Transgrid

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Environmental Impact Statement

EnergyConnect (NSW – Eastern Section)

Technical paper 9 – Air quality impact assessment

Transgrid

EnergyConnect (NSW – Eastern Section)

Technical Paper 9 – Air Quality Impact Assessment

DECEMBER 2021

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Glossary

TERM / ACRONYM	DESCRIPTION
Air NEPM	National Environment Protection (Ambient Air Quality) Measure
Air Toxics NEPM	National Environment Protection (Air Toxics) Measure
Approved Methods	Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 2016
AQIA	Air Quality Impact Assessment
AQMS	Air Quality Monitoring Stations
ARTC	Australian Rail Track Corporation
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
CO	Carbon Monoxide
DPIE	(NSW) Department of Planning Industry and Environment
EMP	Environment Management Plan
EIS	Environmental Impact Statement
ESR	Environmental Scoping Report – previously known as a Preliminary Environmental Assessment
HDV	Heavy duty vehicles defined as vehicles with a gross weight greater than 3.5 tonnes
HEMVs	Heavy earth moving vehicles
IAQM	Institute of Air Quality Management
the IAQM guidance	Guidance on the Assessment of Dust from Demolition and Construction
LNG	Liquefied Natural Gas
NEM	National Electricity Market
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measures
NOx	Oxides of Nitrogen
NPI	National Pollutant Inventory
NSW	New South Wales
OPGW	Overhead Optical Ground Wires
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matters
$PM_{2.5}$	Particles with an aerodynamic diameter of 2.5 micrometres or less
PM_{10}	Particles with an aerodynamic diameter of 10 micrometres or less

TERM / ACRONYM	DESCRIPTION
POEO Act	(NSW) Protection of the Environment Operations Act 1997
RIT-T	Regulatory Investment Test for Transmission
SA	South Australia
SEARs	Secretary Environmental Assessment Requirements
SO_2	Sulphur Dioxide
TSP	Total Suspended Particulates
VIC	Victoria
VOCs	Volatile Organic Compounds
WSP	WSP Australia Proprietary Limited
Units	
ºC	Degree Celsius
km	kilometre
km/h	kilometre per hour
kV	kilovolts
m	Metre
mm	Millimetres
Mtpa	Million tonnes per annum
MW	Megawatt
t/a	tonne per annum
µg/m^3	Microgram per cubic meter
µm	micrometre

Abbreviations

brake/winch sites	A brake and winch site is a temporarily cleared area where plant and equipment is located for the purposes of spooling and winching a conductor into place on erected transmission line towers along a transmission line corridor. Dependent upon the angle of line deviation, the location of the brake and winch site at that angle may or may not be within the nominated transmission line easement. The brake and winch site is only required for the construction phase of the proposal. It does not need to be maintained for ongoing operation and/or maintenance of the transmission line.
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/winch sites and site offices. Within this area, finalisation of the design may identify some minor movement of the final tower locations longitudinally along the transmission line easement area 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).
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 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).
EnergyConnect	An electrical interconnector of around 900 kilometres between the electricity grids of South Australia and New South Wales, with an added connection to north west Victoria. In NSW, EnergyConnect comprises two sections – Western Section (which has been the subject of a separate environmental assessment and approval) and the Eastern Section (the proposal the subject of this EIS).
hazard/high risk tree	Hazard/high risk trees are defined under Transgrid procedures and include any tree or part of a tree that if it were to fall would infringe on the vegetation clearance requirements at maximum conductor sag of the transmission lines. Hazard/high risk trees will be confirmed based on the final proposal design (considering the transmission line conductor profile) and following qualified arborist assessment of the tree. All hazard/high risk trees confirmed as posing a risk to the corridor shall be removed.
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.
permanent works footprint	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 towers, any new substation infrastructure and permanent access tracks.
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	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 *Electricity Network Assets (Authorised Transactions) Act 2015*.
proposal, the	The proposal is known as 'EnergyConnect (NSW – Eastern Section)' as described in Chapter 5 and Chapter 6 of the main EIS document.
proposal study area	The study area for this EIS, which comprises a generally one kilometre wide corridor between the Buronga substation and the Wagga Wagga Substation. It encompasses the indicative disturbance area and transmission line corridor, which has been applied to identify the constraints nearby to the proposal which may or may not be indirectly impacted by the proposal. Access tracks would be located within the proposal study area.
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.

Executive summary

EnergyConnect (NSW – Eastern section)

Transgrid (electricity transmission operator in New South Wales (NSW)) and ElectraNet (electricity distributor in South Australia (SA)) are currently investigating the proposed construction and operation of a new electrical interconnector and network support options between NSW and SA, with an added connection to north-west Victoria.

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 substation as well as other ancillary infrastructure.

Overview of environmental assessment

Existing environment

Climate statistical data collected at the Mildura Airport Automatic Weather Station (AWS), Hay Airport AWS and Wagga Wagga Aeronautical Meteorology Observing (AMO) station was reviewed to evaluate local meteorological conditions.

Except for Wagga Wagga, the air quality study area and surrounding locations are predominantly rural with some scattered residential properties. The main existing emissions are wind-blown dust from exposed land, agricultural activities and from vehicular traffic using the local road network. Wagga Wagga is a city at the eastern extent of the proposal. The air quality within the vicinity of Wagga Wagga is predominantly influenced by industrial emissions, higher levels of traffic emissions and other diffuse emission sources commonly associated with more urban areas.

The National Pollutant Inventory (NPI) database review indicated that the majority of the air quality study area is not likely to be affected by emissions from operations at any NPI reporting facilities. At Wagga Wagga, NPI reporting facilities would have some influence on the air quality in the township.

The latest five years of monitoring data for Total Suspended particulates (TSP), PM_{10} (particulate matter equal to or less than 10 micrometres in aerodynamic diameter) and $PM_{2.5}$ (particulate matter equal to or less than 2.5 micrometres in aerodynamic diameter) at the Buronga and Hay ambient air quality monitoring stations (AAQMS) was analysed and presented in this assessment. These particulate matter fractions were not monitored using reference or reference equivalence methods. As such, the monitoring data was considered indicative of particulate matter concentrations in a rural area.

The closest AAQMS to the proposal is located at Wagga Wagga North. It is a NEPM performance monitoring station and continuously records PM_{10} and $PM_{2.5}$ data. The data was analysed for the period 2016 to 2020. Given the limited data available within the air quality study area, the data collected at the station was considered to be broadly representative of particulate levels in regional urban settings. The data was used for the assessment of air quality impacts during construction of Dinawan substation and associated activities.

In summary, the existing environment of the proposal is characterised by relatively flat terrain with large areas of exposed and agricultural land which is subject to dust generation during hot and windy conditions. The area also typically contains a low number of sensitive receptors along the alignment of the proposed transmission line and within the vicinity of the proposed new Dinawan substation, upgraded and expanded Wagga Wagga substation and the construction compound and accommodation camp sites.

Assessment methodology

In relation to the identification of sensitive receptors, the following approaches were adopted:

- for dispersion modelling on Dinawan substation the nearest sensitive receptors were identified
- for the qualitative assessment on general construction work activities sensitive receptors were identified:
  - within 350 metres of the construction impact area
  - within 50 metres of the route (s) used by construction vehicles on public roads up to 500 metres from the site entrances for the main construction compounds and accommodation camps
- for the assessment of air quality (dust) impacts along haulage routes sensitive receptors were identified within 100 metres of paved roads and 200 metres of unpaved haulage routes.

Dust impacts for construction were assessed for different components of the proposal in relation to impacts on the identified sensitive receptors. The assessment methodologies were applied as follows:

- activities associated with construction of the proposed Dinawan 330kV substation including screening operations were assessed quantitively through air dispersion modelling using the CALPUFF model
- all construction works associated with the proposed upgrade and expansion of the Wagga Wagga substation, all construction compounds, accommodation camps and the transmission line easement were assessed semi-quantitatively with a risk-based approach detailed in the *Guidance on the assessment of dust from demolition and construction* published by the Institute of Air Quality Management (IAQM guidance)
- local haulage routes were addressed qualitatively through the identification of sensitive receptors
- dust emissions from construction works and any dust related construction works 'screened out' by the IAQM guidance criteria was assessed qualitatively. Air quality impacts of potential emissions from the operation phase of the proposal were also assessed qualitatively
- potential gaseous and odour emissions during construction works were addressed qualitatively.

Assessment outcomes

The potential impacts which were identified as a result of the proposed construction and operational phases of the proposal are summarised below.

Construction

For works associated with construction of the proposed Dinawan substation including screening operations, the outcomes of the air dispersion modelling assessment indicated:

- cumulative annual average ground level concentrations of TSP are predicted to be below the assessment criterion of 90 µg/m^3 at all sensitive receptors
- predicted maximum monthly incremental dust deposition levels are below the criterion of 2g/m^2/month (maximum increase from the proposal)
- cumulative 24-hour PM_{10} concentrations at sensitive receptors R2 to R6 exceed the 50 µg/m^3 assessment criterion on one additional day due to the proposal. There are no additional exceedances due to the proposal at receptor R1
- cumulative annual average PM_{10} concentrations is above the assessment criterion of 25 µg/m^3 at all sensitive receptors assessed, noting that this is due to the existing background concentration already being above the criterion before the contribution from the proposal is added
- cumulative 24-hour $PM_{2.5}$ concentrations at all sensitive receptors are below the 25 µg/m^3 assessment criterion. There are no additional exceedances due to the proposal at any of the receptors
- cumulative annual average $PM_{2.5}$ concentrations is above the assessment criterion of 8 µg/m^3 at all sensitive receptors assessed, noting that this is due to the existing background concentration already being above the criterion before the contribution from the proposal is added.

The risk of dust impacts from demolition works, earthworks, construction activities and track out associated with the Wagga Wagga upgrade and expansion, works associated with the construction compound and accommodation camps and the transmissions lines were determined to be low to negligible prior to mitigation.

Construction vehicles travelling on local haulage routes have the potential to generate dust that may have an amenity impact on nearby sensitive receptors. The size of the impact would be dependent on a range of factors including the type and condition of the road (i.e., paved or unpaved), vehicle speed and prevailing meteorological conditions. Dust generated from construction vehicles on paved roads would be of short duration and intermittent in nature and the impact on the receiving environment is anticipated to be low. Driving below the speed limit, particularly through townships and villages would assist in reducing impacts. Dust generated from construction vehicles on unpaved roads has the potential to be high particularly under certain conditions (dry surface roads and high winds). However, the impacts would be intermittent, of short duration and would likely impact only a small number of receptors at any given time.

Gaseous emissions generated from vehicles and fugitive sources would be minimised with the implementation of mitigation measures detailed in Chapter 8 and air quality impacts would not be of significance.

Odour impacts from the wastewater treatment plants at the proposed construction compound and accommodation camp sites were addressed qualitatively and potential impacts are expected to be minimal.

Operation

During normal operation, potential wind-blown dust emissions from unsealed tracks and roads would be negligible. No other air emissions would be generated either from the operation of transmission lines of the proposed Dinawan and upgraded and expanded Wagga Wagga substation.

During routine inspection, maintenance or emergency, potential gaseous and dust emissions are anticipated to be negligible, and the impacts of this on surrounding areas would not be of significance.

Cumulative impacts

Potential cumulative impacts from seven identified proposed developments were considered in this assessment. With appropriate dust control measures in place for all developments during construction, cumulative impacts are not expected to be of significance.

No operational cumulative impacts are expected to occur.

Conclusion

In summary, potential air quality impacts (gaseous and dust emissions) impacts associated with the construction and operation of the proposal were evaluated and were determined to have typically low to negligible impacts on the receiving environment including the nearest sensitive receptors. The implementation of management measures would however be required to ensure that potential dust impacts on the receiving environment are minimised as far as practicably possible.

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 the 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 (of which the proposal is 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 Air quality study area

The air quality study area comprises a generally one-kilometre wide corridor between the Buronga substation and the Wagga Substation. It traverses around 540 kilometres in total. It encompasses the construction impact area and transmission line corridor, which has been applied to identify the constraints nearby to the proposal which may or may not be indirectly impacted by the proposal. Access tracks would be located within the air quality study area.

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

1.3.2 Key features of the proposal

The key components of the proposal include:

- about 375 kilometres of new 330kV double circuit transmission line and associated infrastructure between the Buronga substation Buronga 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 500kV double circuit transmission line and associated infrastructure between the proposed Dinawan 330kV 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 new line bays, relocation and upgrade of existing 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.

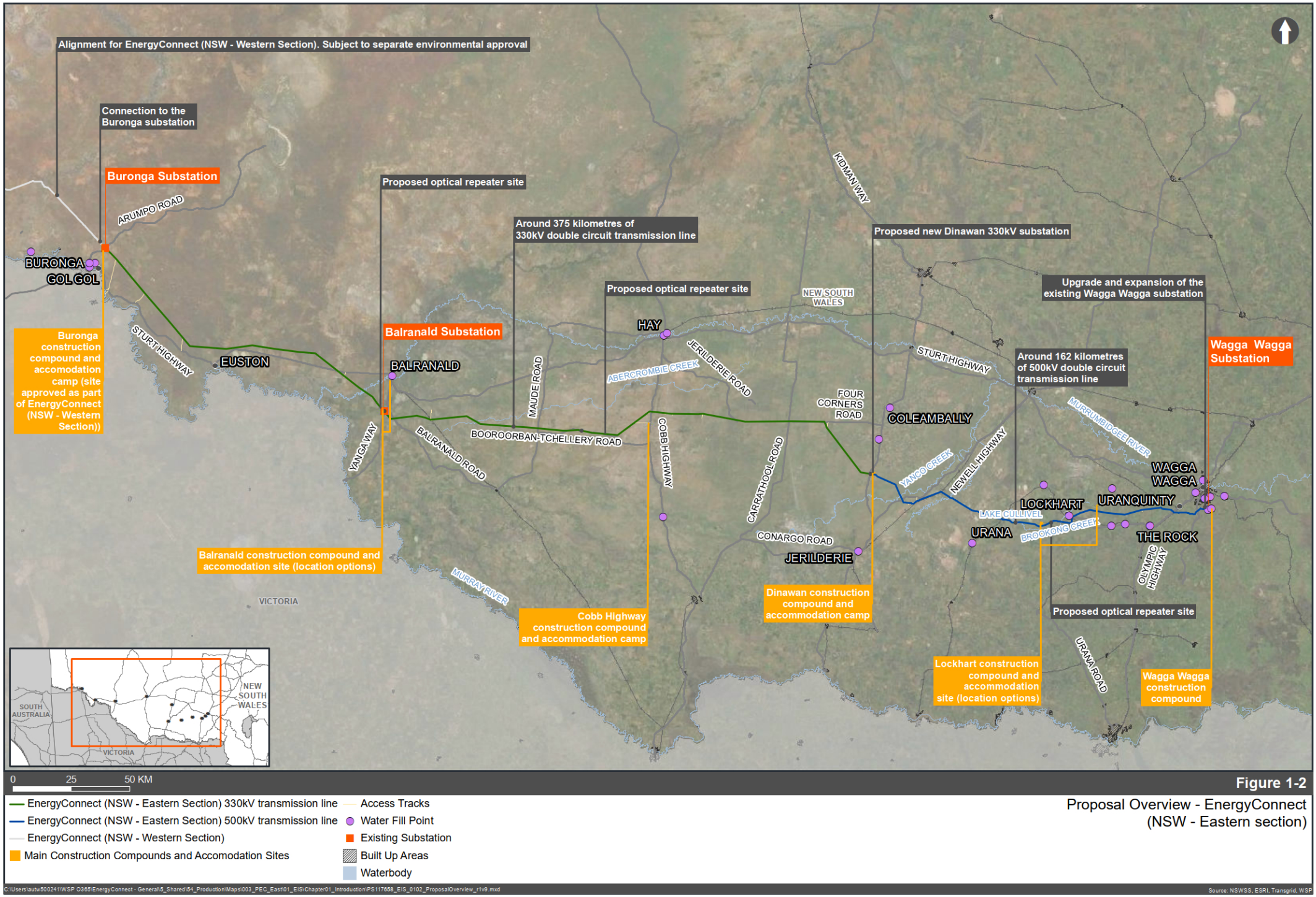

Figure 1-2

Proposal Overview - EnergyConnect (NSW - Eastern section)

- EnergyConnect (NSW - Eastern Section) 330kV transmission line
- EnergyConnect (NSW - Eastern Section) 500kV transmission line
- EnergyConnect (NSW - Western Section)
- Main Construction Compounds and Accomodation Sites
- Access Tracks
- Water Fill Point
- Existing Substation
- Built Up Areas
- Waterbody

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Source: NSWSS, ESRI, Transgrid, WSP

1.3.3 Construction

1.3.3.1 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, 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 existing 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).

1.3.3.2 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 the proposed 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.

1.3.3.3 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.

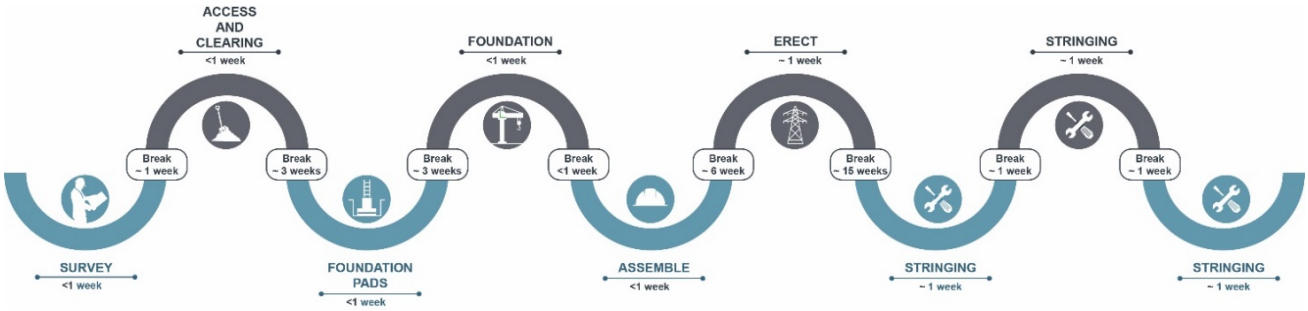


Figure 1-3 Indicative duration of construction activities at transmission line towers

1.3.4 Key pollutants on interest

The construction and operation of the proposal would generate dust. Key dust generating activities would include moving materials, construction works and movement of vehicles on unpaved roads. The combustion of engine fuel from vehicle movements and the operation of on-site plant and machinery has the potential to generate gaseous air pollutants. Overall, the following key air pollutant emissions were identified:

- particulate matter (PM) in the following size fractions:
  - total suspended particulates (TSP)
  - particulate matter with an aerodynamic diameter equal to or less than 10 micrometres in diameter (PM_{10})
  - particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometres in diameter ($PM_{2.5}$)
  - deposited dust
- gaseous air pollutants:
  - carbon monoxide (CO)
  - oxides of nitrogen (NO_x) comprising of nitrogen monoxide (NO) and nitrogen monoxide (NO_2)
  - sulphur dioxide (SO_2)
  - volatile organic compounds (VOCs) (e.g. benzene)
- polycyclic aromatic hydrocarbons (PAHs)
- odour.

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 air quality impacts. It responds directly to the Secretary's environmental assessment requirements (SEARs) (refer to Section 1.4.1) and has been prepared with consideration of *Guidance on the assessment of dust from demolition and construction* (IAQM 2014) and the *Approved methods for the modelling and assessment of air pollutants in NSW* (DEC 2016).

This report has the following objective:

- to assess the potential air quality impacts from construction operational activities of the proposal on the receiving environment.

1.4.1 Secretary's environmental assessment requirements

The NSW Department of Planning, Industry and Environment (DPIE) has provided the 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 Secretary's environmental assessment requirements – Air

REFERENCE	SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	WHERE ADDRESSED
Key issue – Air	An assessment of air quality impacts of the project	Chapter 5 and 6 of this technical paper

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 AQIA.
- *Chapter 4 – Existing environment:* Describes the existing topography, climate, ambient air quality and sensitive receptors.
- *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 on air quality impacts.
- *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.

Appendices to this report are:

- Appendix A – Topographical figure of the proposal area
- Appendix B – Location of identified sensitive receptors along the transmission line
- Appendix C – Location of identified sensitive receptors along the proposed local haulage routes
- Appendix D – Contour plots.

1.6 Limitations

The existing environment study was conducted using publicly available data (e.g. Bureau of Meteorology) and consulting the DPIE (i.e. ambient air quality monitoring data). Due to the remoteness of the proposal and the limited availability of information for the air quality study area, the most representative data was analysed to demonstrate the likely conditions of the existing environment.

2 Legislative and policy context

This chapter describes the key Commonwealth and NSW State legislative and policy context of the proposal in relation to air quality.

2.1 Commonwealth

2.1.1 National Environment Protection Council Act 1994

The National Environment Protection Council (NEPC) was established under the National Environment Protection Council Act 1994 (NEPC Act). The primary functions of the NEPC are to:

- to prepare National Environment Protection Measures (NEPMs)
- to assess and report on the implementation and effectiveness of the NEPMs in each state and territory.

NEPMs are a special set of national objectives designed to assist in protecting or managing aspects of the environment e.g. air quality.

The NEPM relevant to air quality for the proposal is:

- *National Environment Protection (Ambient Air Quality) Measure 2021* (Air NEPM).

2.1.1.1 National Environment Protection (Ambient Air Quality) Measure 2021

Key pollutants commonly found in ambient air are nationally regulated under the National Environment Protection (Ambient Air Quality) Measure (Air NEPM).

The Air NEPM outlines standards and goals for key pollutants that are required to be achieved nationwide, with due regard to population exposure. The national environment protection standards of this measure are presented Table 2-1.

Commonwealth, State and Territory Environment Ministers have flagged an objective to move to a $PM_{2.5}$ standard of 20 µg/m^3 (1-day average) and 7 µg/m^3 (1-year average) by 2025 as prescribed in the Air NEPM 2016 amendment.

These standards are not relevant to air emissions from individual sources, specific industries or roadside locations. Air NEPM standards are intended to be applied at performance monitoring locations that represent air quality for a region or sub-region of 25,000 people or more. These performance monitoring stations are operated by the relevant environmental regulatory authority in each State and Territory.

Table 2-1 Air NEPM standards

POLLUTANT	AVERAGING PERIOD	AIR QUALITY STANDARD[1, 2]
PM_{10}	24 hours	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24 hours	25 µg/m^3
		20 µg/m^3
	Annual	8 µg/m^3
		7 µg/m^3

(1) Defined as a standard that consists of quantifiable characteristics of the environment against which environmental quality can be assessed

(2) µg/m^3 – unit of measurement for particulate matter expressed as micrograms per cubic metre

2.2 State

2.2.1 *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 air quality 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. Under Schedule 1, Part 1, Clause 16, the POEO Act states:

'***16 Crushing, grinding or separating***

*(1) This clause applies to "**crushing, grinding or separating**', meaning the processing of materials (including sand, gravel, rock or mineral, but not including waste of any description) by crushing, grinding or separating them into different sizes.*

……..

(2) *The activity to which this cause applies is declared to be a scheduled activity if it has a capacity to process more than 150 tonnes of material per day or 30,000 tonnes of materials per year.*'

The proposal would involve earthwork materials to be excavated from areas immediately adjacent to the proposed Dinawan substation site, located approximately 30 kilometres south of Coleambally. A mobile screening plant would be required to process this material prior to its use within the substation pad. This activity would occur adjacent to the proposed Dinawan substation site and is expected to process up to between 150,000 and 200,000 cubic metres in total (600 to 700 cubic metres per day) over a period of 12 to 15 months (subject to further geotechnical investigations prior to commencement of construction). For the purposes of this air quality impact assessment, it is assumed that up 200,000 cubic metres would be processed.

The NSW EPA was consulted (email of 11 August 2021) regarding the proposed screening operations at the Dinawan substation site. They advised that the operations would trigger the need for an Environment Protection Licence (EPL) in accordance with the POEO Act and recommended dispersion modelling be undertaken to assess potential air quality impacts at the Dinawan substation site (refer to Section 5.3). The generation of air emissions from construction works outside of the Dinawan site were addressed separately.

2.2.2 *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2016)*

The NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales 2016* (Approved Methods) prescribes the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in the state. The Approved Methods lists impact assessment criteria for a number of pollutants and the relevant criteria of this proposal are presented in Table 2-2.

Table 2-2 Impact assessment criteria

POLLUTANT	AVERAGING PERIOD	STANDARDS
TSP	Annual	90 µg/m^3
PM_{10}	24 hours	50 µg/m^3
	Annual	20 µg/m^3
$PM_{2.5}$	24 hours	25 µg/m^3
	Annual	8 µg/m^3
Deposited dust	Annual	2 g/m^2/month (increase) 4 g/m^2/month (cumulative)

3 Methodology

This chapter describes the methods used to assess the potential impacts of the proposal. As the nature of activities during the construction phase and operation phase vary, the assessment methodology used for two phases were discussed separately.

3.1 Construction

3.1.1 Dust impacts

Potential dust impacts were assessed separately for the following components of the proposal:

- Dinawan substation, construction compound and accommodation camp and associated construction activities
- all other construction activities associated with:
  - the construction of the transmission lines
  - the upgrade and expansion of the Wagga Wagga substation
  - all other project elements including the construction compounds and accommodation camps (other than the Dinawan site)
- local haulage routes.

3.1.1.1 Dinawan substation, construction compound and accommodation camp site

As discussed in Section 2.2.1, the currently estimated volume of material required to be screened at the Dinawan substation site would trigger the need to apply for an EPL. The application for the Environment Management Plan (EMP) would need to include a quantitative air quality impact assessment as supporting documentation.

This technical paper quantitatively assesses potential air emissions associated with construction of the Dinawan substation and construction compound in consideration of the *Approved Method for the modelling and assessment of pollutants in NSW, 2016* (Approved Methods).

A Level 2 assessment was conducted to determine potential impacts for the following pollutants:

- total suspended particulates (TSP)
- dust deposition
- PM_{10}
- $PM_{2.5}$.

A Level 2 assessment is a refined dispersion modelling technique using site-specific input data and requires at least one year of continuous ambient air monitoring data contemporaneous with the meteorological data.

The modelling year (2018) was selected in consideration of guidance provided in the *Approved Methods*.

Generation of meteorological files

The Air Pollution Model

In the absence of a full suite of meteorological data, The Air Pollution Model (TAPM) was used to generate meteorological files. The meteorological component of TAPM is an incompressible, optionally non-hydrostatic, primitive equation model with a terrain-following vertical co-ordinate for three dimensional simulations. The model is connected to a '*databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature and synoptic –scale meteorological analysis for various regions around the world*'. These inputs were used for the model.

TAPM (Version 4.0.5) was run adopting the setup in compliance with the requirements from the *Approved Methods* and using the following parameters:

- four nesting grids of 30 kilometres, 10 kilometres, three kilometres and one kilometre
- 25 by 25 horizontal grid points
- grid centre of 34º6' S, 142º15' E (MGA Zone 54H 615728 m E, 6225749 m S)
- 25 vertical levels (10 metres, 25 metres, 50 metres, 100 metres, 150 metres 200 metres, 250 metres, 300 metres 400 metres, 500 metres, 600 metres, 750 metres, 1,000 metres, 1,250 metres, 1,500 metres, 1,750 metres, 2,000 metres, 2,500 metres, 3,000 metres, 3,500 metres, 4,000 metres 5,000 metres, 6,000 metres, 7,000 metres and 8,000 metres)
- GEODATA 9-Second terrain height database
- TAPM default database for land use, synoptic analysis and sea surface temperature.

TAPM's output was exported as a surface and upper air station at MGA Zone 55H 378811 m E, 6115548 m S and used as upper air data in the meteorological modelling.

The meteorology for the air quality proposal area was modelled using CALMET (V6.5.0). CALMET is a meteorological model which includes a diagnostic wind field generator. It accounts for the treatment of slope flows, terrain effects, such as blocking, and a micrometeorological model for overland and overwater boundary layers. This model produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables to produce the three-dimensional meteorological fields that are utilised in the CALPUFF dispersion model.

A one-year meteorological dataset was compiled for CALPUFF for the calendar year 2018.

Two grid domains were modelled to account for the meteorological station:

- the outer domain with a coarse resolution of 500 metres and 40 kilometres by 40 kilometres'
- the inner domain with a finer resolution of 200 metres and 20 kilometres by 20 kilometres' extent.

Output from the inner domain was then used in the CALPUFF dispersion modelling. Site-specific meteorological data were extracted from the inner domain output at the Dinawan substation (i.e., MGA Zone 55H 378811 m E. 6115548 m S).

Table 3-1 provides a summary of the CALMET configuration.

Table 3-1 CALMET configuration summary

PARAMETERS	CONFIGURATION
Outer domain	Southwest corner (MGA Zone 54H): 595710 m E, 6205827 m S. Resolution: 500 m. Extent: 40 km x 40 km.
Inner domain	Southwest corner (MGA Zone 54H): 605550 m E, 6215716 m S. Resolution: 200 m. Extent: 20 km x 20 km.
Cell faces heights (m)	0, 20, 30, 40, 50, 70, 90, 100, 250, 500, 1000, 1500, 2000.
Biases	-1, -1, -0.75, -0.5, -0.25, 0, 0.5, 1, 1, 1, 1, 1
TERRAD	2 km
Terrain data	1 Second DEM from ELVIS: https://elevation.fsdf.org.au/
Land use	Catchment Scale Land Use Data for Australia (CLUM): https://www.agriculture.gov.au/abares/aclump/land-use/catchment-scale-land-use-of-australia-update-december-2018

Ambient background data

Ambient air monitoring data collected at the Wagga Wagga North AAQMS was used as background data for the proposal and is discussed in further detail in Section 4.4.2.

Sensitive receptors

The nearest sensitive receptors to the proposed Dinawan substation were identified (verified and potential) and are presented in Section 4.2.1 and Appendix B.

Air dispersion modelling

Air dispersion modelling was undertaken using the latest version of CALPUFF (V.7.2.1) in accordance with the requirements of the *Approved Methods*.

CALPUFF is a multi-layer, multi-species, non-steady-state Gaussian puff dispersion model that can simulate the effects of time- and space-varying meteorological conditions on pollutant transport.

CALPUFF is one of the most commonly used models for regulatory dispersion modelling applications in NSW and it provides a distinct advantage in the treatment of calm conditions over steady-state models (such as AERMOD).

Emission estimation

Emission rates for activities at the Dinawan substation were determined using NPI emission factors and the United States Environmental Protection Agency (USEPA) AP-42. An emission factor is a value representing the relationship between an activity and the rate of emissions of a specified pollutant. Emission factors are developed based on test data, material mass balance studies and engineering estimates.

Emission estimates for the Site were based on the following NPI and USEPA AP-42 references:

- NPI Emission Estimation Technique Manual for Mining Version 3.1 (NPI Mining)
- AP-42 Section 11.19.2: Crushed Stone Processing and Pulverized Mineral Processing
- AP-42 Section 13.2.2: Unpaved Roads
- AP-42 Section 13.2.3: Heavy Construction Operation.

The emission calculations and resultant emission rates are discussed in the following sections using the equation presented below and information available for the proposal.

Emission factors are expressed as a function of the weight, volume, distance or duration of the activity emitting the pollutant. The general equation used for the estimation of emissions is:

$$E = A \times EF \times \left(1 - \frac{ER}{100}\right)$$

Where:

E = emission rate
A = activity rate
EF = emission factor
ER = overall emission reduction efficiency (%)

Emission rates were generated for the following sources:

- machinery operation e.g. excavators, scrapers, dozer and grader
- materials handling (loading and unloading trucks)
- wheel generated dust for unpaved roads
- screening operations and associated activities
- wind erosion from stockpiles and exposed areas.

Source characteristics along with the emission rates for each source were used to predict pollutant impact at the gridded and discrete receptors.

3.1.1.2 Other proposal elements, construction compounds and accommodation camps

Other than the assessment of the construction activities associated with the Dinawan substation and earthworks material site (as described above), the dust emissions associated with the construction of proposal were assessed in accordance with the *Guidance on the assessment of dust from demolition and construction* published by the Institute of Air Quality Management (IAQM) in 2014 (hereafter referred to as the IAQM guidance). The IAQM guidance provides a risk-based approach with the aim to identify risks and to recommend appropriate mitigation measures to minimise these risks. The proposal locations included in the dust risk assessment include:

- Balranald construction compound
- Cobb Highway construction compound and accommodation camp
- County-Boundary Road construction compound and accommodation camp
- Wagga Wagga substation upgrade site and Wagga Wagga construction compound
- transmission lines.

The IAQM guidance considers the risk of dust emissions from a construction site causing amenity and health impacts is related to:

- the activities being undertaken (earthmoving, number of vehicles and plant)
- the duration of these activities
- the size of the site
- the meteorological conditions (wind speed, direction and rainfall)
- the proximity of receptors to the activities
- the adequacy of the mitigation measures applied to reduce or eliminate dust
- the sensitivity of the receptors to dust.

The quantity of dust emitted from construction operations is related to the area of land being worked, and the level of construction activity (nature, magnitude and duration).

The wind direction, wind speed and rainfall when construction activities are taking place, would also influence the likelihood of dust impacts. Adverse impacts can occur in any direction from a site. They are, however, more likely to occur downwind of the prevailing wind direction and/or close to the site. Local conditions including topography and natural barriers (e.g., woodland) can affect airborne concentrations due to impaction. Furthermore, existing background concentrations can be used to determine whether ambient air quality standards are likely to be exceeded as a result of construction activities.

The IAQM guidance for assessing risk involves the following steps:

- Conduct a risk-based assessment in accordance with the IAQM guidance for potential dust impact associated with the proposal construction:
    - Step 1: Screen the need for a more detailed assessment. The IAQM guidance document recommends that a risk assessment is undertaken where sensitive receptors are located within 350 metres of the construction impact area or 50 metres of the route (s) used by construction vehicles on public roads up to 500 metres from the site entrance(s). For construction works screened out for a detailed risk assessment (in Step 1), the IAQM guidance indicates it can be concluded that the level of risk is “negligible” and any effects would not be of significance.

- Step 2: Assess the risk of dust impacts. This is done separately for each type activity including demolition, earthworks, general construction and track out[1] by heavy vehicles (i.e. haulage activities).
  - Step 2A: Determine the potential dust emission magnitude (large, medium or small) of the works depending on the type of activity. For demolition, the dust magnitude is classified as large, medium or small depending on the total building volume demolished, type of construction material e.g. concrete, metal, on-site crushing and screening, and height of demolition activities above ground level. For earthworks, the total site area, soil type are the main determining factors. For general constructions works, the total building volume, on-site concrete batching and sandblasting/blasting determine the dust emission magnitude. For track out, the number of heavy vehicle outward movements in any given day, type of surface material and the unpaved road length are key determinants.
  - Step 2B: Determine the sensitivity (high, medium or low) of the area to dust soiling and human health (Table 3-2 and Table 3-3). Several factors are considered including the number of receptors and their proximity to the works, specific receptor sensitivities, existing background concentrations and site-specific factors that may reduce impacts (e.g. trees that may reduce wind-blown dust).
  - Step 2C: Define the risk of dust impacts on dust soiling and human health (Table 3-4 to Table 3-6) by combining the dust emission magnitudes (large, medium or small) for demolition, earthworks, general construction and track out (Step 2A) with the sensitivity of the area (high, medium or low) (Step 2B).
- Step 3: Determine the site-specific mitigation.
- Step 4: Examine the residual effects and determine whether or not these are significant.

Table 3-2 Sensitivity of the area to dust soiling

RECEPTOR SENSITIVITY	NUMBER OF RECEPTORS	DISTANCE FROM THE SOURCE (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10–100	High	Medium	Low	Low
	1–10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	<1	Low	Low	Low	Low

[1] Track out is dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site

Table 3-3 Sensitivity of the area to human health impacts

RECEPTOR SENSITIVITY	ANNUAL MEAN PM_{10} CONCENTRATION[1]	NUMBER OF RECEPTORS	DISTANCE FROM THE SOURCE (m)				
			<20	<50	<100	<200	<350
High	>25 µg/m^3	>100	High	High	High	Medium	Low
		10–100	High	High	Medium	Low	Low
		1–10	High	Medium	Low	Low	Low
	<25 µg/m^3	>100	High	Medium	Low	Low	Low
		10–100	High	Medium	Low	Low	Low
		1–10	Medium	Low	Low	Low	Low
Medium	>25 µg/m^3	>10	High	Medium	Low	Low	Low
		1–10	Medium	Low	Low	Low	Low
Low	<25 µg/m^3	≥1	Low	Low	Low	Low	Low

(1) The annual mean PM_{10} concentration ranges were adjusted to reflect the annual mean Air NEPM standard of 25µg/m^3

Table 3-4 Risk of dust impacts for demolition

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High	Medium	Medium
Medium	High	Medium	Low
Low	Medium	Low	Negligible

Table 3-5 Risk of dust impacts for earthworks and construction

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 3-6 Risk of dust impact from track out[1] from trucks

SENSITIVITY OF AREA	DUST EMISSION MAGNITUDE		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible

(1) Track out refers to dirt, mud or other materials tracked onto a paved public roadway by a vehicle leaving a construction site

3.1.1.3 Local haulage routes

Local haulage routes (paved and unpaved) external to the air quality study area would also be used to transport material by trucks to and from the substations, construction compounds and accommodation camps. Amenity impacts associated with dust potentially generated from trucks was also assessed qualitatively as part of this assessment.

3.1.1.4 Gaseous emissions

Gaseous emissions generated from vehicles and fugitive sources and construction activities screened out by the IAQM guidance were assessed qualitatively.

3.1.1.5 Odour

Wastewater treatment facilities are proposed to be constructed at the following accommodation camps:

- Cobb Highway construction compound and accommodation camp
- Dinawan substation construction compound and accommodation camp
- County-Boundary Road construction compound and accommodation camp.

Where possible, it is proposed to reuse the effluent and greywater generated on-site and to minimise water usage during construction. Some associated odour may be generated on-site and therefore a qualitative assessment was undertaken.

3.2 Operation

During the operational phase, no air emissions are anticipated to be generated either from the operation of transmission lines or at the proposed Dinawan and upgraded Wagga Wagga substations.

Gaseous emissions due to vehicle fuel combustion and wheel-generated dust on unpaved roads have the potential to be generated during routine inspection, maintenance or emergency. The frequency of these events and numbers of vehicles required at that time were addressed to qualitatively assess the potential air quality impacts.

3.3 Mitigation measures

Site-specific mitigation measures were developed for construction and operation of the proposal (refer to Chapter 8).

Following implementation of mitigation measures, residual impacts for the proposal were assessed.

4 Existing environment

4.1 Topography

From Buronga substation, approximately 170 km to the east, the terrain is relatively flat ranging from approximately 53 metres to 70 metres Australian Height Datum (AHD). Travelling east for a distance of 350 kilometres, the terrain gradually increases to approximately 315 metres AHD south of Wagga Wagga substation. There are no topographical features of note along or within the vicinity of the proposal. The Murraguldrie State Park and Carabost National Park lie approximately 37 kilometres and 41 kilometres to the south-east respectively with elevations rising to over 600 metres AHD. The topography of the local area is not expected to influence pollutant dispersal that may be generated during constructions works.

Appendix A presents the topography figures for the air quality proposal area.

4.2 Sensitive receptors

The Approved Methods (EPA, 2016) describes a sensitive receptor as:

> '*A location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of any known or likely future sensitive receptor*'.

Sensitive receptors are located along the entire length of the proposal, within the vicinity of the proposed substation at Dinawan and the existing Wagga Wagga substation and all of the construction camps and laydown areas.

Potential air quality impacts associated with construction of the proposal were assessed separately for the Dinawan substation site and the rest of the proposal (Section 2.2.1). Identified sensitive receptors to the Dinawan substation site and the rest of the proposal alignment are presented in Section 4.2.1 to 4.2.3.

4.2.1 Dinawan substation

Potential air quality impacts (primarily dust) during construction of the proposed Dinawan substation site were assessed separately through quantitative dispersion modelling. The nearest sensitive receptors to the site were identified and are presented in Table 4-1 and Appendix B. The closest sensitive receptor to the Dinawan substation is located approximately 4.5 km to the south-west.

Table 4-1 Identified sensitive receptors at the proposed Dinawan substation site

RECEPTOR ID	ADDRESS	TYPE	DISTANCE TO THE PROPOSED DINAWAN SUBSTATION (m)	DIRECTION
ID:344 (R1)	Jerilderie	Residential (V)	11,100	North-west
ID:1860 (R2)	211 Liddles Lane, Jerilderie	Residential (P)	4,500	South-west
ID:7152 (R3)	Gala Vale	Residential (P)	7,500	North-west
ID:10325 (R4)	Bundure	Residential (P)	5,600	North-east
ID:12740 (R5)	137 Cadell Road, Jerilderie	Residential (P)	6,100	West
ID:27260 (R6)	No address	Residential (P)	7,500	North

(1) Status: P – potential, V – verified

4.2.2 *All sensitive receptors (excluding the Dinawan substation site and local haulage routes)*

Sensitive receptors, within the following distances, were identified in accordance with the *Guidance on the assessment of dust from demolition and construction* published by the Institute of Air Quality Management (IAQM) in 2014 (the IAQM guidance):

- 350 metres of the construction impact area
- 50 metres of the construction impact area proposed to be used by construction vehicles on public roads, including up to 500 metres from identified access points.

These sensitive receptors are presented in Table 4-2 and Appendix B.

Note there are no sensitive receptors within the distances listed above at the following locations:

- Balranald construction compound site
- Cobb Highway construction compound and accommodation camp sites (both options)
- County-Boundary Road construction compound and accommodation camp (Albury Road option).

Table 4-2 Identified sensitive receptors (except Dinawan substation)

RECEPTOR ID	ADDRESS/LOCATION	TYPE	DISTANCE TO THE TRANSMISSION LINE / CONSTRUCTION COMPOUND / CAMP (m)	DIRECTION
County-Boundary Road construction compound and accommodation camp				
ID 26870	No address	Residence (P)	175	East
ID 26871	No address	Residence (P)	210	East
Wagga Wagga construction compound/Wagga Wagga substation				
ID:202	Benlock, 83 Ashfords Road, Gregadoo	Residence	110	South
ID:737	Arundel, 1,504 Gregadoo East Road, Gregadoo	Residence	190	North-east
Transmission lines				
ID:202	Benlock, 83 Ashford's Road, Gregadoo	Residence (P)	240	East
ID:208	Kiyuga, 709 The Rock, Collingullie Road, The Rock	Residence (P)	175	South
ID:211	2 McGeachies Lane, The Rock	Residence (P)	275	North
ID:385	Andriskes Lane, Cullivel	Residence (V)	50	South
ID:422	823 Fernbank Road, Argoon	Residence (V)	225	North-east
ID:450	128 Slys Lane, Milbrulong	Residence (V)	235	North
ID:504	6823 Holbrook Road, Rowan	Residence (V)	240	North-west
ID:534	Colombo Creek Ski Club, Morundah	Ski Club (V)	60	North-east

RECEPTOR ID	ADDRESS/LOCATION	TYPE	DISTANCE TO THE TRANSMISSION LINE / CONSTRUCTION COMPOUND / CAMP (m)	DIRECTION
ID:12942	The Pines, 1072, Cullivel Road, Cullivel	Residence (P)	220	South
ID:20519	Lot 23 DP756397	Residence (V)	350	North-east
ID:20522	877 Cooning Road, Morundah	Residence (V)	235	North-east
ID:26749	Lot 8 DP1177177	Residence (P)	125	South
ID:26750	Lot 3 DP1032723	Residence (P)	155	South-east
ID:26908	No address	Residence (P)	295	South
ID:27028	No address	Residence (P)	210	South

(1) Status: P – potential, V – verified

4.2.3 *Local haulage routes*

For the assessment of the local haulage routes, sensitive receptors within 100 metres of paved roads and 200 metres of unpaved roads were identified and are presented in Appendix C.

4.3 Climate

Meteorological conditions are important for determining the direction and rate at which emissions from a source disperses. The key meteorological parameters for air dispersion are wind speed, wind direction, temperature, rainfall and relative humidity. Historical meteorological data in the vicinity of the air quality study area was reviewed in this section to demonstrate the existing local meteorological conditions.

The Bureau of Meteorology (BoM) collects meteorological data at Automatic Weather Station (AWS) across Australia and can be used for determining climate statistics over a long period.

There are five meteorological stations near the proposal alignment. These are:

- Mildura Airport AWS (station number 076031) located approximately 21.9 kilometres south-west of the closest section of the transmission line (western end). The AWS commenced operation in 1946 and is situated at an elevation of 50 metres.
- Balranald RSL AWS (station number: 049002) located approximately 12 kilometres to the north-east of the closest section of the transmission line. The AWS commenced operation in 1879 and is situated at an elevation of 60 metres.
- Hay Airport AWS (station number: 075019) located approximately 29.2 kilometres north of the closest section of the transmission line (approximately mid-way along the proposal alignment). Hay Airport AWS commenced operation in 2007 and is situated at an elevation of 92 metres. Long-term climate statistical data is not available for this station.
- Narrandera Airport AWS (station number 074148) located approximately 74.6 km to the north-east of the Dinawan substation site. This AWS commenced operation in 1967 and is situated at an elevation of 145 metres. Further detail regarding meteorological data at this AWS is provided in section 5.3.1.1.
- Wagga Wagga Aerodrome Meteorological Observation (AMO) [station number: 072150] located approximately 7.5 kilometres north-east of the closest section of the transmission line (eastern end). This AMO commenced operation in 1941 and is situated at an elevation of 212 metres.

4.3.1 Climate statistics

The climate statistical data recorded by BoM at the Mildura Airport AWS, Hay Airport AWS and Wagga Wagga Aerodrome AMO are presented in Table 4-3, Table 4-4 and Table 4-5.

The local climate at Mildura Airport AWS is characterised by:

- an average maximum temperature of 33.3°C in January
- an average minimum temperature of 4.4°C in July
- an annual average rainfall of 273.5 millimetres and average rainy days of 39.7
- an average maximum 9 am relative humidity of 86% in June
- an average minimum 3 pm relative humidity of 25% in January and December.

Table 4-3 Summary of climate statistics at Mildura Airport AWS

PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Daily mean temperature (1990 to 2020)													
Max (°C)	33.3	32.5	28.8	24.1	19.5	16.3	15.8	17.8	21.2	25.0	28.5	31.0	24.5
Min (°C)	17.4	16.9	13.8	10.0	7.2	5.2	4.4	5.1	7.5	10.0	13.1	15.3	10.5
Rainfall (1991 to 2020)													
Mean rainfall (mm)	25.2	23.1	16.2	16.8	18.7	20.3	21.2	21.6	26.1	24.8	27.7	31.9	273.5
Mean days of rain	2.5	1.9	1.9	2.4	3.2	4.3	4.9	4.5	4.0	3.9	3.4	2.8	39.7
Mean 9 am conditions (1991 to 2010)													
Temperature (°C)	21.4	20.6	17.5	15.3	11.2	8.4	7.6	9.7	13.3	16.5	18.4	20.2	15.0
Relative humidity (%)	52	55	61	63	78	86	85	74	65	53	52	49	64
Wind speed (km/hr)	17.0	15.6	13.7	12.9	10.6	10.9	11.1	13.6	15.9	17.3	16.9	16.8	14.4
Mean 3 pm conditions (1991 to 2010)													
Temperature (°C)	30.8	30.3	27.1	23.1	18.7	15.6	14.8	16.8	19.7	23.1	26.2	28.4	22.9
Relative humidity (%)	25	27	30	34	46	54	52	42	37	30	27	25	36
Wind speed (km/hr)	17.2	16.7	16.1	15.5	15.0	16.4	16.8	18.5	19.3	18.3	17.5	17.7	17.1

(1) ANN: Annual

The local climate at Balranald RSL AWS is characterised by:

- an average maximum temperature of 33.5°C in January
- an average minimum temperature of 3.8°C in July
- an annual average rainfall of 327.7 millimetres and average rainy days of 47.3
- an average maximum 9am relative humidity of 85% in June
- an average minimum 3pm relative humidity of 29% in January.

Table 4-4 Summary of climate statistics at Balranald RSL

PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
Daily mean temperature (1991 to 2020)													
Max (ºC)	33.5	32.8	29.0	24.6	19.5	16.3	15.8	17.9	21.2	25.0	28.2	30.7	24.5
Min (ºC)	17.2	16.8	13.7	9.8	6.7	4.8	3.8	4.6	7.0	9.7	12.9	15.1	10.2
Rainfall (1991 to 2020)													
Mean rainfall (mm)	25.9	30.2	16.9	22.6	22.9	25.6	29.7	25.7	28.8	26.5	39.9	32.9	327.7
Mean days of rain	3.2	2.6	2.3	3.0	3.9	5.1	6.0	5.1	4.6	4.1	4.2	3.2	47.3
Mean 9 am conditions (1991 to 2010)													
Temperature (ºC)	21.9	20.8	17.6	15.0	10.7	8.3	7.4	9.2	12.8	15.2	18.0	20.1	14.8
Relative humidity (%)	54	58	63	65	80	85	84	76	66	57	57	54	66
Wind speed (km/hr)	10.7	10.0	8.4	8.5	6.4	7.1	6.9	8.3	10.5	12.2	10.8	11.1	9.2
Mean 3 pm conditions (1991 to 2010)													
Temperature (ºC)	31.6	30.9	27.7	23.5	18.7	15.6	14.7	16.8	19.8	23.3	26.3	28.6	23.1
Relative humidity (%)	29	30	34	38	50	58	56	47	42	38	34	31	41
Wind speed (km/hr)	12.4	11.2	10.2	10.5	9.9	11.8	10.9	13.2	13.3	13.7	13.1	12.8	11.9

(1) ANN: Annual

The local climate at Wagga Wagga AMO is characterised by:

- an average maximum temperature of 33ºC in January
- an average minimum temperature of 3.1ºC in July
- an annual average rainfall of 558.3 millimetres and average rainy days of 66.8
- an average maximum 9 am relative humidity of 86% in July
- an average minimum 3 pm relative humidity of 26% in January.

