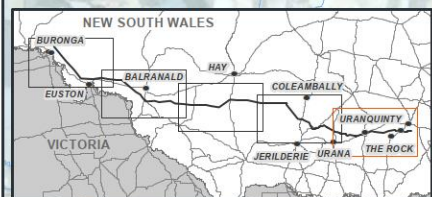
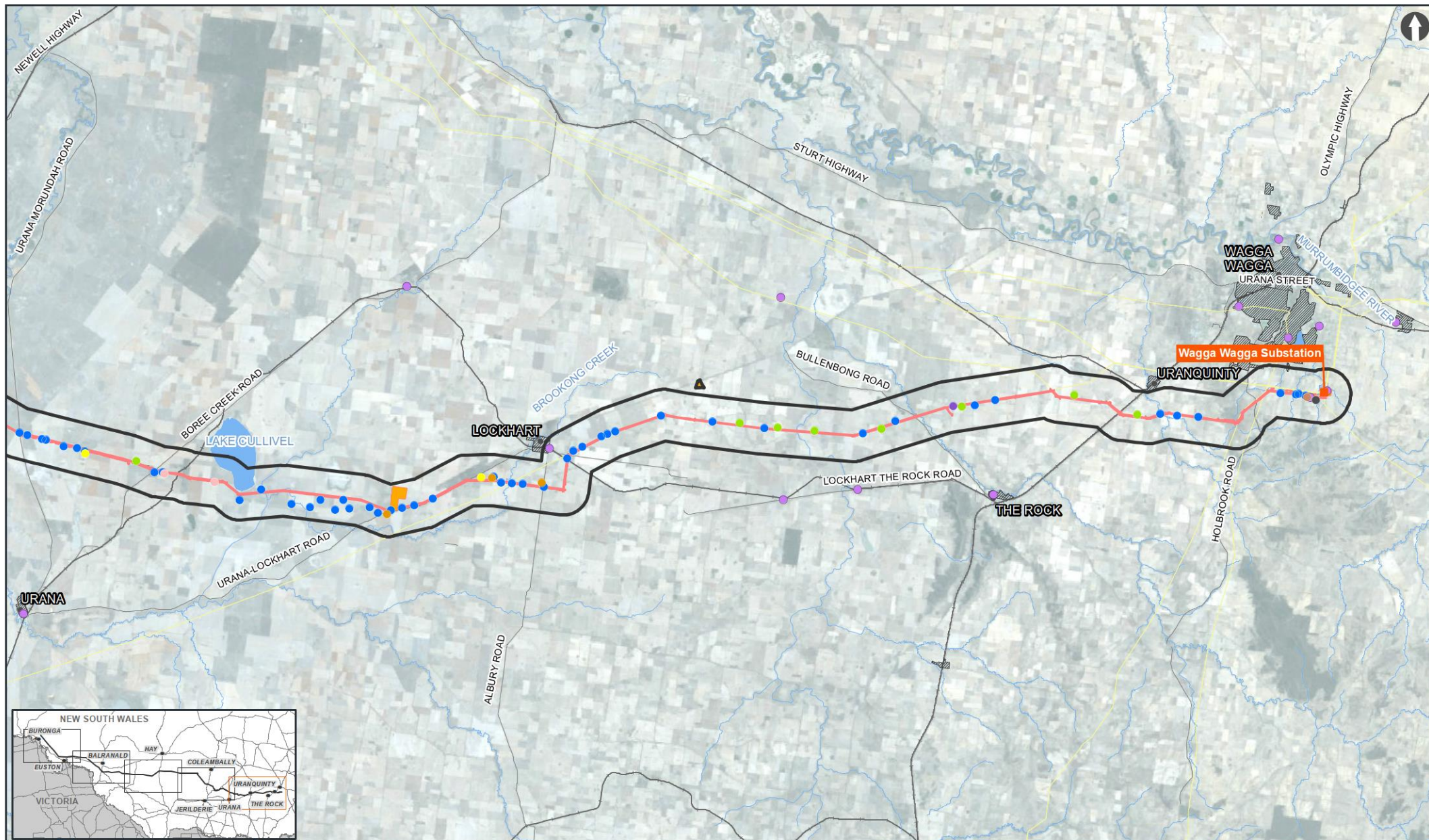
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Supply Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contamination Study Area
- Built Up Areas

- #### Potential Areas of Contamination
- Agricultural Land (1)
 - Cleared Agricultural Land (6)
 - Farm Dam (32)
 - Potential Agricultural Land (1)

- Residential Property (1)
- Scarring - Potential Quarry (1)
- Scarring - Potential Quarry (old) (1)
- Unknown (residence) (2)