Table 4-5 Summary of climate statistics at Wagga Wagga AMO

PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN[1]
Daily mean temperature (1991 to 2020)													
Max (ºC)	33.0	31.5	28.0	23.2	18.1	14.3	13.3	14.9	18.4	22.8	26.9	30.1	22.9
Min (ºC)	17.2	16.8	13.4	9.1	5.7	4.0	3.1	3.3	5.2	8.0	11.8	14.4	9.3
Rainfall (1991 to 2020)													
Mean rainfall (mm)	38.3	45.2	47.7	32.2	38.5	57.4	50.4	47.1	49.7	48.1	53.9	49.3	558.3
Mean days of rain (≥1mm)	4.1	4.0	3.8	3.8	4.7	7.6	8.5	7.5	6.2	5.8	5.9	4.9	66.8
Mean 9 am conditions (1991 to 2010)													
Temperature (ºC)	22.7	21.5	18.3	15.0	10.5	7.9	6.6	8.1	11.5	15.3	18.0	20.8	14.7
Relative humidity (%)	51	57	60	64	78	85	86	81	74	62	57	51	67
Wind speed (km/hr)	15.0	14.0	11.1	10.4	8.2	8.7	8.3	10.0	11.5	12.7	14.2	14.3	11.5
Mean 3 pm conditions (1991 to 2010)													
Temperature (ºC)	30.7	29.7	26.6	22.1	17.5	13.6	12.4	14.0	17.1	20.9	24.8	27.9	21.4
Relative humidity (%)	26	31	32	37	50	62	63	56	51	41	33	28	43
Wind speed (km/hr)	17.4	15.3	14.2	12.8	11.9	11.6	12.2	14.7	16.3	16.7	18.0	18.2	14.9

(1) ANN: Annual

4.3.2 Typical wind conditions

Detailed wind conditions were recorded at Mildura Airport AWS, Hay Airport AWS and Wagga Wagga Aerodrome AMO. Figure 4-1, Figure 4-2 and Figure 4-3 presents annual seasonal wind roses showing the frequency and direction of winds for the past five years (2016 to 2020).

The wind roses at Mildura Airport AWS indicate the following:

- wind direction over five years (2016 to 2020) is predominately southerly and then south-westerly with an annual wind speed of 3.6 m/s and 3.2% calm conditions (wind speeds less than 0.5 m/s)
- during summer, winds are most frequently southerly followed by south-westerly with an average wind speed of 3.9 m/s and 1% calm conditions
- in autumn, winds are most frequently southerly followed by south-westerly with an average wind speed of 3.2 m/s and 4.3% calm conditions
- during spring, southerly, south-westerly and westerly wind directions are dominant with an average wind speed of 3.9 m/s and 2.5% calm conditions
- in winter, westerly, northerly and north-easterly winds are most frequent with an average wind speed of 3.3 m/s and 4.9% calm conditions.

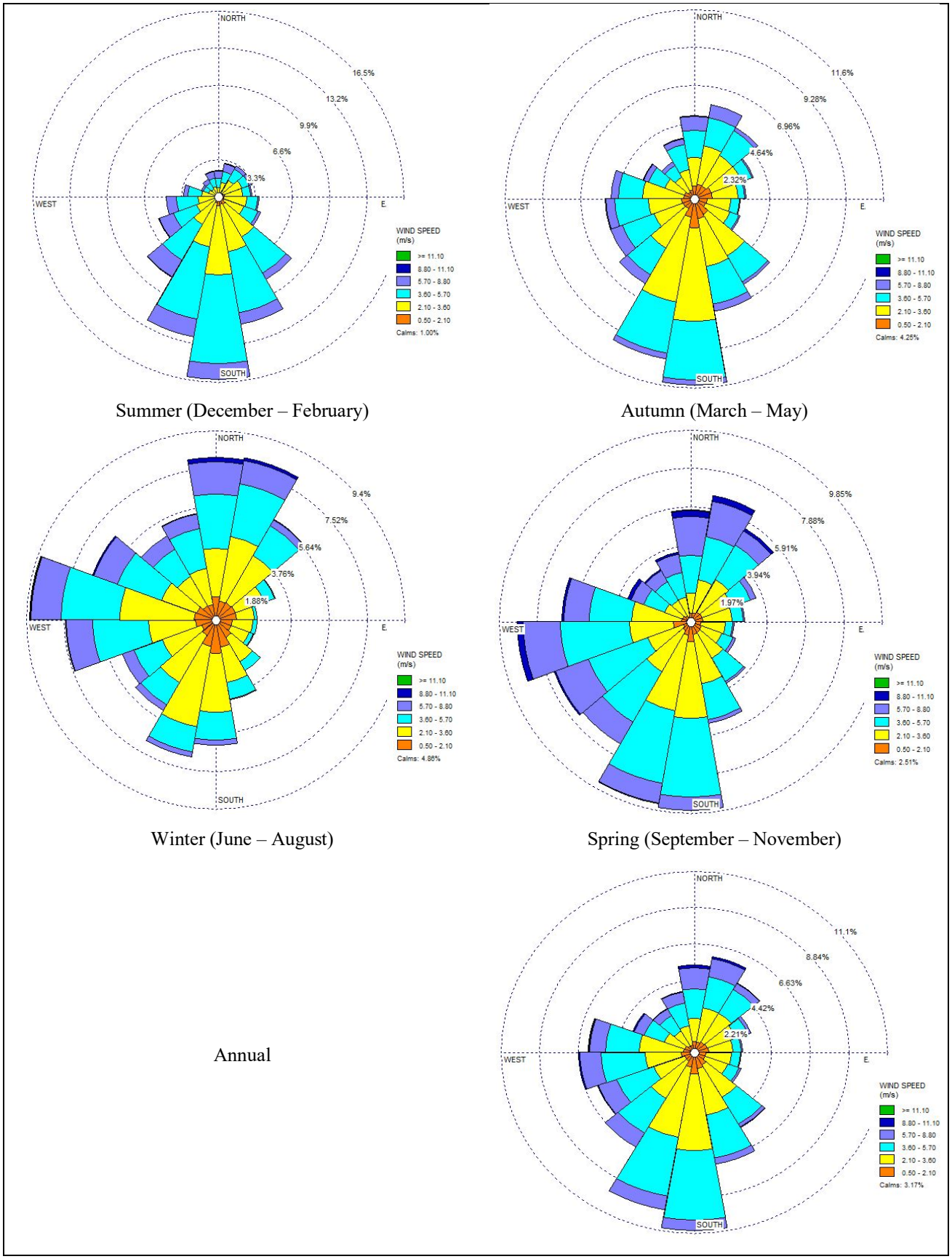
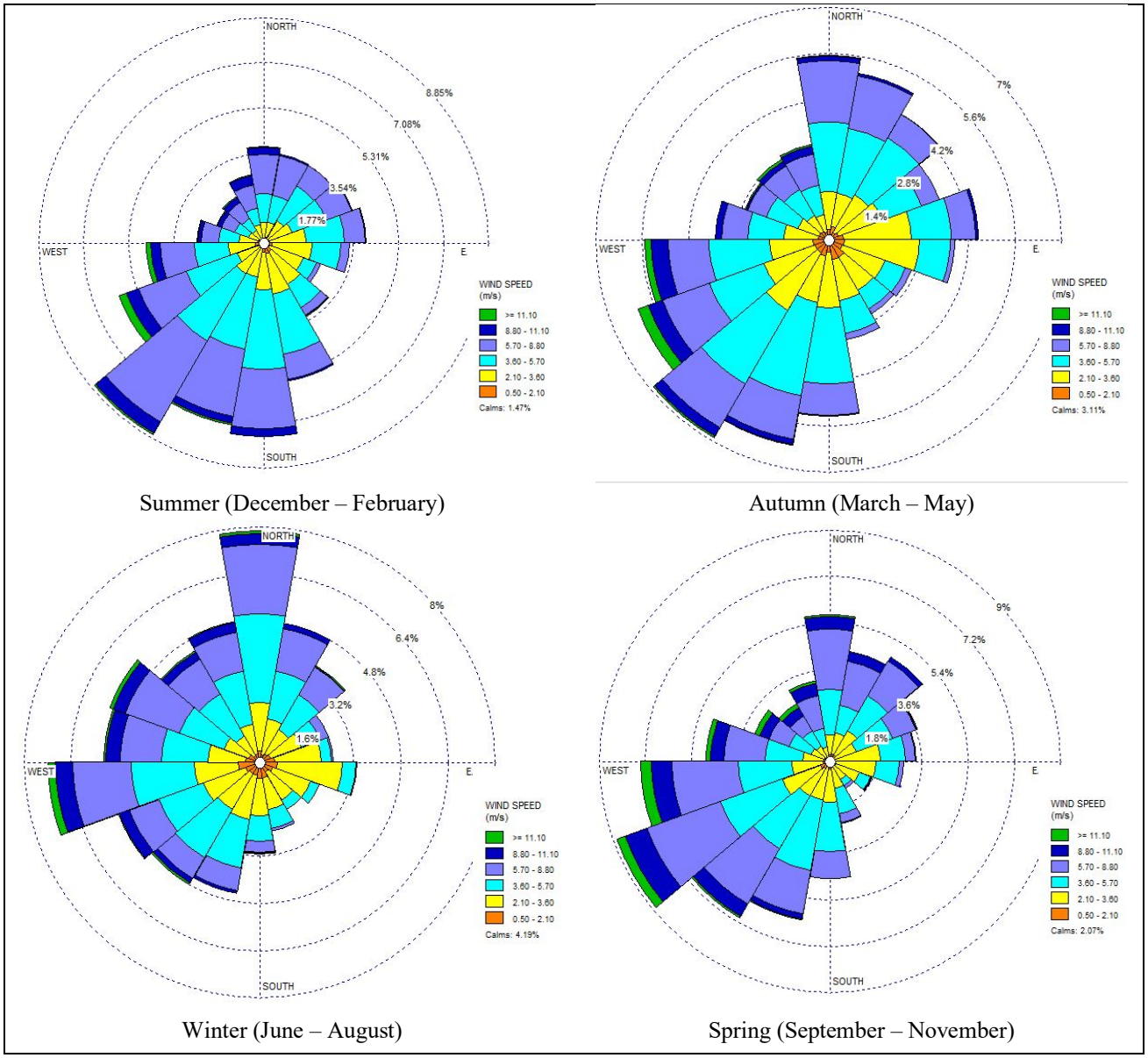


Figure 4-1 Mildura Airport AWS seasonal and annual wind roses (2016–2020)

The wind roses at Hay Airport AWS indicate the following:

- wind direction over five years (2016 to 2020) is predominately south-westerly followed by northerly with an annual wind speed of 4.6 m/s and 2.7% calm conditions (wind speeds less than 0.5 m/s)
- during summer, winds are most frequently south-westerly followed by southerly with an average wind speed of 4.9 m/s and 1.5% calm conditions
- in autumn, winds are most frequently south-westerly followed by northerly with an average wind speed of 4.2 m/s and 3.1% calm conditions
- during spring, south-westerly and then northerly wind directions are dominant with an average wind speed of 5.0 m/s and 2.1% calm conditions
- in winter, westerly, northerly and north-easterly winds are most frequent with an average wind speed of 4.2 m/s and 4.2% calm conditions.



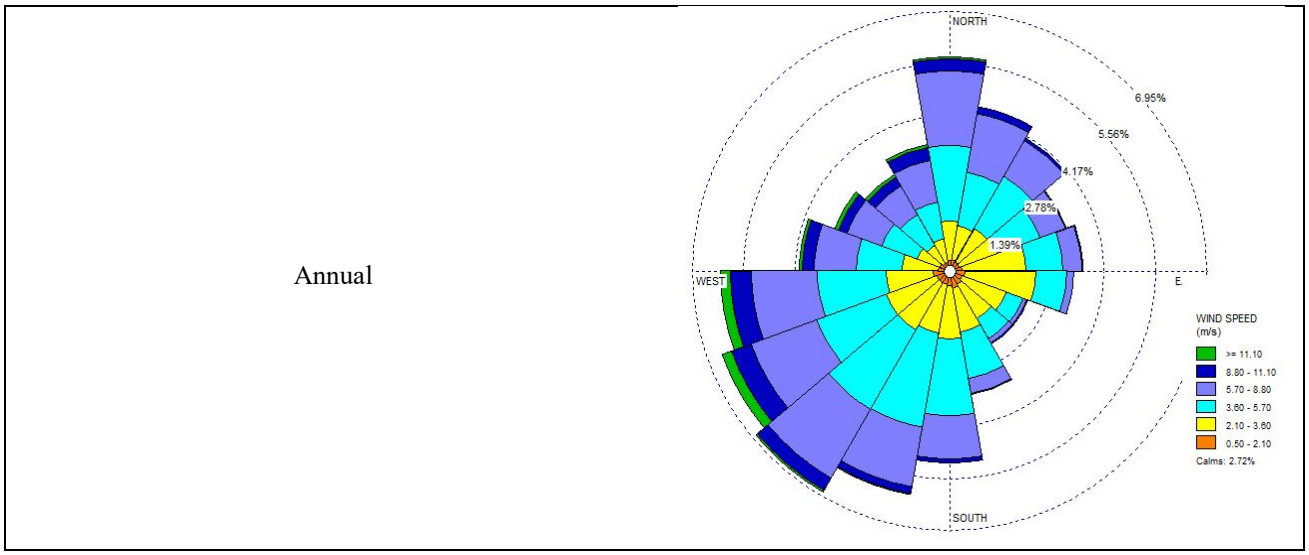
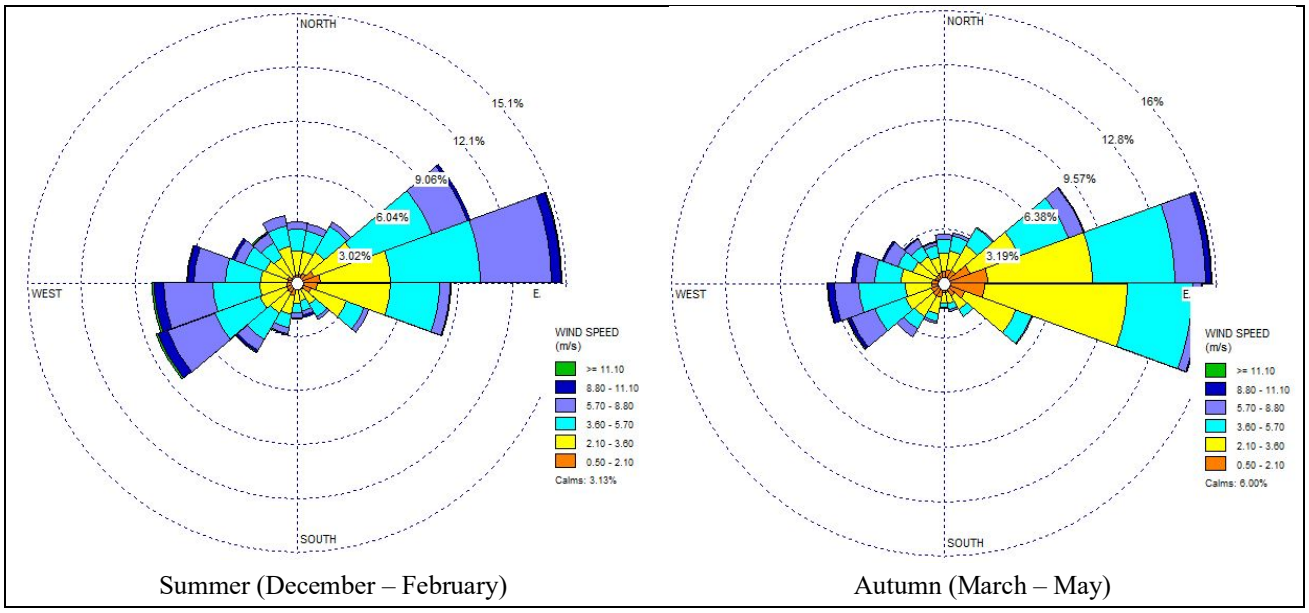


Figure 4-2 Hay Airport AWS annual and seasonal wind roses (2016 to 2020)

The wind roses at Wagga Wagga AMO indicate the following:

- wind direction over five years (2016 to 2020) is predominately easterly followed by south-easterly with an annual wind speed of 3.7 m/s and 5.9% calm conditions (wind speeds less than 0.5 m/s)
- during summer, winds are most frequently easterly followed by north-easterly with an average wind speed of 4.4 m/s and 3.1% calm conditions
- in autumn, winds are most frequently easterly with an average wind speed of 3.3 m/s and 6.0% calm conditions
- during spring, easterly and then south-easterly wind directions are dominant with an average wind speed of 4.0 m/s and 4.8% calm conditions
- in winter, easterly winds are most frequent with an average wind speed of 2.9m/s and 9.5% calm conditions.



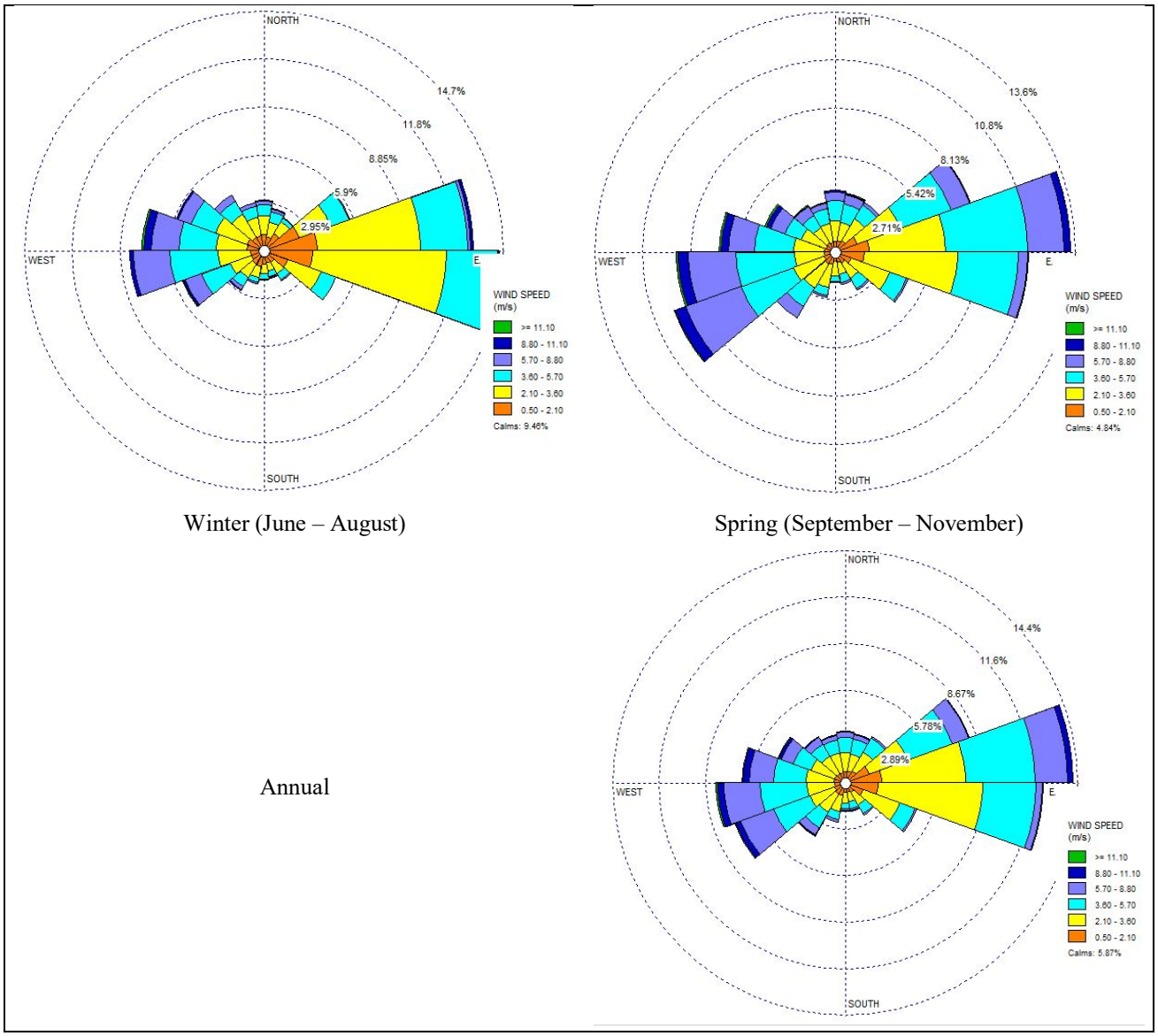
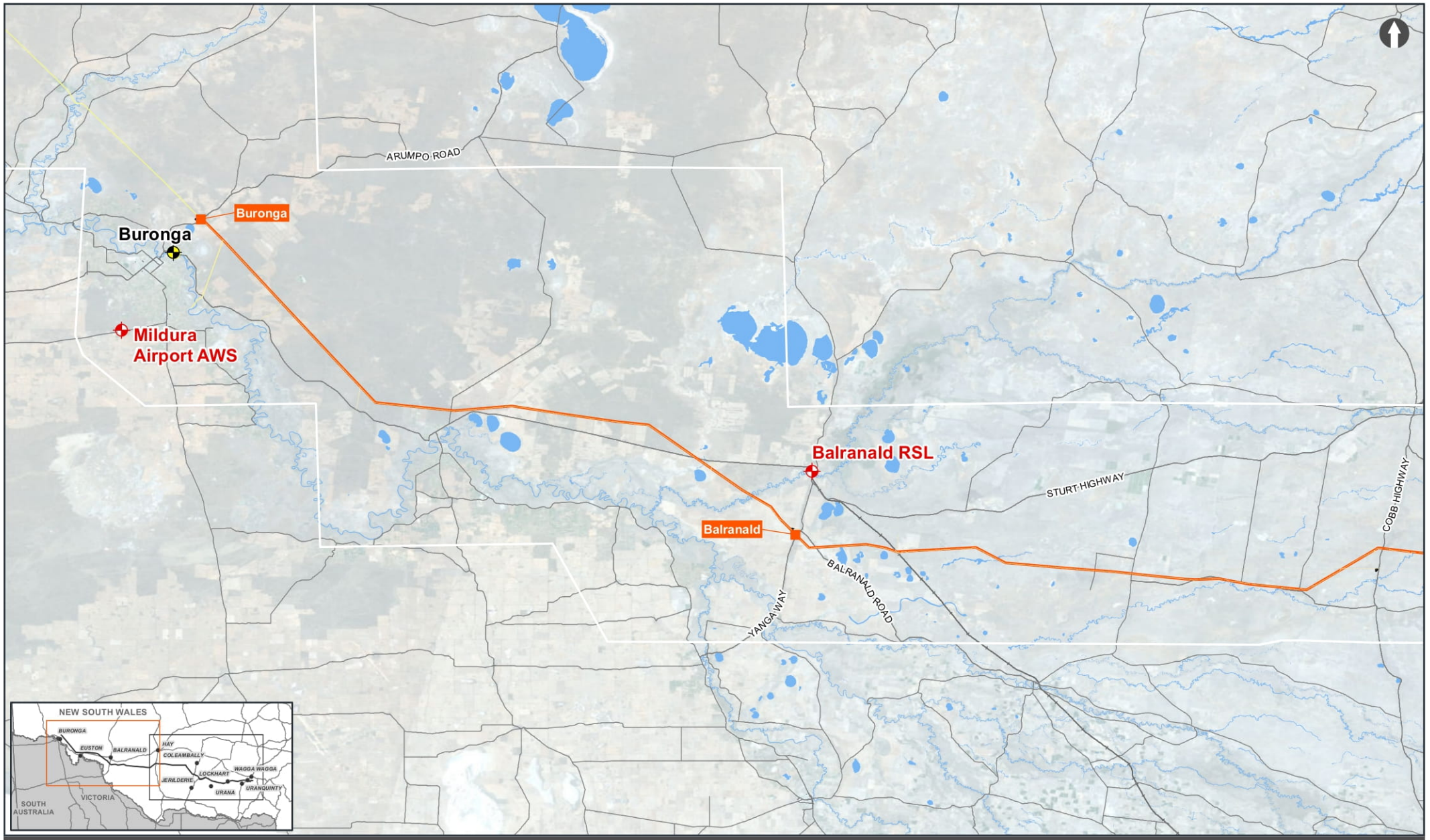


Figure 4-3 Wagga Wagga Aerodrome AMO annual and seasonal wind roses (2016 to 2020)

4.3.3 Locations of AWS and AAQMS

The locations of the AWS and AAQMS are presented in Figure 4-4 below.



Ambient air quality and meteorology monitoring stations - Figure 4-4

Project Components

- Proposed
- Main Construction Compounds and Accomodation Sites
- Access Tracks
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Waterbody
- Ambient air quality monitoring stations
- Meteorological stations

Air qualilty

Sheet 1 of 2

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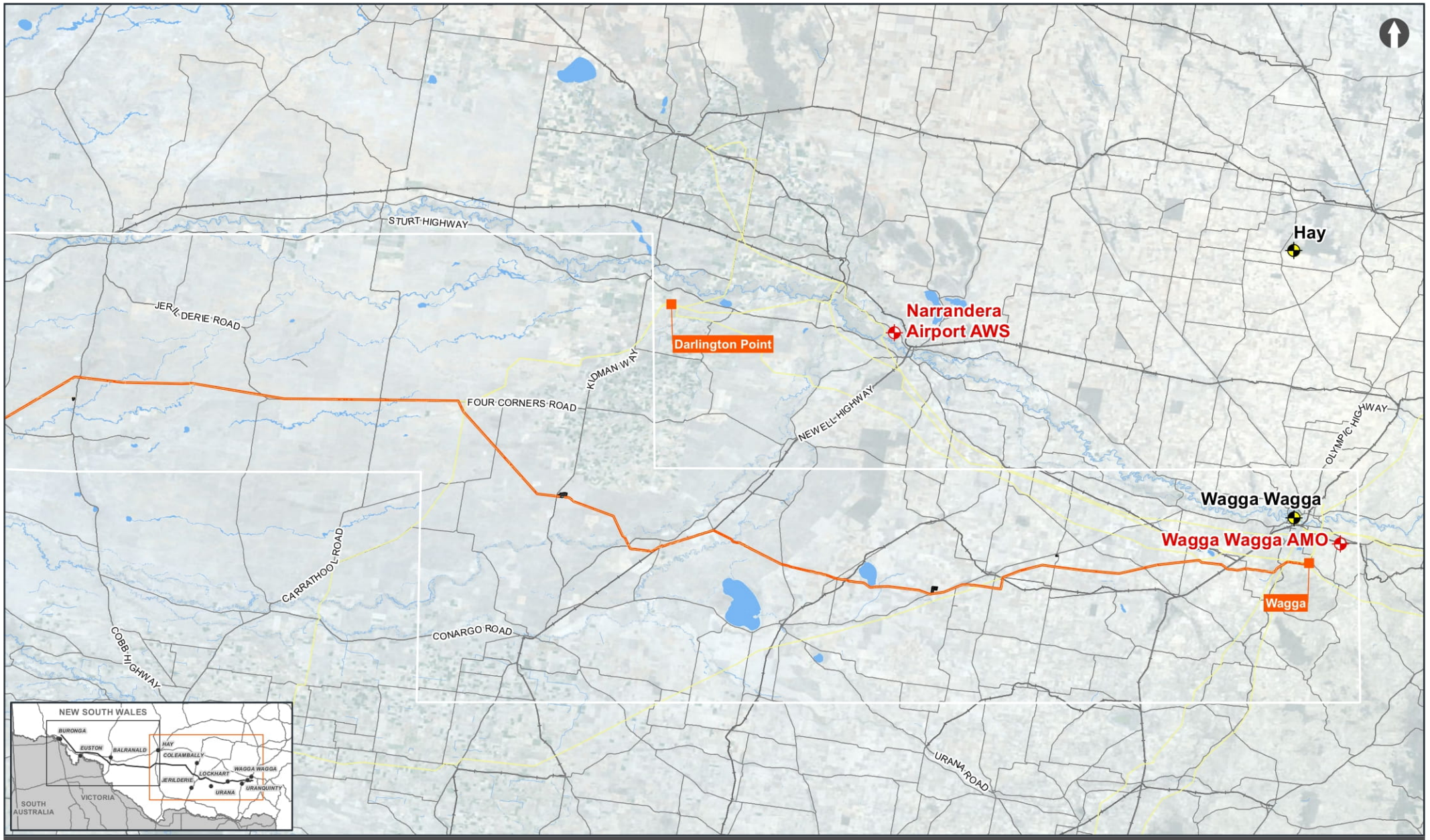
Source: NSWSS, ESRI, Transgrid, WSP



Ambient air quality and meteorology monitoring stations - Figure 4-4

Project Components

- Proposed
- Main Construction Compounds and Accomodation Sites
- Access Tracks
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Waterbody
- Ambient air quality monitoring stations
- Meteorological stations

Air qualilty

Sheet 2 of 2

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Source: NSWSS, ESRI, Transgrid, WSP

4.4 Ambient air quality

4.4.1 Existing emissions sources

Except for Wagga Wagga, the air quality study area and surrounding areas are predominantly rural with some residences located. The main existing emissions are wind-blown dust from exposed land, agricultural activities and from vehicular traffic using the local road network. Wagga Wagga is a rural township at the eastern extent of the proposal and the air quality is influenced is influenced by industrial emissions, higher levels of traffic emissions and other diffuse sources listed below.

The main industrial and non-industrial air emission sources contributing to the local airshed include:

- traffic using the local road networks
- domestic solid and liquid fuel burning
- residential activities (e.g., lawn mowers and barbecues)
- railway operations
- industrial and food manufacturing
- extractive and associated industries
- agricultural activities.

These sources give rise to emissions of pollutants relevant to the proposal including:

- total suspended particulates (TSP), deposited dust, PM_{10} and $PM_{2.5}$
- oxides of nitrogen, carbon and sulphur (NO_x, CO and SO_2)
- Volatile organic compounds (VOCs)
- polycyclic aromatic hydrocarbons (PAHs).

Local air emission sources are collated in the National Pollutant Inventory (NPI). It is an online database that provides public information regarding estimated emissions of 93 substances in Australia, together with the sources and location of these emissions. The NPI also includes estimated emissions data for non-industrial (diffuse) sources such as motor vehicle exhausts, wood heaters, lawn mowers and barbecues.

A review of the NPI database for the 2019/2020 reporting year was conducted to identify and quantify industrial emission and diffuse sources in the LGAs listed in Section 1.3.1 of this report.

The NPI analysis for industrial, diffuse motor vehicle emissions and all emission sources in the identified LGAs are presented in the following sections.

4.4.1.1 Industrial air emission sources

The industrial facilities that reported to the NPI in 2019/2020 for the LGAs detailed in Section 1.3.1 are presented in Table 4-6. The Balranald and Lockhart LGAs did not report air emissions for the 2019/2020 reporting period.

Table 4-6 NPI industrial emission summary for each LGA in 2019/2020

LGA[2]	NUMBER OF FACILITIES	NUMBER OF POLLUTANTS REPORTED
Wentworth	4	30
Balranald	0	0
Murray River	3	13
Hay	2	7
Murrumbidgee	11	8
Federation[1]	10	21
Lockhart	0	0
Wagga Wagga	15	36

(1) Federation LGA was formed by a merge of Corowa Shire and Urana Shire

(2) No reported air emissions in the Edward River Shire

The types of industrial facilities in the LGAs reporting to the NPI include:

- wineries
- metal mining
- sand and gravel extraction
- petroleum product wholesaling
- animal and bird feed manufacturing
- poultry farming and manufacturing
- gas supply
- metal smelting and refining
- meat processing
- sheep, beef cattle and grain farming
- fossil fuel manufacturing
- milk and cream manufacturing
- oilseed crushing and refining
- waste oil refining
- landfill flaring.

Table 4-7 presents industrial emissions in each LGA for the key pollutants listed above.

Table 4-7 NPI reported industrial emission sources for 2019/2020

POLLUTANT	EMISSIONS TO AIR (kg)					
	Wentworth	Murray River	Hay	Murrumbidgee	Federation	Wagga Wagga
PM_{10}	4,405,260	0	42,875	0	41,858	0
$PM_{2.5}$	36,017	0	62.9	0	1,765	15,464
Heavy metals	2,147.9	8	0	0	162	640
NO_x	607,461	0	496	0	108,749	246,200
CO	251,679	0	1,389	0	20,345	100,932
SO_2	455	0	9	0	891	61,009
Total VOCs	40,114	1,134	2,854	39	650,183	70,248
PCDD and PCDF	0	0	0	0	0	0
PAHs [B(a)P TEQ]	8	0	0	0	0.09	0.2

4.4.1.2 All sources

Air emissions from all sources (industrial and diffuse) for the 2019/2020 reporting period (where information was available) are summarised in Table 4-8. In addition to emissions from motor vehicles and industrial reporting facilities, emissions from a range of other sources are included. These are:

- fuel combustion
- service stations
- domestic solid and liquid fuel burning
- lawn mowing
- barbeques
- paved and unpaved roads
- windblown dust
- railways and rail freight transport
- agricultural activities
- wind-blown dust from exposed land.

Table 4-8 NPI reported all emission sources in each LGA for 2019/2020

POLLUTANT	EMISSIONS TO AIR (kg)					
	Wentworth	Murray River	Hay	Murrumbidgee	Federation	Wagga Wagga
PM_{10}	4,410,645	0	42,875	0	41,858	0
$PM_{2.5}$	36,017	0	62.9	0	1,765	0
Heavy metals	2,155	8.1	0	0	162	0
NO_x	621,153	0	496	0	108,749	0
CO	386,084	0	1,389	0	20,345	0
SO_2	24,102	0	8.8	0	891	0
Total VOCs	139,021	1,144	2,885	39	650,183	0
PCDD and PCDF	$4.1x\ 10^{-5}$	0	0	0	0	0
PAHs [B(a)P TEQ]	144	0	0	0	0.09	0

4.4.2 Background air quality

The NSW Government monitors air quality at 47 ambient air quality monitoring stations (AAQMS) in metropolitan and regional centres and 36 rural and regional AAQMS.

There are two rural AAQMS and one NEPM AAQMS in proximity to the air quality study area. These are:

- Buronga AAQMS, approximately 8.3 kilometres to the west of the transmission line
- Hay AAQMS, approximately 29.5 kilometres north of the transmission line
- Wagga Wagga North NEPM AAQMS, approximately 9.4 kilometres north of the transmission line.

The locations of these AAQMS are presented in Figure 4-4 above.

4.4.2.1 Buronga and Hay AAQMS

Dust (i.e., TSP, PM_{10}, $PM_{2.5}$) is being monitored at the rural AAQMS (Buronga and Hay) using TSI multi-channel DRX Dust Trak Aerosol Monitor (8533) or TSI single-channel DustTrak (8520). These instruments are not reference or reference-equivalent monitoring methods. As such, the monitoring data at these AAQMS are considered indicative of particulate matter concentrations in a rural area. The data presented in Table 4-9 for the Buronga and Hay AAQMS provides indicative concentrations in the context of the proposal alignment.

Five years of data (2016 to 2020 inclusive) TSP, PM_{10} and $PM_{2.5}$ monitoring data at the Buronga and Hay AAQMS were analysed. At Buronga AAQMS, PM_{10} and $PM_{2.5}$ data is only available from May 2018 to December 2020. At Hay AAQMS, PM_{10} and $PM_{2.5}$ data is only available from July 2017 to December 2020.

The data collected at the Buronga and Hay AAQMS is summarised below.

At the Buronga AAQMS:

- there were no exceedances of the annual TSP Approved Methods criterion for all five years of data analysed
- there was one exceedance of both the annual PM_{10} (2019) and annual $PM_{2.5}$ (2018) criteria
- there were multiple exceedances of the 24-hour PM_{10} and $PM_{2.5}$ standards in 2018 to 2020.

At the Hay AAQMS:

- there were no exceedances of the annual TSP Approved Methods criterion for all five years of data analysed
- there were no exceedances of both the annual PM_{10} and $PM_{2.5}$ criteria for all five years
- there were multiple exceedances of the 24-hour PM_{10} and $PM_{2.5}$ standards in 2017 to 2020.

Table 4-9 Ambient air quality monitoring data at Buronga and Hay AAQMS (2016–2020)

YEAR	ANNUAL AVERAGE (µg/m³)			MAXIMUM 24-HOUR AVERAGE (µg/m³)			
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	Number and date of maximum exceedances
Buronga AAQMS							
2016	6.6	ND	ND	34.9	ND	ND	0
2017	9.2	ND	ND	71.8	ND	ND	0
2018	10.6	13.1[2]	**10.1**[2]	166.0[2]	**162.8**[2]	**116.0**[2]	PM_{10}: 6 (maximum on 22 November) $PM_{2.5}$: 13 (maximum on 22 November)
2019	37.9	**33.5**	7.5	1444.5	**1292.5**	**118.2**	PM_{10}: 36 (maximum on 21 November) $PM_{2.5}$: 10 (maximum on 7 May)
2020	10.1	9.5	3.3	463.0	**440.2**	**84.5**	PM_{10}: 12 (maximum on 22 January) $PM_{2.5}$: 4 (maximum on 7 May)

YEAR	ANNUAL AVERAGE (µg/m³)			MAXIMUM 24-HOUR AVERAGE (µg/m³)			
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$	Number and date of maximum exceedances
Hay AAQMS							
2016	3.8	ND	ND	21.6	ND	ND	0
2017	7.6[3]	9.8[4]	6.3[4]	86.2[3]	**86.1**[4]	**40.7**[4]	PM_{10}: 3 (maximum on 9 August $PM_{2.5}$: 4 (maximum on 9 August)
2018	8.7	8.5	6.6	71.6	**71.4**	**40.2**	PM_{10}: 1 (maximum on 14 September $PM_{2.5}$: 4 (maximum on 14 July)
2019	14.5	12.8	6.2	141.4	**116.3**	**63.3**	PM_{10}: 9 (maximum on 21 November $PM_{2.5}$: 5 (maximum on 18 December)
2020	13.4	12.1	4.3	310	**285.3**	**195.5**	PM_{10}: 14 (maximum on 23 January $PM_{2.5}$: 10 (maximum on 7 January)
Air NEPM standard	***90***[6]	***25***	***8***	***NA***	***50***	***25***	

(1) ND: No data available

(2) Data available from 13 May to 31 December 2018

(3) Data not available from 22 August to 5 December 2018 (71% data capture)

(4) Data not available from 1 January to 8 July 2017 and 22 August to 5 December 2017 (19% data capture)

(5) TSP, PM_{10} and $PM_{2.5}$ monitoring data for 2016 to 2020 was provided by NSW EPA.

(6) There is no Air NEPM standard for annual TSP. The Approved Methods prescribes an annual TSP criterion of 90 µg/m³. There are no standards or guideline values for 24-hour TSP.

4.4.2.2 Wagga Wagga North AAQMS

The closest AAQMS to the proposal is located at Wagga Wagga North. It is a NEPM performance monitoring stations and continuously records PM_{10} and $PM_{2.5}$ data. Overall, the data collected at the station are broadly representative of particulate levels in regional urban settings.

Ambient air quality monitoring data for the stations listed were analysed and the maximum concentrations reported for the period 2016 to 2020. The data is presented in Table 4-10 and Air NEPM exceedances are highlighted in bold.

The monitoring data is summarised as follows:

- the annual PM_{10} concentrations exceeded the Air NEPM standard in 2018 and 2019
- the 24-hour PM_{10} and $PM_{2.5}$ concentrations the exceeded the Air NEPM standard for all years monitored. The exceedances in 2019 and 2020 were due to bushfire smoke
- the annual $PM_{2.5}$ concentrations exceeded the Air NEPM standard for all years monitored (2017 to 2020).

Data collected at the Wagga Wagga North AAQMS was used as background data for the air quality impact assessment at the Dinawan substation.

Table 4-10 Ambient air quality monitoring data at Wagga Wagga North AAQMS (2016–2020)

YEAR	ANNUAL AVERAGE (µg/m³)		MAXIMUM 24-HOUR AVERAGE (µg/m³)		
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	Number and date of maximum exceedance
2016	20.7	ND	**114.7**	ND[1]	PM_{10}: 16 (maximum on 3 April)
2017	20.4	**8.5**[2]	**171.6**	**40.8**[2]	PM_{10}: 10 (maximum on 31 March) $PM_{2.5}$: 7 (maximum on 27 November)
2018	**26.9**	**8.9**	**127.2**	**90.2**	PM_{10}: 34 (maximum on 18 March) $PM_{2.5}$: 3 (maximum on 19 February)
2019	**34.7**	**11.0**	**251.7**	**129.4**	PM_{10}: 60 (max on 20 December) $PM_{2.5}$: 20 (maximum on 22 December)
2020	21.9	**12.9**	**259.4**[3]	**559.5**[3]	PM_{10}: 23 (maximum on 10 January) $PM_{2.5}$: 32 (maximum on 5 January)
Air NEPM standard	***25***	***8***	***50***	***25***	

(1) ND: No data available

(2) Continuous $PM_{2.5}$ monitoring commenced on and February 2016

(3) The maximum 24-hour average $PM_{2.5}$ concentration in 2021 is higher than the maximum 24-hour average PM_{10} concentration. Reason: the day the maximum 24-hour average $PM_{2.5}$ concentration (5 January 2021) was recorded, there was no 24 hour PM_{10} data available.

(4) Monitoring data from 2016 to 2020 was downloaded from https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility

4.4.3 Adopted background concentrations

Background concentrations for the 2018 calendar year, except for annual TSP (2019), are presented in Table 4-11 corresponding to the year selected for the meteorological modelling. This data was selected to represent background concentrations for the proposal.

Table 4-11 Background concentrations

POLLUTANT	AVERAGING PERIOD	BACKGROUND CONCENTRATION (µG/M3)	STANDARD (µG/M³)	YEAR	SOURCE
PM_{10}	24-hour	24-hour time varying	50[2]	2018	Wagga Wagga North AAQMS
	Annual	**26.9**	25[2]		
$PM_{2.5}$	24-hour	24-hour time varying	25[2]	2018	
	Annual	**8.9**	8[2]		
TSP	Annual	37.9	90[3]	2019	Buronga AAQMS
Deposited dust	Annual	No background data available	4 g/m²/month[3]	NA	NA

(1) NA: Not applicable

(2) Air NEPM standard

(3) Standards listed in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, 2016*

It is noted that the annual PM_{10} and $PM_{2.5}$ background concentrations are above their respective Air NEPM standards.

Annual TSP data recorded at the Buronga AAQMS for 2019 was used as background. Data collected in 2018 at the Buronga AAQMS indicated that the annual TSP concentration was lower than the annual PM_{10} concentration collected at the Wagga Wagga North AAQMS.

5 Assessment of construction impacts

5.1 Construction program

Subject to NSW and Commonwealth planning approvals, construction of the proposal is planned to commence in late-2022.

5.1.1 Dinawan and Wagga substations

The existing Wagga Wagga substation would be upgraded and expanded to add a new 330kV line and would be operational by August 2024. Construction of the new Dinawan 330kV substation would commence in around quarter 4 of 2022 and be operational in 2024.

The Buronga substation upgrade and expansion were considered as part of the EnergyConnect, NSW – Western Section (subject to separate environmental assessment). Potential air quality impacts during construction works for the Western Section were considered in the following technical papers:

- *EnergyConnect, (NSW – Western Section), Technical paper 7 – Air Quality Impact Assessment*, WSP, October 2020
- *EnergyConnect, (NSW – Western Section), Amendment Report – Air Quality Impact Assessment*, WSP, March 2021.

Potential air quality impacts during construction of the Buronga substation and associated activities at the site are not considered further in this report.

The indicative duration of works at each stage of the substation construction is presented in Figure 5-1.

5.1.2 Transmission lines

Construction of the transmission lines would take approximately 18 months and commence (subject to environmental approval) in -late-2022. The indicative duration of each stage is presented in Figure 5-1. Site decommissioning is expected to extend approximately six months beyond the commissioning (operational) phases with an estimated completion in March 2025.

For emissions associated with construction activities, the duration of construction works indicates the period during which the emissions would be potentially generated. However, construction works at each transmission line would be intermittent and construction activities would not occur for the full duration for each stage of construction (see Figure 1-3). The construction methodology would be further developed and confirmed during detailed design.

5.1.3 Main construction compounds and accommodation camps

The main construction compounds and accommodation camps would operate within the timeframes presented in Figure 5-1. These locations include:

- Balranald construction compound
- Cobb Highway construction compound and accommodation camp
- Dinawan substation construction compound and accommodation camp
- County-Boundary Road construction compound and accommodation camp
- Wagga Wagga substation construction compound.

The Balranald accommodation camp is an existing facility located in the township of Balranald and has not been considered as part of the assessment presented in this technical paper.

The Buronga construction compound and accommodation camp site (approved as part EnergyConnect (NSW – Western)) is also proposed to be used to support the delivery of the proposal. The use of this camp would be as per the conditions of approval for the EnergyConnect (NSW – Western) project (and as such is not considered further in this assessment).

The concrete batching plants along the transmission lines would operate within the construction timeframes presented in Figure 5-1 but of shorter duration.

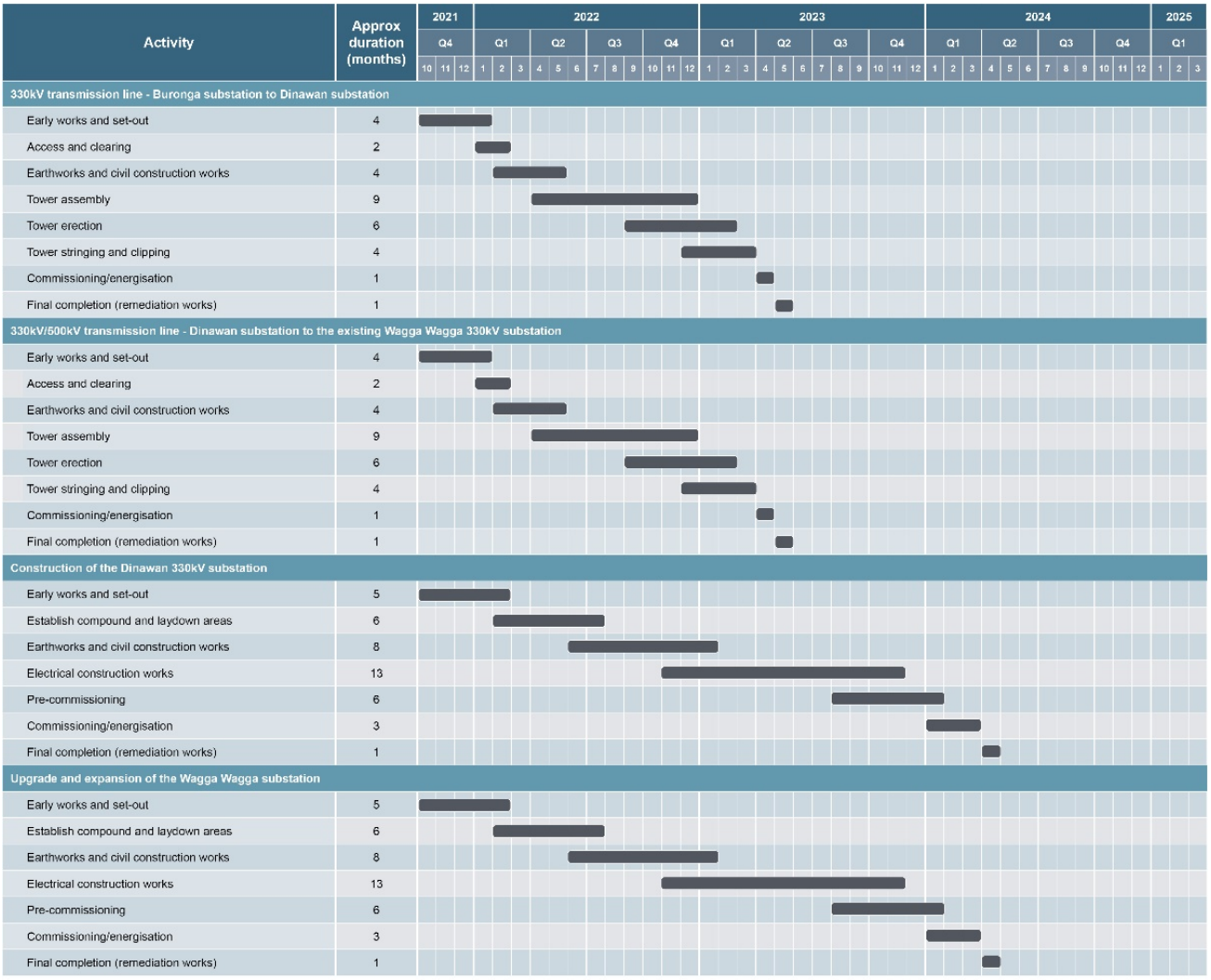


Figure 5-1 Indicative construction period and working hours for each substation and transmission lines

5.2 Construction activities

5.2.1 Dinawan and Wagga wagga substation construction works

Table 5-1 lists the proposed work phases and key activities required to construct the proposed Dinawan substation and the upgrade and expansion of the existing Wagga Wagga substation.

Table 5-1 Substation construction, upgrades, expansion work phases and key construction activities

WORK PHASE	KEY CONSTRUCTION ACTIVITIES
Site establishment, early works, and setout works	— Site surveys (e.g., locating services/utilities) — Install environmental controls — Vegetation clearing/tree trimming — Establishment of site compounds and erection of safety barriers around work site.
Construction of access track	— Establishment of access tracks for construction of substation.
Wagga Wagga substation demolition works	— Assess buildings for the presence of asbestos and remove as required — Soft strip stripping inside buildings.
Dinawan earthwork material site	— Removal of topsoil — Excavation and screening of borrow material — Remediation and seeding.
Main civil construction works	— Construction of substation bench — Construction of stormwater drainage system — Earthgrid installation — Construction of footings including main transformer compound — Construction of spill oil drainage system including oil containment tank. — Construction of substation fencing — Construction of conduits and pits — Construction of buildings — May include blasting at some locations.
Main Electrical Construction Works	— Structure and high voltage equipment erection — Transformer delivery and installation — Cabling and termination — High voltage conductor installation — Decommissioning of existing substation elements as part of upgrade and expansion works.
Switchyard Surfacing	— Installation of gravel around the substation.
Pre-Commissioning / commissioning	— Point to Point testing — High voltage testing — High voltage equipment operational check — Protection, control, and metering system testing — Transmission line cutover — Protection, control, and metering checks — High voltage equipment operation.

WORK PHASE	KEY CONSTRUCTION ACTIVITIES
Demobilisation	— Removal of temporary construction facilities — Rehabilitating and landscaping work sites and the affected area (as required/proposed) — Removing environmental controls once areas are established.

5.2.2 *Transmission line construction works*

Table 5-2 presents the proposed work phases and key activities for the transmission line construction works.

Table 5-2 Work phase and key construction activities for transmission line construction

WORK PHASE	KEY CONSTRUCTION ACTIVITIES
Site establishment, early works, and set out works	— Site surveys (e.g., locating services/utilities) — Establishment of fill earthwork material site — Install environmental controls — Vegetation clearing/tree trimming — Establishment of site compounds and erection of safety barriers around work sites.
Establishment of access tracks, connection points	— Establishment of access tracks to structures for construction of towers — Tie in works for road connections.
Tower foundation installation	— Excavation of pole and tower foundations at various sites along the easements — Installation of pole butts and tower foundations, including pole and concrete deliveries (may include blasting at some locations).
Erection of towers	— Delivery of steel work to each tower site, assembly of towers — Erection of towers.
Stringing and Clipping of conductors	— Stringing and clipping of conductors.
Commissioning	— Testing and commissioning works.

5.2.3 Construction compounds and accommodation camps

Table 5-3 presents the work phases and key activities associated with construction activities for the construction compounds and accommodation camps.

Table 5-3 Work phase and key construction activities for the construction compounds and accommodation camps

WORK PHASE	KEY CONSTRUCTION ACTIVITIES
Site establishment, early works, and setout works	— Site surveys (e.g., locating services/utilities) — Install environmental controls — Vegetation clearing/tree trimming — Establishment of site compounds and erection of safety barriers around work site.
Compound and laydown areas	— Clearing grubbing — Vegetation removal — Taking deliveries — Earthworks to establish hardstand — Installation of utilities infrastructure (drainage, conduit runs, sewerage) — Installation of site/accommodation sheds — Installation of roofs and walkways — Spray seals, white lining, barrier installation — Installation of workshops, containers, canopies — Furnishing and utilities connections.
Operation of the compound	— Office works — Staff/worker meetings/briefings — Material handling — Operation of concrete batching plants — Logistics (loading/unloading trucks) — Taking deliveries — De-stuffing/re-distribution of materials — Staff training — Maintenance.
Operation of the accommodation camp	— Accommodation facility operations. heating, cooling, lighting.
Demobilisation / rehabilitation	— Site rehabilitation — Removal of temporary works — Seeding/stabilising — Minor landscaping — Removal of materials — Defect rectification — Inspections — Road repairs as required.

5.2.4 Vehicle movements

Construction vehicle movements would comprise vehicles transporting compound and camp infrastructure, equipment and plant, materials, spoil and waste, as well as mini-buses and light vehicles associated with construction workers travelling to and from construction areas. These movements would occur daily across the whole of the proposal. Non-standard or oversized loads would also be required for the substation upgrade and expansion works (such as delivery of transformer units) and transportation of transmission line tower materials.

Indicative daily vehicle movements for the proposal are outlined in Table 5-4. These vehicle movements are based on the expected typical and peak construction period for the proposal and would be confirmed during detailed design.

Table 5-4 Indicative vehicle movements

COMPOUND SITE	VEHICLE MOVEMENTS [1,2,3]			
	Light vehicles (typical)	Light vehicles (maximum)	Heavy vehicles (typical)	Heavy vehicles (maximum)
Buronga construction compound and accommodation camps	80	130	80	200
Balranald construction compound	40	70	100	200
Balranald accommodation camp	100	160	20	60
Cobb Highway construction compound and accommodation camp	100	180	100	200
Dinawan construction compound and accommodation camp	160	250	160	320
Lockhart construction compound and accommodation camp	170	280	170	350
Wagga Wagga construction compound	100	130	100	200

Notes:

(1) Indicative daily movements based on current program of works. This is an average and there would be days of increased peak activities which may impact these average/indicative numbers and conversely days of decreased activity.

(2) Vehicle movements are combined (i.e. a heavy/light vehicle arriving and leaving a site within a day counts as one movement).

(3) Indicative movements assume that most of the workers are based in the camp, staff commuting from local townships.

Construction vehicle traffic would be greatest during the main earthworks and civil construction activities.

In general, vehicle movements would be scheduled outside peak periods wherever possible. However, there would be a need for some vehicle movements during these periods. Worker vehicle movements would also be required during both the morning and afternoon peak hour periods.

5.2.5 Local haulage routes

Indicative traffic movements presented in Table 5-4 detail typical and peak heavy vehicles anticipated to travel along the paved (sealed) and unpaved (unsealed) roads (local haulage routes).

5.3 Dust impacts

Dust impacts depend on the quantity and drift potential of the particles in the atmosphere. Larger particles (the larger particle fractions of TSP) settle out closer to the source due to their larger mass. The deposition of the particles can cause nuisance and aesthetic impacts on the receiving environment. Finer particles (PM_{10} and $PM_{2.5}$) remain entrained in the atmosphere for longer and therefore dispersed at greater distances from the source. The fine nature of these particles also has the potential for human health impacts if not adequately controlled.

Dust generation is expected to occur during construction works associated with the following components of the proposal:

- Balranald construction compound
- Cobb Highway construction compound and accommodation camp
- Dinawan substation construction compound and accommodation camp
- County-Boundary Road construction compound and accommodation camp
- Wagga Wagga substation and construction compound.
- transmission lines along the entire length of the proposal
- access track construction.

Sections 5.3.1, 5.3.2 and 5.3.3 assess the potential dust impacts associated with the proposal.

5.3.1 Dinawan substation, construction compound and accommodation camp

As prescribed in the Approved Methods, a Level 2 assessment was conducted to determine potential dust impacts during construction of the Dinawan substation, construction compound and accommodation camp.

5.3.1.1 Dispersion modelling

Model year selection

There is no site-specific meteorological data collected for the Dinawan substation site. The closest Bureau of Meteorology (BoM) automatic weather station (AWS) to the Dinawan substation is Narrandera Airport AWS (station number 074148) around 74.6 kilometres to the north-east. Wind direction, wind speed and rainfall data collected at this station for the period 2016, 2017, 2018 and 2020 (no data was available for 2019) were analysed to select a representative year for CALPUFF meteorological dataset compilation. Annual rainfall data are presented in Table 5-5, and seasonal and annual wind roses are presented in Figure 5-2. The data indicated that:

- calm winds ranged from 13 per cent (2020) to 16 per cent of the year (2017)
- average wind speeds in were generally consistent across all years (3.3 m/s to 3.5 m/s) with 2018 recording the highest average annual wind speed of 3.5 m/s
- the predominant south-westerly wind direction was observed for all years
- annual rainfall of 160 millimetres in 2017 was the lowest in all five years.

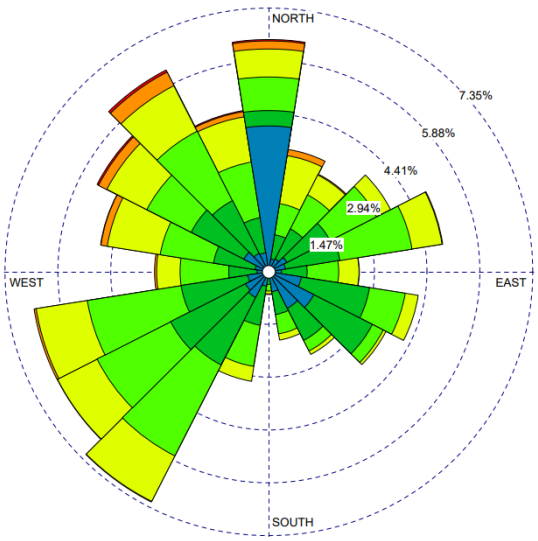
2018 was selected as the model year for dispersion modelling and is considered as representative of the long-term meteorological conditions at the Dinawan substation site with the potential to have greater dust impacts on the receiving environment. 2018 had the highest annual average wind speed of 3.5 m/s and the second lowest rainfall (250 millimetres) over the past five years. Dust is more likely to be generated and travel further under windy and drier conditions. It is also acknowledged that this was at the commencement of a period of drought.

Table 5-5 Total annual rainfall at the Narrandera Airport AWS from 2016 to 2020

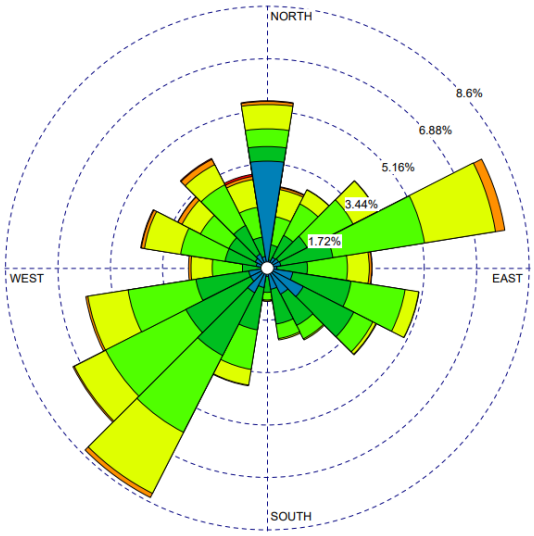
YEAR	2016	2017	2018	2019	2020
Annual rainfall (mm)	630	160	250	NA	600

(1) NA: Not available

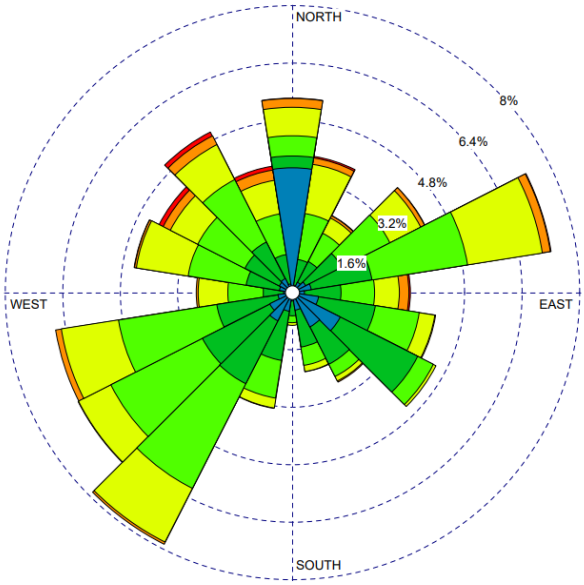
For a Level 2 assessment, one year of continuous meteorological data contemporaneous with one year of continuous ambient air quality monitoring data for TSP, PM_{10} and $PM_{2.5}$. The year 2018 was chosen for both the generation of meteorological modelling files and background ambient air quality data. Given the large distance from the Dinawan substation to the Narrandera Airport AWS, TAPM was used to generate surface and upper air data for the assessment.



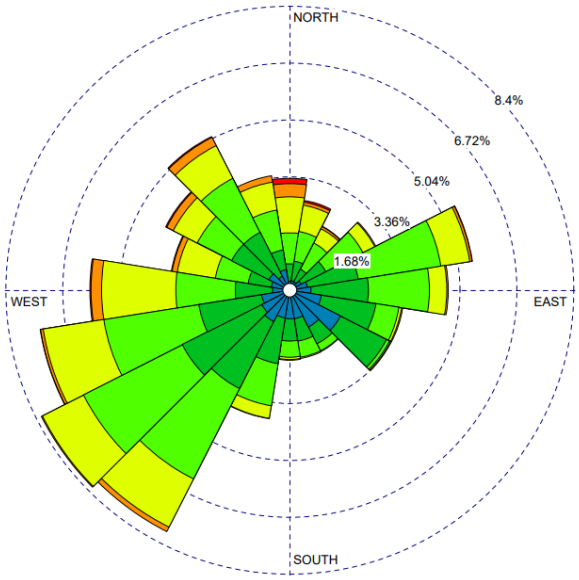
2016



2017



2018



2019

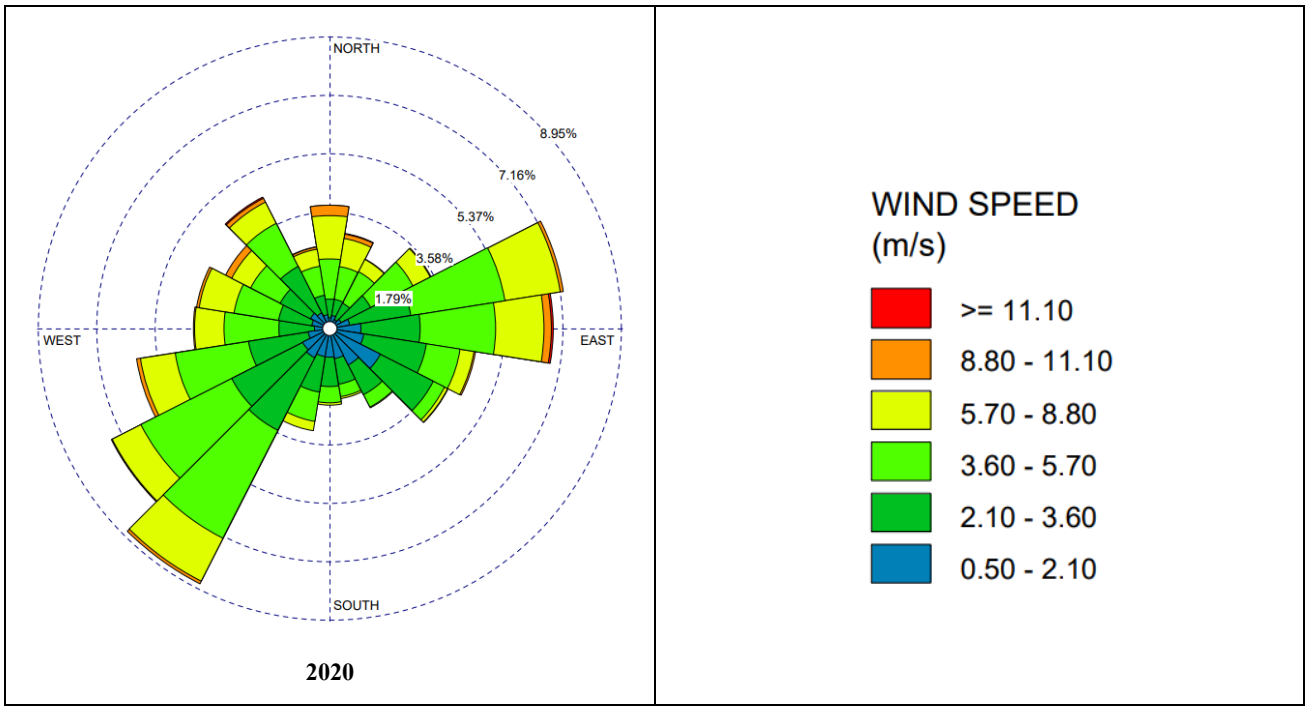


Figure 5-2 Annual wind rose plots for Narrandera Airport AWS (2016–2020)

5.3.1.2 Air dispersion modelling

Emission sources

Fugitive emissions at the Dinawan substation site have the potential to be generated from the following sources:

- machinery operation e.g., excavators, scrapers, dozer and grader
- concrete batching plant
- materials handling (loading and unloading trucks)
- wheel generated dust for unpaved roads
- screening operations and associated activities
- wind erosion from stockpiles and exposed areas.

Emission inventory

Standard working hours for construction works would be from 7:00 am to 7:00 pm with a one-hour break. All emissions are expected be generated during this period except for emissions from the concrete batching plant and wind erosion which were modelled for all hours.

As site-specific silt content and moisture content were not available while preparing this report, default emission factors from the NPI Mining manual were used to estimate emission rates.

It is noted that where an emission factor for $PM_{2.5}$ is not available, a $PM_{2.5}$ to PM_{10} ratio of 0.15 was used as recommended by USEPA AP-42.

An emission inventory was generated for each emission source, the details of which are provided in the following sections.

Machinery operation

For the purposes of the assessment, it was estimated that three excavators, three scrapers, one dozer and one grader would be used on the site at various locations at any one point in time. In practice, the machinery would be used on material in the earthwork material site, the substation pad or construction compound and camp site.

Scrapers may also be used both for topsoil removal and materials transportation within the broader site. The emission rates for scrapers were estimated assuming topsoil removal.

Emission factors adopted for all machinery are obtained from Table 2 in the NPI Mining manual and the emission inventory for machinery operation are presented Table 5-6 to Table 5-8.

Table 5-6 Emission inventory for excavators and scrapers

MACHINERY	MODELLED LOCATION	OPERATION PERIOD	EMISSION FACTORS (KG/T)			THROUGH PUT(T/H)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
			TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$
Excavator 1	Earthwork material site	7 am – 7 pm	0.029	0.014	0.002	128	No control	1.03	0.496	0.074
Excavator 2	Earthwork material site		0.029	0.014	0.002	128	No control	1.03	0.496	0.074
Scraper 1	Earthwork material site		0.029	0.0073	0.001	85	Water carts and/or polymers (50%)	0.342	0.086	0.013
Scraper 2	Earthwork material site		0.029	0.0073	0.001	85	Water carts and/or polymers (50%)	0.342	0.086	0.013
Scraper 3	Substation pad		0.029	0.0073	0.001	85	Water carts and/or polymers (50%)	0.342	0.086	0.013
Concrete batching plant	Adjacent Screens	24 hours/day	0.10	0.050	0.0075	90	No control	2.500	1.250	0.188

Table 5-7 Emission inventory for the dozer

MACHINERY	MODELLED LOCATION	OPERATION PERIOD	EMISSION FACTORS (KG/H/VEHICLE)			CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
			TSP	PM_{10}	$PM_{2.5}$		TSP	PM_{10}	$PM_{2.5}$
Dozer	Earthwork material site	7 am to 7 pm	17	4.1	0.615	Water sprays (50%)	2.4	0.57	0.085

Table 5-8 Emission inventory for grader

MACHINERY	MODELLED LOCATION	OPERATION PERIOD	EMISSION FACTORS (KG/H/VKT)			VEHICLE SPEED (KM/H)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
			TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$
Grader	Substation pad	7 am to 7 pm	1.08	0.340	0.051	10	Water sprays (50%)	1.5	0.47	0.071

Material handling

Materials handling operations at the Site include the transfer of materials by means of loading and unloading trucks. Potential emission sources are identified to be:

- loading trucks at the earthwork material site (MH1)
- loading trucks at the stockpile (MH2)
- trucks dumping onto the stockpile (MH3)
- trucks dumping at the substation pad (MH4).

Emission factors for materials handling are obtained from Table 2 in the NPI Mining manual and the emission inventory is presented in Table 5-9.

Table 5-9 Emission inventory for materials handling

ACTIVITIES	OPERATION PERIOD	EMISSION FACTORS (KG/T)			THROUGHPUT (T/H)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
		TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$
MH1	7 am to 7 pm	0.029	0.014	2.1E-03	390	Water carts and/or polymers (50%)	1.6	0.76	0.11
MH2	7 am to 7 pm	0.029	0.014	2.1E-03	120	Water carts and/or polymers (50%)	0.48	0.23	0.035
MH3	7 am to 7 pm	0.01	0.0042	6.3E-04	210	Water carts and/or polymers (50%)	0.18	0.07	0.011
MH4	7 am to 7 pm	0.01	0.0042	6.3E-04	405	Water carts and/or polymers (70%)	0.34	0.14	0.021

Wheel generated dust from unpaved roads at the Dinawan substation site

Vehicles travelling on unpaved internal haulage roads would generate dust by the force of the wheels on the road surface. It has been assumed for the assessment that all the excavated soil from the earthwork material site would be transferred to the stockpile adjacent to the screens. The product from screening would then be transferred to the substation pad or stockpiled if not suitable for use.

Both trucks and scrapers may be used to transport materials among different sites (i.e., site 1, site 2, the stockpile area and substation pad). This assessment conservatively assumed all materials would be transported using trucks. Specific haul roads have not been developed at this stage. Haulage routes modelled in this assessment represents a simplified and averaged indication of the future haul roads

Two possible haul roads have been identified as follows:

- earthwork material site to stockpile
- stockpile to substation pad.

The unpaved road emission factor equations obtained from the NPI Mining are:

$$E_{TSP} = \frac{0.4536}{1.6093} \times 4.9 \times \left(\frac{s}{12}\right)^{0.7} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45} \quad kg/VKT$$

$$E_{PM10} = \frac{0.4536}{1.6093} \times 1.5 \times \left(\frac{s}{12}\right)^{0.9} \times \left(\frac{W \times 1.1023}{3}\right)^{0.45} \quad kg/VKT$$

Where:

s = silt content (%).
W = vehicle gross mass (t).

Silt content of 8.5 per cent was used in the modelling based on the mean silt content for construction sites obtained from *AP-42, Section 13.2.2 Unpaved Roads*. The emission inventory for wheel generated dust from unpaved roads is presented in Table 5-10.

Table 5-10 Emission inventory for wheel generated dust from unpaved roads

ROADS	STATUS	OPERATION PERIOD	VEHICLE WEIGHT (T)	EMISSION FACTORS (KG/VKT)			TRIPS/HOUR	ROAD LENGTH (M)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
				TSP	PM_{10}	$PM_{2.5}$				TSP	PM_{10}	$PM_{2.5}$
Earthwork material site to stockpile	Loaded	7 am to 7 pm	70	4.68	1.37	0.21	6	1,132	Level 2 watering (75%)	3.46E-03	1.01E-03	1.52E-04
	Unloaded	7 am to 7 pm	40	3.64	1.07	0.16	6	804				
Stockpile to Pad	Loaded	7 am to 7 pm	70	4.68	1.37	0.21	6	448	Level 2 watering (75%)	5.20E-03	1.52E-03	2.28E-04
	Unloaded	7 am to 7 pm	40	3.64	1.07	0.16	6	448				

Screening operations

A mobile screening plant is proposed to reduce the size of excavated material from sites 1 and 2 and meet the engineering requirements for use as the substation base. Excavated material is expected to be screened at a rate of approximately 600 to 700 cubic metres per day. The final quantity of material requiring screening would be further developed during detailed design.

It was conservatively assumed the screening plant would be operating from 7:00 am to 7:00 pm. As the exact operation hours is not known at this stage, the emission estimation was conducted using an average total daily throughput over a 12-hour period. Material density of 1.8 tonnes per cubic metre was assumed in the assessment.

The exact screening methodology would be developed during detailed design. Emission factors for screening activities were obtained from *AP-42 Section 11.19.2: Crushed Stone Processing and Pulverized Mineral Processing* as recommended by *AP-42 Section 13.2.3: Heavy Construction Operation*.

Other activities associated with screening operations include:

- loading to hopper
- conveyor transfer points
- conveyor dropping points
- unloading from surge piles.

Materials would be transferred out of the screening plant using conveyors. Emission factors for the associated activities were adopted from the NPI Mining manual.

Given the small footprint of the screening plant and multiple emission sources contained within the plant, all sources associated with screening operations were combined and modelled as one volume source.

The emission inventory for screening and associated activities is presented in Table 5-11.

Table 5-11 Emission inventory for screening and associated activities

SOURCES	NUMBER OF SOURCES	EMISSION FACTORS (KG/T)			THROUGHPUT (T/H)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
		TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$
Loading to hopper	1	0.029	0.014	0.0021	105	Water carts and/or polymers (50%)	0.423	0.204	0.031
Screening (controlled)	1	0.0011	0.00037	0.000025	105	Water carts and/or polymers	3.21E-02	1.08E-02	7.29E-04
Conveyor transfer points	3	0.00032	0.00015	0.0000225	105	Covering and water carts and/or polymers (70%)	0.0084	0.0039	0.0006
Conveyor dropping points	1	0.004	0.0017	0.000255	105	Water carts and/or polymers (50%)	0.058	0.025	0.004
Unloading from surge piles	1	0.03	0.013	0.00195	105	Water carts and/or polymers (50%)	0.438	0.190	0.028
Total							0.959	0.433	0.064

Wind erosion

Dust emissions are expected to occur due to the wind erosion of stockpiles and exposed areas. The following sources potentially subject to wind erosion were identified:

- material from the earthwork material site
- material stockpiles
- substation pad.

The Dinawan construction compound and accommodation camp would be covered by hardstand materials, and a laydown area would be used to mainly store plant, machinery and other non-dust-generating materials. Therefore, wind erosion at this area was not considered.

The final extent of the earthwork material site would be confirmed by further geotechnical investigations during refinement of the final construction methodology. Excavation of the material sites would be conducted progressively and up to 50 per cent of the area presented may be disturbed at any given time. As the works are subject to more detailed construction planning, a conservative approach to this assessment was adopted. The whole extent of the extraction area was modelled as an area source, with a factor of 50 per cent used to adjust the area afterwards. This method is expected to slightly overestimate the impacts on sensitive receptors rather than modelling actual extent of extraction over a smaller area.

Potential dust emissions from exposed areas and stockpiles would be controlled by water application (such as water carts or polymers application). In addition, the active earthwork material site areas would be compacted periodically using rollers or compactors during each working day which would stabilise the surface and reduce dust emissions. As such, dust emission reduction is considered to be 50 per cent during working hours and 75 per cent at night time. This assessment has conservatively assessed emissions from wind erosion over the entire year.

A number of stockpiles would likely be required at the stockpile area. One for the temporary storage of material which needs to be screened, an overburden stockpile and multiple stockpiles for the products of the screening plant.

Each stockpile would around 2,400 cubic metres with a height of 2.5 metres. The exact locations of the stockpiles are not known at this stage and both stockpiles would be located within the stockpile area. Exported materials would be delivered to the substation upgrade and expansion pad directly.

Existing topsoil would be removed from the substation pad at the start of earthworks. This assessment conservatively assumed topsoil removal would occur in the first two months and the substation construction area would be subjected to wind erosion.

All materials transferred externally or from the stockpiles to the substation would be compacted and dampened with water carts and/or polymers. Dust generated from wind erosion at the substation during base construction is considered to be negligible and not modelled in this assessment.

Default emission factors for wind erosion detailed in the NPI Mining manual was adopted in this assessment and the emission inventory is presented in Table 5-12. It is noted that emission rates presented in this table are the total emissions.

Table 5-12 Emission inventory for wind erosion

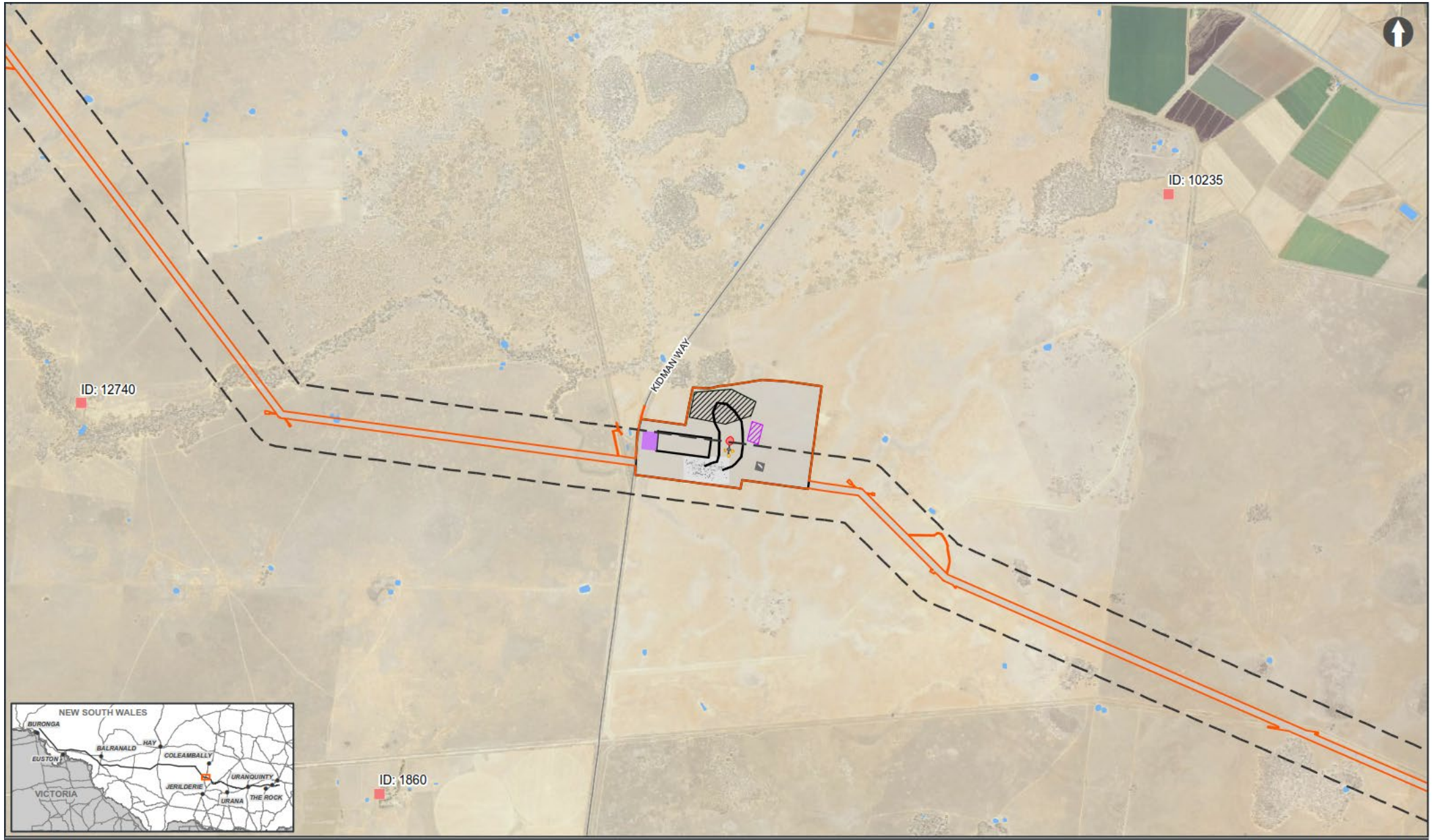
SOURCES	PERIOD	EMISSION FACTORS (KG/T)			AREA (M^2)	CONTROL MEASURES AND REDUCTION RATE	MODELLED EMISSION RATES (G/S)		
		TSP	PM_{10}	$PM_{2.5}$			TSP	PM_{10}	$PM_{2.5}$
Earthwork material site	24 hours per day	1.11E-05	5.56E-06	8.33E-07	202,775	Water carts and/or polymers (50%)	1.127	0.563	0.084
Main stockpile		1.11E-05	5.56E-06	8.33E-07	15,400	Water carts and/or polymers (50%)	0.086	0.043	0.006
Screens stockpile 1		1.11E-05	5.56E-06	8.33E-07	1,256	Water carts and/or polymers (50%)	0.007	0.003	0.001
Screens stockpile 2		1.11E-05	5.56E-06	8.33E-07	1,256	Water carts and/or polymers (50%)	0.007	0.003	0.001
Screens stockpile 3		1.11E-05	5.56E-06	8.33E-07	1,256	Water carts and/or polymers (50%)	0.007	0.003	0.001
Overburden stockpile		1.11E-05	5.56E-06	8.33E-07	25726	Water carts and/or polymers (50%)	0.143	0.071	0.011
Substation Pad		1.11E-05	5.56E-06	8.33E-07	123,011	Water carts and/or polymers (50%)	0.683	0.342	0.051

Source characteristics

Emission sources are modelled as follows:

- machinery: nine volume sources
- material handling: four volume sources
- unpaved roads: three road sources
- screening: one volume source
- wind erosion: six area sources.

Indicative location of modelled sources are presented in Figure 5-3.



0 0.25 0.5 KM

Air Quality - Figure 5-3

Location of Modelled Sources at Dinawan Substation

- Eastern Construction Impact Area (version 3-02/09)
- Main Construction Compounds and Accommodation Sites
- Camp
- Laydown
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Within 350m of the Proposal Alignment

Sensitive Receptors

- Residential dwelling (3)

Dinawan Borrow Pit - Option 2

- Borrow Pit
- Overburden Stockpile
- Topsoil Windrow
- Stockpiles
- Unsuitable Material
- Screens
- Haul Roads
- Concrete Batching Pad

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Source: NSWSS, ESRI, Transgrid, WSP

5.3.1.3 Modelled receptors

Both gridded and sensitive receptors identified in Section 4.2.1 were included in the modelling. The south-west corner of the uniform grid domain was located at 378811 m E, 6115548 m S (MGA Zone 55H) with a resolution of 250 metres. A total extent of 20 kilometres by 18 kilometres by 13 kilometres was covered in the modelling. The sensitive receptors (R1 to R6) included in the model are presented in Table 4-1.

5.3.1.4 Particle size distribution

TSP, PM_{10} and $PM_{2.5}$ was modelled as particles to output dust deposition. As site-specific particle size distribution was not available at the time of modelling, a representative particle size distribution for mining operations was used. These are presented in Table 5-13.

Table 5-13 Particle size distribution

PARTICLE FRACTION	GEOMETRIC MEAN DIAMETER (µM)	GEOMETRIC STANDARD DEVIATION (µM)
TSP	30	2
PM_{10}	8.7	2
$PM_{2.5}$	0.35	2

5.3.1.5 Model assumptions

The following conservative assumptions were included in the modelling assessments:

- the concrete batching plant would be continuously operational
- all the excavated soil from the earthwork material site would be transferred to the stockpile adjacent to the screens
- product from screening would be transferred to the substation pad or stockpiled if not suitable for use
- all materials would be transported using trucks
- the screening plant would be operational from 7.00 am to 7.00 pm
- material would be screened at a rate of approximately 600 to 700 cubic metres per day
- the whole extent of the extraction area was modelled as an area source
- emissions from wind erosion were modelled over the entire year
- topsoil removal would occur in the first two months of the proposal and the substation construction area would be subjected to wind erosion
- each stockpile would be up to around 2,400 cubic metres with a height of 2.5 metres.

The adoption of conservative assumptions means that the incremental dust concentrations (TSP, PM_{10}, $PM_{2.5}$ and deposited dust) represent conservative estimates of the potential impacts (Section 5.3.1.6) at the sensitive receptors and the receiving environment.

5.3.1.6 Modelling results

The maximum predicted incremental concentrations for TSP, PM_{10}, $PM_{2.5}$ and deposited dust for averaging periods consistent with the assessment criteria were extracted at modelled sensitive receptors. Background data were added to incremental concentrations for TSP, PM_{10}, and $PM_{2.5}$ to assess compliance of cumulative concentrations with relevant impact assessment criteria.

TSP

Table 5-14 presents the predicted annual average increment and cumulative TSP concentration. The contour plot for annual average incremental concentrations is presented in Appendix C.

The modelling results indicate:

- the cumulative annual average ground level concentrations of TSP are predicted to be below the assessment criterion of 90 µg/m^3 at all sensitive receptors
- the predicted highest incremental annual average TSP concentration of 0.51 µg/m^3 occurred at receptor R2 and accounts for 0.6 per cent of the assessment criterion.

Table 5-14 Predicted annual average TSP ground level concentrations

RECEPTORS	INCREMENTAL (µg/m^3)	CUMULATIVE (µg/m^3)[1]
R1	0.06	38
R2	0.51	38
R3	0.17	38
R4	0.39	38
R5	0.20	38
R6	0.29	38
Criterion	***90***	

(1) Background annual average TSP concentration of 37.9 µg/m^3

PM_{10}

24-hour average PM_{10} time-series concentrations were extracted from modelling outputs and added to contemporaneous background concentrations to give the cumulative concentrations (proposal contribution plus background). Predicted results are summarised in Table 5-15. Contour plots for 24-hour average and annual average PM_{10} incremental concentrations are presented in Appendix C.

It is noted that the predicted 24-hour average cumulative PM_{10} concentrations are presented in Table 5-15 in two ways as follows:

- the maximum 24-hour average incremental (project contribution) PM_{10} concentrations plus the background concentration for the same day. For example, the highest incremental 24-hour PM_{10} concentration of 3.5 µg/m^3 at sensitive receptor R1 occurred on 3 February 2018. The background concentration for the 3 February 2018 was added to the predicted concentration to give the cumulative concentration
- the maximum cumulative concentration was determined at each sensitive receptor i.e., the maximum total concentration irrespective of the magnitude of the incremental or background concentrations.

The modelling results indicate that:

- the maximum incremental 24-hour average PM_{10} concentration at all receptors is 16µg/m^3 (R2) accounting for 32 per cent of the assessment criterion and the maximum annual average PM_{10} concentration at all receptors is 0.67 µg/m^3 (R2) accounting for 2.7 per cent of the relevant criterion
- the cumulative 24-hour PM_{10} concentrations at sensitive receptor R2 to R6 exceed the 50 µg/m^3 assessment criterion on one additional day due to the proposal. There are no additional exceedances due to the proposal at receptor R1
- the cumulative annual average PM_{10} concentrations is above the assessment criterion at all sensitive receptors assessed due to the background concentration being above the criterion before the contribution from the proposal is added which accounts for less than three per cent of the criterion and would contribute no more than 0.7 µg/m^3 to the receiving environment.

Table 5-15 Predicted 24-hour average and annual average PM_{10} concentrations

RECEPTORS	24-HOUR AVERAGE (µg/m³)						ANNUAL AVERAGE (µg/m³)	
	Maximum incremental plus background (for that day)			Maximum cumulative exceedance (due to project contribution)				
	Date	Incremental	Cumulative	Date	Incremental	Cumulative	Incremental	Cumulative[1]
R1	3/02/2018	3.5	26	No exceedances			0.09	**27**
R2	22/07/2018	16	30	27/03/2018	5.5	**51.7**	0.67	**27.6**
R3	28/04/2018	7.4	49	17/02/2018	1.2	**50.1**	0.24	**27.1**
R4	5/05/2018	15	40	20/11/2018	2.3	**52.2**	0.52	**27.4**
R5	5/10/2018	9.9	18	17/02/2018	3.1	**52**	0.28	**27.2**
R6	26/08/2018	6.8	29	26/04/2018	2.8	**50.6**	0.40	**27.3**
Criteria				***50***			***25***	

(1) Background annual average PM_{10} concentration of 26.9µg/m³

A 24-hour time series plot for the most potentially affected sensitive receptor R2, showing the contribution from the proposal and contemporaneous background data over one year (2018) is presented in Figure 5-4. The time series plot shows that there were 34 exceedances of the 50 µg/m³ assessment criterion at R2 all due to high background concentrations. There was one additional exceedance at R2 due to a contribution from the proposal. The contribution from the proposal (incremental) was 11 per cent of the assessment criterion.

Analysis of the data for the other sensitive receptors indicated there were no additional exceedances due to the proposal at sensitive receptor R1. However, there was one additional exceedance due to the proposal at receptors R3 to R6. The contribution from the proposal (incremental) ranged between 2.4 to 11 per cent of the assessment criterion.

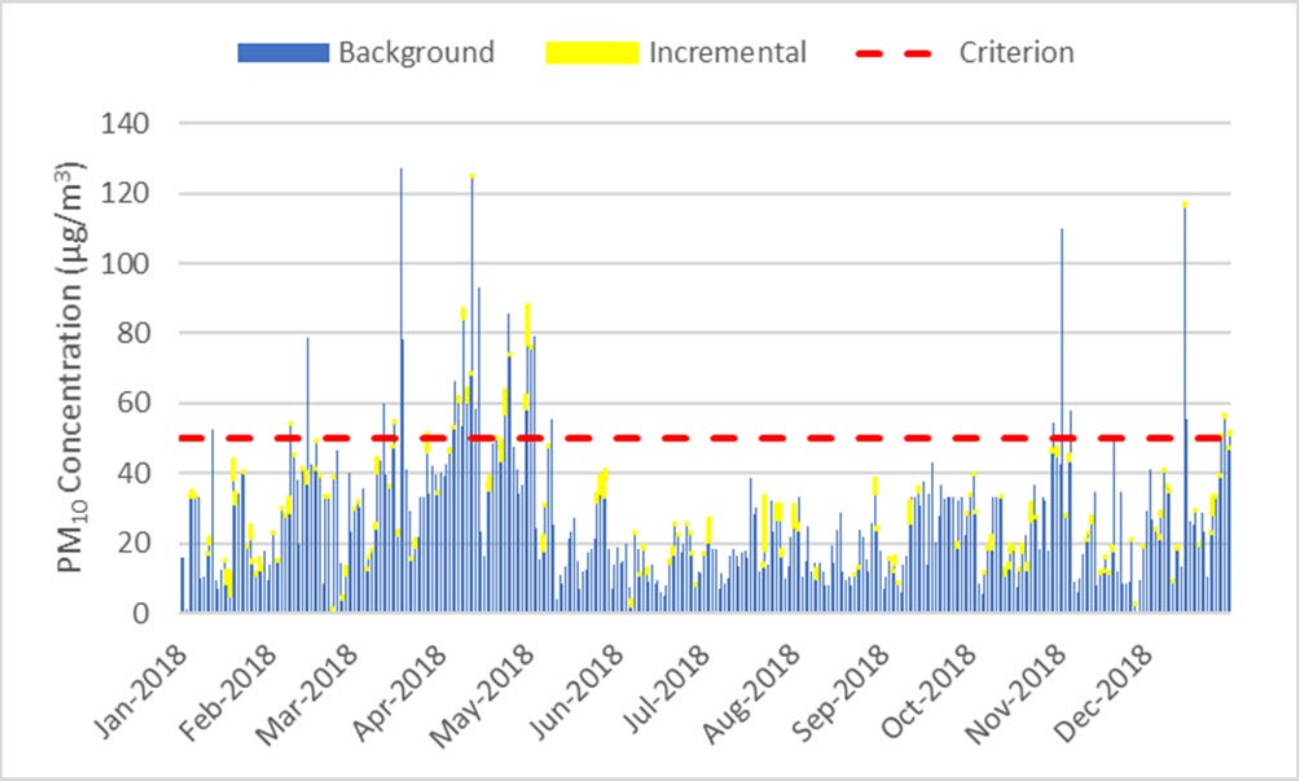

Figure 5-4 24-hour average PM_{10} time series concentrations at R2

$PM_{2.5}$

24-hour average $PM_{2.5}$ time-series concentrations were extracted from modelling outputs and added to contemporaneous background concentrations to give the cumulative concentrations (proposal contribution plus background). Predicted results are summarised in Table 5-16. Contour plots for 24-hour average and annual average $PM_{2.5}$ incremental concentrations are presented in Appendix C.

It is noted that the predicted 24-hour average cumulative $PM_{2.5}$ concentrations are presented in Table 5-16 in two ways as follows:

- the maximum 24-hour average incremental (project contribution) $PM_{2.5}$ concentrations plus the background concentration for the same day. For example, the highest incremental 24-hour $PM_{2.5}$ concentration of 1.1 µg/m^3 at sensitive receptor R1 occurred on 3 February 2018. The background concentration for the 3 February 2018 was added to the predicted concentration to give the cumulative concentration
- the maximum cumulative concentration was determined at each sensitive receptor i.e., the maximum total concentration irrespective of the magnitude of the incremental or background concentrations.

The modelling results indicate that:

- the maximum incremental 24-hour average $PM_{2.5}$ concentration at all receptors is 4.9 µg/m^3 (R4) accounting for 20 per cent of the assessment criterion and the maximum annual average $PM_{2.5}$ concentration at all receptors is 0.18 µg/m^3 (R2) accounting for 2.3 per cent of the relevant criterion
- the cumulative 24-hour $PM_{2.5}$ concentrations at all sensitive receptors are below the 25 µg/m^3 assessment criterion
- the cumulative annual average $PM_{2.5}$ concentrations exceeds the assessment criterion at all sensitive receptors assessed due to the background concentration exceeding the criterion before the contribution from the proposal is added. The annual average $PM_{2.5}$ background concentration exceeds the assessment criterion before the contribution from the proposal is added. The contribution from the proposal at the most impacted receptor (R2) is 2.3 per cent of the assessment criterion and the proposal would not contribute more than 0.2µg/m^3 to the receiving environment.

Table 5-16 Predicted 24-hour average and annual average $PM_{2.5}$ concentrations

RECEPTORS	24-HOUR AVERAGE (µg/m^3)						ANNUAL AVERAGE (µg/m^3)	
	MAXIMUM INCREMENTAL PLUS BACKGROUND (FOR THAT DAY)			MAXIMUM CUMULATIVE EXCEEDANCES (DUE TO PROJECT CONTRIBUTION)				
	DATE	INCREMENTAL	CUMULATIVE	DATE	INCREMENTAL	CUMULATIVE	INCREMENTAL	CUMULATIVE[1]
R1	3/02/2018	1.1	6.7	No exceedances			0.031	**8.9**
R2	22/07/2018	4.1	12	No exceedances			0.18	**9.1**
R3	28/04/2018	2.2	16	No exceedances			0.072	**9.0**
R4	5/05/2018	4.9	9.6	No exceedances			0.15	**9.0**
R5	20/06/2018	3.9	14	No exceedances			0.086	**9.0**
R6	30/11/2018	2.2	5.5	No exceedances			0.12	**9.0**
Criteria				***25***			***8***	

(1) Background annual average $PM_{2.5}$ concentration of 8.9µg/m^3

A 24-hour time series plot for sensitive receptor R2, showing the contribution from the proposal and contemporaneous background data is presented in Figure 5-5. The time series plot shows that there were 4 exceedances of the 25 µg/m^3 assessment criterion at R2 all due to background concentrations exceeding the criterion before the contribution from the proposal is added. There were no additional exceedances due to contribution from the proposal.

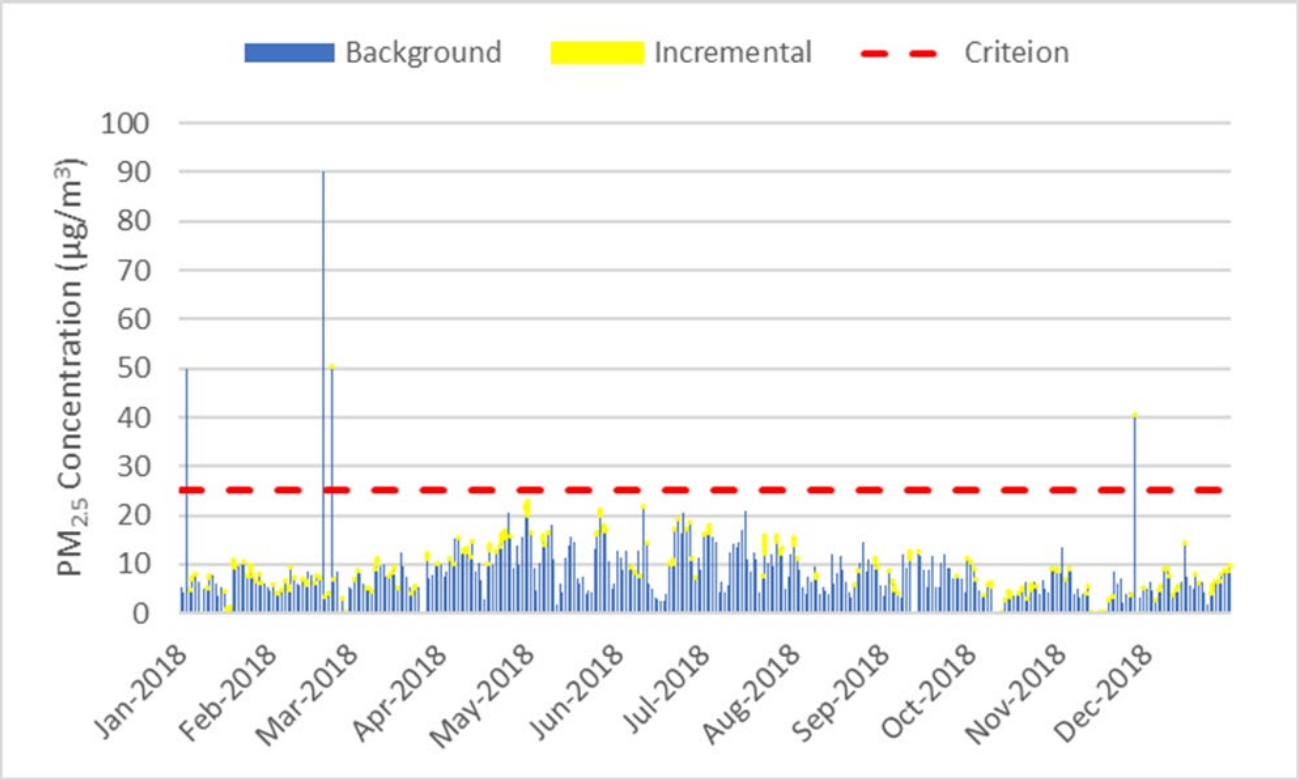

Figure 5-5 24-hour average PM_{10} time series concentrations at R2

Deposited dust

Predicted maximum monthly incremental dust deposition levels are presented in Table 5-17. There is no background monitoring data for dust deposition at Dinawan substation or within the air quality study area and incremental results only are assessed. The contour plot for the predicted monthly dust deposition levels is presented in Appendix C.