Figure 4-8
Potential Areas of Contamination



0 10 20 KM

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Water Supply Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Contamination Study Area
- Built Up Areas

Potential Areas of Contamination

- AEC - SMEC 2020d (1)
- Agricultural Land (8)
- Cleared Agricultural Land (3)
- Construction Site (1)
- Farm Dam (48)
- Residential Property (2)
- Scarring - Potential Quarry (2)
- Waste Management Facility (1)

Figure 4-8

Potential Areas of Contamination

Sheet 5 of 5

5 Assessment of construction impacts

5.1 Potential to encounter contamination

A number of potentially contaminating activities that have been identified within the construction impact area and the contamination study area are presented in Table 4-10 with the associated area of contamination concern illustrated in Figure 4-8.

If inadequately managed, disturbance of contaminated areas has the potential to:

- mobilise contaminants, affecting nearby soils, surface water and groundwater
- increase the migration of contaminants into surrounding areas via leaching, overland flow and/or subsurface flow (water and/or vapour) or dust, with the potential to impact on receiving environments, such as Lake Albert, Lake Urana, the Darling River, the Murrumbidgee and the Murray River, and the surrounding community
- increase the risk of exposure to contaminants (direct contact and/or inhalation) by site workers, visitors and the local community.

Information reviewed during the desktop assessment has identified that greater than 63 per cent of the construction impact area is undisturbed native vegetation with minimal areas of contamination concern identified. Biosecurity risks are also discussed further within *Technical Paper 1 – Biodiversity Development Assessment Report*.

Soil contamination could also be encountered during construction work at locations not previously identified as areas of potential concern. An unexpected contamination finds procedure would need to be developed as part of the construction environmental management plan (CEMP).

Based on the information reviewed in Section 4.2.5, there is no known or expected naturally occurring asbestos minerals or serpentine and amphibole occurrence within the contamination study area. Therefore, no naturally occurring asbestos impacts are expected in relation to the construction of the proposal.

The risk of disturbing or encountering contaminated material during construction varies depending on the extent and type of contamination and the work undertaken. Based on available information, and experience, a risk rating has been assigned to each land use and activity based on the potential for that use or activity to cause contamination; this information is presented in Table 5-1.

The likelihood of widespread contamination to impact the study area (as outlined in Table 5-1 below) has been considered depending on the type of contamination (effected media), as well location of the potential contamination source in relation to the construction impact area and contamination study area. Given the mostly flat topography and depth of groundwater (approx. five to 10 mBGL, SMEC 2020), the following methodology has been adopted:

- service stations greater than 500 metres from the construction impact area have been assumed as low risk, and not assessed in Table 5-1
- PFAS investigation sites greater than two kilometres from the construction impact area have been assumed as low risk, and not assessed in Table 5-1
- drycleaners greater than one kilometre from the construction impact area have been assumed as low risk, and not assessed in Table 5-1.

Table 5-1 Preliminary risk ranking

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Farm dams Refer to blue symbol in Figure 4-8	Excavation activities	As dams are replenished by rainfall, there is a potential for run-off carrying soil fertilisers, animal dung, pesticides and other pollutants to impact on water quality and sediment quality within the dam. If not managed appropriately, disturbance of sediments within the farm dam could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — off-site transport of contaminants via vehicle/plant movements — surface water run-off and discharge into receiving environment.	Medium potential for contaminant build-up within the dam sediments; medium likelihood that dam sediments would need to be disturbed during construction due to the presence of farm dam's within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low
	Pile construction and de-watering	As dams are replenished by rainfall, there is a potential for run-off carrying soil fertilisers, animal dung, pesticides and other pollutants to impact on water quality and sediment quality within the dam. If not managed appropriately, construction de-watering activities have the potential to draw-down surface water from within the farm dam, which has the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — incidental discharge into receiving environment.	Low likelihood that dam water would be disturbed during construction. Multiple farm dams are located within the construction impact area.	Potential exposure pathway (unknown if dam water is in continuity with groundwater)	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Cleared agricultural land Refer to Figure 4-6 for location of grazing modified pastures, cropping and irrigated cropping land uses.	Excavation activities, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Common contaminants of concern associated with agricultural activity include pesticides, herbicides, nutrients and heavy metals. If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — off-site transport of contaminants via vehicle/plant movements — risk of dust exposure to construction workers — surface water run-off and discharge into receiving environment.	Medium potential for agricultural contaminants to be present. Multiple locations of cleared agricultural land are located within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Medium
	Pile construction and de-watering	Common contaminants of concern associated with agricultural activity include pesticides, herbicides, nutrients and heavy metals. If not managed appropriately, construction de-watering activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — incidental discharge into receiving environment.	Groundwater depth anticipated to be >5 mBGL. Low likelihood for groundwater contamination.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Dinawan and Wagga Wagga substations	Excavation activities, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Common contaminants of concern associated with electrical substations include PCBs and hydrocarbons. SMEC (2020a) report did not identify any contaminant concentrations above the adopted assessment criteria within soil samples analysed. If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — off-site transport of contaminants via vehicle/plant movements — risk of dust exposure to construction workers — surface water run-off and discharge into receiving environment.	Low potential for contaminants to be present however works have the potential to intercept/mobilise any existing contamination at the site. Both the Dinawan and Wagga Wagga substations are located within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low
	Pile construction and de-watering	Common contaminants of concern associated with electrical substations include PCBs and hydrocarbons. If not managed appropriately, construction de-watering activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — incidental discharge into receiving environment.	Groundwater depth anticipated to be >5 mBGL. Low likelihood for groundwater contamination	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Main transmission line easement Refer to yellow symbol in Figure 4-8.	Excavation activities, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Common contaminants of concern associated with maintenance activity surrounding powerlines include pesticides, herbicides, and hydrocarbons. If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — off-site transport of contaminants via vehicle/plant movements — risk of dust exposure to construction workers — surface water run-off and discharge into receiving environment.	Low potential for contaminants to be present. The main transmission line easement falls within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low
	Pile construction and de-watering	Common contaminants of concern associated with maintenance activity surrounding powerlines include pesticides, herbicides, and hydrocarbons. If not managed appropriately, construction de-watering activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — incidental discharge into receiving environment.	Groundwater depth anticipated to be >5mbgl. Low likelihood for groundwater contamination	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Potential quarries and potential scaring/earthworks sites	Excavation activities, vegetation clearing, vehicle movement, temporary stockpiling and utilities works	Potential contaminants of concern associated with potential earthworks/excavations include hydrocarbons, heavy metals, pesticides and asbestos impacted fill material. No significant filling is evident from aerial photographs. If not managed appropriately, disturbance of contaminated soil could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — direct contact, ingestion and inhalation by residential users — off-site transport of contaminants via vehicle/plant movements — risk of dust exposure to construction workers/residential users of the site — surface water run-off and discharge into receiving environment.	Low potential for widespread contaminants to be present. Potential scaring/earthworks sites are located within the construction impact area. Coordinates for locations are shown in Table 4-9.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
	Pile construction and de-watering	Common contaminants of concern associated with residential areas and areas surrounding dwellings/homesteads include hydrocarbons, heavy metals and asbestos impacted fill material. If not managed appropriately, construction de-watering activities have the potential to encounter contaminated groundwater which has the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers and residential users — incidental discharge into receiving environment.	Groundwater depth anticipated to be >5 mBGL. Low likelihood for groundwater contamination.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low
PFAS sites (within 1 km of study area).	Water fill point. Use of potential contaminated water for construction activities (dust suppression, washdown areas). Minor trench excavation for temporary utilities.	If not managed appropriately, use of potentially contaminated water sources could result in the following PFAS exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — direct contact, ingestion and inhalation by residential users — off-site transport of contaminants via vehicle/plant movements — surface water run-off and discharge into receiving environment.	Medium potential for widespread contaminants to be present (no significant impacts expected for sites >500 m). No PFAS sites are located within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

AREA OF INTEREST	CONSTRUCTION ACTIVITY	CONSTRUCTION IMPACT	LIKELIHOOD	CONSEQUENCE	PRELIMINARY RISK EVALUATION
Service Stations (within 500 m of water fill points 301, 602 and 603).	Water fill point Use of potential contaminated water for construction activities (dust suppression, washdown areas). Minor trench excavation for temporary utilities.	If not managed appropriately, use of potentially hydrocarbon contaminated water sources could result in the following exposure scenarios which have the potential to impact on human health and/or the environment: — direct contact, ingestion and inhalation by construction workers — direct contact, ingestion and inhalation by residential users — off-site transport of contaminants via vehicle/plant movements — surface water run-off and discharge into receiving environment.	Low potential for widespread contaminants to be present (depth of groundwater likely >5 m). No service Station sites are located within the construction impact area.	Exposure pathway complete during construction (without the implementation of appropriate controls).	Low

5.2 Potential impacts to the study area from contamination

The following section outlines potential impacts from contamination identified in Table 5-1 as potentially being encountered within the construction impact area.