The modelling results indicate that maximum increase in dust deposition levels at all receptors are below the impact assessment criterion of 2 g/m^2/month. The highest level of 0.056 g/m^2/month was predicted at sensitive receptor R2, accounting for three per cent of the criterion.

Table 5-17 Predicted maximum monthly deposited dust levels

RECEPTORS	INCREMENTAL (G/M^2/MONTH)
R1	0.007
R2	0.056
R3	0.009
R4	0.053
R5	0.013
R6	0.017
Maximum increase criterion	***2***

5.3.2 *Other substations, construction compounds and accommodation camps*

This section assesses the potential dust impacts associated with construction activities at the following locations:

- Balranald construction compound
- Cobb highway construction compound and accommodation camp
- County-Boundary Road construction compound and accommodation camp
- upgraded Wagga Wagga substation and construction compound
- transmission lines along the entire length of the proposal.

The dust assessment adopts a risked based approach outlined in the IAQM guidance was adopted in this assessment. Construction works included in the detailed risk assessment ('screened in') are evaluated in Section 5.3.2.1 to 5.3.2.6.

The following work has been included in this section:

- risk assessment:
  - Step 1: Screen the requirement for a more detailed assessment.
  - Step 2: Assess the risk of dust impacts. This is done separately for each of three activities including earthwork, construction and vehicle track out.
    - Step 2A: Determine the potential dust emission magnitude.
    - Step 2B: Determine the sensitivity of the area.
    - Step 2C: Assess the risk by combining the factors in Step 2A and Step 2B.
  - Step 3: Determine the site-specific mitigation.
  - Step 4: Examine the residual effects and determine whether or not these are significant.

5.3.2.1 Step 1 – Screen the need for a detailed assessment

The IAQM guidance recommends that a risk assessment of potential dust impacts from construction activities is undertaken when sensitive receptors are located within:

- 350 metres of the boundary of the site
- 50 metres of the routes used by construction vehicles on the public highway up to 500 metres from the site entrance points.

In cases where no sensitive receptors identified within these locations, the need for a more detailed assessment is '*screened out*'. It can be concluded that the level of risk is negligible, and any impacts would not be of significance. Given that with the progress of refining the proposed location of infrastructure, there is potential that the exact location for each transmission line tower and associated construction site may change along the proposal, therefore, the transmission line easement was conservatively used as the site boundary for transmission lines construction.

5.3.2.2 Step 2A – Determine the potential dust emission magnitude

The potential dust emission magnitudes for demolition, earthworks, construction and vehicle track out activities were evaluated in this section. Examples provided in the IAQM guidance have been used to classify potential large, medium, or small dust emission magnitude as shown in Table 5-18.

Table 5-18 Example definitions for large, medium and small dust emission magnitude

ACTIVITIES	LARGE	MEDIUM	SMALL
Demolition	— Total building volume >50,000 cubic metres (m^3) — Potentially dusty construction material e.g., concrete — On-site crushing/screening — Height of demolition activities (>20 metres (m) above ground level)	— Total building volume 20,000–50,000 m^3 — Potentially dusty construction material — Height of demolition activities (10–20 m above ground level)	— Total building volume <50,000 m^3 — Low potential for dust release e.g., metal — Height of demolition activities (<20 m above ground level) — Demolition during wetter months
Earthworks	— Total site area >10,000 square metres — Potential dusty soil type (e.g., clay) — >10 heavy earth moving vehicles active at any one time — Formation of bounds >8 metres in height — Total material moved >100,000 tonnes (t)	— Total site area 2,500–10,000 square metres (m^2) — Moderately dusty soil type (e.g., silt) — 5–10 heavy earth moving vehicles active at any one time — Formation of bounds 4–8 metres (m) in height — Total material moved 20,000 t – 100,000 t	— Total site area <2,500 m^2 — Soil type with large grain size (e.g., sand) — <5 heavy earth moving vehicles active at any one time — Formation of bounds <4 m in height — Total material moved <20,000 t — Earthworks during wetter months
Construction	— Total building volume >100,000 m^3 — On-site concrete batching — Sandblasting	— Total building volume 25,000–100,000 m^3 — On-site concrete batching — Potentially dusty construction material (e.g., concrete)	— Total building volume <25,000 m^3 — Construction material with low potential for dust release (e.g., metal cladding or timber)
Track out[1]	— >50 heavy duty vehicles (HDV>3.5t) outward movements in any one day — Potential dusty surface material (e.g., high clay content) — Unpaved road length >100 m	— 10–50 HDV (>3.5t) outward movements in any one day — Moderately dusty surface material (e.g., high clay content) — Unpaved road length 50–100 m	— <10 HDV (>3.5t) outward movements in any one day — Surface material with low potential for dust release — Unpaved road length <50 m

Demolition

The dust emission magnitude was assessed at upgraded Wagga substation where demolition works of the transformer storage, oil storage and equipment would occur to accommodate the double circuit configuration.

The dust emission magnitude is determined by the following parameters:

- building volume (cubic metres)
- type of construction material being demolished
- operation of a crushing/screening plant
- height of the demolition activity.

Table 5-19 Demolition magnitude at Wagga Wagga substation

PROPOSAL LOCATION	BUILDING STRUCTURE VOLUME	CONSTRUCTION MATERIAL	ON-SITE CRUSHING / SCREENING	HEIGHT OF ACTIVITIES ABOVE GROUND LEVEL (m)	EMISSION MAGNITUDE
Wagga Wagga laydown/substation	<50,000 m^3	Concrete	No	<10m	Small

Earthworks

For this proposal, earthworks would be required for excavating on-site material, movement of material on-site, haulage tipping and stockpiling.

The transmission lines would be supported on a series of transmission line towers spaced between 450 and 600 metres apart. The main earthworks associated with the construction of the transmission lines would be structural excavations. A self-supporting structure with four foundations per structure was conservatively assumed to estimate the volume of excavated material. Reinforced concrete would be used to fill the excavations. Excavated material would be stockpiled and used for backfill around the foundations (where appropriate).

Given the distance between structures, each structure location is considered to be a separate site. Access tracks of around 600 metres in length on both sides of each structure were assumed to be part of each site.

Details of the indicative earthworks at each Disturbance Area A site are:

- total site area would approximately be 9,450 square metres:
  - the disturbance area at each structure would be up to 65 by 90 metres, equivalent to 5,850 square metres (structural excavation area for four foundations would be approximately 13 square metres)
  - access tracks area would be 3,600 square metres (six metres in width, 600 metres in length excluding 90 metres in the disturbance area)
- the total material moved at each structure site from the proposal would approximately be 200 cubic metres, equivalent to 1,102 tonnes (assuming earth density of 5,510 kilograms per cubic metre)
- the soil type is sandy/clay
- less than five heavy earth moving vehicles active at any one time.

Table 5-20 presents the dust emission magnitude for earthworks at each proposal location.

Table 5-20 Dust emission magnitude during earthworks

PROPOSAL LOCATION	INDICATIVE SITE AREA (m^2)	SOIL TYPE	NUMBER OF HEMVs	MATERIAL HANDLED		EMISSION MAGNITUDE
				m^3	Tonnes	
Cobb Highway construction compound and accommodation camp	123,000	Sand/Clay	5-10	–	<20,000	Medium
County-Boundary Road construction compound and accommodation camp	150,000	Sand/Clay	5-10	–	<20,000	Medium
Wagga Wagga substation and construction compound	115,000	Sand/Clay	>10	–	<20,000	Large
Transmission line sites	9,450	Sand/Clay	<5	200	1,102	Small

(1) HEMVs: Heavy earth moving vehicles

Construction

The key factors when determining the potential dust emission magnitude during the construction phase include the building volume, method of construction, construction materials, and duration of build. Table 5-18 provides examples of small, medium and large dust emission magnitudes.

Table 5-21 presents the dust emission magnitude for construction works at each proposal location.

Table 5-21 Dust emission magnitude for construction works

PROPOSAL LOCATION	BUILDING VOLUME (m^3)	CONSTRUCTION MATERIAL	ON-SITE CONCRETE BATCHING	BLASTING	EMISSION MAGNITUDE
Cobb Highway construction compound and accommodation camp	25,000 – 100,000	Timber	Yes	No	Medium
County-Boundary Road construction compound and accommodation camp	25,000 – 100,000	Timber	Yes	Possibly/Yes	Medium
Wagga Wagga substation and construction compound	25,000 – 100,000	Timber/concrete	Yes	Possibly/Yes	Medium
Transmission line sites	NA	Steel	No	No	Small

(1) NA: Not applicable

Track out

Track out is defined as '*the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when HDVs leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site*' (the IAQM Guidance).

HDVs would travel from construction sites and onto public roads through access points shown in the sensitive receptor figures (Appendix B).

Table 5-22 Dust emission magnitude for track out

PROPOSAL LOCATION	DAILY HDV OUTWARD MOVEMENTS	SURFACE MATERIAL	UNPAVED ROAD LENGTH (m)	EMISSION MAGNITUDE
Cobb Highway construction compound and accommodation camp	>50	Sandy/clay	>100	Large
County-Boundary Road construction compound and accommodation camp	>50	Sandy/clay	>100	Large
Wagga Wagga substation and construction compound	>50	Sandy/clay	>100	Large
Transmission line sites	<10	Sandy/clay	>100	Medium

5.3.2.3 Step 2B – Determine the sensitivity of the area

The sensitivity of the surrounding land uses takes account of several factors. These are:

- the specific sensitivities of receptors
- the number of receptors and their proximity to the site
- local background PM_{10} concentrations
- site-specific factors that may reduce the risk of wind-blown dust (e.g., trees).

Table 5-23 Summary of the sensitivity of the surrounding area

PROPOSAL LOCATION	DEMOLITION		EARTHWORKS		CONSTRUCTION		TRACKOUT	
	DS[1]	HH[2]	DS[1]	HH[2]	DS[1]	HH[2]	DS[1]	HH[2]
Cobb Highway construction compound and accommodation camp	NA	NA	Low	Low	Low	Low	Low	Low
County-Boundary Road construction compound and accommodation camp	NA	NA	Low	Low	Low	low	Low	Low
Wagga Wagga substation and construction compound	Low	Low	Low	Low	Low	Low	Low	Low
Transmission line sites	NA	NA	Low	Low	Low	Low	Low	Low

(1) DS: Dust soiling
(2) HH: Human health
(3) NA: Not applicable

5.3.2.4 Step 2c – Define the risk of impact

The dust emission magnitudes for demolition, earthworks, construction and track out were combined with the sensitivity of the area to determine the risk of dust impacts. The matrices providing the thresholds for the risk of dust impacts are presented in Table 5-24.

Table 5-24 Summary of dust risk

PROPOSAL LOCATION	DEMOLITION		EARTHWORKS		CONSTRUCTION		TRACKOUT	
	DS[1]	HH[2]	DS[1]	HH[2]	DS[1]	HH[2]	DS[1]	HH[2]
Cobb Highway construction compound and accommodation camp	NA	NA	Low	Low	Low	Low	Low	Low
County-Boundary Road construction compound and accommodation camp	NA	NA	Low	Low	Low	Low	Low	Low
Wagga Wagga substation and construction compound	Negligible	Negligible	Low	Low	Low	Low	Low	Low
Transmission line sites	NA	NA	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

(1) DS: Dust soiling
(2) HH: Human health
(3) NA: Not applicable

The outcomes of the dust risk assessment indicates that the risk of human health effects due to dust and the risk of dust soiling is negligible to low without mitigation at all proposal locations assessed for demolition, earthworks, construction works and track out respectively.

5.3.2.5 Step 3 – Site specific mitigation

Risks are described in terms of a negligible, low, medium or high risk. Where there are low, medium or high risks of an impact, then site-specific mitigation is required based on the risk level. For cases where the risk category is negligible, no mitigation measures beyond those required by legislation is required.

For general mitigation measures, the highest risk category was applied. To minimise the dust impacts associated with the proposal, site-specific mitigation measures are presented in Section 8.1.

5.3.2.6 Step 4 – Determine significance of residual impacts

For all construction activities, the aim is to prevent significant impacts on receptors through effective mitigation. As stated in the IAQM guidance, this is normally possible. Therefore, with the implementation of site-specific mitigation measures detailed in Section 8.2 residual dust impacts would low in terms of dust soiling and health effects.

5.3.3 Local haulage routes

In addition to the risk assessment conducted for track out from construction works (see Sections 5.3.2.1 to 5.3.2.6), potential amenity impacts from dust generated on paved and unpaved roads were also considered.

There are two hundred and thirty-one paved and unpaved roads that have been identified as potentially being required to accommodate local haulage routes for the proposal. Of these, there are approximately fifty roads used by construction traffic that are characterised as unpaved. The local haulage routes are presented on figures in Appendix C. There are 5,193 sensitive receptors within 100 metres of the identified paved roads. A majority of these are concentrated in the townships and villages through which the haulage routes pass. There are 59 receptors within 200 metres of unpaved roads. These receptors which are generally scattered along the various local haulage routes have been identified.

Construction vehicles travelling on paved roads have the potential to generate dust by the force of the wheels on the road, the road surface and vehicle speed. The surface of most paved roads is bitumen and would not in themselves generate dust. During dry conditions, dust present on the paved roads may be generated in the wake of the construction vehicles potentially impacting sensitive receptors. Construction vehicles would be required to adhere to the posted speed limits in particular when passing through townships and villages where the majority of sensitive receptors are located. This would assist in reducing potential dust, and associate amenity, impacts. Additionally, impacts are expected to be of short duration and intermittent and occur infrequently.

Construction vehicles travelling on unpaved haulage routes would also generate dust by the force of the wheels on the road surface, the road condition and vehicle speed. The extent of dispersion and the size of impact would be dependent on meteorological conditions including wind speed and wind direction. Notwithstanding, dust generated from trucks on unpaved roads has the potential to be high particularly under certain conditions (dry surface road and high winds). However, the impacts would be intermittent, of short duration and would likely only impact a small number of receptors at any given time.

Management measures proposed in Section 8.1 should assist with reducing impacts at identified sensitive receptors.

5.4 Gaseous emissions

Gaseous emissions such as CO, NO_x, SO_2, VOCs and PAHs would be generated from vehicles and fugitive sources during the construction phase.

5.4.1 Vehicle emissions

Diesel fuel combustion from vehicle movements and on-site plant and machinery operation would generate CO, NO_x, SO_2 and trace amounts of non-combustible hydrocarbons (i.e., VOCs and PAHs). The emission rates and potential impact on surrounding areas would depend on the number and power output of the combustion engines, the quality of fuel used, the condition of the engines and the intensity of use.

During the construction phase, equipment and material would be transported to each tower site along the alignment, the Dinawan and Wagga Wagga substation sites, the main construction compound and accommodation camp sites or concrete batching plants along transmission lines. Details of daily heavy vehicle movements are presented in Table 5-4. The plant and machinery involved in the proposal construction include excavators, cranes, rigid tippers, semi-trailers, rollers, dozers, concrete agitators, watercarts, graders, stringing winches, backhoes, dumper trucks, trenchers, transport trucks, generators and air compressors.

Light vehicles would be used to transport workers. Maximum daily movements of light vehicles at the Dinawan and Wagga substations is projected to be around 100. At the combined construction compound and accommodation camp sites the maximum daily light vehicle movements is around 200 and around 160 for the accommodation camps only.

Fuel combustion emissions from plant and equipment along the transmission line easement would be intermittent and transient. Given the anticipated duration of works at any given location, the likely numbers of emission sources, and scheduling of activities (i.e. not all machinery would be operating in the same location simultaneously), gaseous emissions are not anticipated to significantly influence local air quality Emissions would be adequately manageable through the implementation of mitigation measures (refer to Section 8.1).

5.4.2 Fugitive emissions

Petroleum, diesel, liquefied natural gas (LNG) and mineral oils stored in the storage and laydown areas at the construction compound and accommodation camp sites have the potential to generate fugitive emissions. These hazardous and dangerous goods would be secured in purpose built bunded and secure areas. These emissions are expected to be minor and readily dispersed within the sites. With appropriate handling and storage, air quality impacts from these fugitive sources are considered to be negligible.

5.5 Odour

The proposed wastewater treatment plants are anticipated to consist of a generally contained system that would include biological and chemical treatment, filtration and disinfection.

The treatment system would mainly comprise of enclosed tanks with the following potential odour sources:

— wastewater screening to remove inorganics
— screened material stored in waste bins
— sludge storage.

In an event that inorganic materials accumulate on the screens, waste bins are not emptied regularly or not properly closed, or waste sludge is not appropriately stored before off-site removal to a licensed facility, odour emissions may potentially impact on the receiving environment.

The most potentially affected receptors are on-site workers living within the accommodation camp. In general, there is low potential for odour generation at the wastewater facilities, given the relatively small scale of the treatment plants with no large open sources. If odour emissions do occur, they are likely to be infrequent, of short duration and of low intensity. Potential odour impacts on workers within the accommodation camp are anticipated to be of low significance.

Off-site receptors are not expected to be adversely impacted by odour emissions given the approximate distance of the wastewater treatment plants. Potential odour emissions from the wastewater treatment plants at each of the accommodation camps are not of significance.

6 Assessment of operational impacts

6.1 Infrastructure operations

During normal operation, wind-blown dust would be generated from unsealed access tracks along the transmission lines and unsealed roads at the Dinawan and Wagga Wagga substations. These emissions are anticipated to be minor. No other air emissions are anticipated to be generated either from the operation of transmission lines or the Dinawan or Wagga Wagga substations.

It is noted that sulphur hexafluoride (SF_6) is a gas used as an insulating medium in the switchgear to be located at the existing Wagga Wagga and proposed Dinawan 330kV substations. SF_6 is pressurised and contained within the equipment, so under normal operating conditions there would be no emission of the gas expected. There is expected to be negligible venting of the gas during the filling process, as well as in abnormal operating conditions should a leak develop in the equipment. The equipment would be monitored in real-time for leaks so that a maintenance crew can identify and repair the source of the leak. In outdoor and well ventilated spaces, SF_6 presents no immediate health risk to the community or the environment. However, SF_6 is considered a significant potential greenhouse gas and all reasonable steps would be taken in the construction, operation and decommissioning of the equipment to minimise the stray venting of SF_6 gas to the atmosphere – ensuring an overall minimal impact.

6.2 Permanent access tracks

Where required, access tracks used for the construction of the proposal would be retained to support ongoing maintenance operations for the proposal and for access and egress of emergency vehicles.

The general expectation is that these permanent access tracks would carry a very low volume of vehicles and only be used occasionally. Any possible risk of operational air quality impacts is therefore expected to be minimal.

6.3 Inspection, maintenance or emergency works

During routine inspection, maintenance or emergency works, light vehicles or light aircraft would be used to transport personnel to the sites, this would generate emissions due to fuel combustion and dust emissions from light vehicles travelling on unsealed roads.

The maintenance access requirements are expected to be as follows:

- For the transmission lines:
  - annual fly over inspection, as part on seasonal bushfire prevention survey
  - routine asset inspection and routine maintenance on a six-yearly cycle for self-supporting towers and three-yearly cycle for guyed structures by light vehicles
  - light aircrafts or light vehicles would be used to access the sites as fault and emergency occurs which would be rare.
- For the proposed Dinawan and existing Wagga Wagga substations
  - switching operators would undertake planned and unplanned switching of equipment using light vehicles two to three times a week by one to two personnel
  - routine substation asset inspection would be conducted on a yearly cycle using light vehicles by two to three personnel
  - routine/planned substation maintenance would typically be on a monthly basis and undertaken by three to five personnel in light trucks

- fault and emergency access using light vehicles should an unplanned outage occur, or repair of damaged assets is required (which is rare).

The frequency to access the proposal during operation phase are anticipated to be low and the number of vehicles required during these events would be small. Therefore, the gaseous and dust emissions during operation phase is anticipated to be negligible, and the impacts on surrounding areas would be not of significance.

7 Cumulative impact

7.1 Overview

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).

A number of proposed developments have been identified and these include:

- EnergyConnect – Western Section
- Buronga Solar Farm
- Buronga Landfill Expansion
- Buronga – Gol Gol residential expansion
- Inland Rail – Albury to Illabo
- Uranquinty Solar Farm
- Gregadoo Solar Farm.

7.2 EnergyConnect (NSW – Western Section)

The EnergyConnect (NSW – Western Section) 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, and received, separate environmental planning approvals for the 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 mid-2023.

There is the potential for minor cumulative impacts during construction works depending on the timing and nature of the project and the proposal. On-site management measures should ensure impacts are minimised. Cumulative impacts during operation are expected to be minimal and not of significance.

7.3 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).

With appropriate soil and water control measures in place for both developments during construction and operation it is estimated that there would be no cumulative impacts to geomorphology, water supply or water quality as a result of this project and the proposal. The site is located out of the floodplain and therefore would not impact local flood risk.

Cumulative impacts during construction and operation of this project and the proposal are not anticipated.

7.4 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).

Buronga landfill is located approximately five kilometres to the west of Buronga substation and transmission line. There is the potential for cumulative impacts from the project and the proposal. The extent of cumulative impacts from the project and proposal would depend on site management practices and the prevailing wind direction. Mildura Airport AWS records westerly wind flow during winter and spring from the landfill to the proposal and a low frequency of easterly winds.

7.5 Buronga – Gol Gol residential expansion

Wentworth Shire Council is proposing a new subdivision 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.

It is not expected that there would be cumulative impacts to flood risk and geomorphology because the development would need to comply with the Wentworth Shire Council Development Control Plan 2011 which outlines conditions for erosion and sediment control and flood liable land.

No timeframe on proposed development of the urban release areas has been identified at this time, however should the proposed residential expansion commence at the same time as the construction of the proposal, this may result in a cumulative demand for water during the construction phase. Long term water supplies may be impacted if water demand management strategies are not developed. The change in land use is also likely to impact local water quality and add to the already poor water quality ratings for the Darling River.

Given the nature of the development and the distance to the proposal, cumulative impacts to air quality are not expected.

7.6 Inland Rail – Albury to Illabo

Australian Rail Track Corporation (ARTC) is proposing to upgrade the Albury to Illabo section of the Inland Rail Project, 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 proposal is made up of discrete sections of proposed upgrades, 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 be completed by late 2024. Operations are to commence in 2025.

Part of the eastern end of the proposal (where it crosses the existing railway line and Olympic highway would be located approximately 2.5 kilometres to the south of the nearest enhancement site for the Inland Rail project. There is the potential for cumulative impacts from the Inland Rail project and the proposal (in particular should construction occur at similar times). The extent of cumulative impacts from the Inland Rail project and proposal would depend on site management practices and the prevailing wind direction. Wagga Wagga Airport AMO records predominantly easterly or south-easterly wind flows. This would assist in minimising potential cumulative impacts. Additionally, at the location where the proposal and the Inland Rail project meet, the main construction works for proposal would be the installation of towers and transmission lines. The risk assessment for these works, indicated the risk of potential air quality impacts on the receiving environment was negligible (5.3.2.4).

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 megawatts (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. Given current timing for the proposed solar farm, there is the potential for the proposal and the solar farm construction periods to overlap.

Given the distance of the solar far project to the proposal, cumulative impacts to air quality are not expected.

7.8 Gregadoo Solar Farm

The Gregadoo Solar Farm will be located about 13 km south-east of Wagga Wagga. The project is proposed to comprise construction, operation and decommissioning of a maximum 47 MW solar farm and associated infrastructure. Construction is expected to commence mid-2021.

Given the distance of the solar farm project to the proposal, cumulative impacts to air quality are not expected.

8 Mitigation measures

8.1 Site specific mitigation measures

Site-specific mitigation measures have been proposed to minimise air quality impacts associated with the proposal. Mitigation measures for the proposal are presented in Table 8-1.

Table 8-1 Mitigation measures

REFERENCE	MITIGATION MEASURE	TIMING	APPLICATION LOCATION(S)
AQ1	To minimise particulate and gaseous emissions during construction, the following measures (as a minimum) would be implemented where practicable and appropriate: — use water carts and/or polymers or surfactants as required for dust suppression — adjust the intensity of dust generating activities based on observed dust levels and weather forecasts — protect stockpiled materials from wind erosion to minimise dust generation and position stockpiles as far as practicable away from any nearby receptors — limit vehicle movements to designated entry/exit routes and parking areas — implement measures to minimise the tracking of dust generating material onto paved roads — inspect and clean paved roads in the vicinity of site access points as required to minimise dust generation (up to 100 metres either side of the access point) — cover the loads of potential dust producing materials — minimise the extent of ground disturbance as far as practicable — stabilise disturbed areas as soon as practicable. The effectiveness of the implemented controls would be monitored, and additional controls implemented as required to address any performance issues identified.	Construction	All locations
AQ2	Ensure that all vehicles and machinery are fitted with appropriate emission control equipment and maintained in a proper and efficient manner in line with guidelines contained in the National Environment Protection (Diesel Vehicle Emissions) Measure 2009.	Construction	All locations

REFERENCE	MITIGATION MEASURE	TIMING	APPLICATION LOCATION(S)
AQ3	To minimise emissions from concrete batching plants, the following measures (as a minimum) would be considered and implemented where practicable and appropriate: — store all aggregate and sand in appropriate storage bins or bays to minimise dust generation, and ensure that the material does not exceed the height of the bay — fit cement silos and hoppers with dust filters and emergency pressure alert and automatic cut off overfill protection — fully seal all inspection points and hatches — ensure that all transfer methods adopted address and minimise potential dust generation — transfer of cement from storage to batching using sealed steel augers. The effectiveness of the implemented controls would be visually monitored and additional controls implemented as required to address any performance issues identified.	Construction	Concrete batching plant(s)
AQ4	To minimise dust emissions during screening activities, the following measures (as a minimum) would be considered and implemented where practicable and appropriate: — ensure screen covers are fitted to the screening equipment — control dust emissions from screening activities using water sprinklers, where required and appropriate — inspect the water sprinklers on a regular basis and maintain as required to ensure operational efficiency — where practicable, install wind breaks in appropriate locations adjacent to the dust generating equipment and processes — prior to screening, dampen the rocks during dry weather conditions. The effectiveness of the implemented controls would be monitored and additional controls implemented as required to address any performance issues identified.	Construction	Dinawan substation earthworks material site
AQ5	To minimise potential odour emissions and impacts from the wastewater treatment plants, the following measures would be considered and implemented where practicable and appropriate: — prevent excessive inorganic material accumulating on the screens by disposing of screened material in waste bins on a regular basis — place waste bins containing screened material and sludge as far away as practicable from the construction compound and accommodation sites — ensure waste bins are fully closed at all times — remove screened material and sludge from site at regular intervals and dispose in an appropriate manner. The effectiveness of the implemented controls would be monitored and additional controls implemented as required to address any performance issues identified.	Construction	Cobb Highway, Dinawan and County-Boundary Road construction compound and accommodation sites

REFERENCE	MITIGATION MEASURE	TIMING	APPLICATION LOCATION(S)
AQ6	During atmospheric conditions that are conducive to dust generation, dust generation from project-related traffic movements on unsealed roads and access tracks (routes) in close proximity to sensitive receivers would be visually monitored. Where dust from project-related traffic movements is impacting or has the potential to impact the sensitive receivers, measures to minimise dust emissions and potential associated amenity impacts would be implemented. The following measures would be implemented where practicable and appropriate: — lower the speed of project-related traffic along the routes — apply dust suppression (for example using water carts or the application soil binders) on appropriate sections of the route in the vicinity of potentially affected sensitive receivers. The effectiveness of the implemented controls would be visually monitored and additional controls identified and implemented as required and where practicable such as. — minimise the volume of project-related traffic using the routes — use alternative routes. The measures would remain implemented until more suitable atmospheric conditions prevail or the controls are no longer required to minimise potential dust impacts.	Construction	All locations

8.2 Residual impacts

8.2.1 Construction

The risk of dust impact from demolition, earthworks, construction works and trackout activities associated with the Wagga Wagga substation upgrade and expansion, construction compounds, accommodation camps and transmission lines are low to negligible prior to mitigation. With mitigation measures identified in Table 8-1 in place for all dust generating activities and locations, the risk of potential air quality impacts would be further reduced to negligible and would not be of significance.

Air dispersion modelling of dust emissions during construction of the Dinawan substation included ancillary sources such as activities at the construction compound, accommodation camp and screening operations. With proposed mitigation measures in place, predicted 24-hour PM_{10} concentration indicated one additional exceedance due to the proposal over the modelled year. Further management measures may be required especially during periods of high winds (>5 m/s) and dry soil conditions.

Gaseous emissions generated from vehicles and fugitive sources during construction phase would be minimised with mitigation measures in place (per Table 8-1) and air quality impacts would not be of significance.

Odour emissions from the on-site wastewater treatment plants would be low. The systems would be contained and managed to ensure odour generated is minimised.

8.2.2 Operation

During normal operation, potential wind-blown dust emissions from sealed and unsealed tracks and roads would be negligible. No other air emissions would be generated either from the operation of transmission lines or the Dinawan or Wagga Wagga substation.

During routine inspection, maintenance or emergency, the potential gaseous emissions and dust emissions are anticipated to be negligible, and the impacts on surrounding areas would not be significant. Notwithstanding, management measures as detailed in the existing Transgrid maintenance procedures would be implemented to ensure potential air quality impacts are minimised.

9 Conclusion

The NSW DPIE has provided the SEARs for the EIS which specifically outlines the specialist study requirements of the EIS. This report addresses the SEARs associated with air quality. The potential impacts from the construction and operation phases of the proposal are summarised below.

9.1 Construction

For works associated with construction of the Dinawan substation including screening operations, the outcomes of the air dispersion modelling assessment indicated:

- cumulative annual average ground level concentrations of TSP are predicted to be below the assessment criterion of 90 µg/m^3 at all sensitive receptors
- predicted maximum monthly incremental dust deposition levels are below the criterion of 2 g/m^2/month (maximum increase from the proposal)
- cumulative 24-hour PM_{10} concentrations at sensitive receptors R2 to R6 exceed the 50 µg/m^3 assessment criterion on one additional day due to the proposal. There are no additional exceedances due to the proposal at receptor R1
- cumulative annual average PM_{10} concentrations is above the assessment criterion of 25 µg/m^3 at all sensitive receptors assessed, noting that this is due to the existing background concentration already being above the criterion before the contribution from the proposal is added
- cumulative 24-hour $PM_{2.5}$ concentrations at all sensitive receptors are below the 25 µg/m^3 assessment criterion. There are no additional exceedances due to the proposal at any of the receptors
- cumulative annual average $PM_{2.5}$ concentrations is above the assessment criterion of 8 µg/m^3 at all sensitive receptors assessed, noting that this is due to the existing background concentration already being above the criterion before the contribution from the proposal is added.

The risk of dust impacts from demolition works, earthworks, construction activities and trackout associated with the Wagga Wagga upgrade and expansion, works associated with the construction compound and accommodation camps and the transmissions lines were determined to be low to negligible prior to mitigation.

Construction vehicles travelling on local haulage routes have the potential to generate dust that may have an amenity impact on nearby sensitive receptors. The size of the impact would be dependent on a range of factors including the type and condition of the road (i.e., paved or unpaved), vehicle speed and prevailing meteorological conditions. Dust generated from construction vehicles on paved roads would be of short duration and intermittent in nature and the impact on the receiving environment is anticipated to be low. Dust generated from construction vehicles on unpaved roads has the potential to be high particularly under certain conditions (dry surface roads and high winds). However, the impacts would be intermittent, of short duration and would likely only impact a small number of receptors at any given time.

Gaseous emissions generated from vehicles and fugitive sources during construction phase would be minimised with mitigation measures in place and air quality impacts would not be significant.

Odour impacts from the wastewater treatment plants at the proposed construction compound and accommodation camp sites were addressed qualitatively and potential impacts are expected to be minimal.

9.2 Operation

During normal operation, potential wind-blown dust emissions from unsealed tracks and roads would be negligible. No other air emissions would be generated either from the operation of transmission lines of the proposed Dinawan and upgraded and expanded Wagga Wagga substation.

During routine inspection, maintenance or emergency, potential gaseous and dust emissions are anticipated to be negligible, and the impacts of this on surrounding areas would not be of significance.

Potential cumulative impacts from seven identified proposed developments were considered in this assessment. With appropriate dust control measures in place for all developments during construction, cumulative impacts are not expected to be of significance. No operational cumulative impacts are expected to occur.

In summary, potential air quality impacts (gaseous and dust emissions) impacts associated with the construction and operation of the proposal were evaluated and were determined to have typically low to negligible impacts on the receiving environment including the nearest sensitive receptors. The implementation of management measures would however be required to ensure that potential dust impacts on the receiving environment are minimised as far as practicably possible.

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11 References

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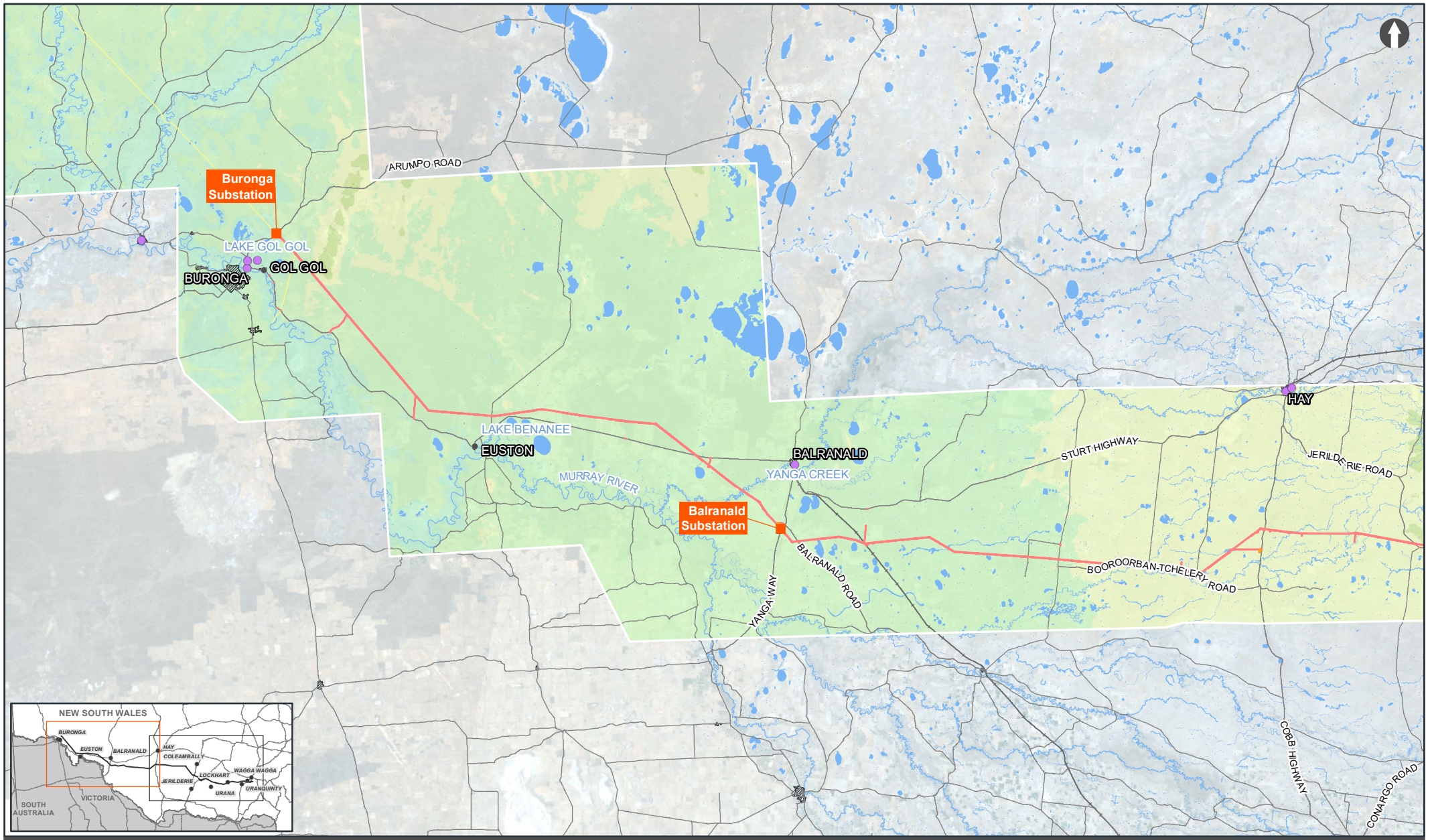
United States Environment Protection Authority, AP-42 Section 13.2.3: Heavy Construction Operation.

Appendix A

Topographical figure of the proposal area


Buronga Substation
ARUMPO ROAD
LAKE GOL GOL
GOL GOL
BURONGA
LAKE BENANEE
EUSTON
MURRAY RIVER
BALRANALD
YANGA CREEK
Balranald Substation
HAY
STURT HIGHWAY
JERILDERIE ROAD
BOOROORBAN-TCHELERI ROAD
BALRANALD ROAD
YANGA WAY
COBB HIGHWAY
CONARGO ROAD
NEW SOUTH WALES
VICTORIA
SOUTH AUSTRALIA
COLEAMBALLY
LOCKHART
WAGGA WAGGA
URANA
URANQUINTY
JERILDERIE
0 10 20 KM
Air Quality - Figure A-1
Project Components
Construction Impact Area
Main Construction Compounds and Accommodation Sites
Water Fill Point
Existing Transmission Line Infrastructure
Existing Substation
Existing Railway
Built Up Areas
Waterbody
Surface Elevation (10m intervals)
18 - 25
25 - 50
50 -75
75 - 100
100 - 125
125 - 150
150 - 175
175 - 200
200 - 225
225 - 250
250 - 275
275 - 300
300 - 325
325 - 350
350 - 375
375 - 400
400 - 425
425 - 450
450 - 475
475 - 500
500 - 525
525 - 550
550 - 575
575 - 60
Topography
Sheet 1 of 2
Source: NSWSS, ESRI, Transgrid, WSP
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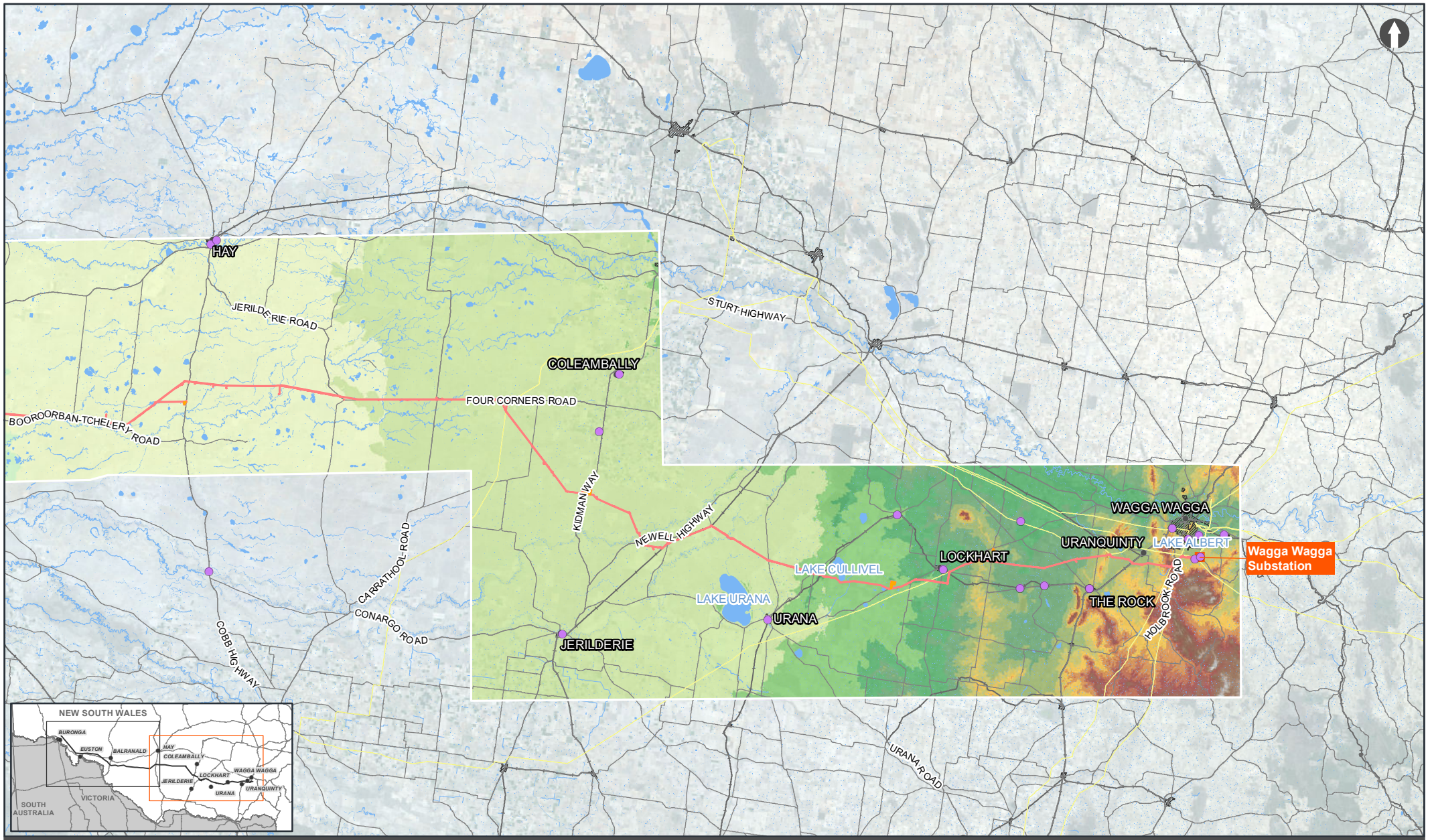

Air Quality - Figure A-1

Project Components
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Water Fill Point

- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Surface Elevation (10m intervals)

18 - 25	100 - 125	225 - 250	350 - 375	475 - 500
25 - 50	125 - 150	250 - 275	375 - 400	500 - 525
50 -75	150 - 175	275 - 300	400 - 425	525 - 550
75 - 100	175 - 200	300 - 325	425 - 450	550 - 575
	200 - 225	325 - 350	450 - 475	575 - 60

Topography

Sheet 2 of 2

Source: NSWSS, ESRI, Transgrid, WSP

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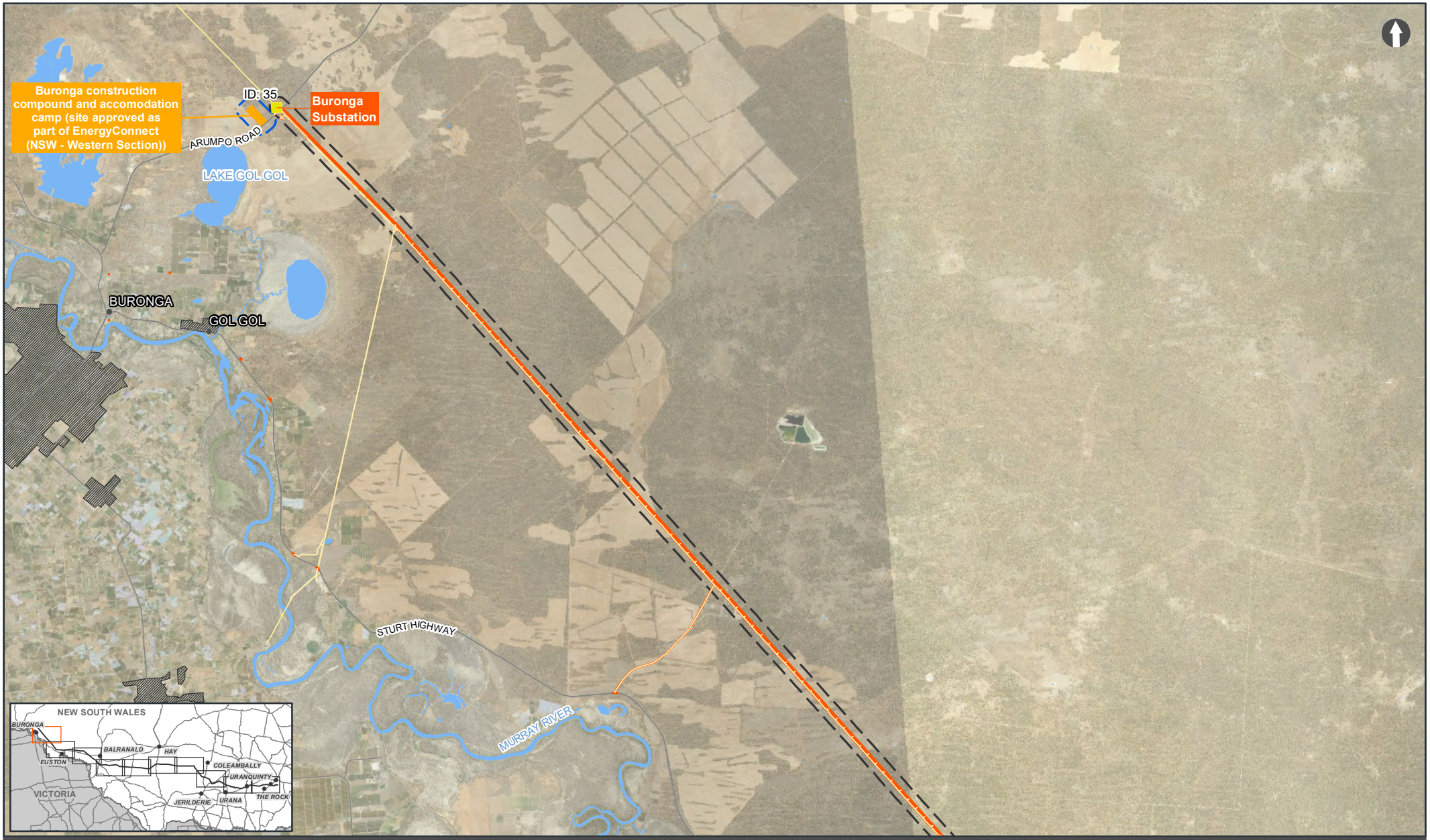
Appendix B

Location of identified sensitive receptors along the transmission line



Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors

- Utility facility (1)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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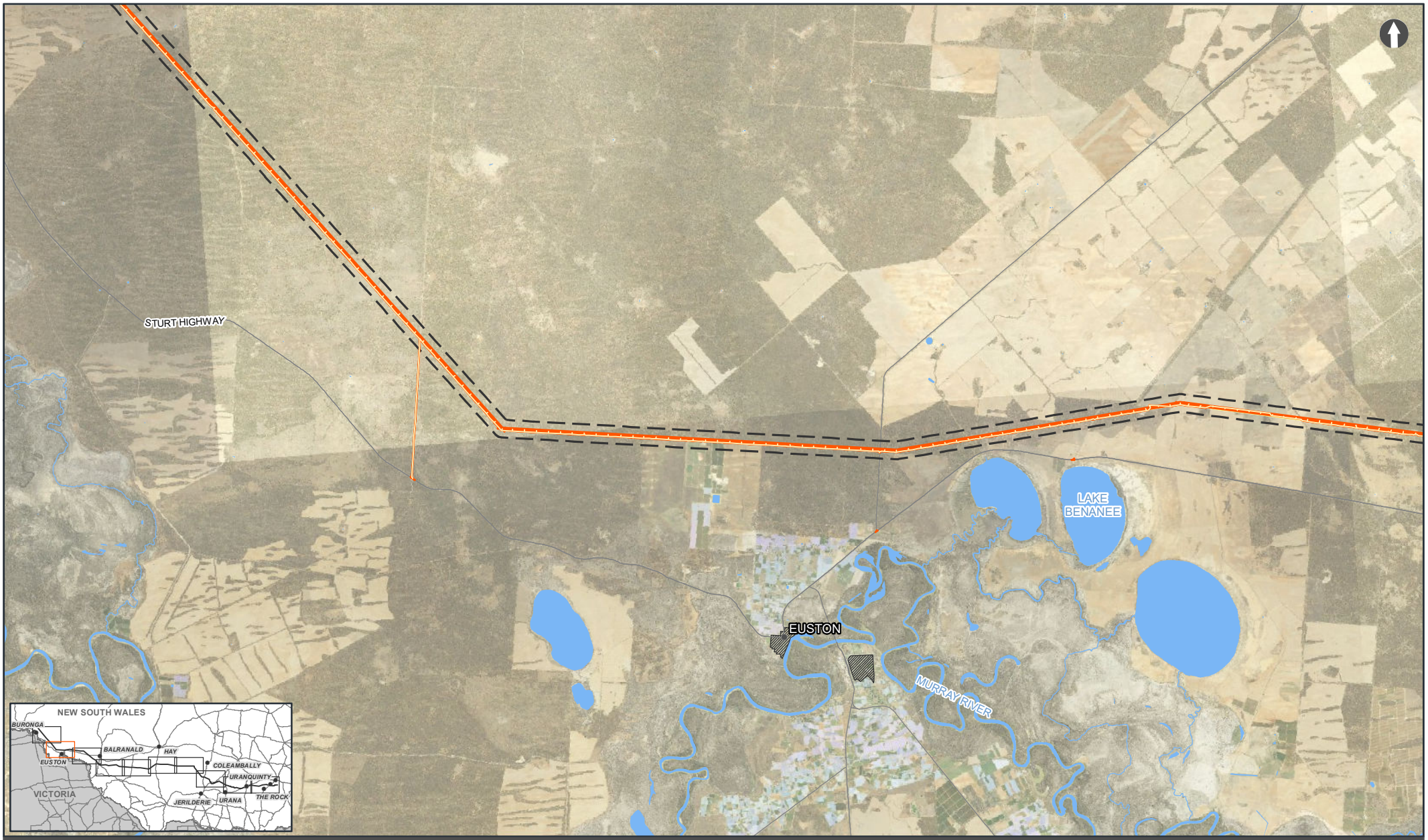