5.2.1 *Soil contamination*

Construction activities, including excavation activities, vegetation clearing, vehicle movement and utility works, would disturb the soil. This could result in the exposure of sensitive receivers to contaminated soils, which could lead to ecological or human health impacts, if not properly managed. To assess the potential for contamination impacts during construction of the proposal, a contamination assessment has been performed in accordance with guidelines made or approved under the CLM Act. The outcomes of the qualitative risk ranking completed are presented in Table 5-1. The majority of the areas of environmental concern were evaluated to pose a low risk during construction, with areas of cleared agricultural land and potential quarry/earthworks sites assigned a medium risk. It is noted that the risk rankings in Table 5-1 are prior to the implementation of the recommended management measures identified in Section 8.

The potential risk associated with unexpected contamination finds (including potential uncontrolled filling) have not been assessed as this would be managed in accordance with an unexpected contaminated finds procedure (refer to Appendix A).

Following the implementation of recommended management measures, it is anticipated that the identified medium risk rankings would ultimately present a low risk of exposure and would be effectively managed through controls in place in the CEMP and unexpected finds protocol.

5.2.2 *UXO*

The contamination study area crosses several UXO areas identified by the DoD. Construction activities, including excavation activities, vegetation clearing, vehicle movement and utility works, have the potential to disturb UXO. Mitigation measures for UXO areas are outlined in Chapter 8. The UXO areas within the vicinity of the construction impact area are shown within Figure 4-7.

5.2.3 *Groundwater contamination*

Based on the findings of the contamination and groundwater investigations, groundwater from identified areas of environmental concern poses a low risk to the environment with regard to the construction of the proposal. This is because the volumes of groundwater expected to interact with proposal infrastructure features during construction would be negligible or are not expected to require management.

If during construction, volumes of groundwater are encountered which may require management and potential disposal associated with de-watering activities, further investigations would be carried out to confirm the contaminant levels within the groundwater, potential volumes that may need to be managed and measures for appropriate management.

Releases of groundwater off-site into the surrounding environments (if required) would be managed through the CEMP to protect the surrounding surface and groundwater environments.

5.3 Impacts to the soil environment from construction activities

Storage and laydown areas would be used to store construction materials, plant and equipment and recovered waste and recycling materials. Hazardous and dangerous goods storage would include petroleum, diesel, liquefied natural gas (LPG), herbicide, pesticide and mineral oils that would be secured in purpose-built bunded and secure areas. The potential impact resulting from construction storage and waste management is exposure of the surrounding soil and water environments to contamination from spills and leaks from plant and equipment during standard operations or incidents.

With appropriate and relatively standard construction controls in place as part of the CEMP, the risks from these activities would be minimised.

5.3.1 Acid sulfate soils and acid rock

Based on the information reviewed in Section 4.2.4, there is a low probability of encountering acid sulfate soils within most of the contamination study area with the exception of low lying areas surrounding former lakes and river beds, which are mapped as having a high probability of acid sulfate soil occurrence. Areas of potential acid sulfate soils or actual acid sulfate soils should be managed in accordance with the Acid Sulfate Soil Manual (ASSMAC, 1998). Should avoidance of low lying and waterlogged areas be unavoidable a preliminary assessment as per Figure 2-1 would be undertaken to determine whether acid sulfate soils are present and if the proposed works are likely to disturb these soils.

5.3.2 Salinity

Development of bushland for alternative land use can change the movement of surface, and groundwater, resulting in a change in the way salts and other minerals interact. When the water table rises close to the surface, it carries dissolved salts that are typically locked in the soil and rock profile to the surface.

The current hydrogeological model is not anticipated to alter significantly during the proposal, given the limited scale of the proposed construction activity. As such, no significant impact on soil salinity is anticipated from the proposal. The localised impact would be managed by preventing re-use of excavated saline soils in low salinity areas.

Salinity has the potential to damage foundations of infrastructure, make soils unsuitable for re-use as fill, preclude vegetation growth and may affect landscaping. Saline soil and water have the potential to damage concrete and metal structures, including piers and transmission line tower foundations. Given there is a potential risk of saline soils throughout the contamination study area, there is the potential to impact on structures associated with the proposal. Construction materials that can provide a resistance to saline conditions should be selected (where practicable) in areas of high-risk salinity soils.

Construction within areas of moderate to high-risk saline soils would be managed under a CEMP and should be carried out in accordance with the NSW Department of Primary Industries (2014) *Salinity Training Handbook*.

5.3.3 Soil erosion and sediment transportation

The highest potential for soil erosion would be associated with the disturbance of soils on existing slopes during construction. Given the terrain of the construction, the footprint is predominantly flat; however, it includes rolling hills to alluvial floodplains. As soil disturbance could occur across the length of the permanent works footprint, soil erosion and the associated sediment transportation is a hazard that could occur as a result of the construction of the proposal.

The DP2020a geotechnical report indicates that surface soils have a moderate to high potential for dispersion. Off-site transportation of sediments and soils could transport contaminated soils (if present) to sensitive receivers which may cause the contamination of surface water bodies.

6 Assessment of operational impacts

6.1 Impacts from existing potential sources of contamination to the environment and exposure to users

The operation of the proposal should not result in exposure of the surrounding environment and users (e.g. maintenance workers or farmers) to potentially contaminated soil or groundwater. Soil disturbance activities would not be part of the general maintenance activities as the infrastructure components would all be above ground.

Detailed groundwater investigation is presented within *Technical paper 15 – Groundwater impact assessment*.

The proposal does not require groundwater take during its operation and therefore the key potential operational impacts to the groundwater environment are through impacts to water quality from maintenance operations or permanent impacts to groundwater levels and quality from blasting (if required) which occur during the construction phase. The potential risk and impacts would be less than during the construction phase and are considered low.

6.2 Impacts to the environment from proposal activities

The operational impact related to the proposal would be potential hydrocarbon (fuels, diesel, oils) contamination of soil, surface water and groundwater arising from incidents involving vehicle accidents, leaks and spills in the transmission line easement or at the proposed substation sites. Spill volumes from such incidents would be expected to be minor; however, the potential for hydrocarbon fuel to migrate off-site cannot be discounted. Spill containment facilities (such as bunded containers, designated fill points, and spill kits) would be used on maintenance work sites and at the proposed Dinawan and Wagga Wagga substations. Furthermore, it is expected that the operator will implement and develop incident response procedures to manage the risk from these occurrences.

7 Cumulative impact

Cumulative impact assessment means the consideration of other nearby development projects along with the proposal. Projects with the potential for cumulative impacts with the proposal were identified through a review of publicly available information and environmental impact assessments from the following databases:

- NSW Major Projects website (NSW Government, searched October, 2021)
- Relevant council websites (searched October, 2021)
- Australian Government – Department of Environment and Energy, EPBC Public notices list (Australian Government, searched October, 2021).

Three proposed developments have been identified, and these include:

- EnergyConnect (NSW – Western Section)
- Buronga Solar Farm
- Buronga – Landfill expansion
- Buronga – Gol Gol residential expansion
- Balranald – Mineral Sands Mine
- Inland Rail – Albury to Illabo
- Uranquinty Solar Farm
- Gregadoo Solar Farm.

7.1 EnergyConnect (NSW – Western Section)

The NSW – Western Section of EnergyConnect would comprise around 135 kilometres of new 330kV double circuit transmission line and associated infrastructure between the SA/NSW border and the existing Buronga substation, upgrade of the Buronga substation and upgrade of the existing 22 kilometre 220kV single circuit transmission line between the Buronga substation and the NSW/Victoria border at Monak. Transgrid has previously sought separate environmental planning approvals for EnergyConnect (NSW – Western Section).

The EnergyConnect (NSW – Western Section) was approved in September 2021. Construction of the proposal is scheduled to commence in early-2022 (enabling phase). The construction of the transmission lines would take approximately 18 months while the Buronga substation upgrade and expansion would be delivered in two components and be operational by late-2023. Site decommissioning and remediation is expected to extend approximately one year beyond the commissioning (operational) phases, with estimated completion in early-2025.

The EnergyConnect (NSW – Western Section) project would occur at the western end of the current proposal and include some parallel alignment for the first six kilometres of the proposal alignment.

The proposal contamination impacts during construction and operational phases are expected to be relatively localised to the proposal disturbance areas, and therefore cumulative impacts are not expected.

No operational cumulative impacts would be expected.

7.2 Buronga Solar Farm

The Buronga Solar Farm development includes a 400 MW solar farm with energy storage and associated infrastructure located adjacent to the proposal Buronga substation. The EIS for the project is currently being prepared. The project would also involve the construction of a 220kV or 330kV transmission line for connection to the existing Buronga substation. The construction schedule for the proposal is identified as being about approximately 18 to 24 months from site establishment to completion (noting commencement subject to approval from DPIE).

No operational cumulative impacts would be expected.

7.3 Buronga landfill expansion

The proposal includes the expansion to the existing Buronga landfill to allow for an increase in the total quantity of waste that can be accommodated from 30,000 tonnes to 100,000 tonnes of general waste per annum. The proposal would consist of the construction of multiple additional landfill cells over the next 30 years comprising a volume of approximately 4.8 million cubic metres over an area of approximately 395,000 square metres (including the current active landfill cell).

The proposal contamination impacts during construction are expected to be completed progressively, and therefore significant cumulative impacts are not expected. No operational cumulative impacts would be expected.