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Air Quality - Figure B-1

Sensitive Receptors

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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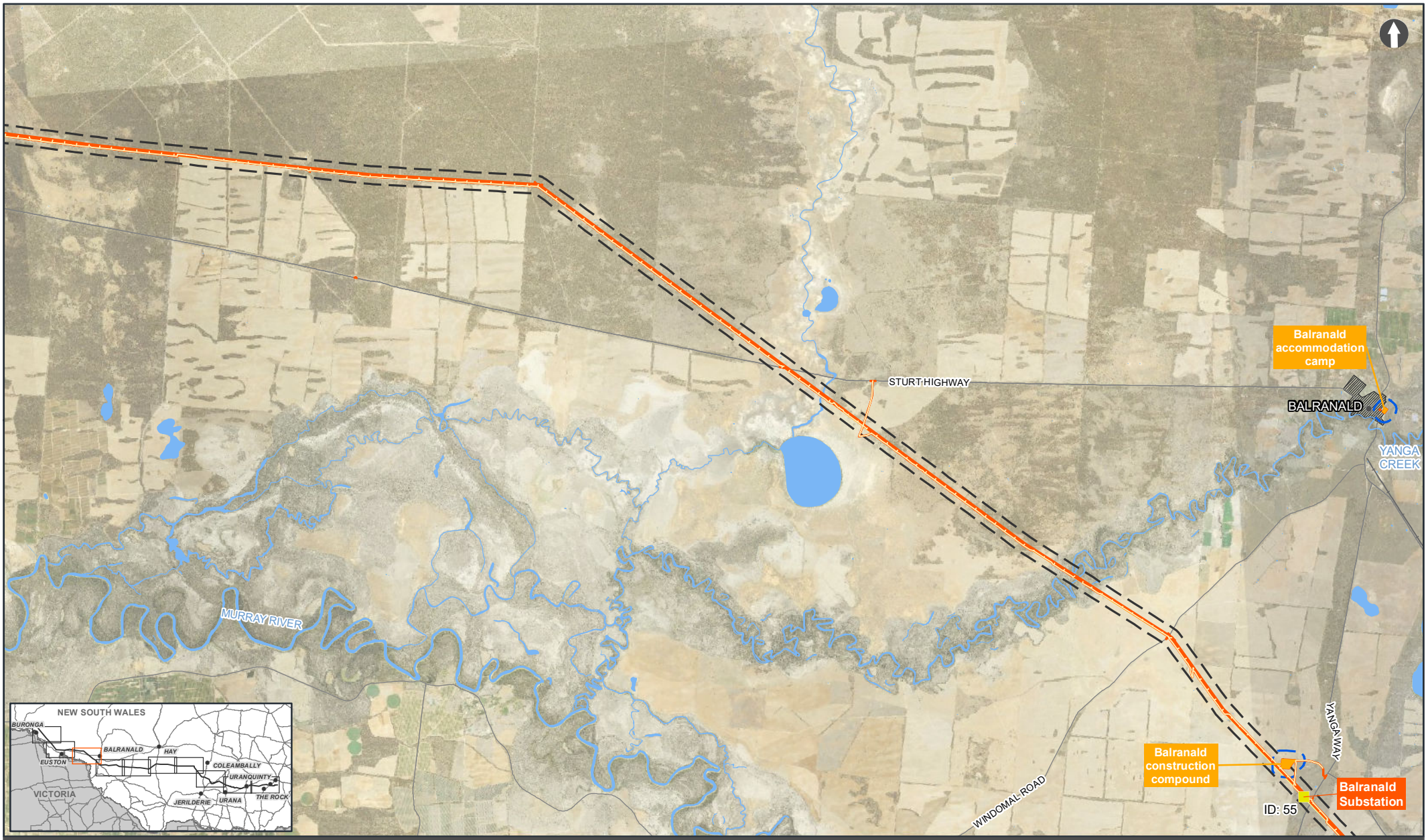

Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors

- Utility facility (1)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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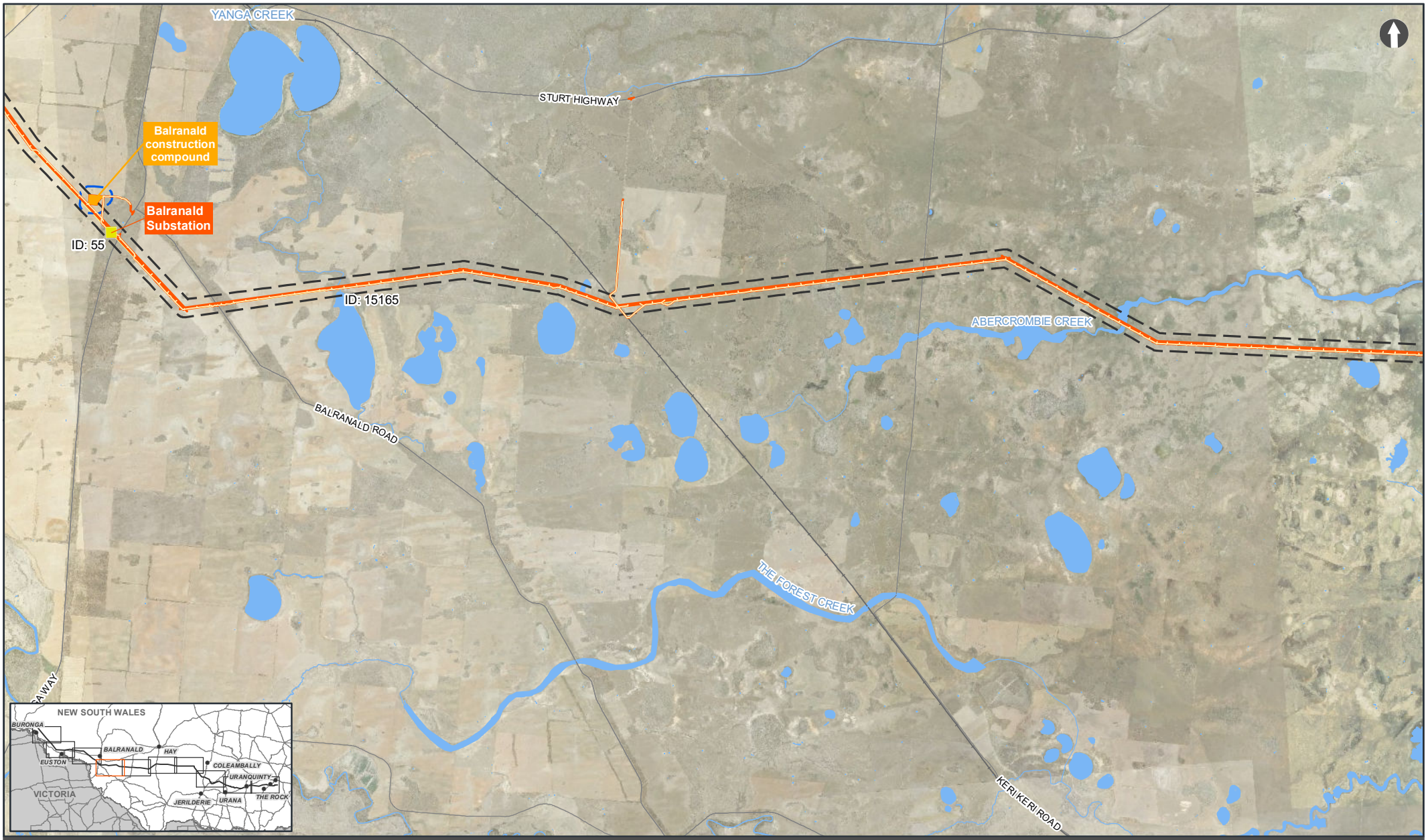


Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

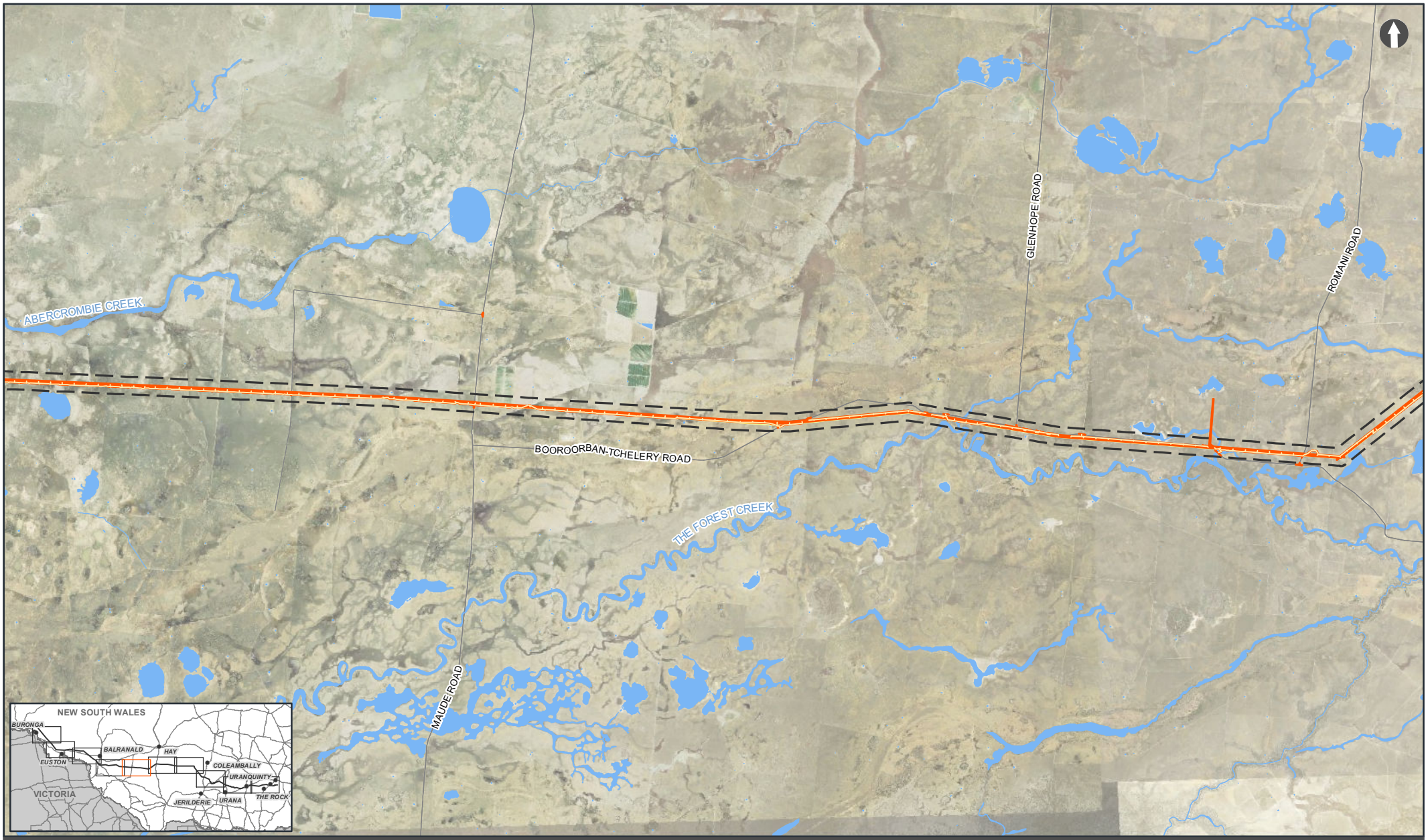
Sensitive Receptors

- Utility facility (1)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixB\PS117658_AQ_B001_SensitiveReceptors_r1v5.mxd



Air Quality - Figure B-1

Sensitive Receptors

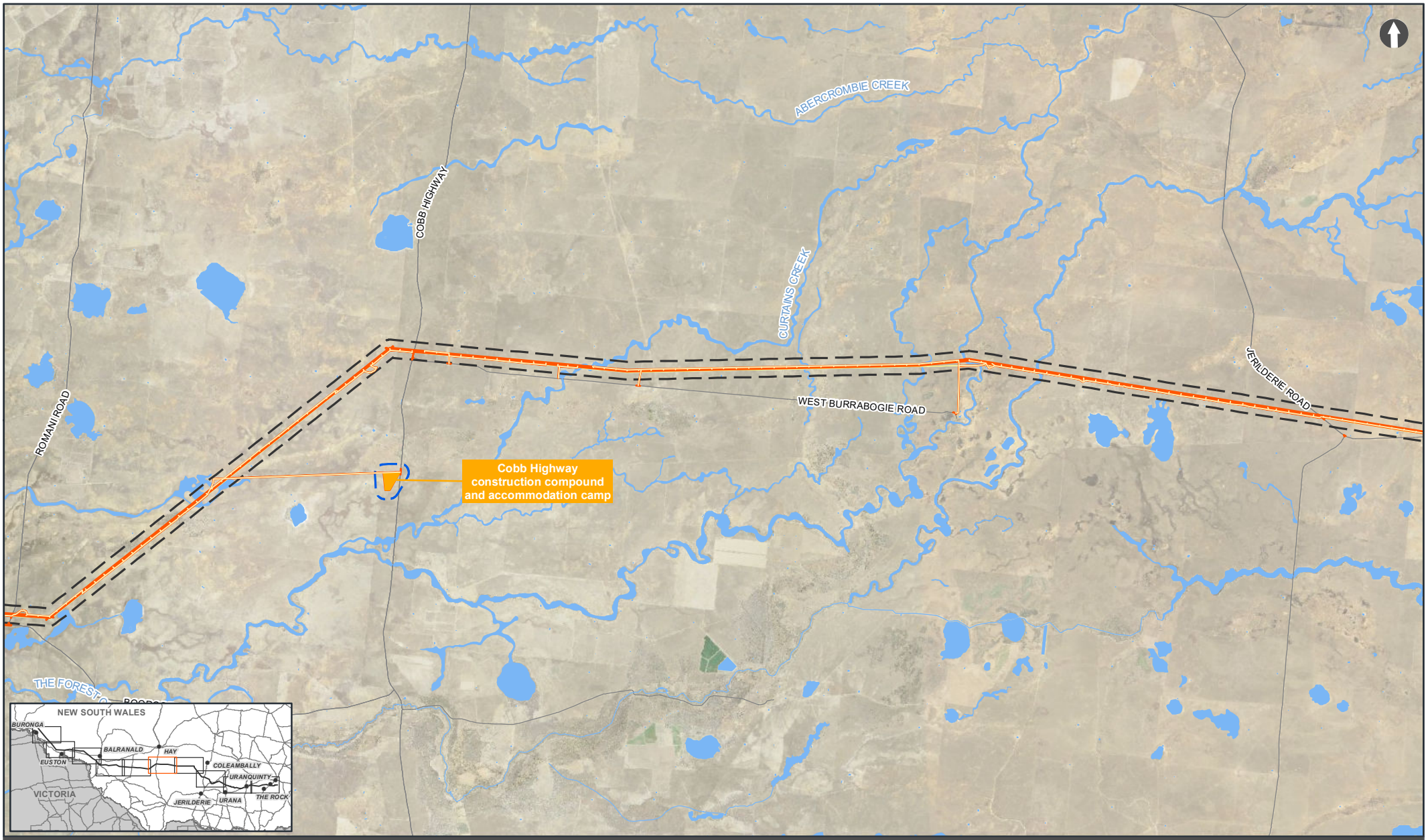
Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixB\PS117658_AQ_B001_SensitiveReceptors_r1v5.mx



Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixB\PS117658_AQ_B001_SensitiveReceptors_r1v5.mxd

Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors

- Residential dwelling (1)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors

- Community facility (1)
- Residential dwelling (2)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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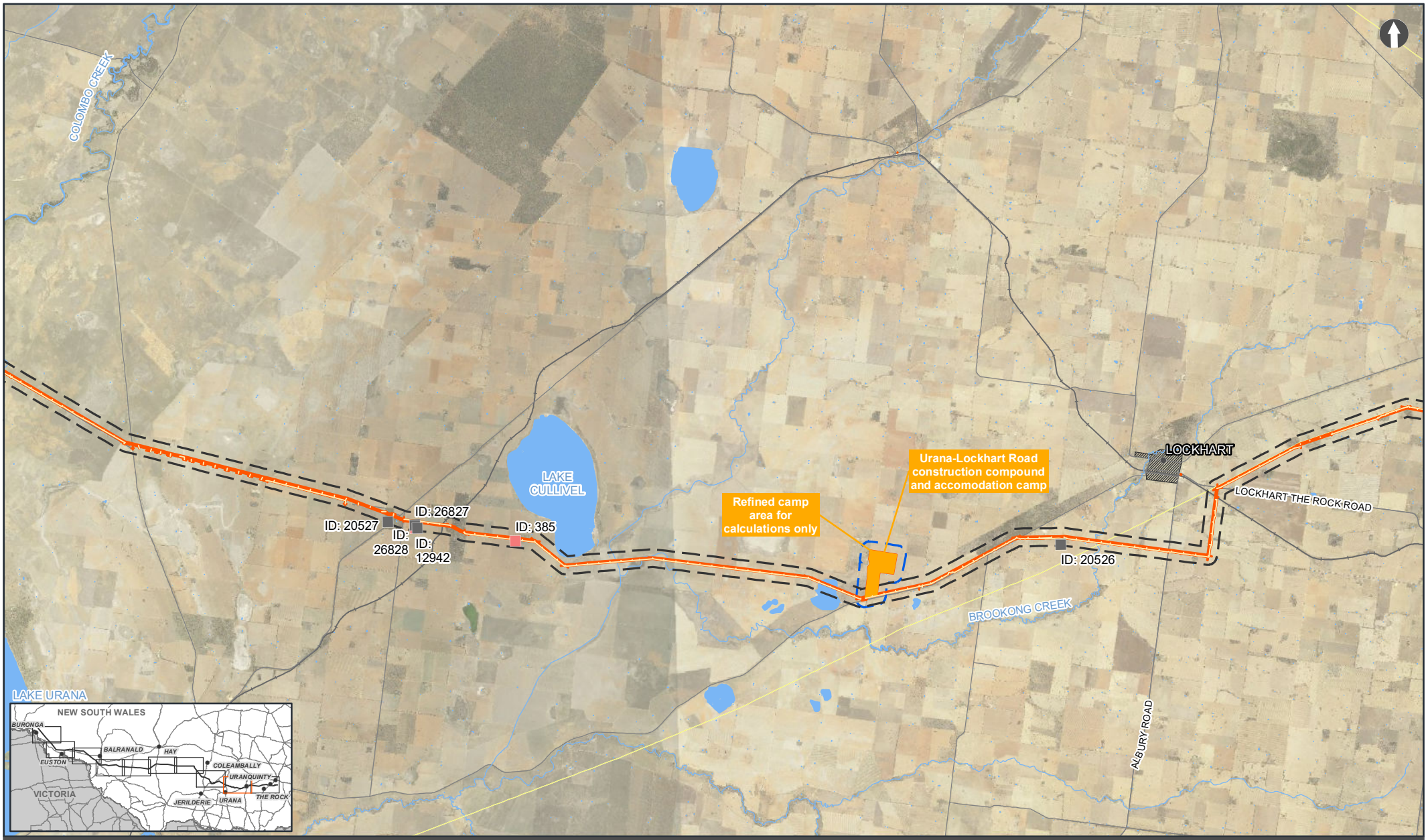

Air Quality - Figure B-1

Sensitive Receptors

Project Components

- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors

- Industry facility (4)
- Residential dwelling (2)

Sheet 10 of 10

Source: NSWSS, ESRI, Transgrid, WSP

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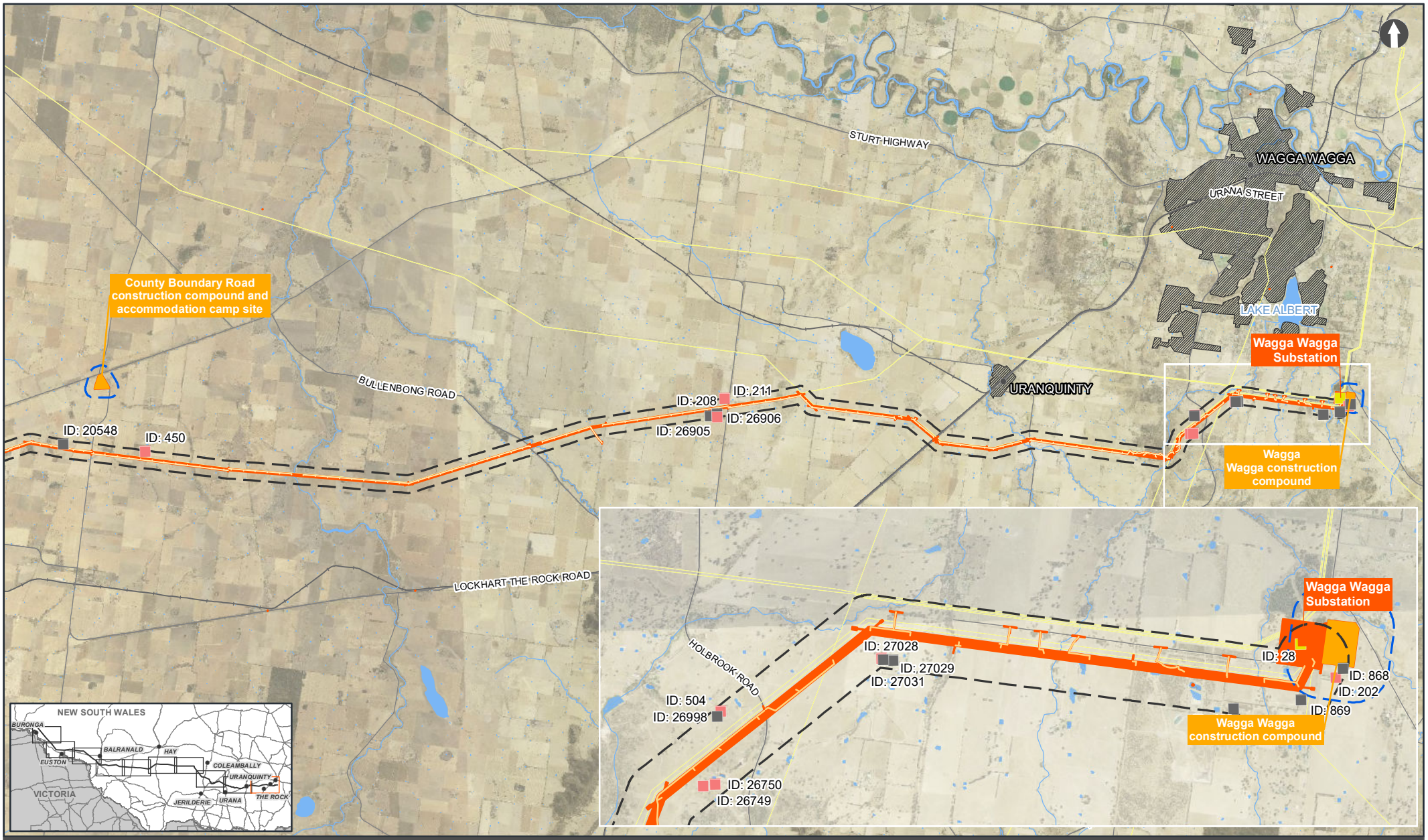

Air Quality - Figure B-1

Sensitive Receptors

Project Components
- Construction Impact Area
- Main Construction Compounds and Accommodation Sites
- Access Tracks
- Within 350m of the Proposal
- Within 350m of Main Construction Compounds and Accomodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation
- Existing Railway
- Built Up Areas
- Waterbody

Sensitive Receptors
- Industry facility (9)
- Residential dwelling (9)
- Utility facility (1)

Source: NSWSS, ESRI, Transgrid, WSP

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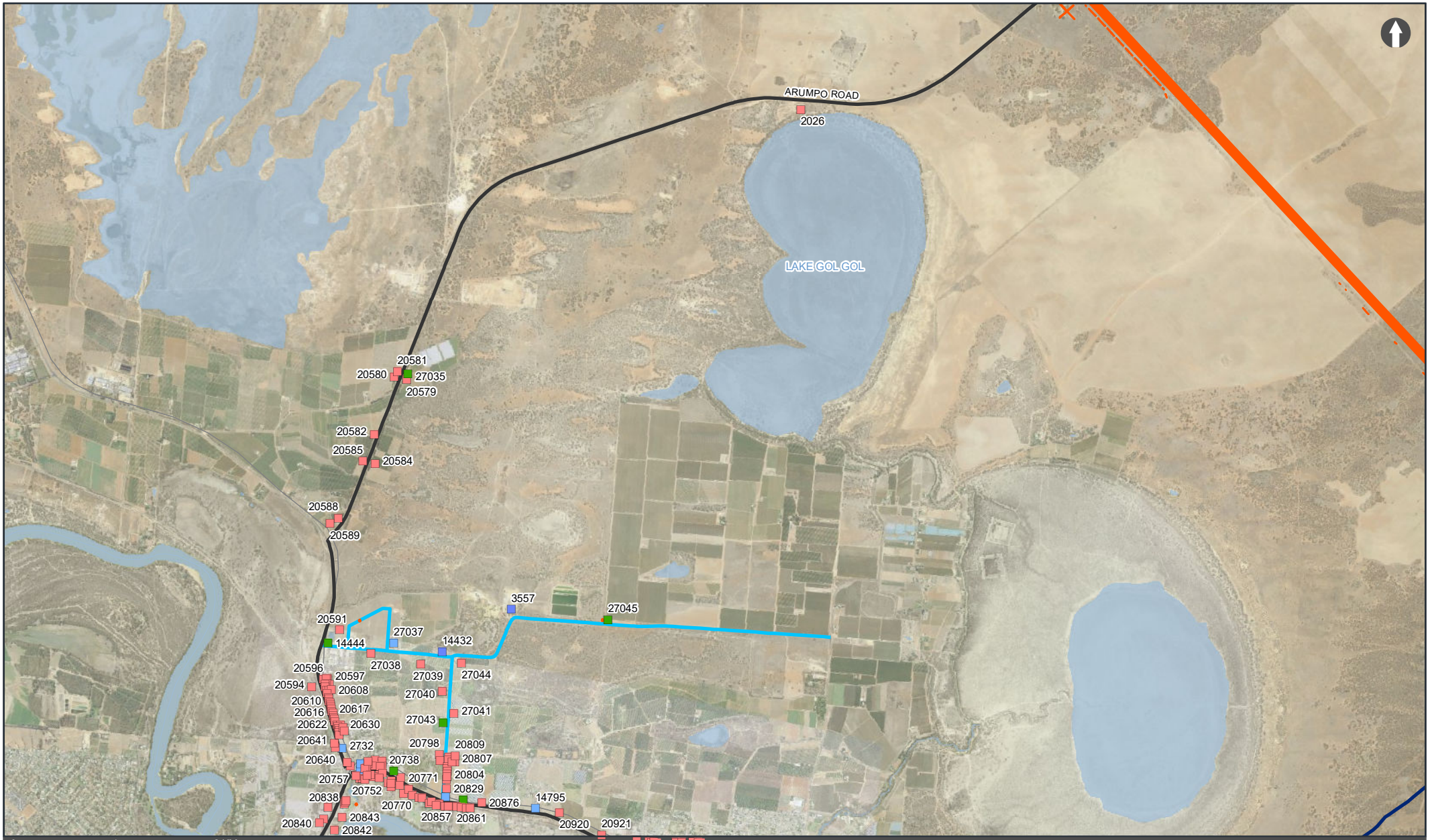
Appendix C

Sensitive receptor figures along the proposed local haulage routes

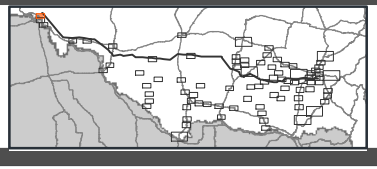


Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (7)
Industry facility (6)
Residential dwelling (122)
Utility facility (2)



Sensitive Receivers within 100m of Haulage Routes

(sheet 1 of 84)

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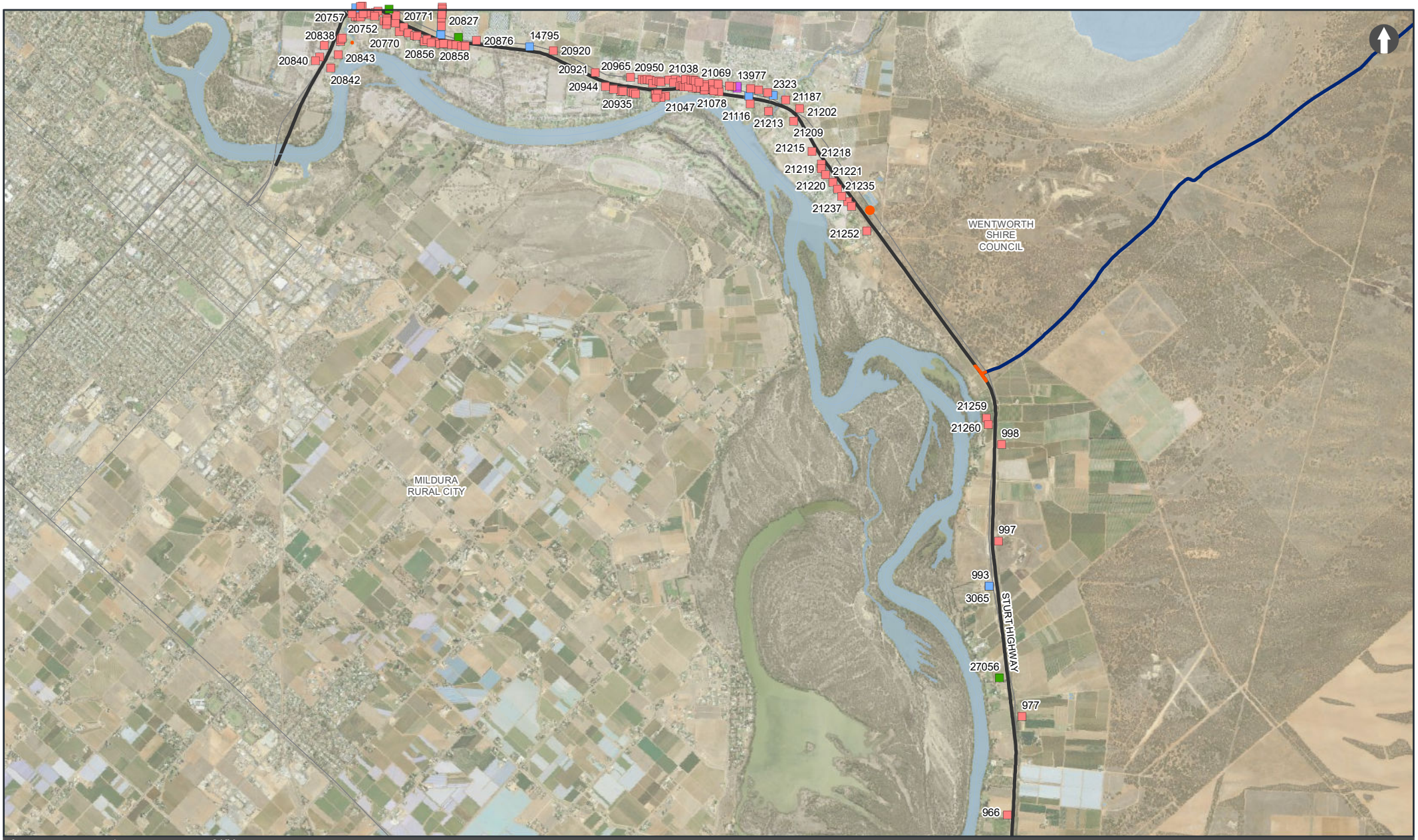
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (7)
Education facility (2)
Industry facility (3)
Residential dwelling (127)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 2 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (4)

Sensitive Receivers within 100m of Haulage Routes

(sheet 3 of 84)

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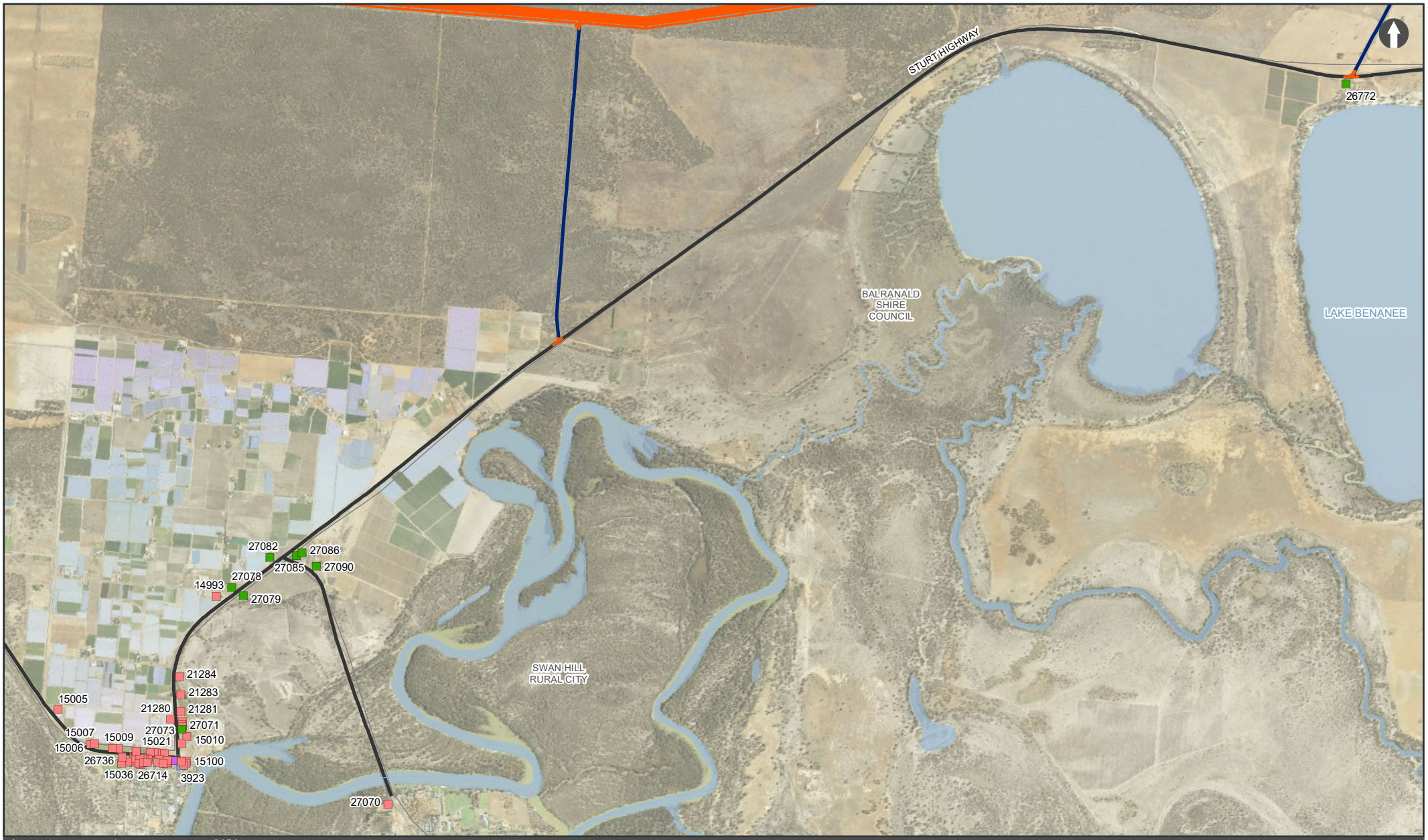
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 4 of 84)

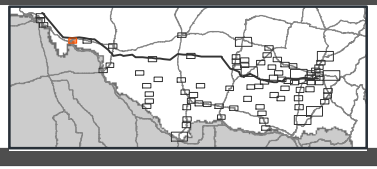
- Construction Impact Area
- Existing Substation
- Existing Railway
- Watercourse

Transport Routes

- Primary Haulage Route
- Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)

- Community facility (1)
- Education facility (1)
- Industry facility (8)
- Residential dwelling (52)



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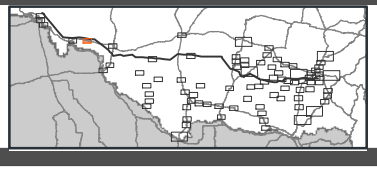
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 5 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (12)
Industry facility (7)
Recreation facility (1)
Residential dwelling (139)

Sensitive Receivers within 100m of Haulage Routes

(sheet 6 of 84)

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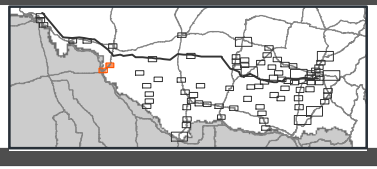
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Industry facility (1)
Residential dwelling (15)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 7 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (6)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 8 of 84)

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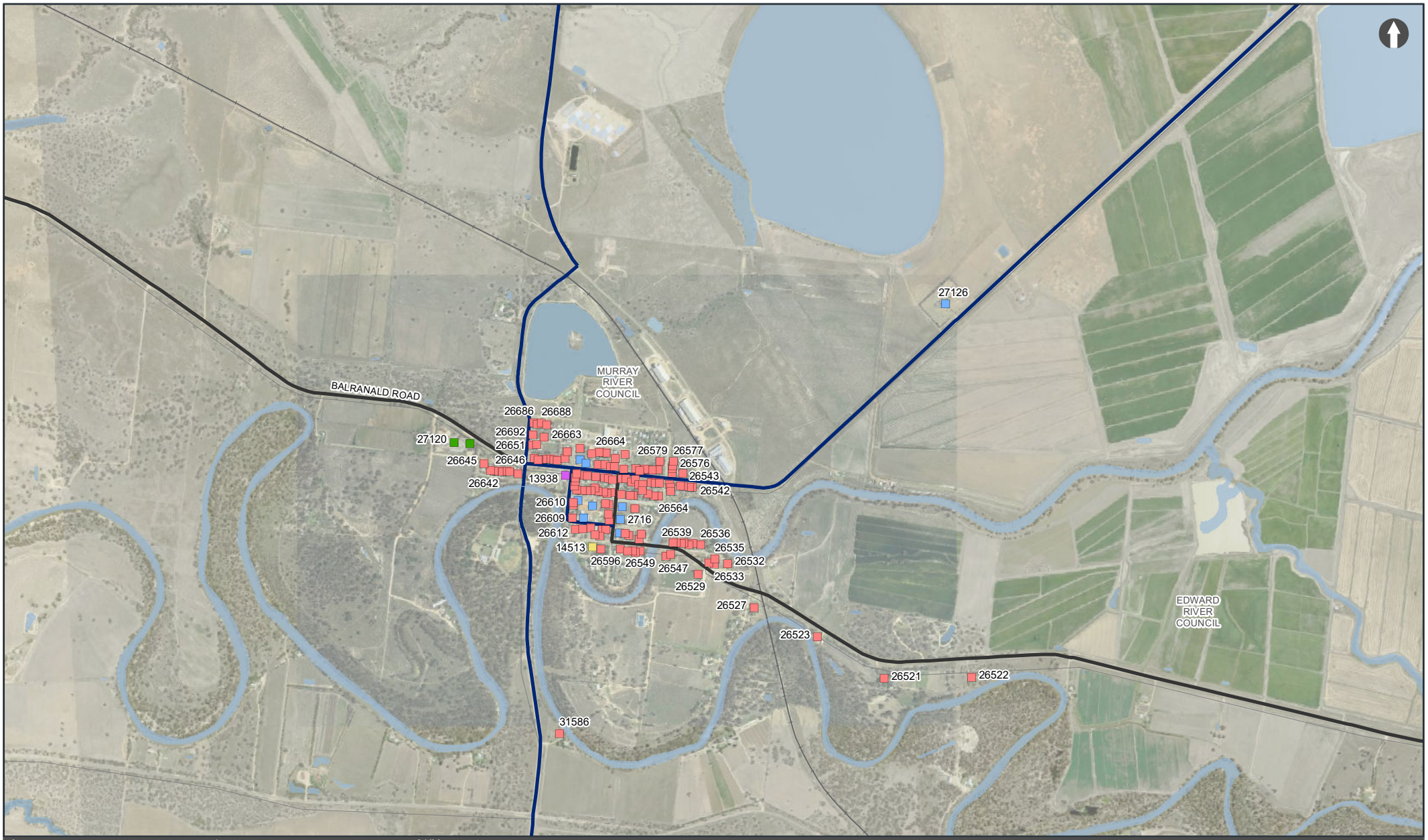
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (135)
Community facility (9)
Education facility (1)
Industry facility (2)
Medical facility (1)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 9 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

(sheet 10 of 84)

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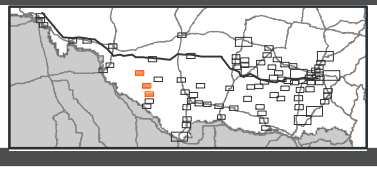
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 11 of 84)

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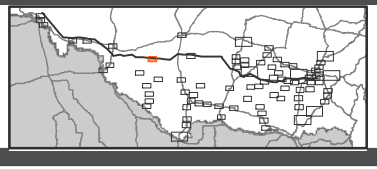
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Industry facility (1)



Sensitive Receivers within 100m of Haulage Routes

(sheet 12 of 84)

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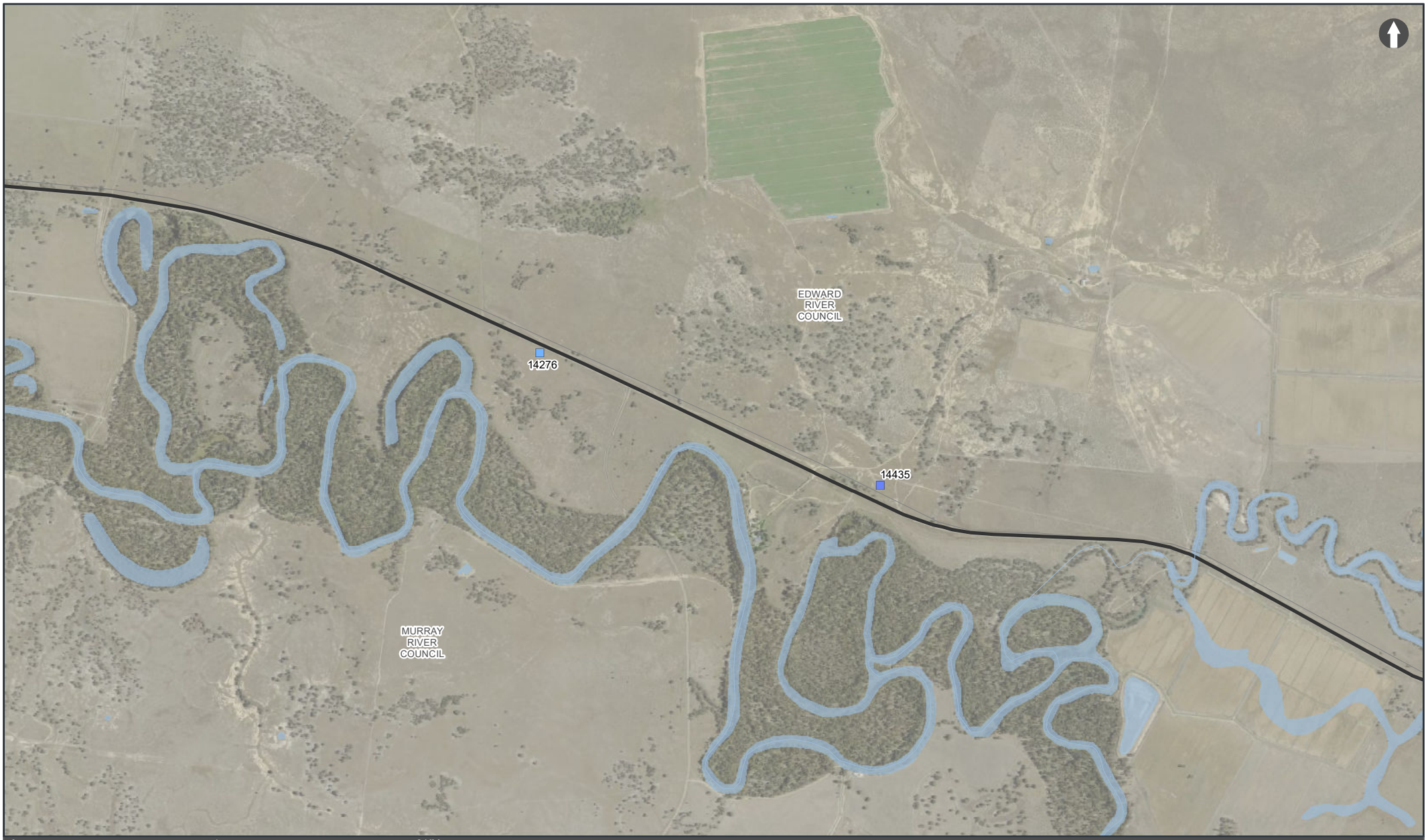
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Utility facility (1)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 13 of 84)

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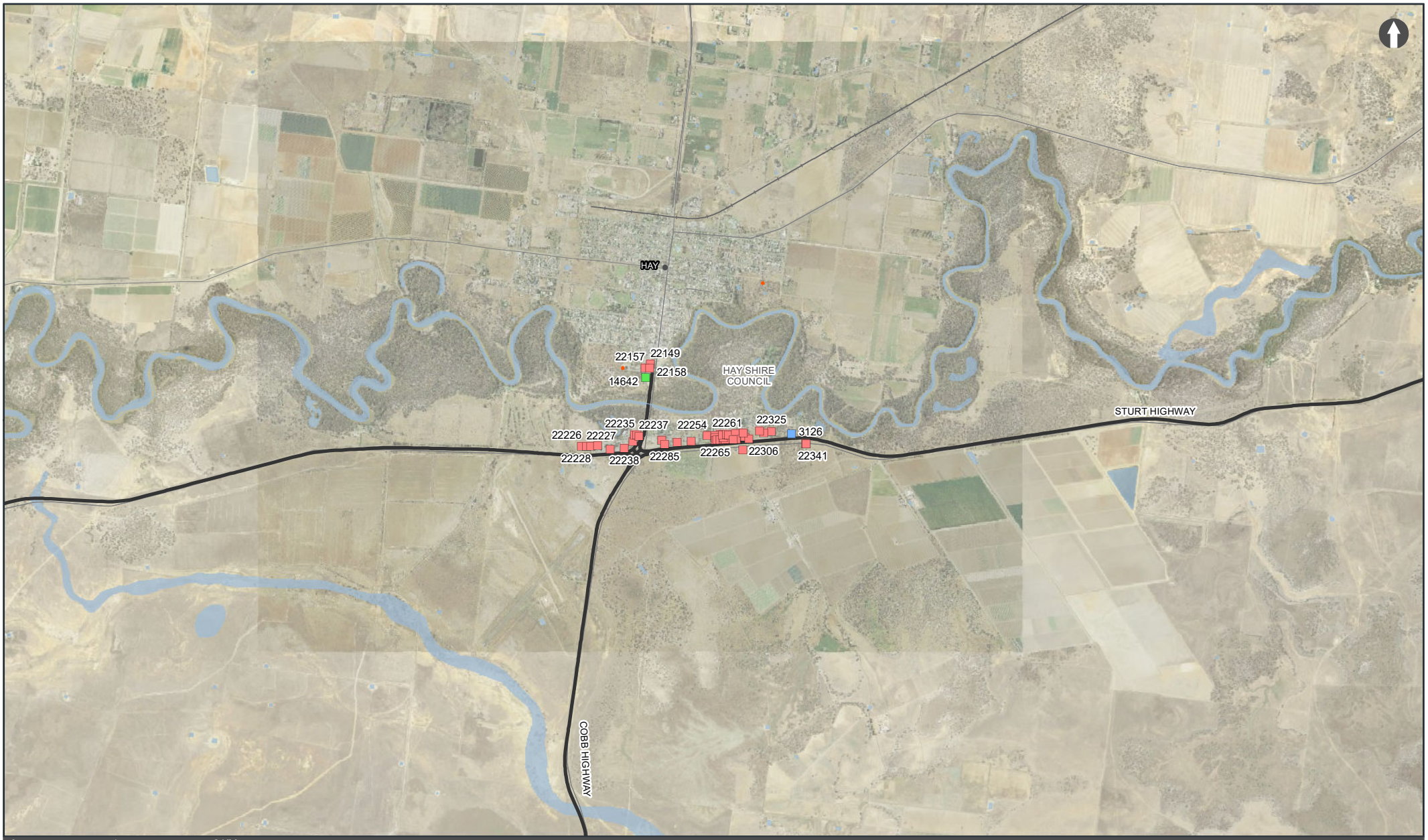
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Recreation facility (1)
Residential dwelling (43)

Sensitive Receivers within 100m of Haulage Routes

(sheet 14 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

0 1 2 KM

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (2)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 15 of 84)

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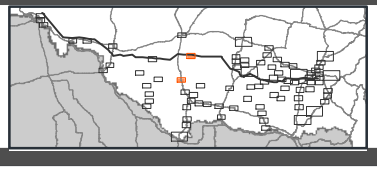
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (3)

Sensitive Receivers within 100m of Haulage Routes

(sheet 17 of 84)