7.4 Buronga – Gol Gol residential expansion

Wentworth Shire Council is proposing new subdivisions to provide approximately 500 new large residential housing allotments in the Buronga – Gol Gol growth area, approximately 10 kilometres to the west of the proposal. The contamination impacts of the proposal during construction and operational phases are expected to be relatively localised to the project specific proposal disturbance areas, and therefore cumulative impacts are not expected. No operational cumulative impacts would be expected.

No operational cumulative impacts would be expected.

7.5 Balranald mineral sands mine

The proposal contamination impacts during construction are expected to be completed progressively, and therefore significant cumulative impacts are not expected.

No operational cumulative impacts would be expected.

7.6 Inland Rail – Albury to Illabo

ARTC is proposing to upgrade the Albury to Illabo section, along the 185 kilometres of existing operational narrow-gauge railway from the Victorian/New South Wales border to Illabo in regional NSW. The Proposal would provide clearance of the existing 'Main South' corridor to operate 1,800 metres long, 6.5 metres high, double stacked trains and includes the provision of dual track in areas for train passing. The project is made up of discrete sections of proposed upgrade, including upgrades within the existing rail corridor at Uranquinty, The Rock and within the centre of Wagga Wagga.

Subject to planning approval, construction is planned to commence in mid-2023 and complete by late 2024. Operations to commence in 2025.

The proposal contamination impacts during construction and operational phases are expected to be relatively localised to the project specific proposal disturbance areas, and therefore cumulative impacts are not expected.

No operational cumulative impacts would be expected.

7.7 Uranquinty solar farm

Origin Energy is proposing to develop a commercial scale solar photovoltaic site and associated battery storage at Uranquinty. The proposal would have a capacity of up to 200 MW of renewable energy production for the local electricity supply. The site is located north-west of Uranquinty village along Uranquinty Cross Road, around 15 kilometres south-west of Wagga Wagga.

The proposal contamination impacts during construction and operational phases are expected to be relatively localised to the project specific proposal disturbance areas, and therefore cumulative impacts are not expected.

No operational cumulative impacts would be expected.

7.8 Gregadoo solar farm

Project approval permits the construction, operation and decommissioning of a maximum 47 MW photovoltaic solar farm and associated infrastructure. The Gregadoo Solar Farm will be located about 13 kilometres south-east of Wagga Wagga in the Wagga Wagga LGA. Construction is expected to commence mid-2021.

The proposal contamination impacts during construction and operational phases are expected to be relatively localised to the project specific proposal areas, and therefore cumulative impacts are not expected. No operational cumulative impacts would be expected.

7.9 Summary

With appropriate measures in place for all developments during construction, no substantial cumulative impacts would be expected. No cumulative operational impacts would be expected.

8 Mitigation measures

The proposal is anticipated to have a limited impact to contamination, which will be further reduced with the implementation of mitigation measures outlined within the CEMP and the soil and water management sub-plan.

The mitigation measures would be implemented and monitored for their effectiveness during construction. Typical provisions within the CEMP would include:

- development of an erosion sediment control plan (ESCP) – this would be developed in consideration of guidance in relevant volumes of the *Managing Urban Stormwater: Soils and Construction Volume 1 Landcom, 2004* (Blue Book), section 3.2.13
- stockpile management procedures for segregating soil and preventing cross-contamination of clean soil with contaminated soil for areas of medium risk contamination
- management of surface water – including at excavation sites with the aim of diverting water around the sites
- materials (i.e. spoil) tracking and records, if material is removed from site or moved out of a contaminated area within the site.

The following tables provide the mitigation measures which would be implemented for the proposal. Locations of areas with identified mitigation measure is detailed within Table 8-1, unless noted within the table.

Table 8-1 Mitigation measures – Contamination

ID	IDENTIFIED MITIGATION MEASURE	TIMING	APPLICABLE LOCATION(S)
CL-1	Construction materials would be selected to withstand high saline soil and groundwater environment (where applicable).	Pre-construction and construction	Locations mapped as moderate to high-risk salinity. Refer to Figure 4-1 for location of high salinity area.
CL-2	Disturbance to areas of medium risk of contamination would be avoided or minimised where practicable during construction. Disturbance to these areas refers to intrusive work, such as excavation. Where disturbance cannot be avoided, potential impacts would be minimised during finalisation of the design and construction methodology where practicable. Areas of medium risk of contamination that would be disturbed by construction activities would be further investigated including completion of a site inspection. Based on the outcome of the site inspection, where considered to be required, a Phase 2 investigation would be completed in accordance with NEPM 2013. Additional mitigation measures identified through further investigation would also be implemented.	Pre-construction	Cleared agricultural land, potential quarry and PFAS sites.

ID	IDENTIFIED MITIGATION MEASURE	TIMING	APPLICABLE LOCATION(S)
CL-4	Existing areas of waterlogging and poor drainage would be avoided, where possible, with regard to both access tracks and permanent structures.	Construction	Locations mapped as moderate to high-risk salinity. Refer to Figure 4-1 for location of high salinity area.
CL-5	Construction materials, spoil and waste would be suitably stored to minimise the potential for soil, groundwater or water quality impacts.	Construction	All
CL-6	Prior to ground disturbance in areas of potential acid sulfate soil occurrence (e.g. in low lying areas surrounding former or current lakes and river beds), testing would be carried out to determine the presence of actual and/or potential acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the <i>Acid Sulfate Soil Manual</i> (ASSMAC, 1998) and Transgrid's HSE Guideline.	Construction	All areas identified as potential acid sulphate soil. Refer to Figure 4-2 for acid sulphate soil areas.
CL-7	Prior to ground disturbance, a visual inspection would be undertaken for the presence of saline soils. Areas of known or suspected salinity would be subject to further testing as required. If salinity is confirmed, excavated soils would be managed in accordance with <i>Book 4 Dryland Salinity: Productive use of Saline Land and Water</i> (NSW DECC 2008) and the <i>Salinity Training Manual</i> (DPI, 2014) to manage salinity impacts. Erosion controls would be implemented in accordance with <i>The Blue Book</i> (Landcom, 2004).	Construction	All
CL-8	All chemicals, fuels or other hazardous substances would be stored in accordance with the supplier's instructions and relevant legislation, Australian Standards and applicable guidelines. The capacity of any bunded area shall be at least 130 per cent of the largest chemical volume contained within the bunded area. The location of the bunded enclosure/s shall be shown on the site plans.	Construction and operation	All (construction) Dinawan and Wagga substations (operation)
CL-9	The discovery of previously unidentified contaminated material would be managed in accordance with an unexpected contamination finds procedure.	Construction	All

ID	IDENTIFIED MITIGATION MEASURE	TIMING	APPLICABLE LOCATION(S)
CL-10	A site-specific risk assessment would occur for locations where there is a risk of encountering UXO. The risk assessment would be carried out prior to any activities that could interact with UXO. This would include field verification to validate the historical assessment of UXO contamination and identify appropriate mitigation practices. The risk assessment would occur with input from an appropriate UXO specialist and would identify if and when an explosives engineer is required during site activities. An unexpected finds procedure would be implemented. The procedure would specify the actions that site personnel must take to minimise the risk to and from any UXO encountered. The management actions identified in the risk assessment would be implemented prior to and during all relevant site activities. All personnel conducting intrusive works within an identified UXO area would be provided with appropriate safety and awareness briefing(s) prior to the participating in the intrusive works.	Pre-construction and construction	UXO sites
CL-11	Environmental spill kits containing spill response materials suitable for the works being undertaken would be available with extras available to be carried in vehicles for use at maintenance work sites.	Operation	Dinawan and Wagga Wagga substations
CL-12	All chemicals or other hazardous substances at the Balranald and Wagga Wagga substations would be stored in bunded and weatherproof facilities away from drainage lines, and in accordance with the <i>Environmental Handbook</i> (Transgrid, 2016). The capacity of the bunded area would be at least 130 per cent of the largest chemical volume contained within the bunded area. The location of the bunded enclosure/s would be shown on the site plans.	Operation	Dinawan and Wagga Wagga substations

9 Conclusion

The assessment identified minimal potential contamination sources within the contaminated study area and the construction impact area. The areas of contamination concern identified pose a low to medium risk. A wide scale detailed site investigation (DSI) of the construction impact area is not necessary and further investigations would target areas identified within this investigation.

This report assesses the impacts of potential contamination during construction and operation of the proposal. The assessment has included a desktop review of available information and databases, and consolidation of the data to identify potential areas of interest and concern.

Based on the results reported herein, the information suggests that the construction impact area did not appear to be affected by broad-scale contamination, and the risk of soil contamination is generally low. Greater than 63 per cent of the contamination impact area is undisturbed native vegetation with minimal areas of contamination concern identified. Furthermore, given the expected depth to groundwater, and the absence of an identified groundwater contamination source (with the exception of potential PFAS in several water fill points north of the Wagga Wagga substation) and potential contaminants in soil, the potential for significant groundwater contamination beneath the site is also considered to be low. Further investigations would be carried out at the water fill locations potentially impacted by PFAS, and the Oak Plains UXO area (Category: Substantial). Further investigation of UXO Category Slight or UXO Category Other areas may be required based on risk assessment which would be conducted by a suitable specialist.