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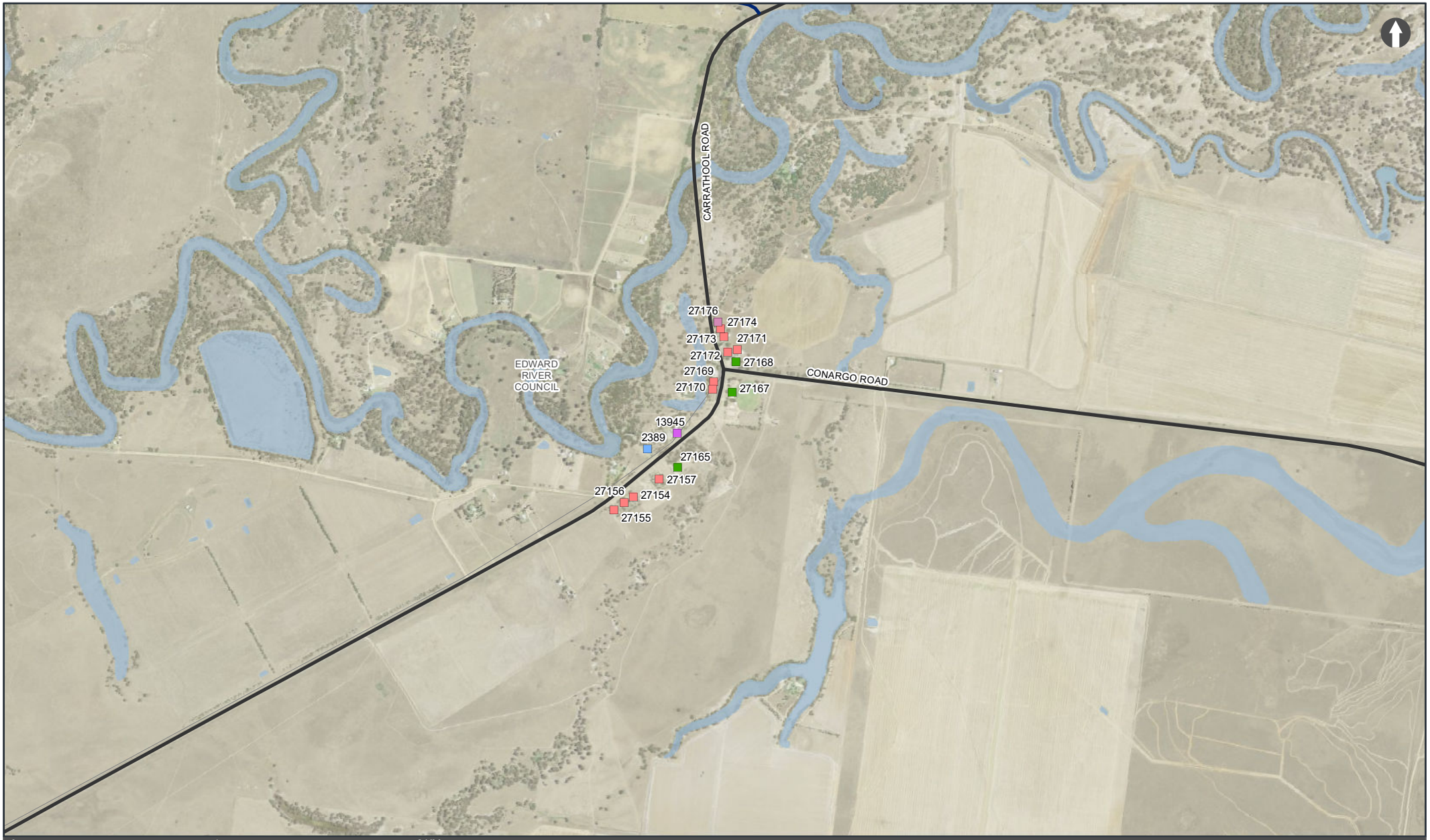
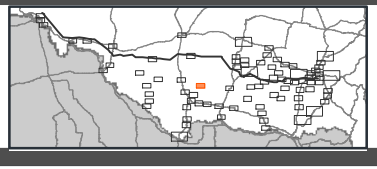


Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (10)
Community facility (1)
Education facility (1)
Industry facility (3)
Religious facility (1)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 18 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Industry facility (2)
Residential dwelling (8)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 19 of 84)

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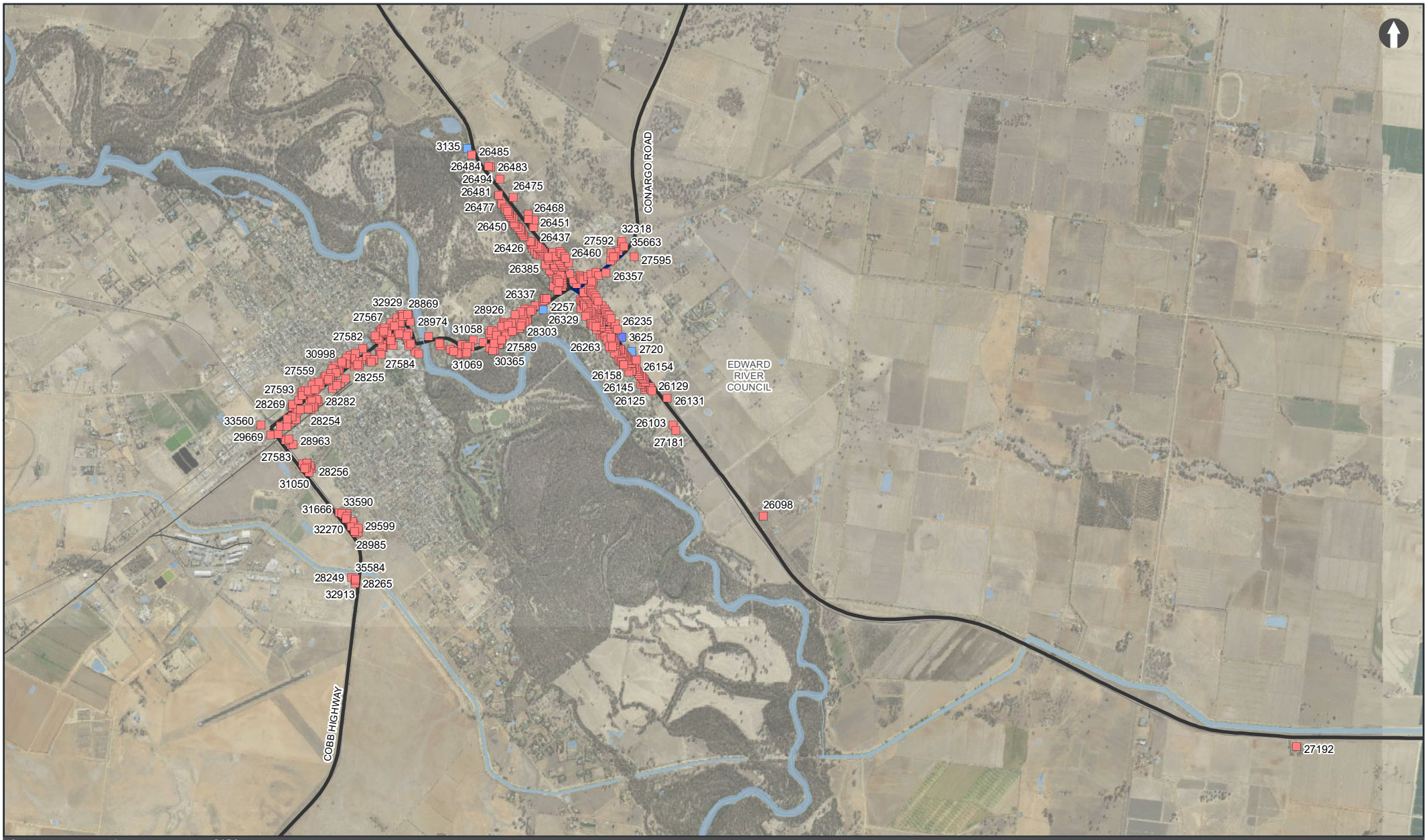
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (3)
Residential dwelling (474)
Utility facility (1)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 20 of 84)

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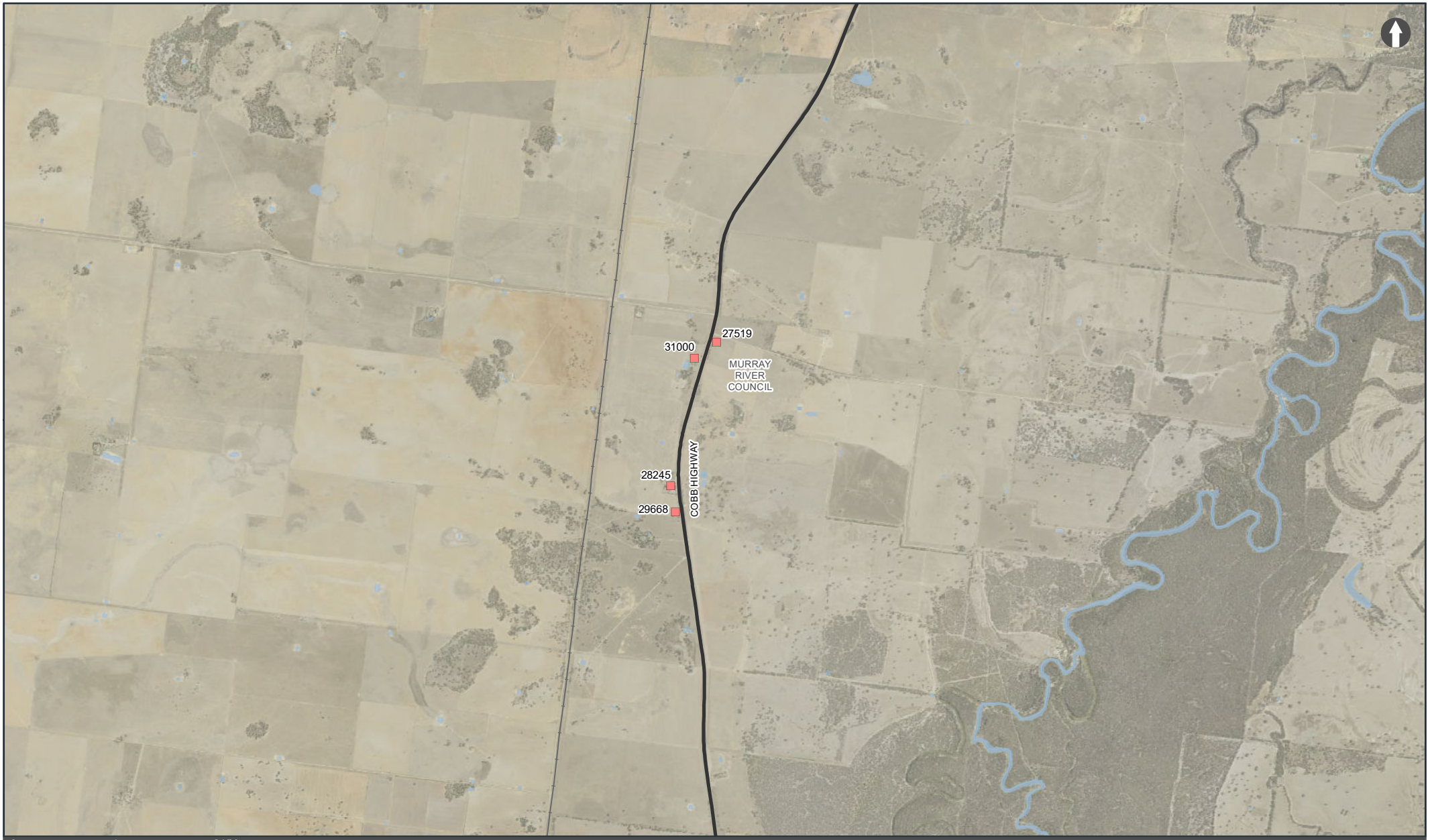
Source: NSWSS, ESRI, Transgrid, WSP

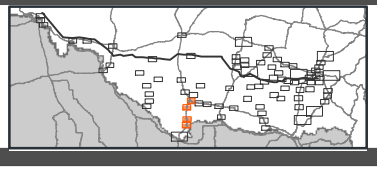


Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (4)



Sensitive Receivers within 100m of Haulage Routes

(sheet 21 of 84)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixC\PS117658_AQ_C001_SensitiveReceiversWithin100mHaulage_r1v3.mxd

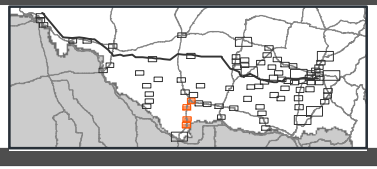
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (77)



Sensitive Receivers within 100m of Haulage Routes

(sheet 22 of 84)

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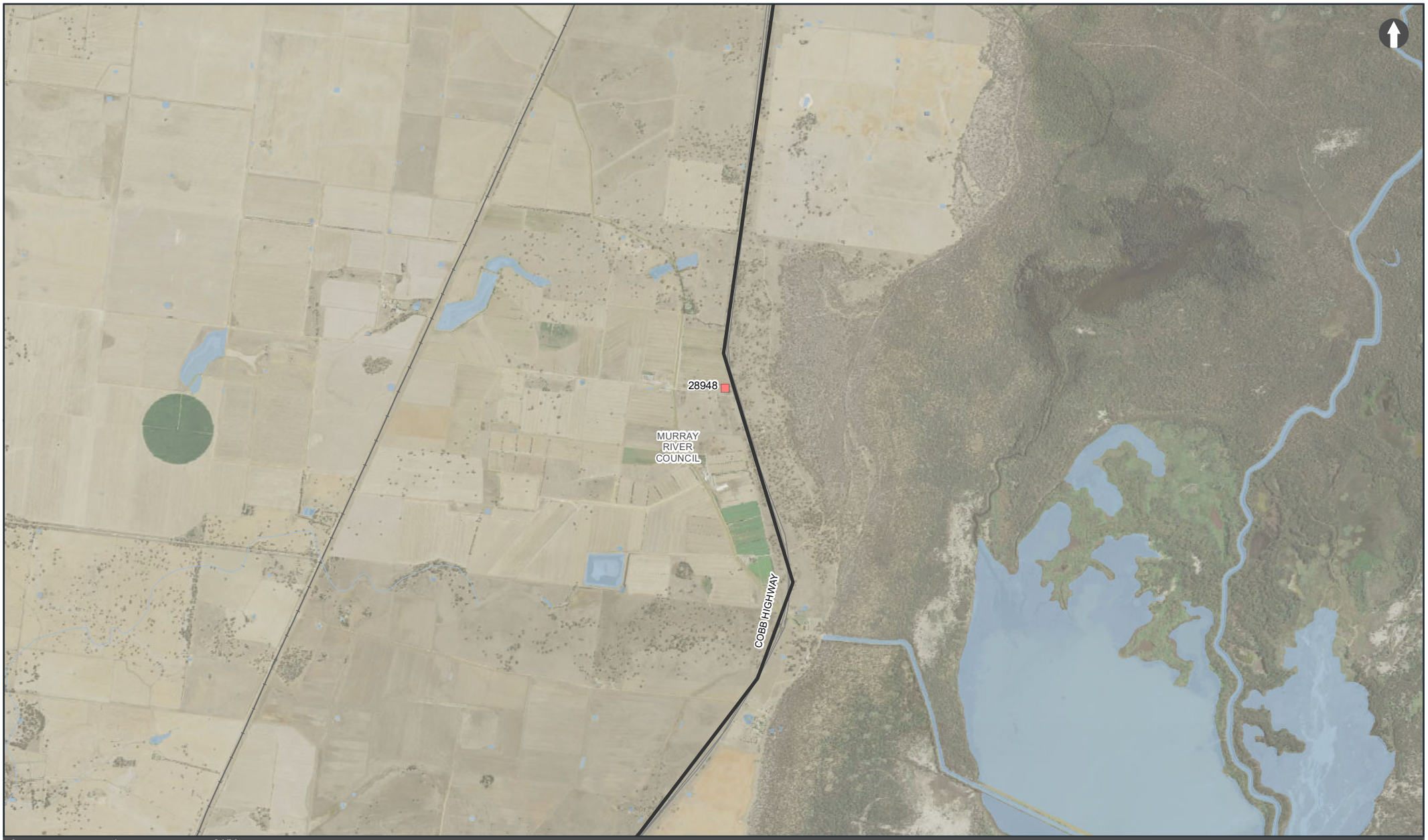
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

(sheet 23 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Industry facility (1)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (6)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (171)
Community facility (4)
Education facility (1)
Industry facility (3)
Recreation facility (2)

Sensitive Receivers within 100m of Haulage Routes

(sheet 26 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (13)
Medical facility (1)
Recreation facility (5)
Utility facility (1)

Sensitive Receivers within 100m of Haulage Routes

(sheet 27 of 84)

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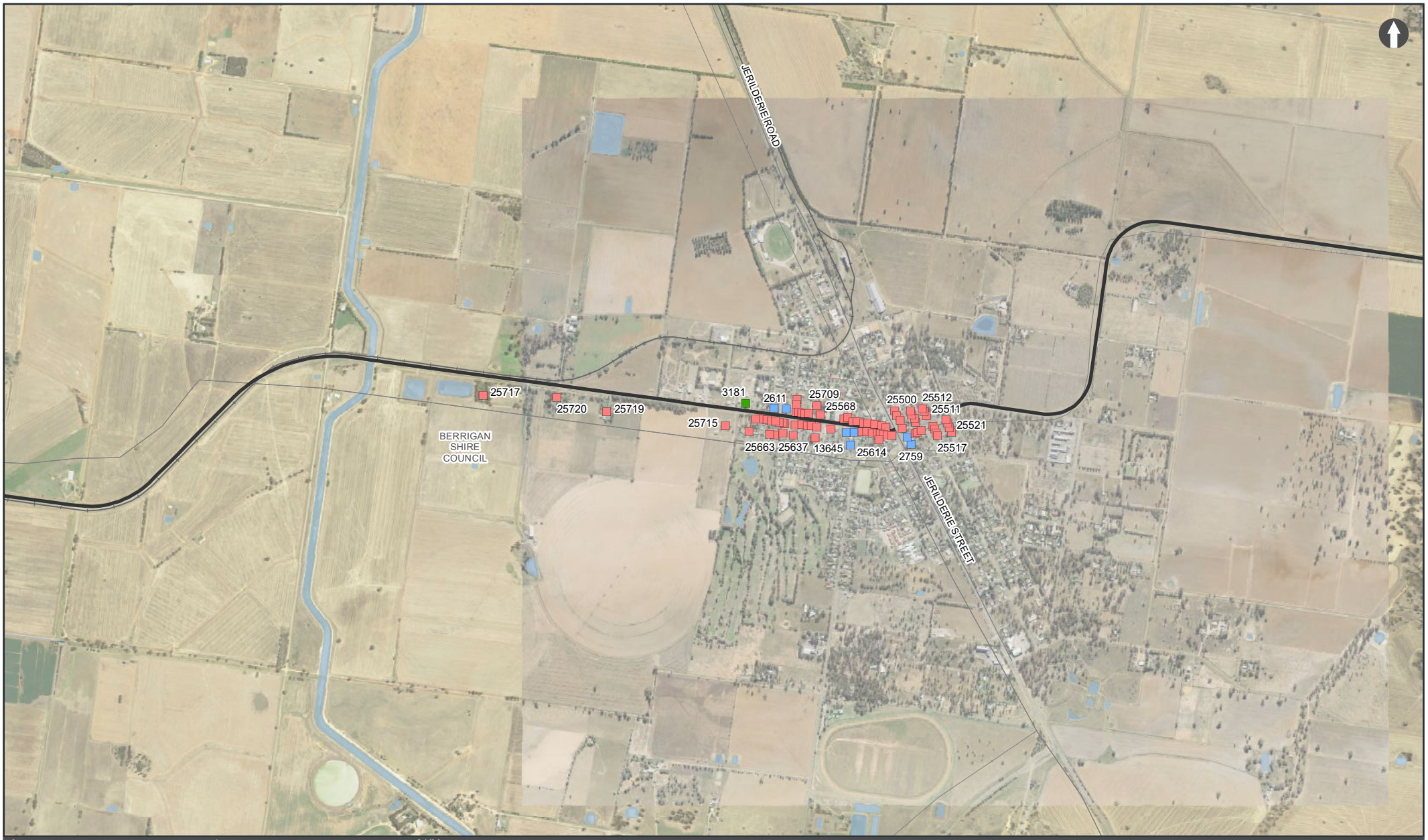
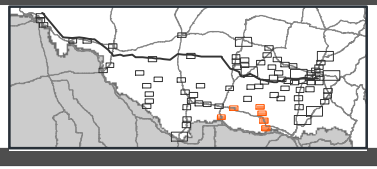
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (7)
Industry facility (1)
Residential dwelling (73)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 28 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (7)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 29 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (11)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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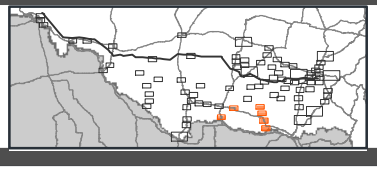
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (12)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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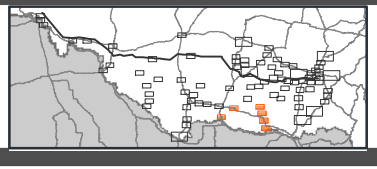
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (14)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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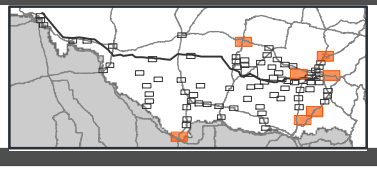
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (3)
Utility facility (1)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 34 of 84)

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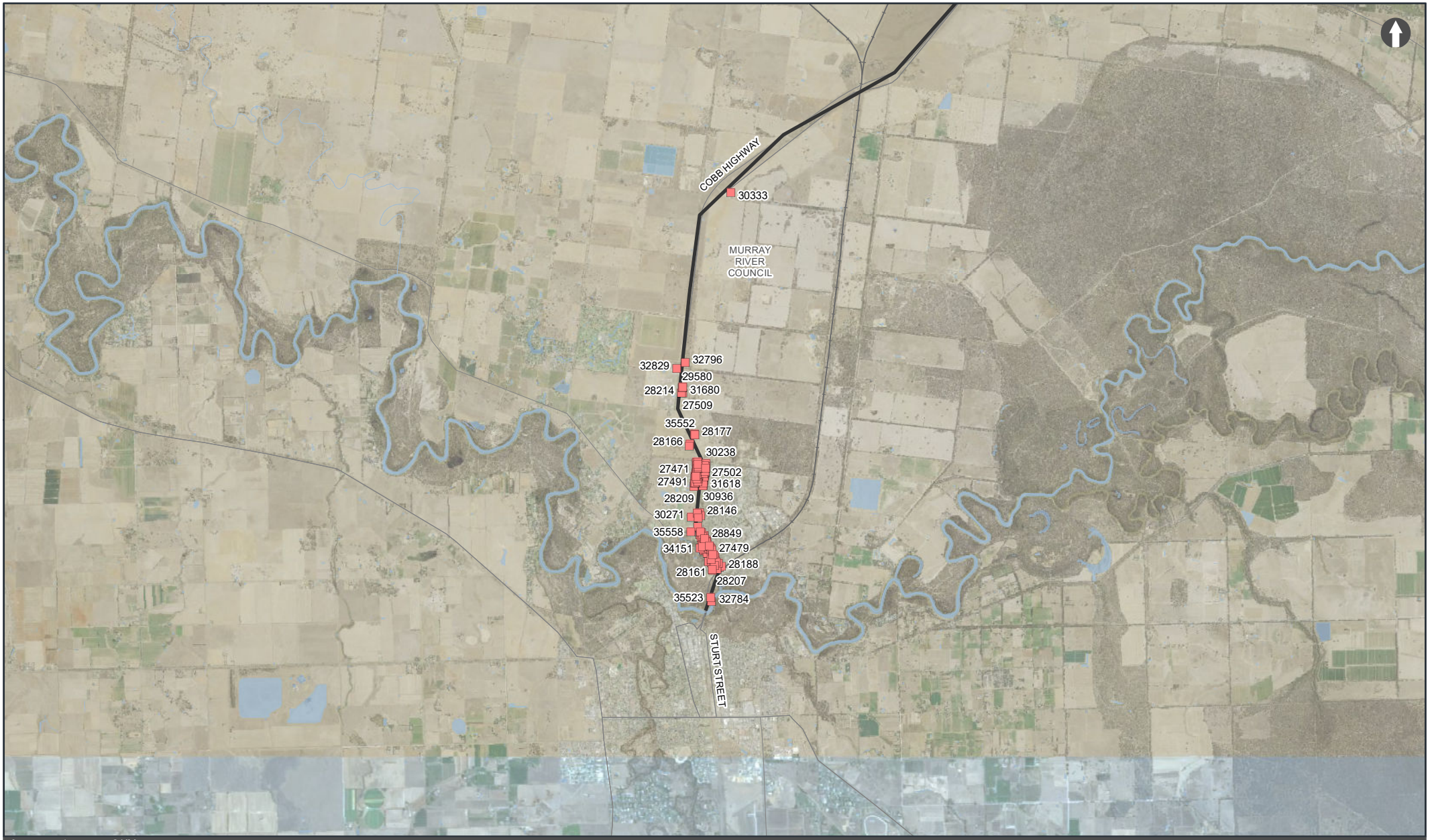
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (163)

Sensitive Receivers within 100m of Haulage Routes

(sheet 35 of 84)

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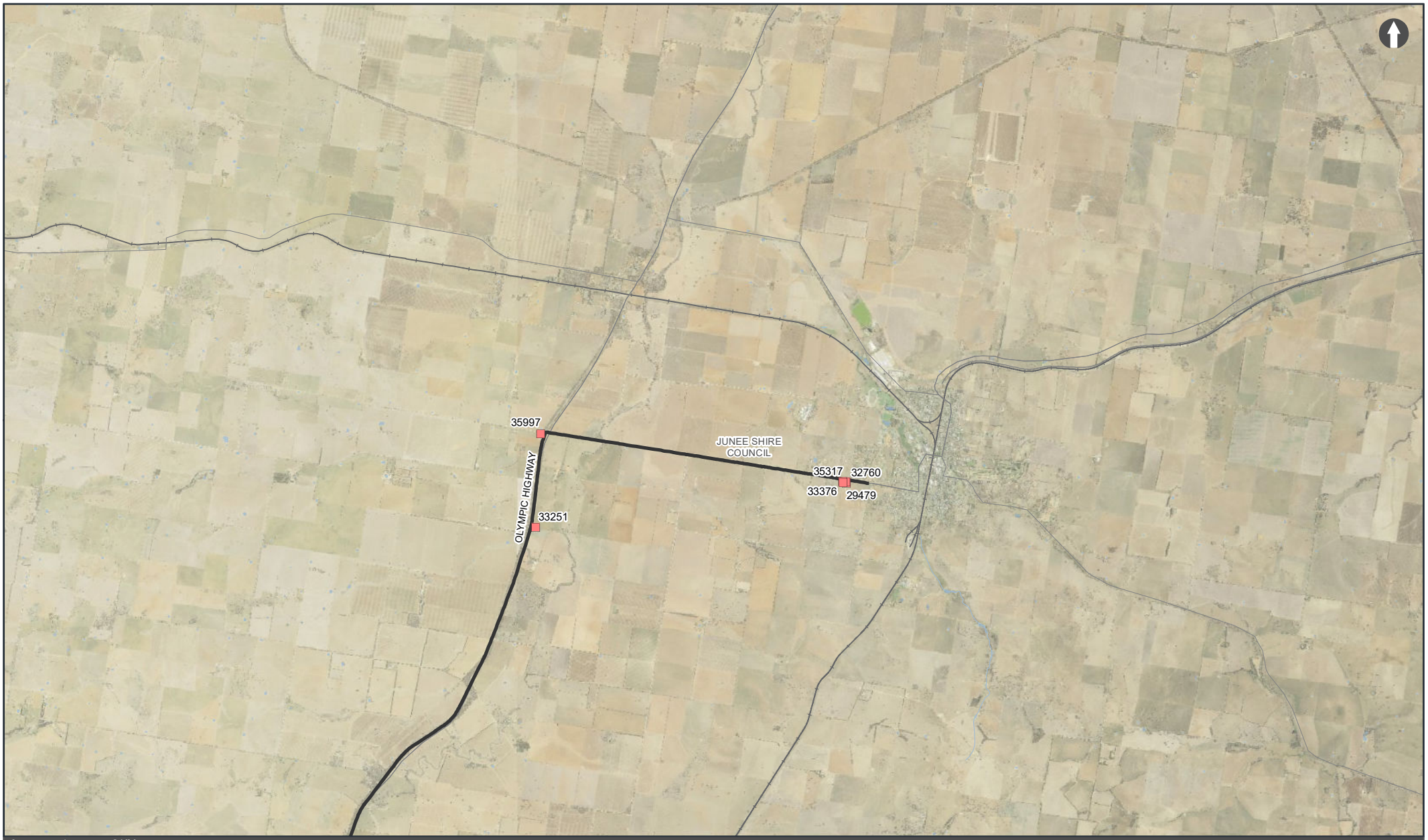
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (6)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (14)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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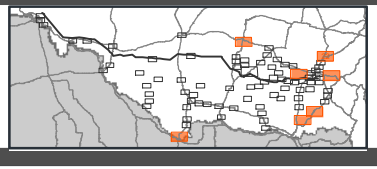
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (16)



Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (22)

Sensitive Receivers within 100m of Haulage Routes

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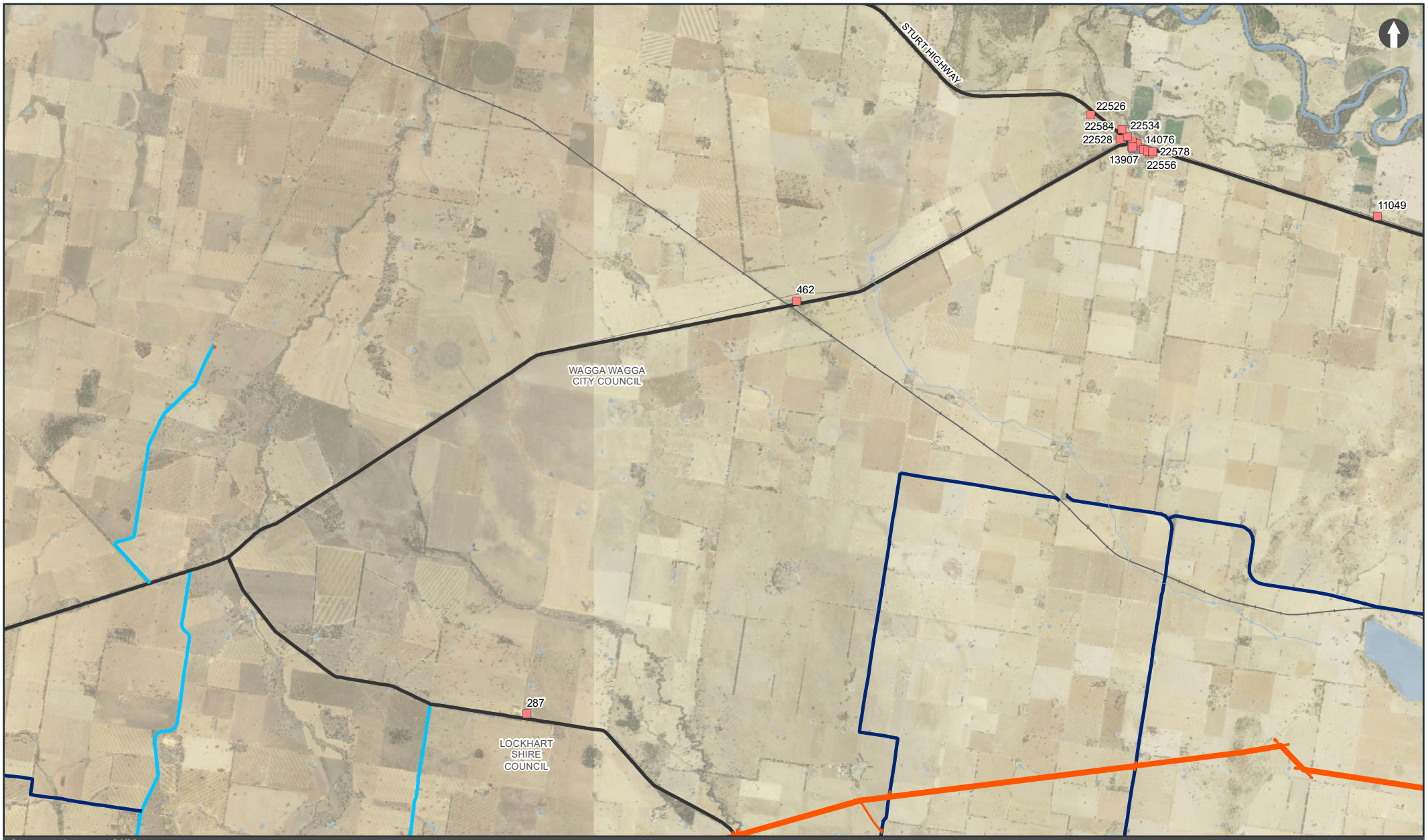
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Education facility (1)
Residential dwelling (20)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)

Sensitive Receivers within 100m of Haulage Routes

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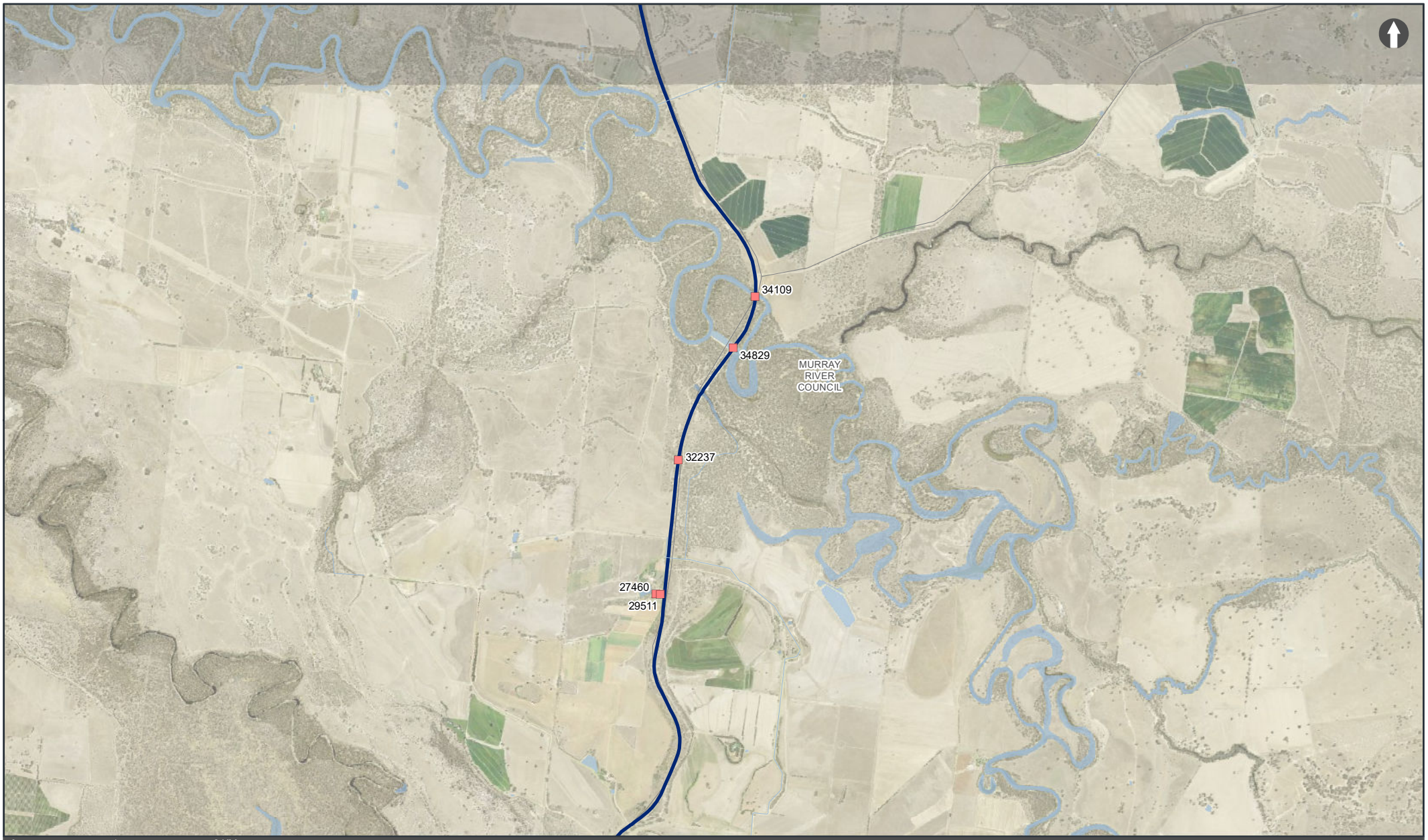
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (5)

Sensitive Receivers within 100m of Haulage Routes

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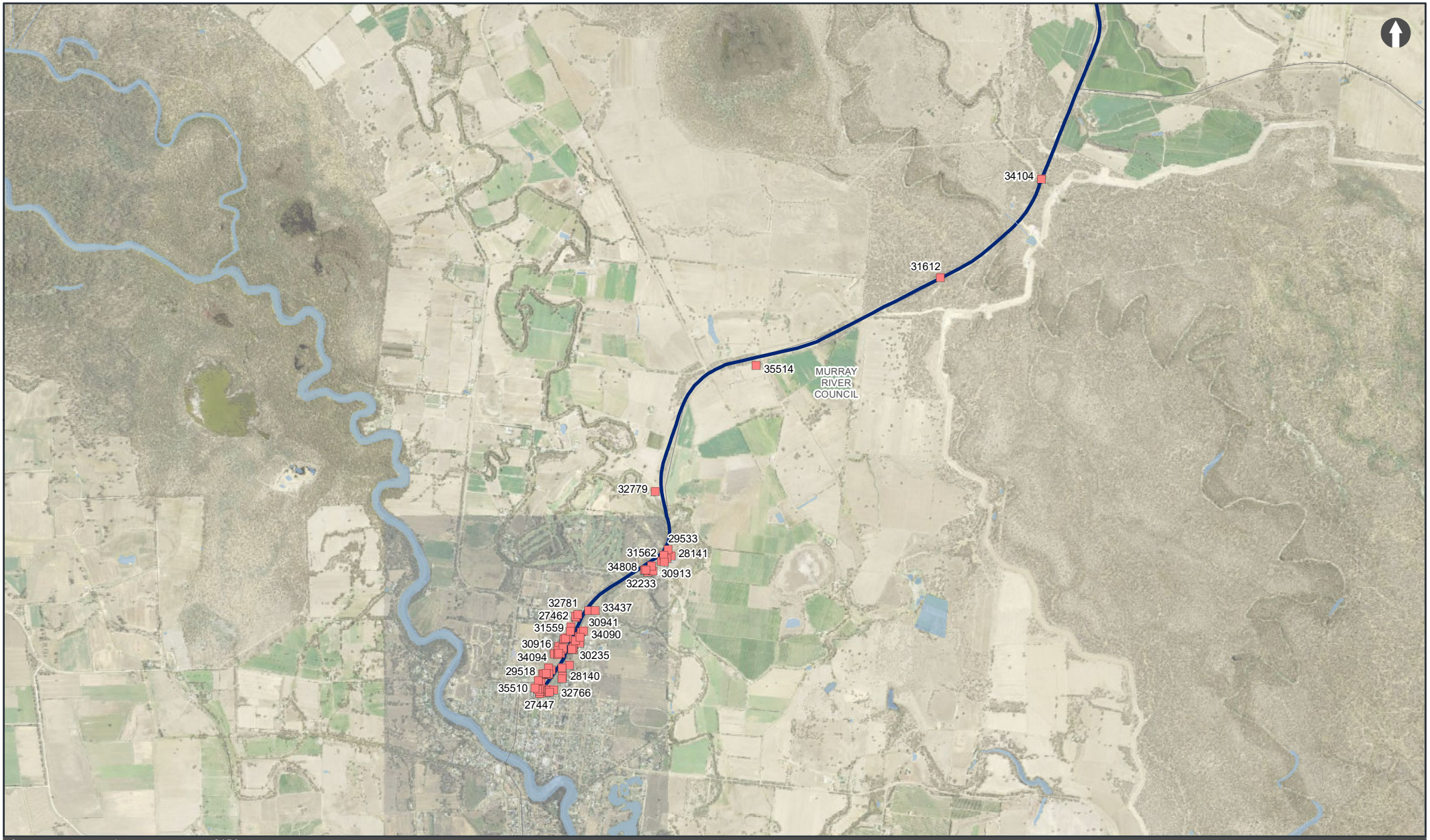
Source: NSWSS, ESRI, Transgrid, WSP

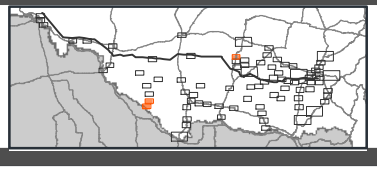


Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (70)



Sensitive Receivers within 100m of Haulage Routes

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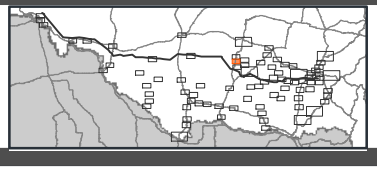
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (3)



Sensitive Receivers within 100m of Haulage Routes

(sheet 44 of 84)

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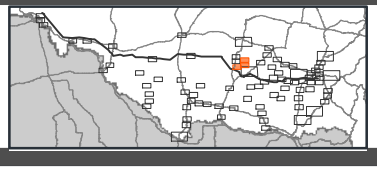
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Collector Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)



Sensitive Receivers within 100m of Haulage Routes

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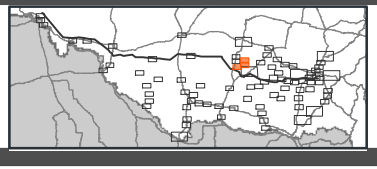
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Collector Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (6)



Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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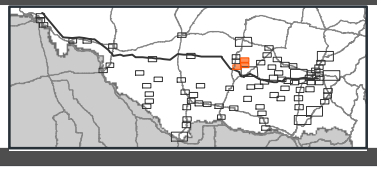
Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Local Haulage Route
Collector Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (3)



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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

(sheet 48 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

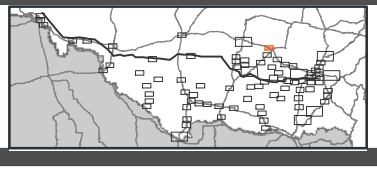
Sensitive Receivers within 100m of Haulage Routes

(sheet 49 of 84)

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Recreation facility (1)
Residential dwelling (3)



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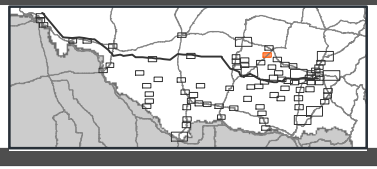
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (1)



Sensitive Receivers within 100m of Haulage Routes

(sheet 50 of 84)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixC\PS117658_AQ_C001_SensitiveReceiversWithin100mHaulage_r1v3.mxd

Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (2)
Residential dwelling (14)

Sensitive Receivers within 100m of Haulage Routes

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C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixC\PS117658_AQ_C001_SensitiveReceiversWithin100mHaulage_r1v3.mxd

Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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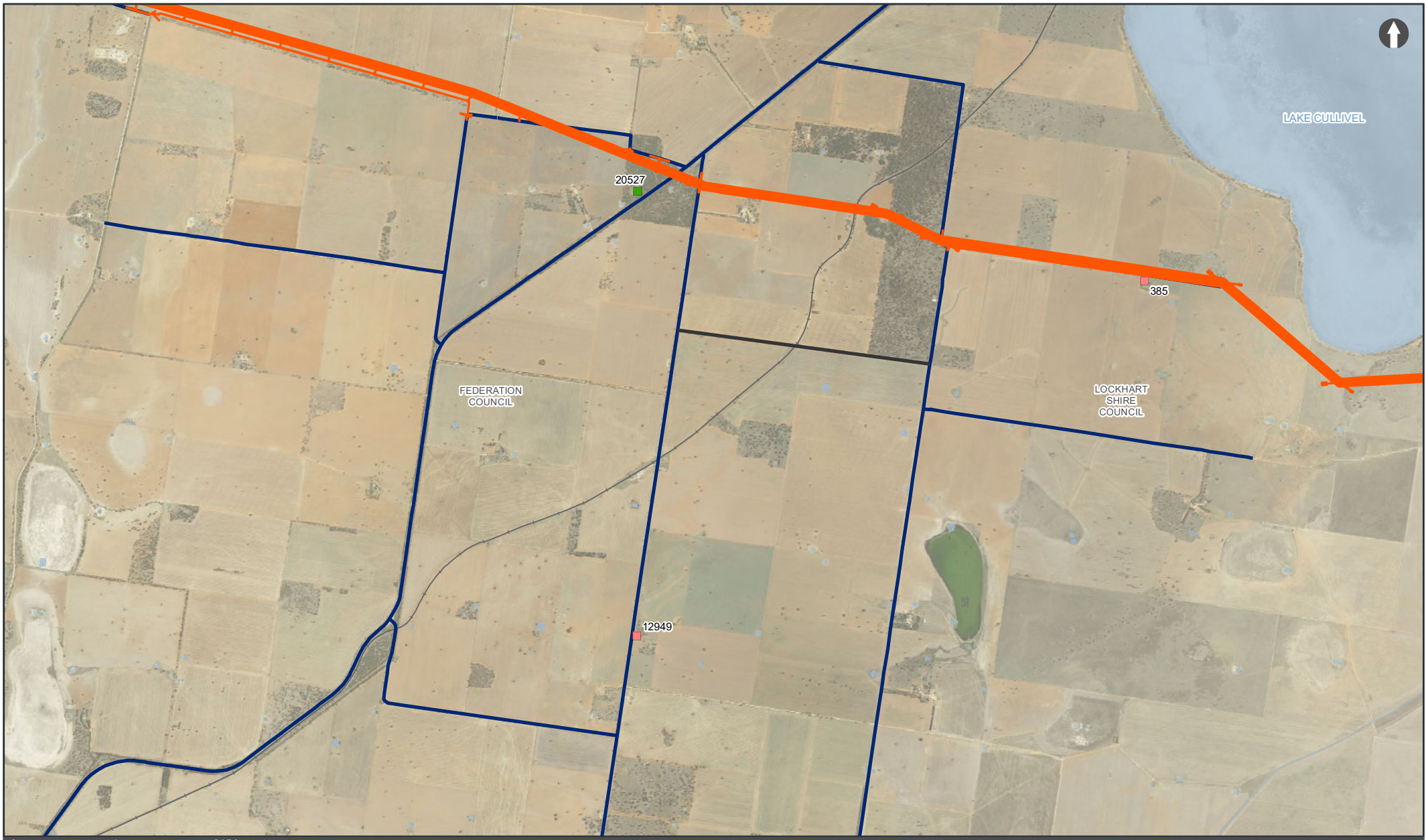
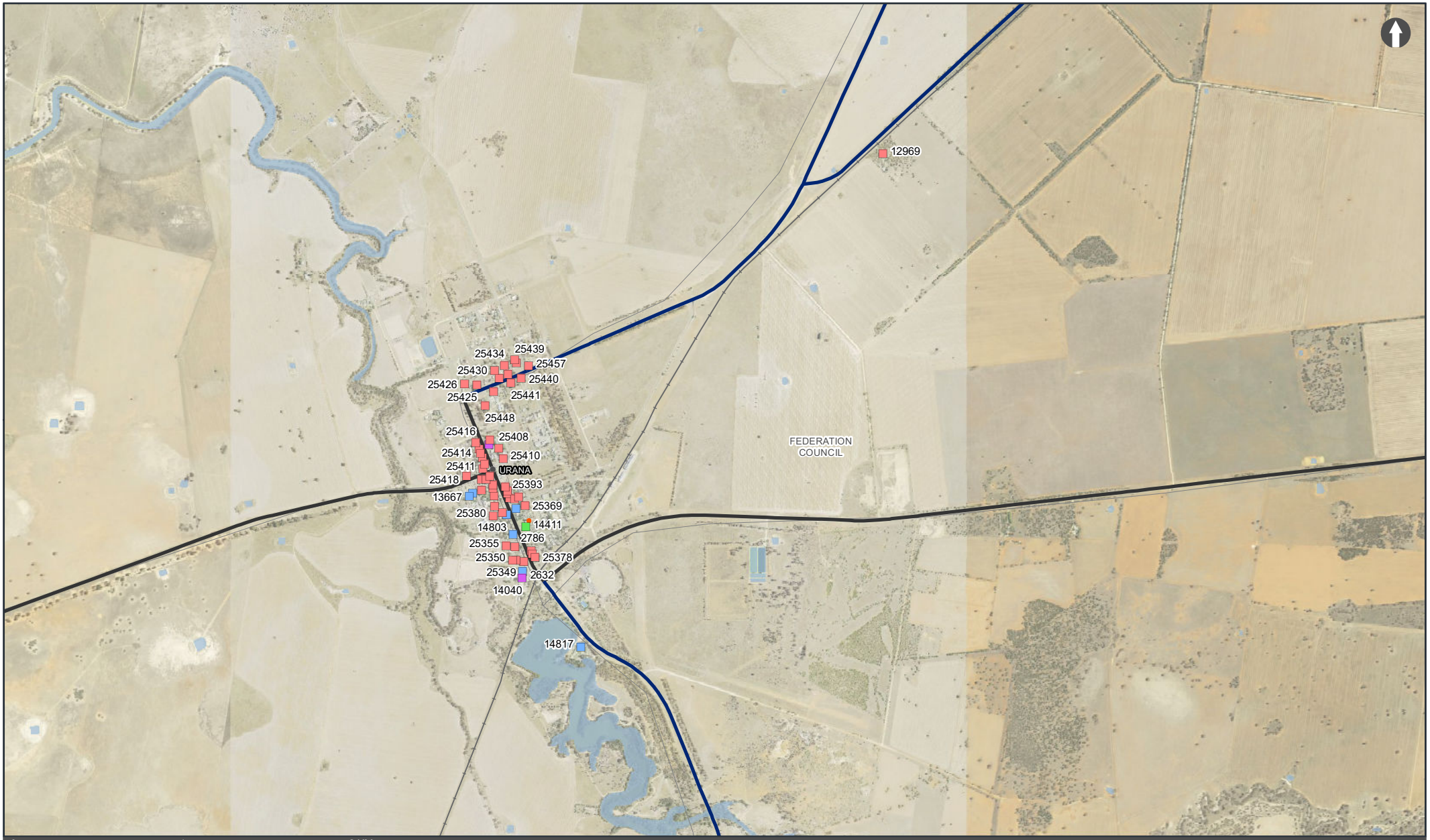
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 53 of 84)



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (7)
Education facility (2)
Recreation facility (1)
Residential dwelling (49)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)
Shed (1)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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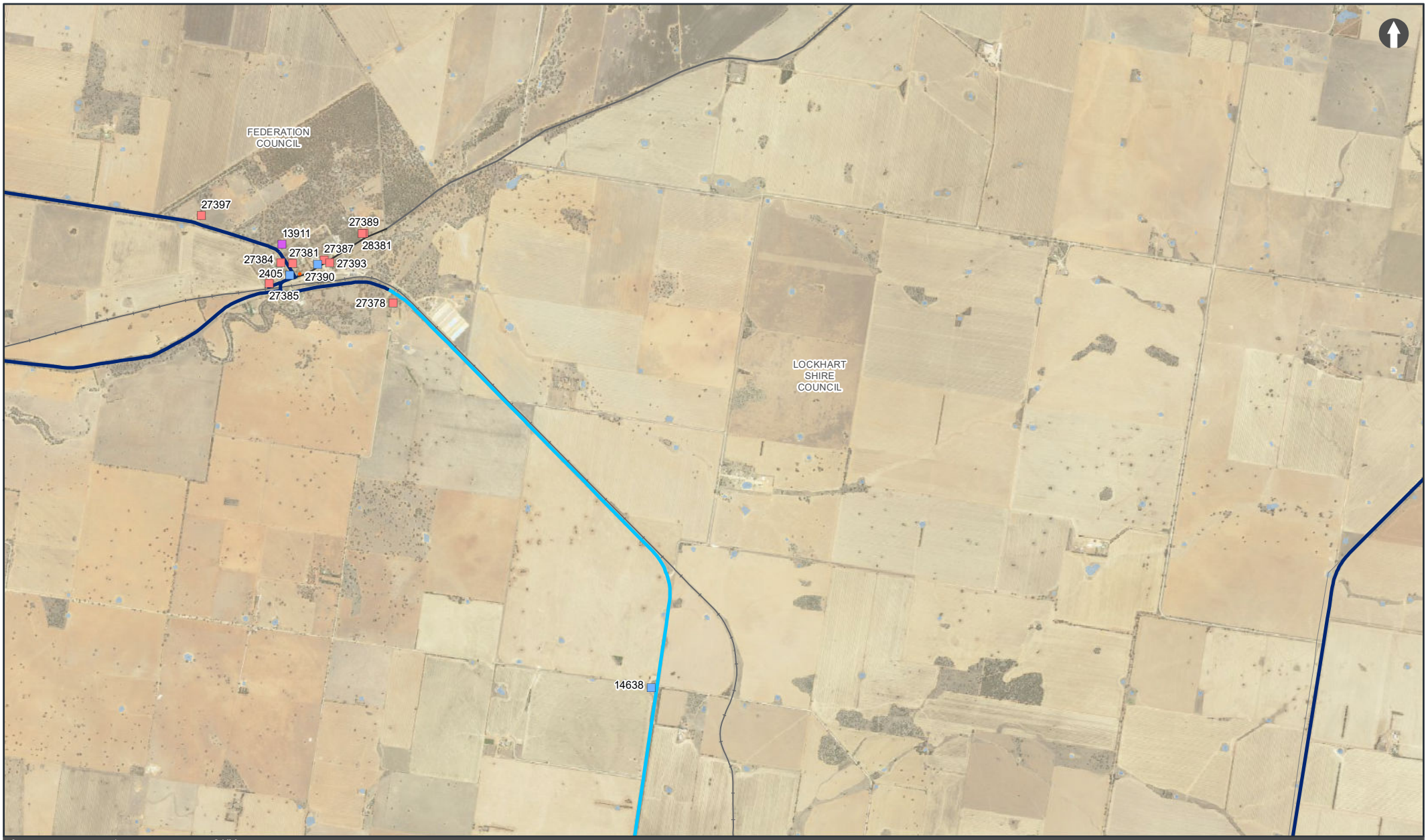
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route
Water Haulage Route
Local Haulage Route
Collector Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (4)
Education facility (1)
Residential dwelling (9)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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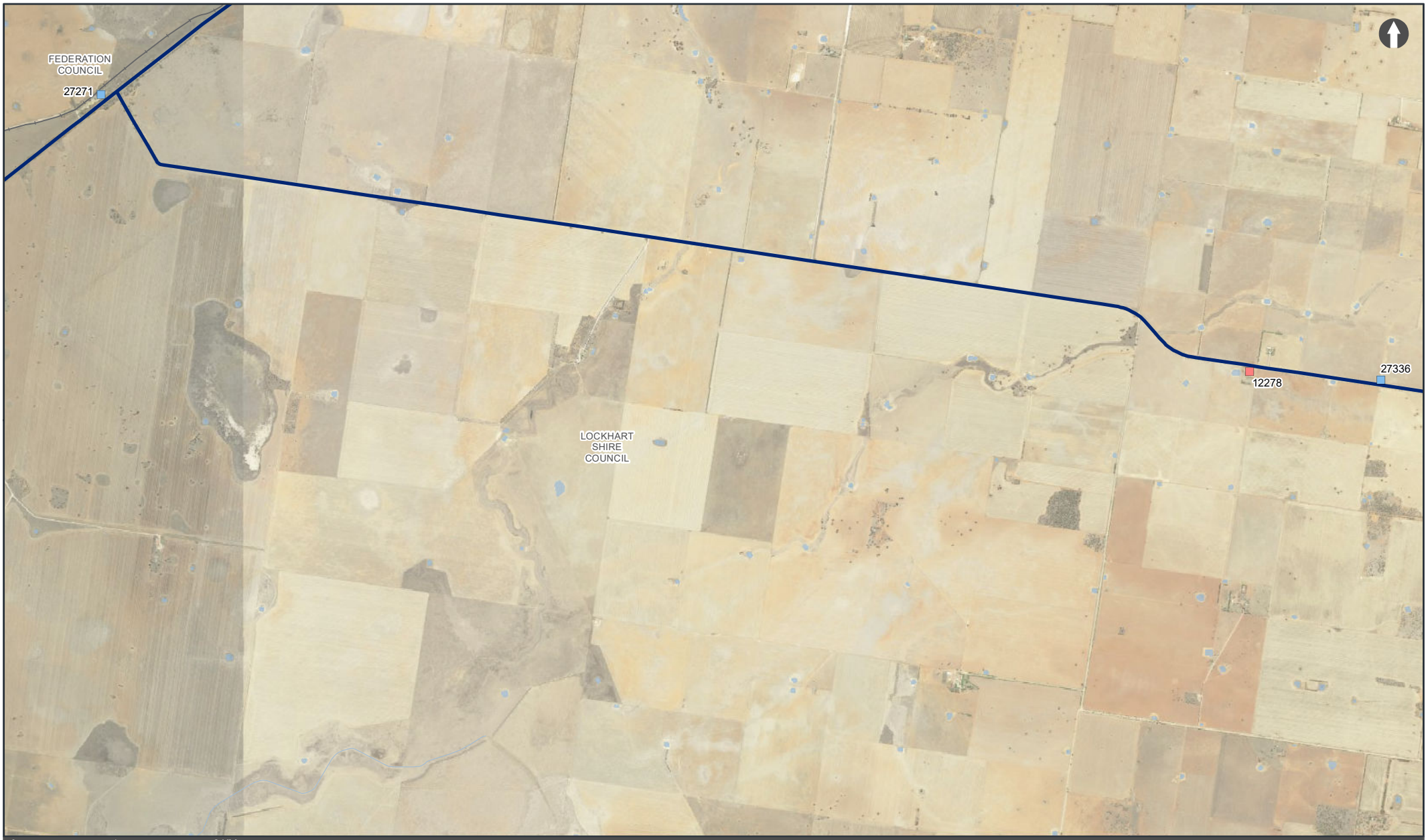
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)
Shed (2)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (2)
Residential dwelling (2)

Sensitive Receivers within 100m of Haulage Routes

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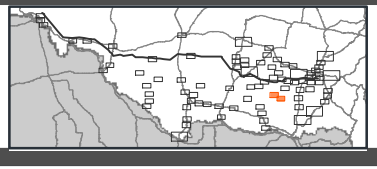
Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (3)



Sensitive Receivers within 100m of Haulage Routes

(sheet 59 of 84)

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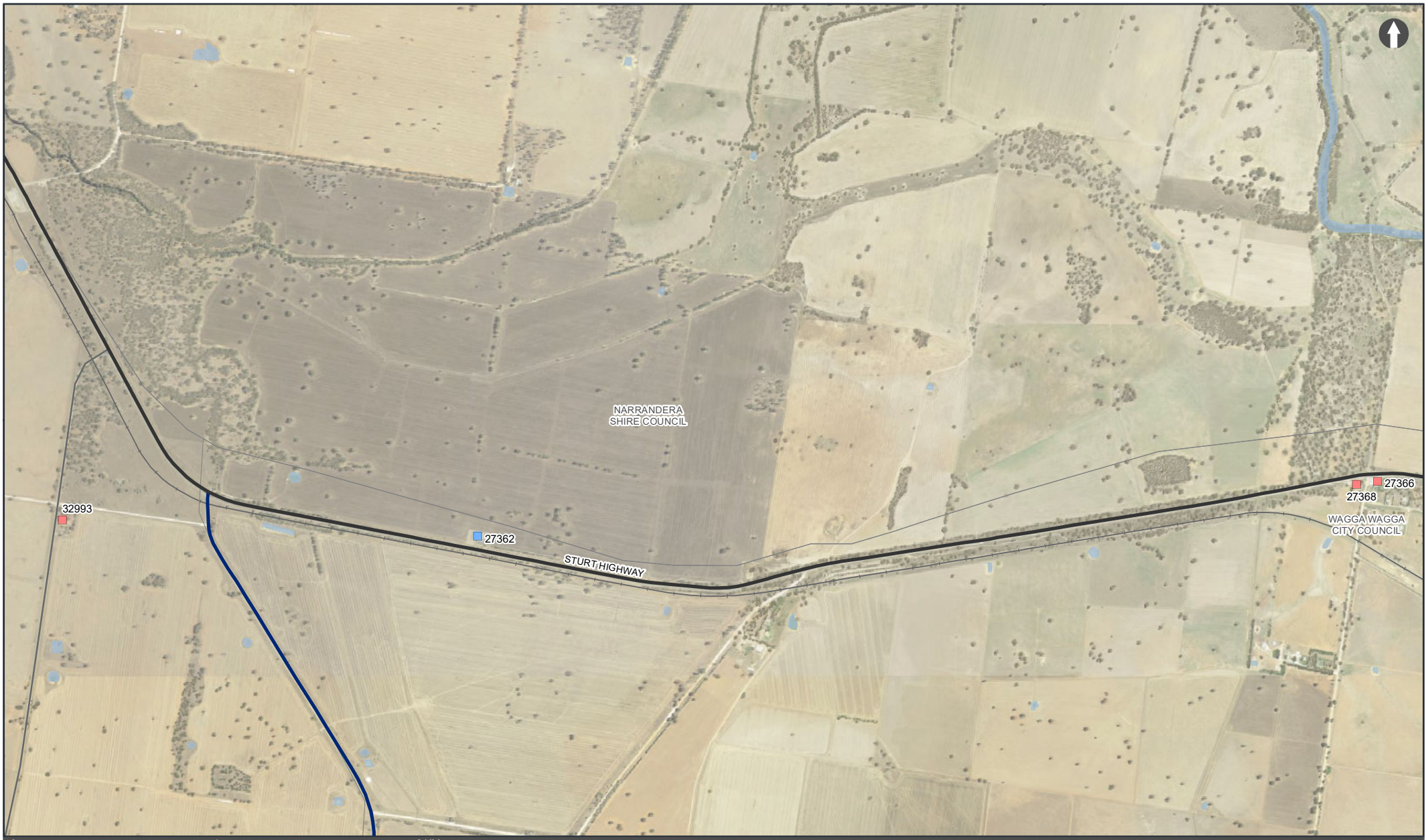
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Collector Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (3)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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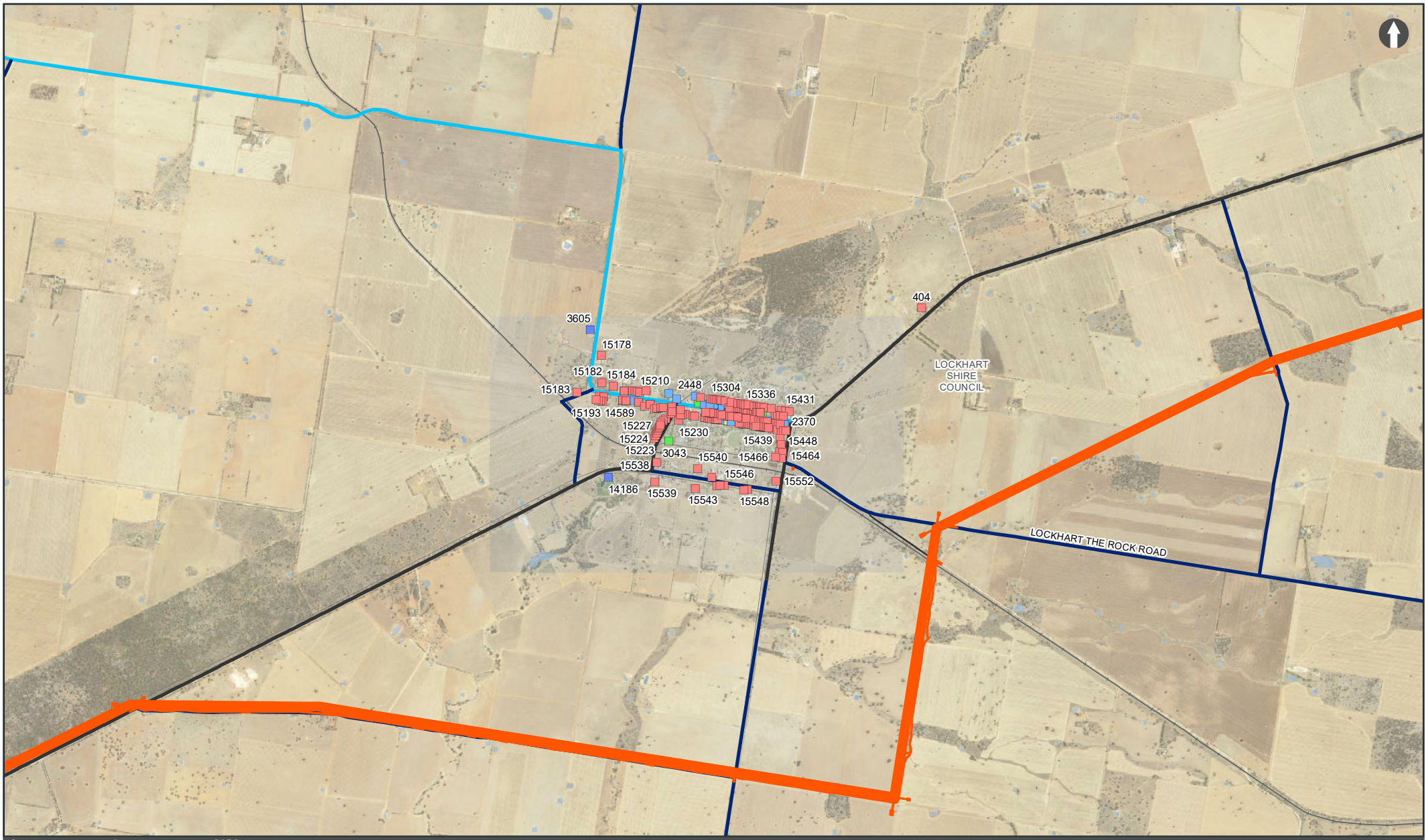
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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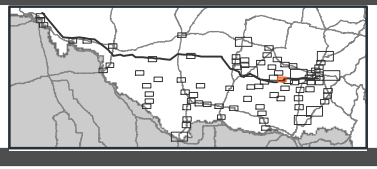
Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Water Haulage Route
Local Haulage Route

Sensitive Receivers (within 100m of Haulage)
Utility facility (2)
Community facility (13)
Medical facility (2)
Recreation facility (3)
Residential dwelling (173)



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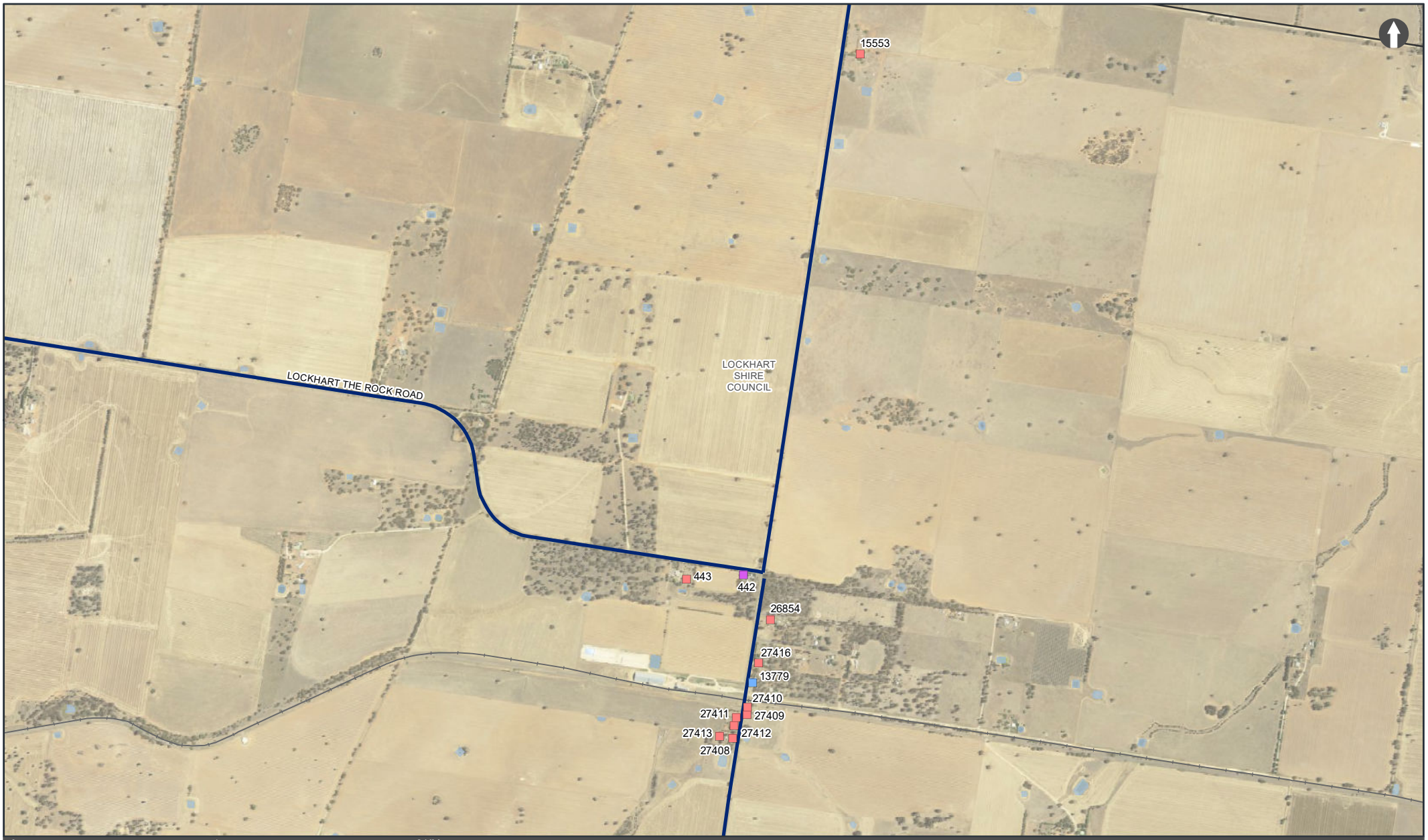
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route
Local Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Education facility (1)
Residential dwelling (10)

Sensitive Receivers within 100m of Haulage Routes

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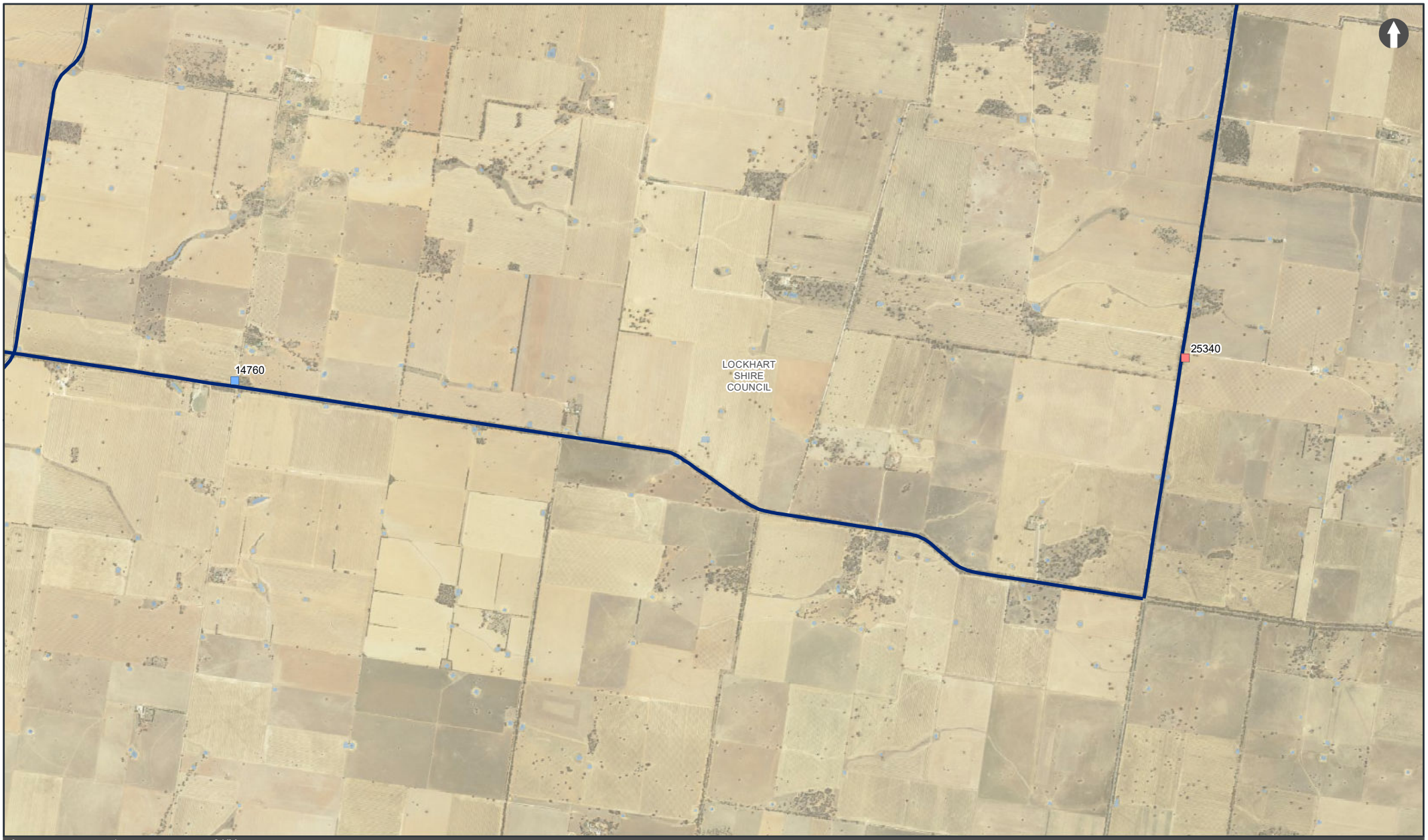
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route
Water Haulage Route
Local Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (8)

Sensitive Receivers within 100m of Haulage Routes

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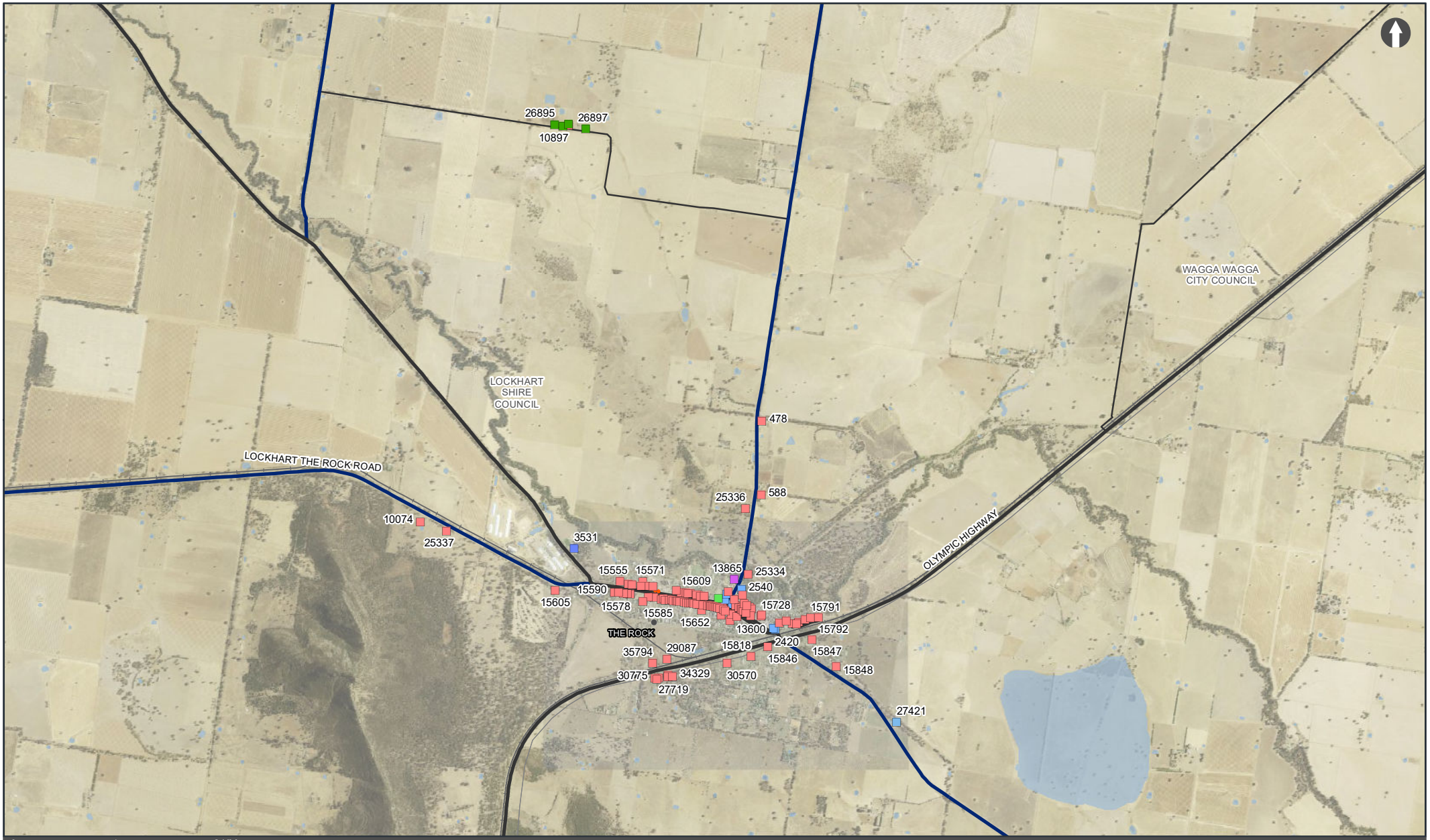
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 66 of 84)

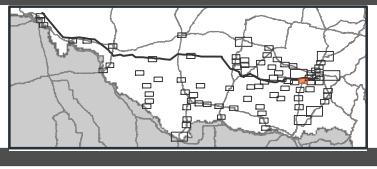
- Construction Impact Area
- Existing Substation
- Existing Railway
- Watercourse

Transport Routes

- Primary Haulage Route
- Secondary Haulage Route
- Local Haulage Route

Sensitive Receivers (within 100m of Haulage)

- Residential dwelling (105)
- Community facility (6)
- Education facility (1)
- Industry facility (4)
- Recreation facility (1)
- Shed (1)
- Utility facility (1)



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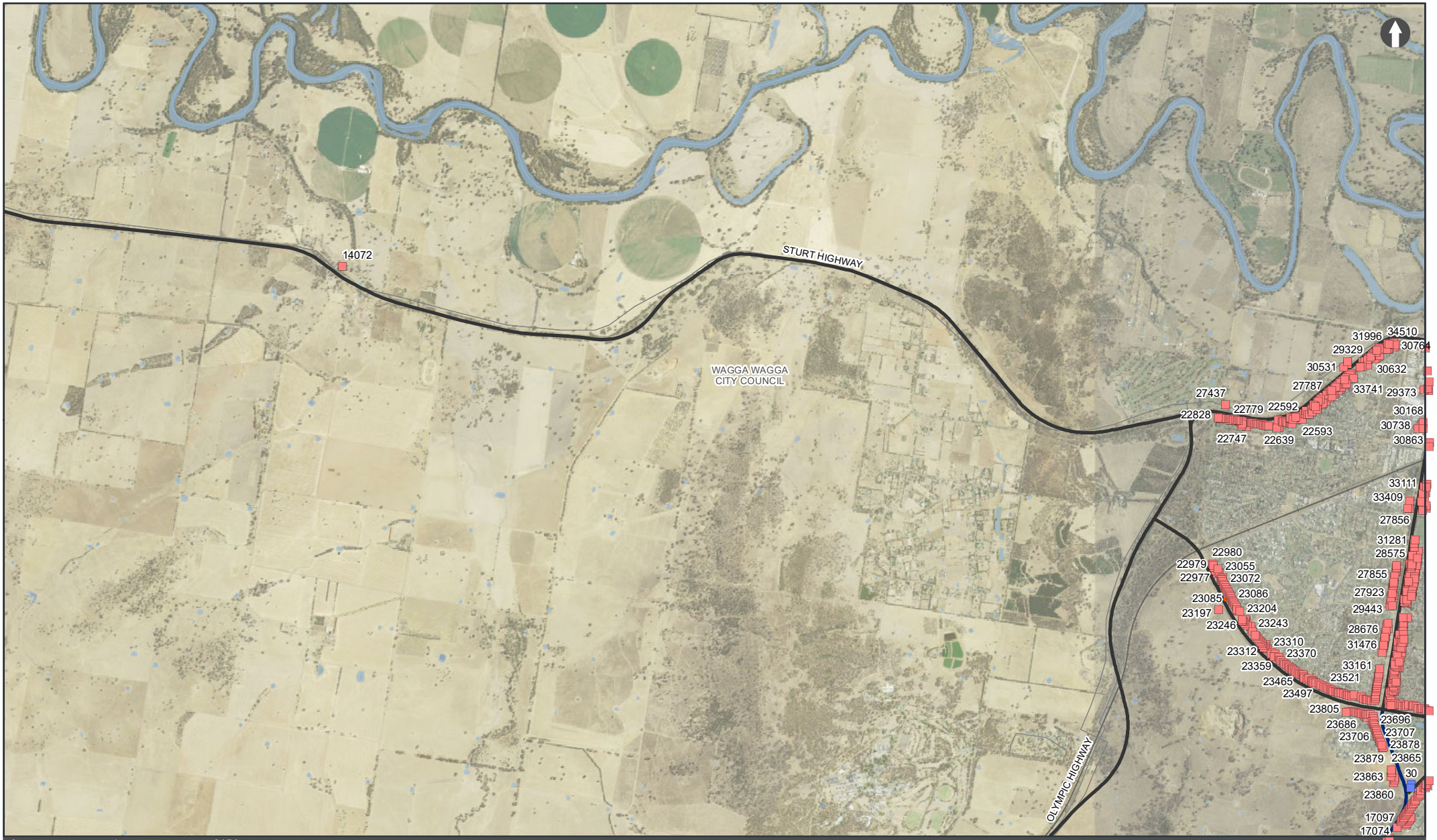
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (510)
Utility facility (2)

Sensitive Receivers within 100m of Haulage Routes

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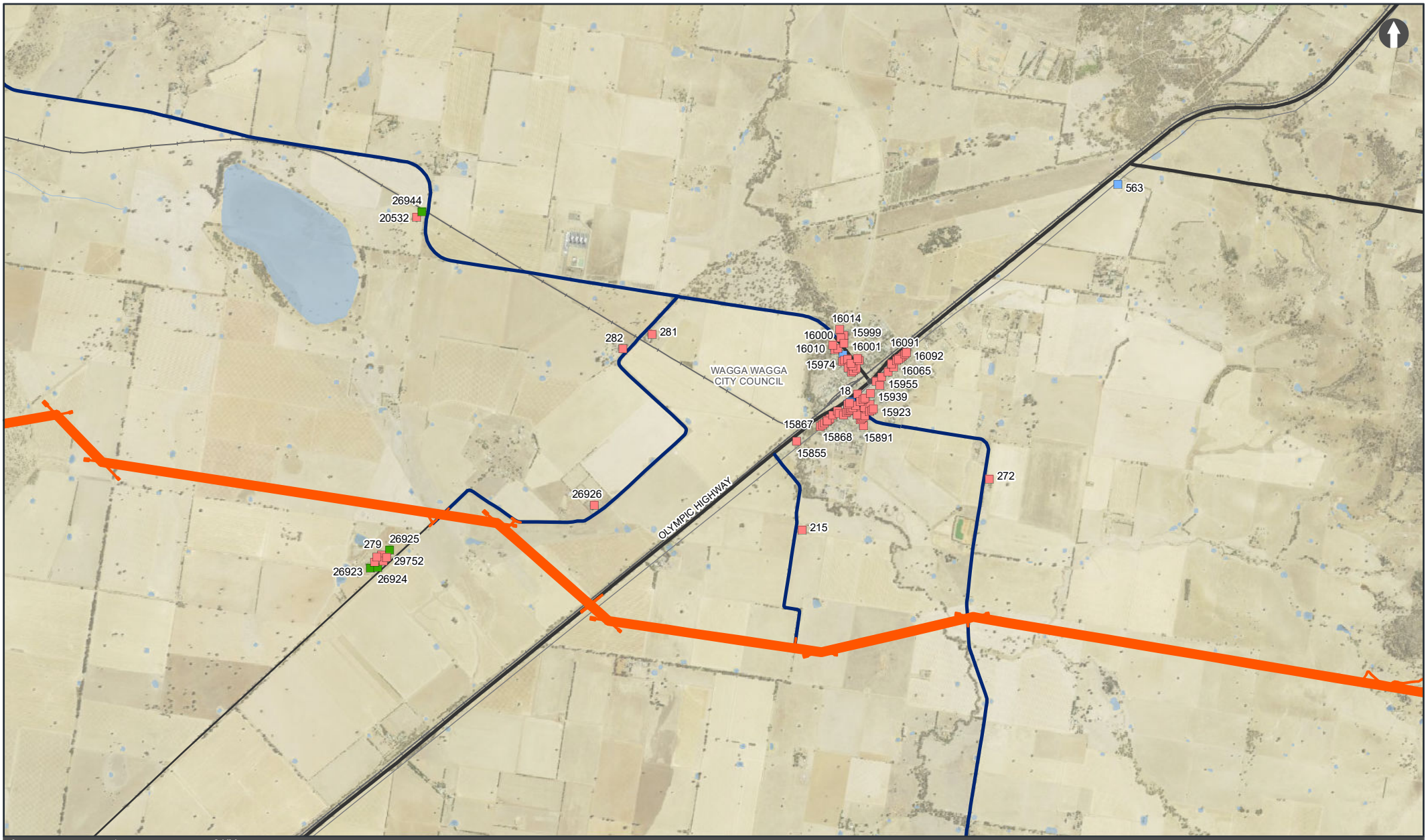
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Local Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (4)
Industry facility (4)
Residential dwelling (82)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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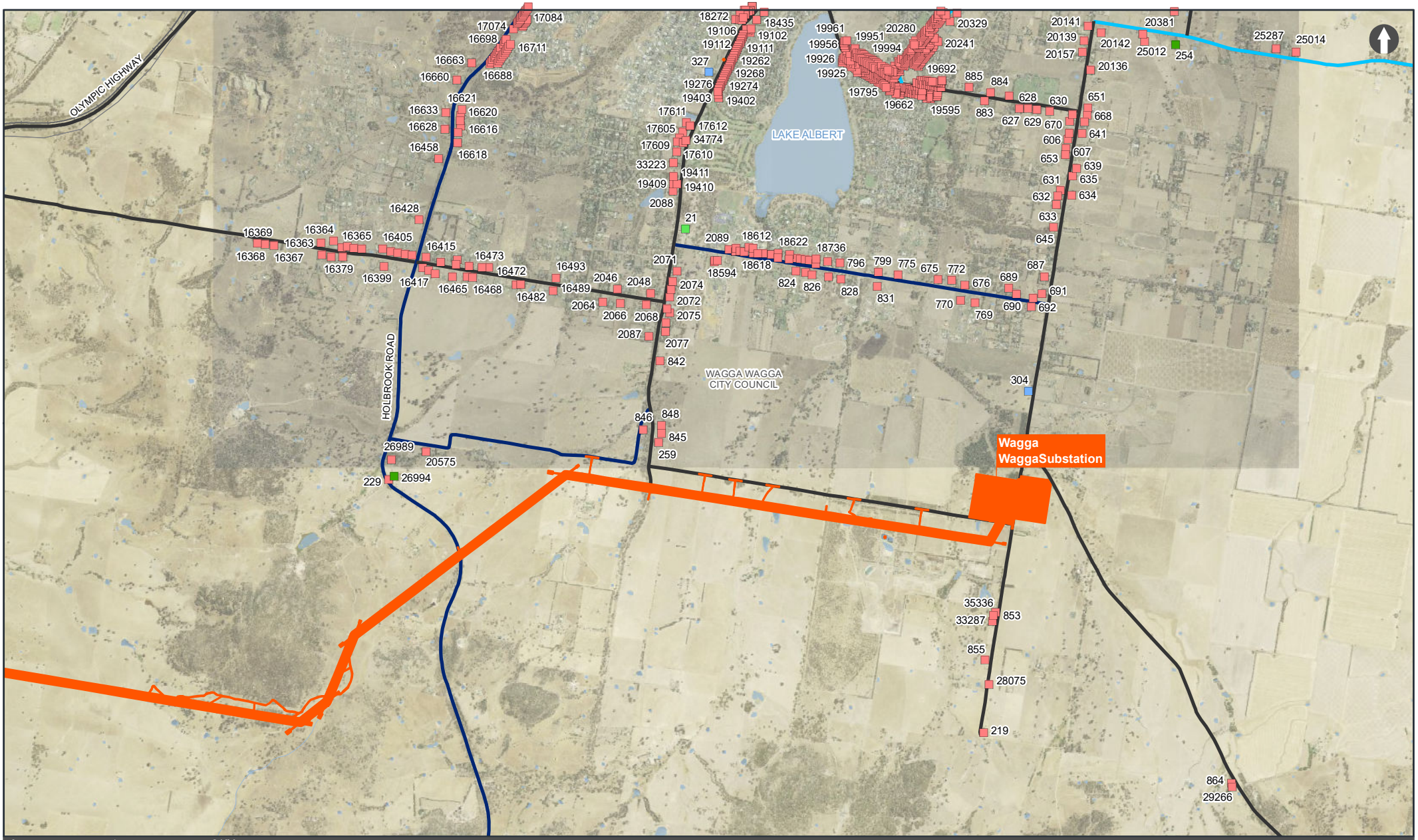
Source: NSWSS, ESRI, Transgrid, WSP



Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (2)
Industry facility (2)
Recreation facility (1)
Residential dwelling (577)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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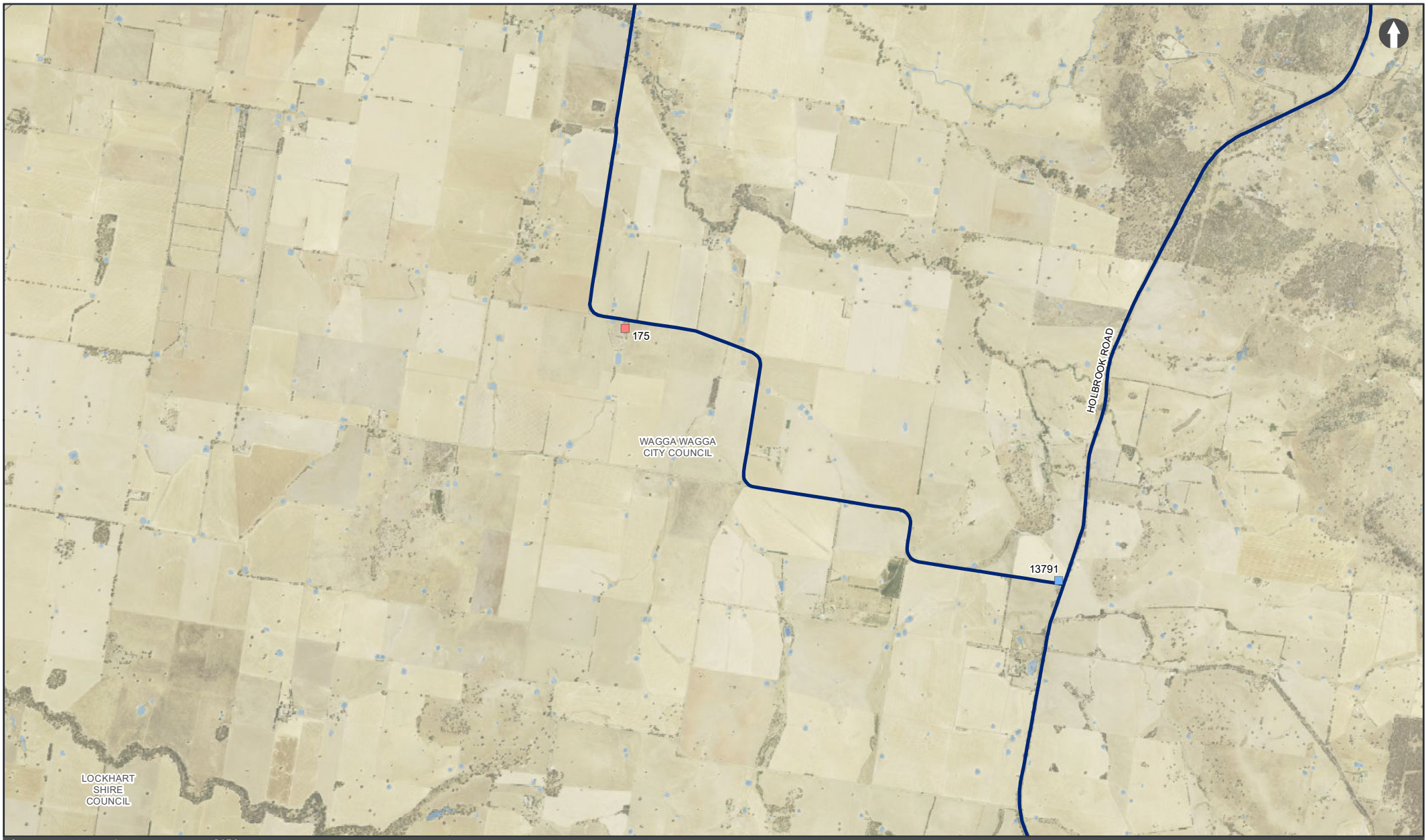
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (1)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

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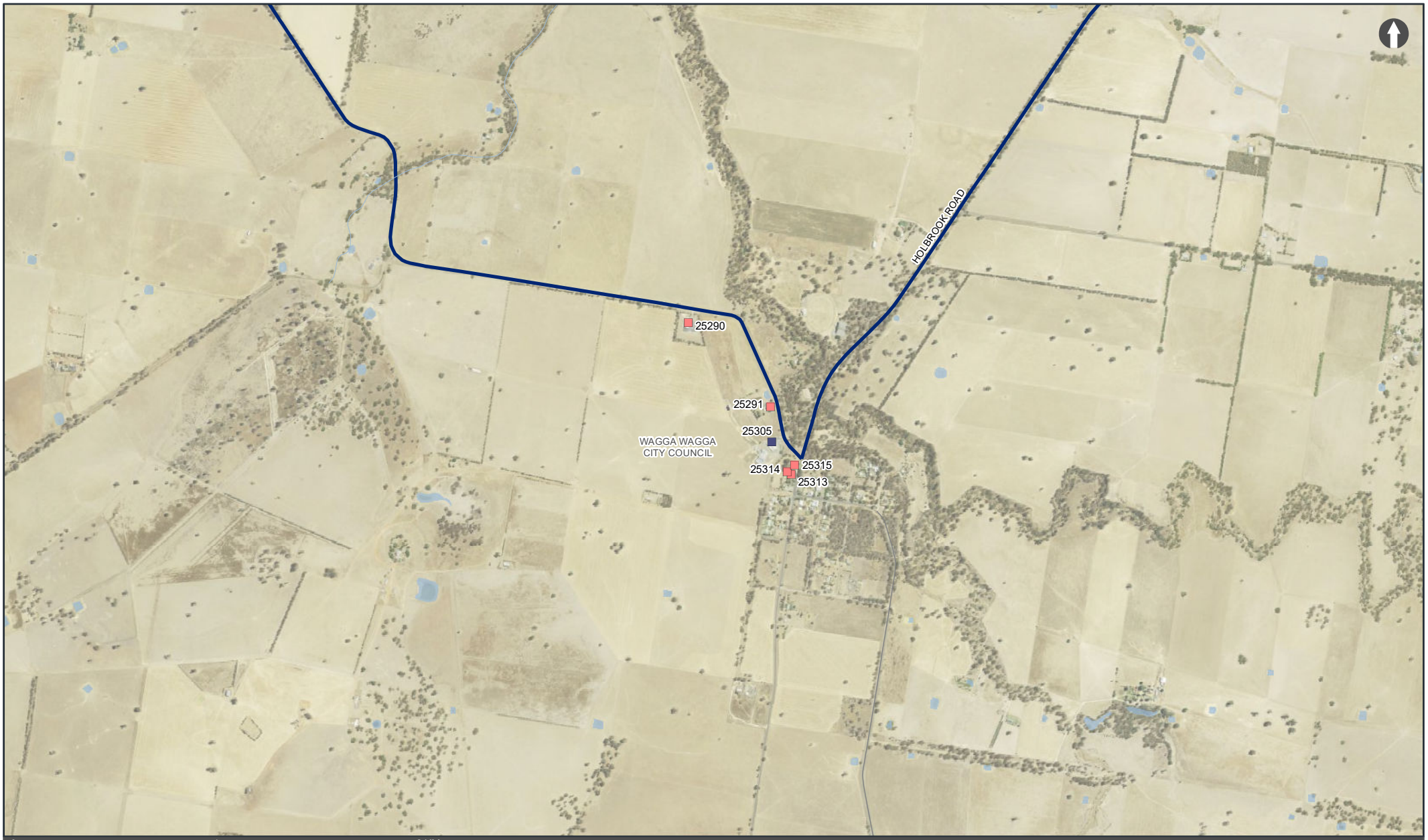
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Industry facility (or shed) (1)
Residential dwelling (5)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (14)

Sensitive Receivers within 100m of Haulage Routes

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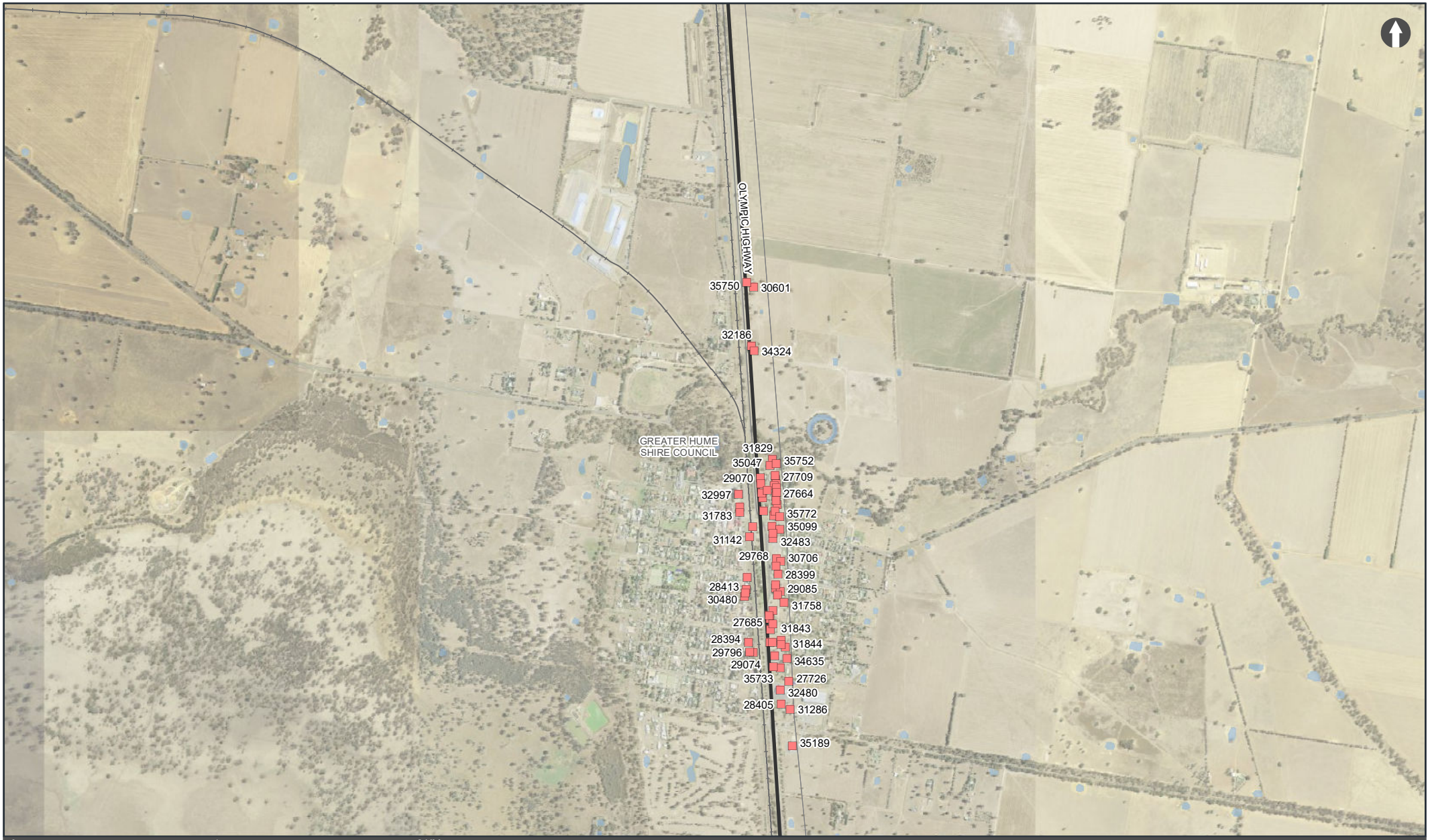
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (69)