Minimal potential contamination sources were identified within the contamination study area, and where identified are limited to the existing transmission infrastructure, proposed Dinawan and existing Wagga Wagga substations, cleared agricultural land, farm dams, and potential quarrying/minor earthworks. The majority of these areas of contamination concern have been assessed to pose a low risk during construction, with areas of cleared agricultural land and a potential quarry/assigned a medium risk.

Cleared agricultural land used for grazing modified pastures, cropping and irrigated cropping and potential former quarries and earthworks sites are medium risk. Construction activity at these areas, such as excavation and temporary stockpiling may disturb common contaminants of concern associated with agricultural activities posing exposure scenarios with environment and human health receptors if not managed correctly. The management of these areas would be addressed in the CEMP.

While dryland salinity has been identified as posing a potential issue to the construction and management of the proposal; these are not expected to result in a high risk to the proposal. The probability of encountering acid sulfate soils within most of the contamination study area is low with the exception of low lying areas surrounding former lakes and river beds, which are mapped as having a high probability of acid sulfate soil occurrence. Potential naturally occurring asbestos hazards were not identified based on available risk mapping, and geotechnical data.

Mitigation measures, as detailed in this report, would ameliorate or minimise any expected impacts to generally acceptable levels. Additional investigation would be completed if deemed applicable following detail design and site inspection to target proposed disturbance within areas of cleared agricultural land, UXO area, potential PFAS impacted water fill points and the potential quarries/stockpile locations. Mitigation measures are detailed in Chapter 8. The remaining residual risks are considered low and would be managed by a CEMP. Should unexpected contamination be identified during the site works appropriate management, and remediation options would need to be identified through the unexpected contamination finds protocol (Appendix A).

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Appendix A

Unexpected finds procedure



A1 Unexpected finds procedure

The following document details protocols regarding what must be done if potentially contaminated or hazardous materials are unexpectedly encountered during construction activities.

What is an unexpected find and where could it be?

An unexpected find is likely to comprise of any buried material which is not a typical soil material (i.e. fill, soil, rock) or waters which are suspected of being contaminated or Potential Asbestos Containing Materials are encountered during development works. There could be many kinds of unexpected materials that could be encountered during excavation works including (but not limited to):

- buried wastes
- buried containers/drums
- discoloured and odorous soils and groundwater/seepage
- underground tanks
- munitions/unexploded ordnance (UXO)
- asbestos (the management of unexpected asbestos finds is presented as a separate protocol).

These unexpected finds are likely to be associated with poor waste disposal or construction activities.

Where is there a risk of encountering an unexpected find?

The higher risk activities for encountering unexpected finds during construction activities are considered to be excavation works.

Higher risk areas for encountering unexpected finds during construction activities are considered to be:

- areas within and immediately adjacent to current or historical refuelling facilities, mechanical and industrial operations and historical airport operations.

What to do if an unexpected find is encountered?

In the event of an unexpected find is encountered, the following should be undertaken:

- cease any further excavation or ground disturbance, in the area of the find(s)
- the discoverer of the find(s) will notify machinery operators in the immediate vicinity of the find(s) so that work can be temporarily halted
- the site supervisor and the Principal will be informed of the find(s)
- do not remove or unnecessarily disturb the area of the find(s)
- ensure that the area of the find(s) is adequately marked as a no-go area for machinery or further disturbance and that the potential for accidental impact is avoided.

Note the location and nature of the finds, and report the find to:

- Transgrid Person appointed project manager
- Environmental Consultant appointed to the project from Transgrid.

Where feasible, ensure that any excavation remains open so that the finds can be recorded and verified. Excavation may be backfilled if this is necessary to comply with work safety requirements. An excavation that remains open should only be left unattended if it is safe and if required for safety adequate protective fencing is installed around it.

Following consultation with the *environmental consultant*, and, where advised, any other relevant stakeholder groups, the significance of the finds should be assessed, and an appropriate management strategy followed. Depending on project resources and the nature of the find(s), this process may require input from external consultants.

Development works in the area of the find(s) may re-commence, if and when outlined by the management strategy, developed in consultation with, and approved by the relevant environmental advisor.

For munitions and UXO, a project representative will need to contact the local police to organise attendance and disposal of munitions/UXO by suitably qualified UXO consultant and contractor.

A flow chart demonstrating the requirements for managing unexpected finds is provided below.

Legislative, standards and codes of practise

These protocols have been developed to ensure adherence to relevant legislative, standards and codes of practices.

- *Occupational Health and Safety Act 2000* and associated regulations
- *Contaminated Land Management Act 1997*