Sensitive Receivers within 100m of Haulage Routes

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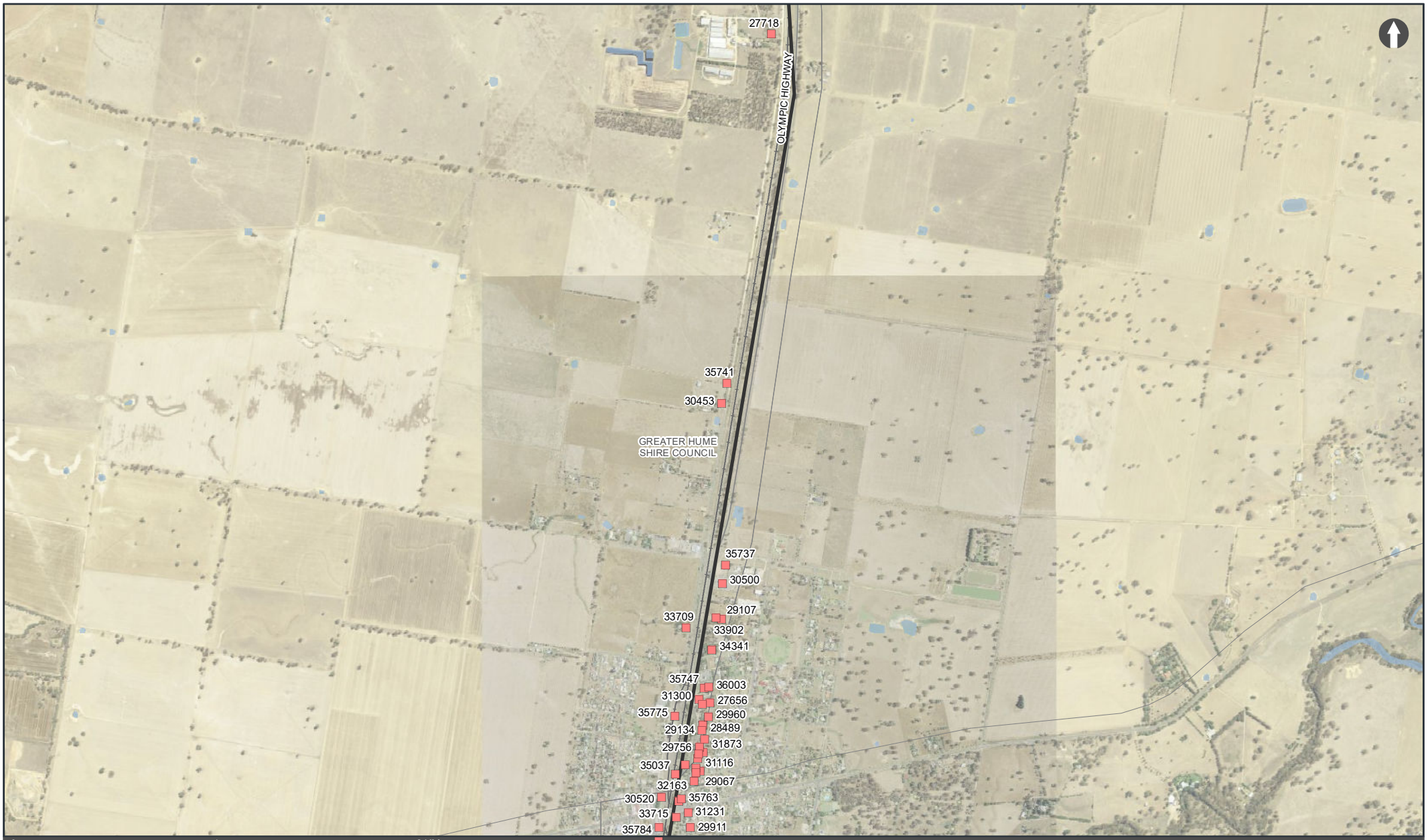
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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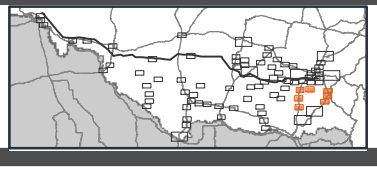
Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (37)



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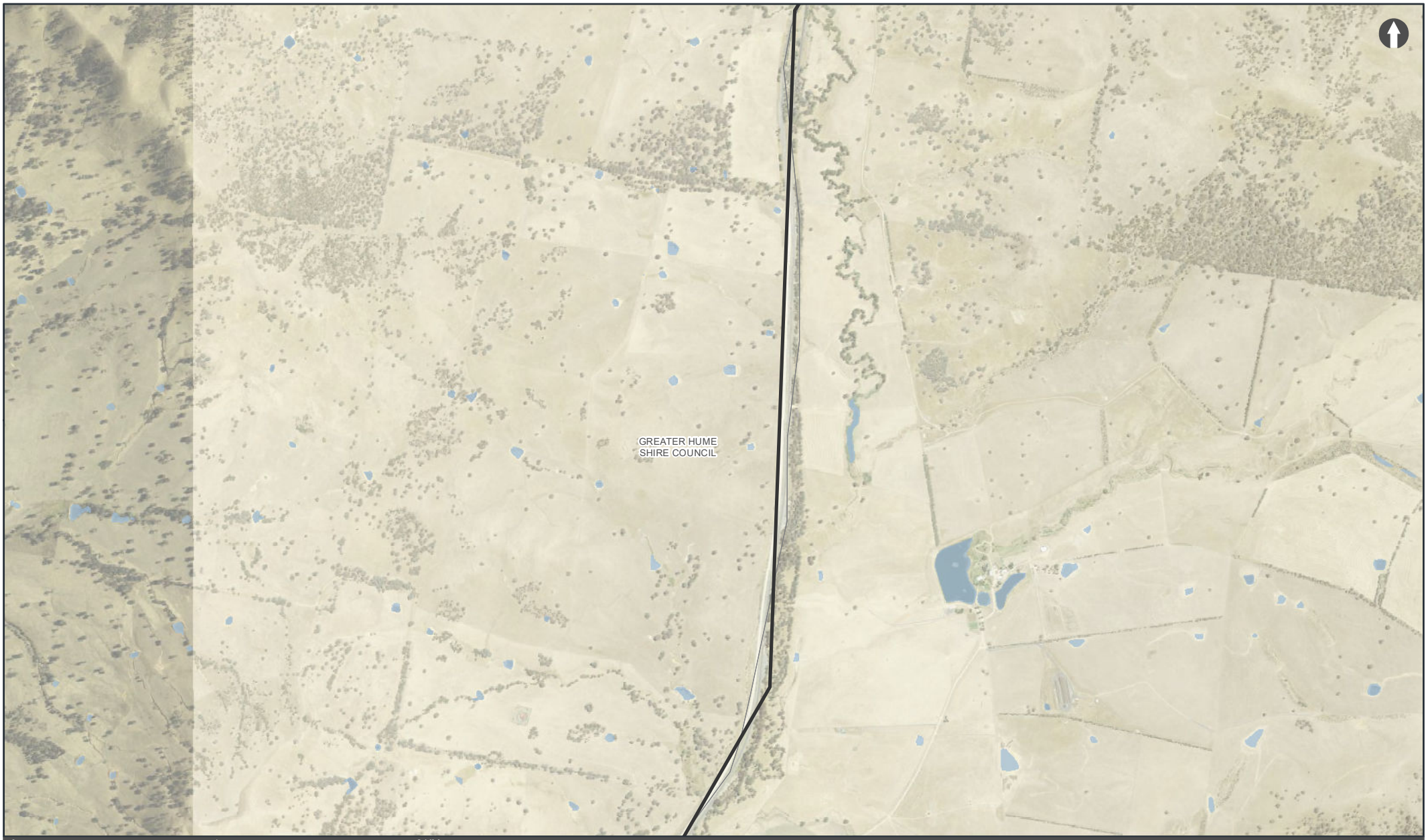
Source: NSWSS, ESRI, Transgrid, WSP



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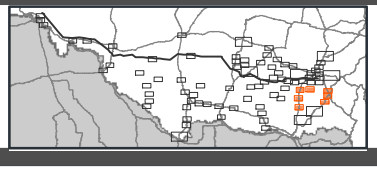
Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route



Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (8)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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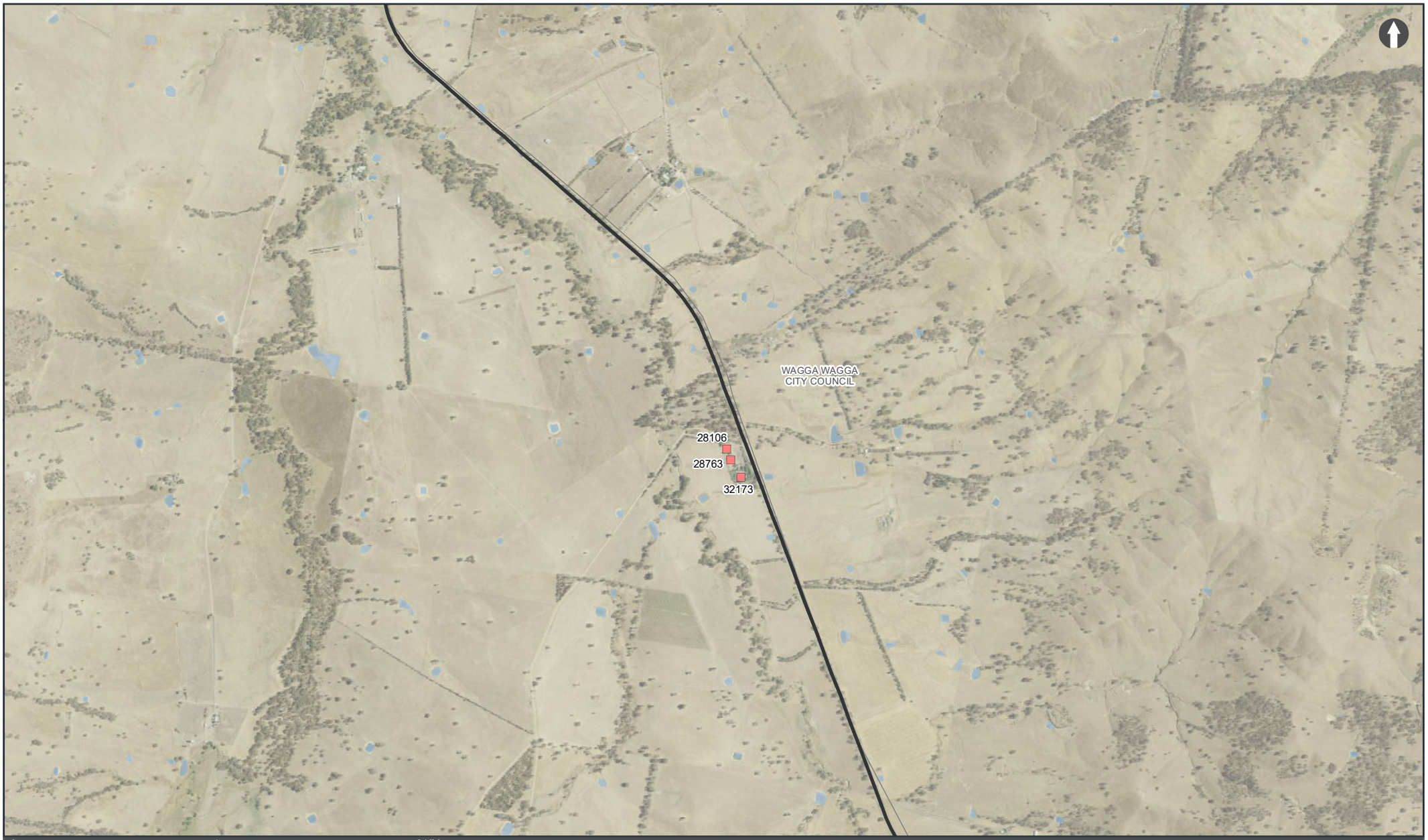
C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixC\PS117658_AQ_C001_SensitiveReceiversWithin100mHaulage_r1v3.mxd

Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (3)

Sensitive Receivers within 100m of Haulage Routes

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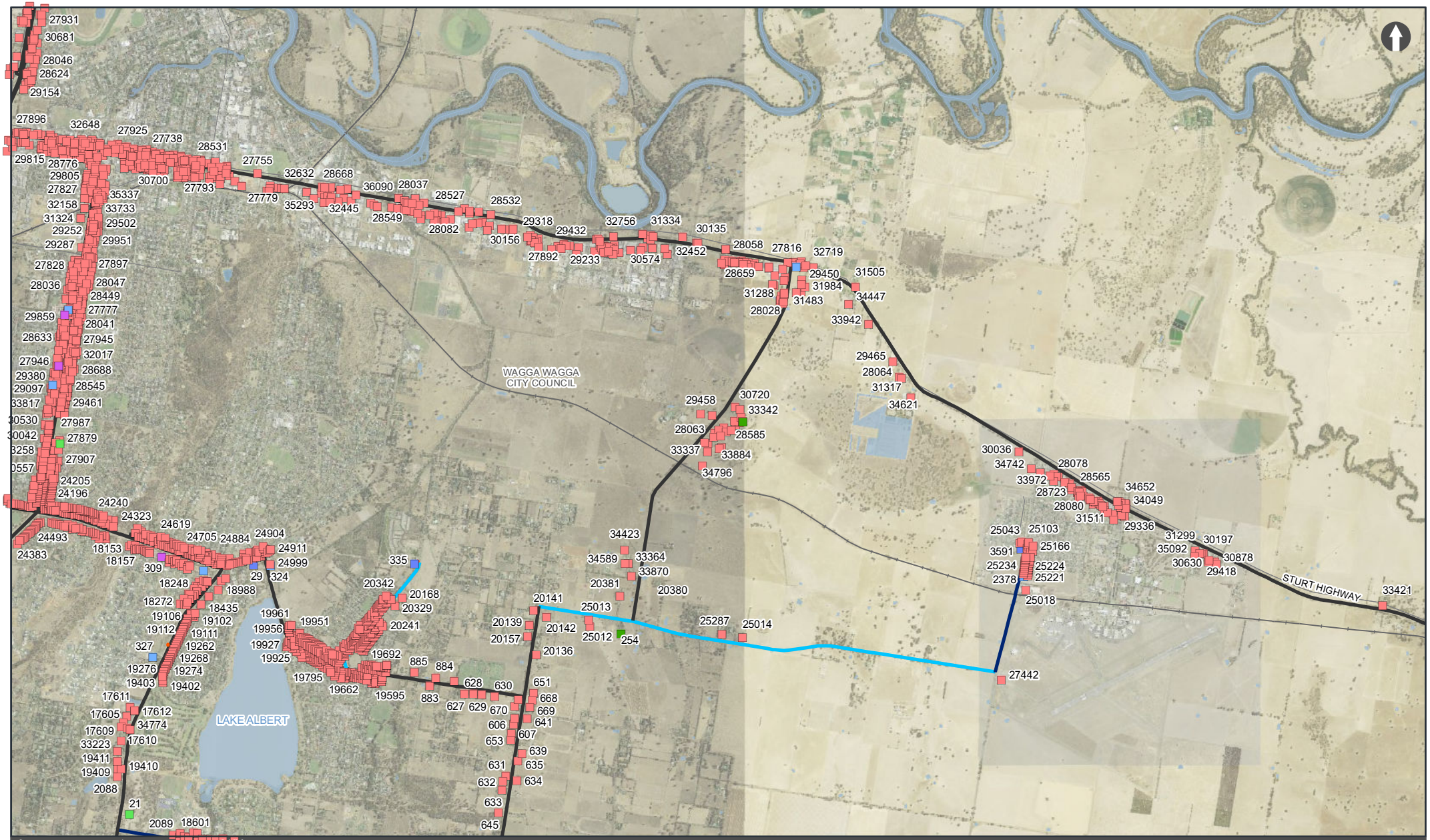
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

(sheet 78 of 84)

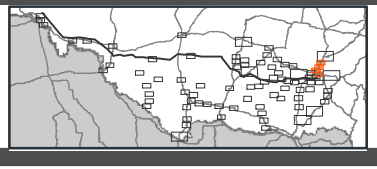
- Construction Impact Area
- Existing Substation
- Existing Railway
- Watercourse

Transport Routes

- Primary Haulage Route
- Secondary Haulage Route
- Water Haulage Route

Sensitive Receivers (within 100m of Haulage)

- Residential dwelling (1837)
- Utility facility (3)
- Community facility (7)
- Education facility (3)
- Industry facility (2)
- Recreation facility (2)



Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

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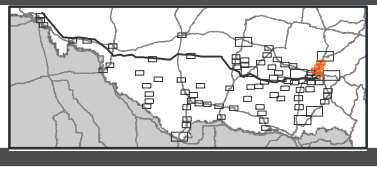
Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (5)



Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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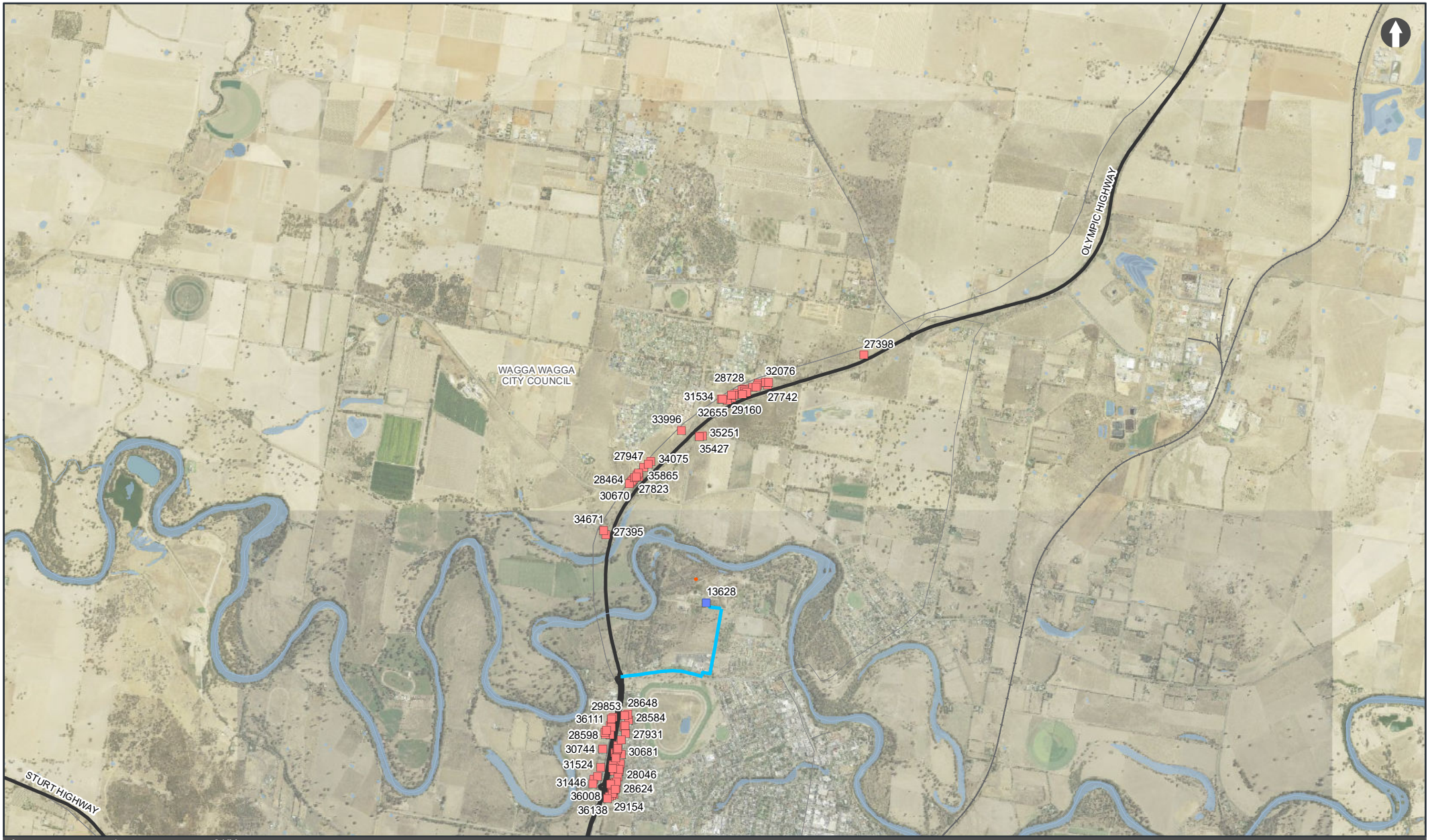
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Water Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (90)
Utility facility (1)

Sensitive Receivers within 100m of Haulage Routes

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Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (1)

Sensitive Receivers within 100m of Haulage Routes

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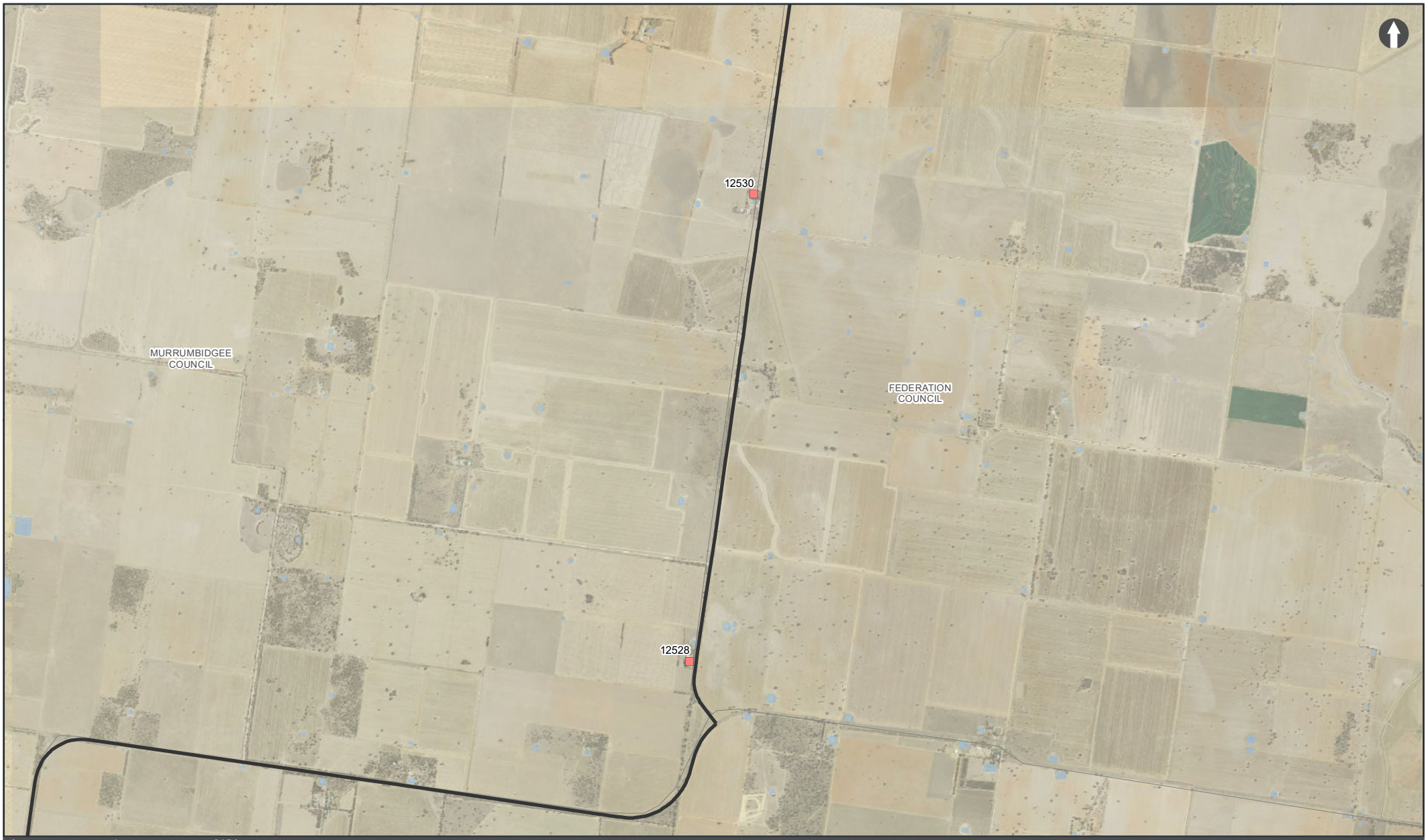
Source: NSWSS, ESRI, Transgrid, WSP

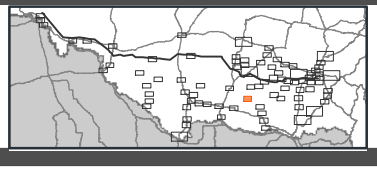


Air Quality - Figure C-1

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Residential dwelling (2)



Sensitive Receivers within 100m of Haulage Routes

(sheet 83 of 84)

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Source: NSWSS, ESRI, Transgrid, WSP

Construction Impact Area
Existing Substation
Existing Railway
Watercourse

Transport Routes
Primary Haulage Route
Secondary Haulage Route

Sensitive Receivers (within 100m of Haulage)
Community facility (3)

Air Quality - Figure C-1

Sensitive Receivers within 100m of Haulage Routes

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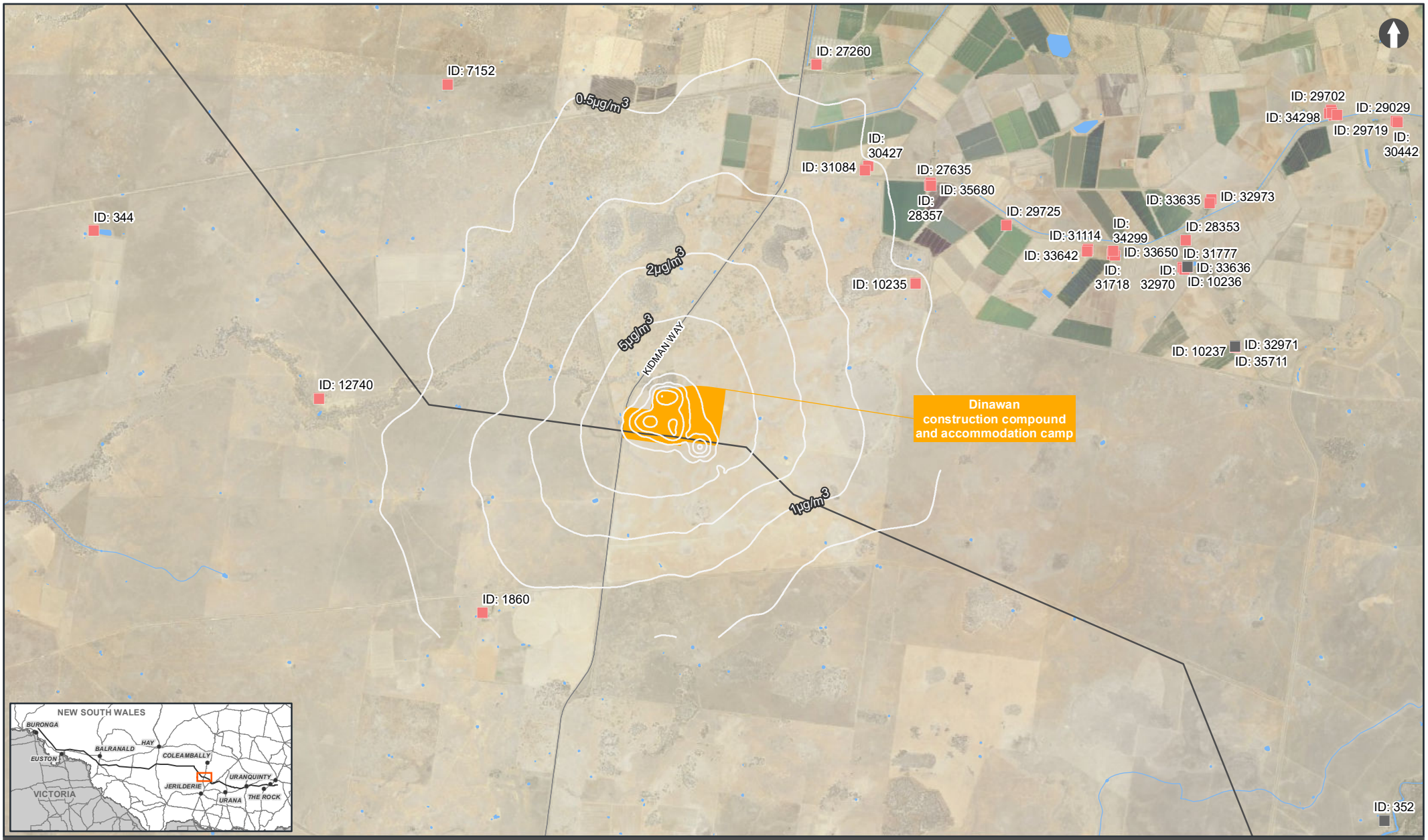
Source: NSWSS, ESRI, Transgrid, WSP

Appendix D

Contour plots



Air Quality - Figure D-1

Project Components
- EnergyConnect (NSW - Eastern Section)
- Main Construction Compounds and Accommodation Sites
- Existing Substation
- Existing Transmission Line Infrastructure

Sensitive Receptors
- Industry facility (3)
- Residential dwelling (32)

Annual Average TSP Incremental Concentrations (µg/m³) Contours

Annual Average TSP Incremental Concentrations (µg/m³)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D001_Dinawan_AnnualAverageTSPConcentrations_r1v5.mxd

Source: NSWSS, ESRI, Transgrid, WSP

Air Quality - Figure D-2

Project Components
- EnergyConnect (NSW - Eastern Section)
- Main Construction Compounds and Accommodation Sites
- Existing Substation
- Existing Transmission Line Infrastructure

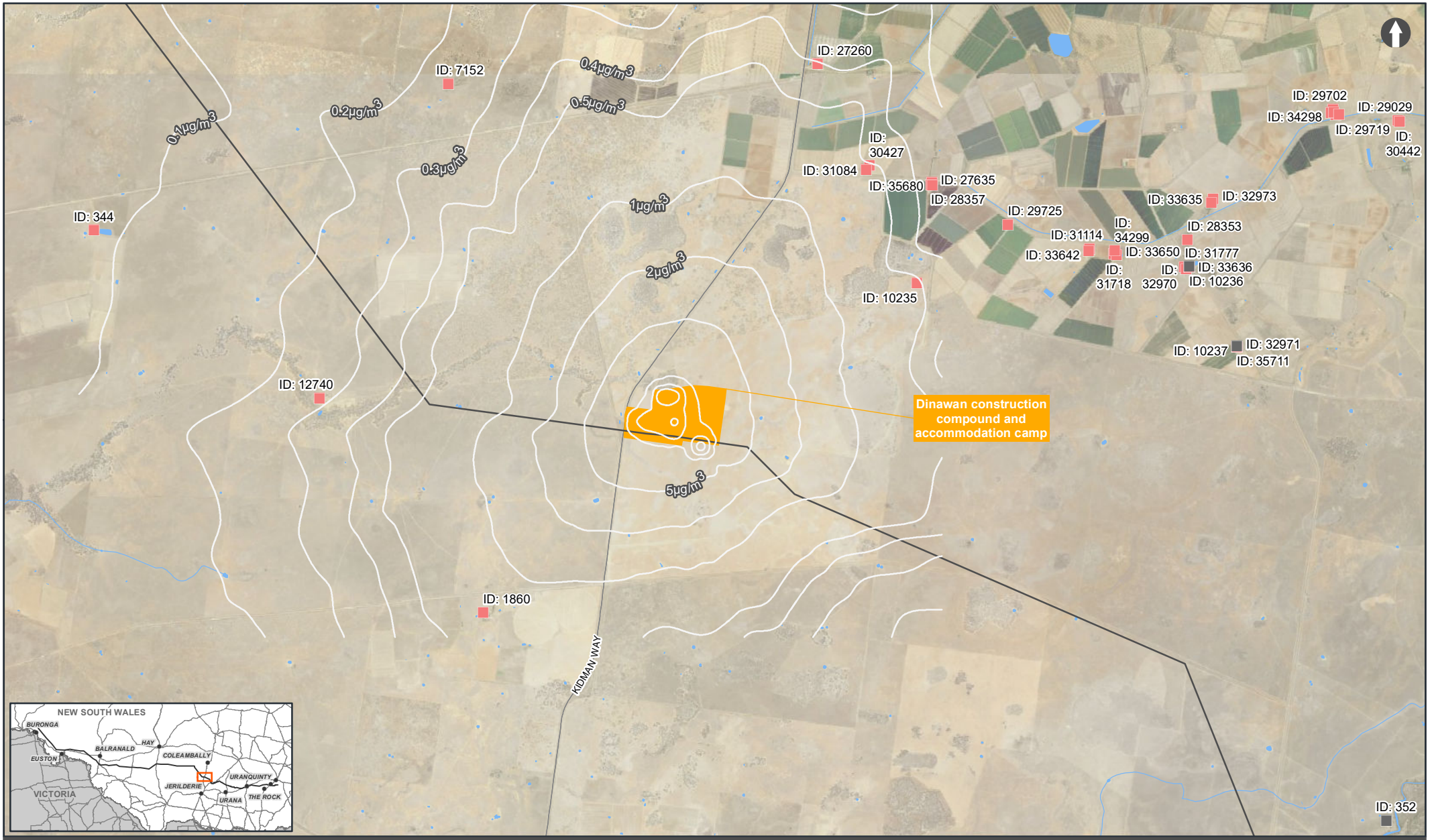
Sensitive Receptors
- Industry facility (3)
- Residential dwelling (32)

24-Hour Average PM_{10} Incremental Concentrations ($\mu g/m^3$) Contours

24-Hour Average PM_{10} Incremental Concentrations ($\mu g/m^3$)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D002_Dinawan_24hrPM10Concentrations_r1v4.mxd

Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure D-3

Project Components
- EnergyConnect (NSW - Eastern Section)
- Main Construction Compounds and Accommodation Sites
- Existing Transmission Line Infrastructure
- Existing Substation

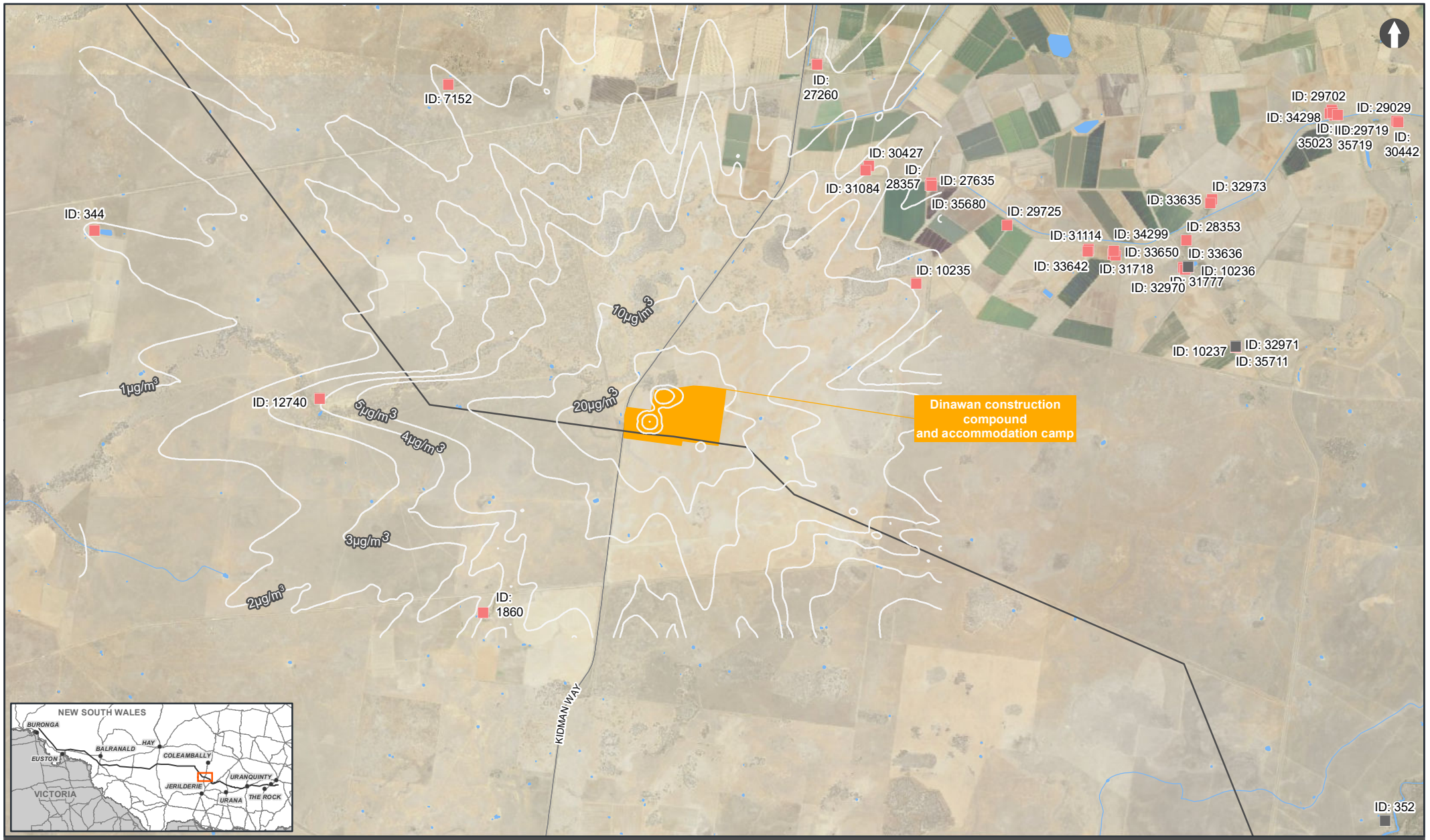
Sensitive Receptors
- Industry facility (3)
- Residential dwelling (32)

Annual Average PM_{10} Incremental Concentrations ($\mu g/m^3$)

Annual Average PM_{10} Incremental Concentrations ($\mu g/m^3$)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D003_Dinawan_AnnualPM10Concentrations_r1v4.mxd

Source: NSWSS, ESRI, Transgrid, WSP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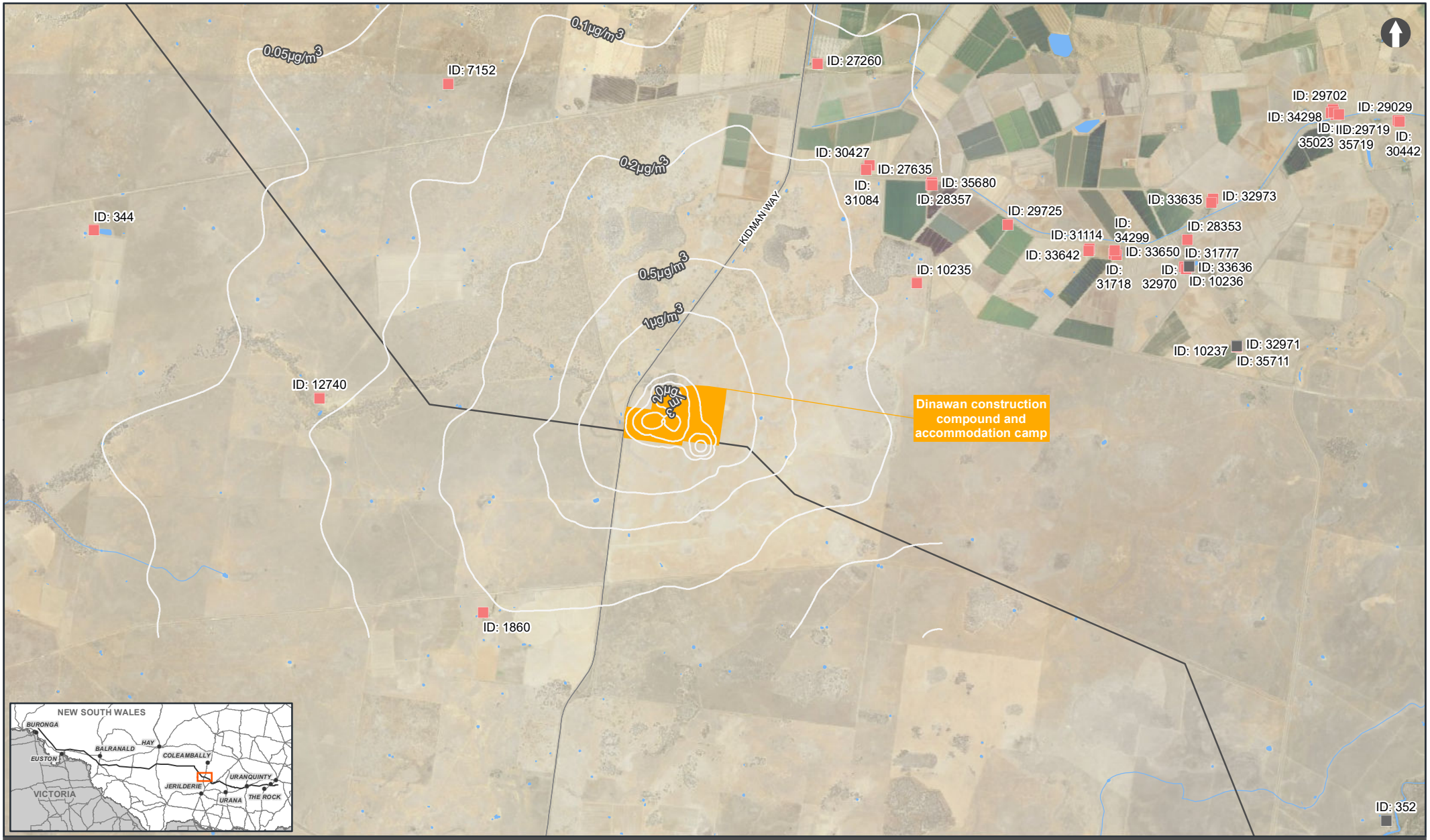
ID: 29719
35023
35719
ID: 30442
ID: 32973
ID: 33635
ID: 28353
ID: 31114
ID: 34299
ID: 33650
ID: 33636
ID: 33642
ID: 31718
ID: 10236
ID: 31777
ID: 32970
ID: 10235
ID: 32971
ID: 10237
ID: 35711
ID: 12740
1µg/m3
5µg/m3
4µg/m3
10µg/m3
20µg/m3
3µg/m3
2µg/m3
Dinawan construction compound and accommodation camp
ID: 1860
KIDMAN WAY
ID: 352
NEW SOUTH WALES
VICTORIA
BURONGA
HAY
BALRANALD
EUSTON
COLEAMBALLY
URANQUINTY
JERILDERIE
URANA
THE ROCK
0
2.5
5 KM
Air Quality - D-4
Project Components
EnergyConnect (NSW - Eastern Section)
Main Construction Compounds and Accommodation Sites
Existing Substation
Existing Transmission Line Infrastructure
Sensitive Receptors
Industry facility (3)
Residential dwelling (32)
24-hour Average PM2.5 Incremental Concentrations (µg/m3) Contours
24-Hour Average PM2.5 Incremental Concentrations (µg/m3)
C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D004_Dinawan_24hrPM2-5Concentrations_r1v4.mxd
Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure D-5

Project Components
- EnergyConnect (NSW - Eastern Section)
- Main Construction Compounds and Accommodation Sites
- Existing Substation
- Existing Transmission Line Infrastructure

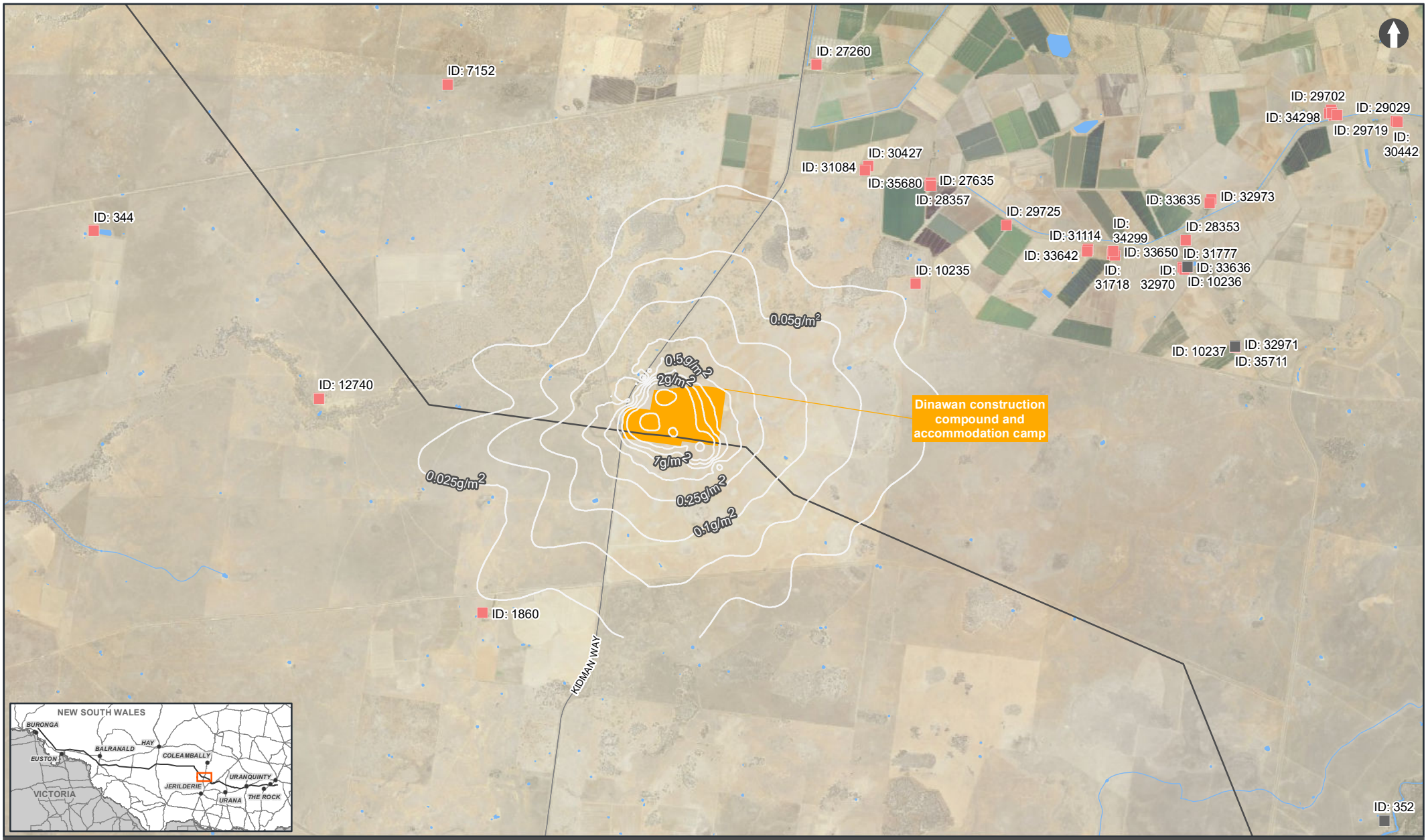
Sensitive Receptors
- Industry facility (3)
- Residential dwelling (32)

Annual Average $PM_{2.5}$ Incremental Concentrations ($\mu g/m^3$)

Annual Average $PM_{2.5}$ Incremental Concentrations ($\mu g/m^3$)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D005_Dinawan_AnnualPM2-5Concentrations_r1v4.mxd

Source: NSWSS, ESRI, Transgrid, WSP



Air Quality - Figure D-6

Proposed Alignment
- EnergyConnect (NSW - Eastern Section)
- Main Construction Compounds and Accommodation Sites
- Existing Substation
- Existing Transmission Line Infrastructure

Sensitive Receptors
- Industry facility (3)
- Residential dwelling (32)

Monthly Deposited Dust Incremental Concentrations (g/m²/month) Contours

Monthly Deposited Dust Incremental Concentrations (g/m^2/month)

C:\Users\autw500241\WSP O365\EnergyConnect - General\5_Shared\54_Production\Maps\003_PEC_East\02_SpecialistReports\08_AirQuality\AppendixD\PS117658_AQ_D006_Dinawan_MonthlyDepositedDustConcentrations_r1v4.mxd

Source: NSWSS, ESRI, Transgrid, WSP

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