

Modification Report

Modification 3 – Killingworth to Kooragang Island Gas Pipeline

Jemena Gas Networks (NSW) Limited



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Position	Director Approvals		

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This modification can be found on the Department of Planning, Housing and Infrastructure's Major Project website:

<https://www.planningportal.nsw.gov.au/major-projects/projects/mod-3-hunter-lateral-pipeline> (or search 'Hunter Lateral Pipeline' on the Major Projects website).

The Major Projects website is the location where this Modification Report and associated specialist technical reports will be published.

This website is also the location for the community to provide their feedback on the modification if a public exhibition is required.

Abbreviations

A	
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHRS	<i>Aboriginal Cultural Heritage Consultation Requirements for Proponents</i>
AEP	Annual Exceedance Probability
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ARI	Annual Recurrence Interval
AS	Australian Standard
ASSMP	Acid Sulfate Soil Management Plan
B	
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BOM	Bureau of Meteorology
BPL	Bushfire Prone Land
BSAL	Biophysical Strategic Agricultural Land
C	
CAQIA	Construction Air Quality Impact Assessment
CEMP	Construction Environmental Management Plan
CHMP	Cultural Heritage Management Plan
CIA	Cumulative Impact Assessment
CIA Guidelines	<i>Cumulative Impact Assessment Guidelines for State Significant Projects</i>
CN	City of Newcastle
CO₂-e	carbon dioxide equivalent
Cth	Commonwealth of Australia
CTGM	Chichester Trunk Gravity Main
D	
DA	development application
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water

DIN	<i>Deutsches Institut für Normung</i> (German Institute for Standardisation)
DP	deposited plan
DPHI	Department of Planning, Housing and Infrastructure
E	
Engagement Guidelines	<i>Undertaking Engagement Guidelines for State Significant Projects</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2021</i> (NSW)
ERP	Emergency Response Plan
ESD	Ecologically Sustainable Development
F	
FEMP	Flood Emergency Management Plan
FTE	full-time equivalent
FPL	flood planning level
G	
GDE	groundwater dependent ecosystem
GHG	greenhouse gas
GSOO	<i>Gas Statement of Opportunities</i> (AEMO 2025)
H	
HDD	horizontal direct drilling
HIPAP	Hazardous Industry Planning Advisory Paper
HLF	Hunter Lateral Facility
HVFMS	Hunter Valley Flood Mitigation Scheme
I	
IAP2	International Association of Public Participation
IAQM Guidance	<i>Guidance on the Assessment of Dust from Demolition and Construction</i>
K	
km	kilometre
KP	kilometre point
kPa	kilopascal

kV	kilovolt
kW/m²	kilowatt per square metre
L	
ℓ	litre
L_{Aeq} dB(A)	Level A-weighted equivalent decibel
LALC	Local Aboriginal Land Council
Large Emitters Guide	<i>NSW Guide for Large Emitters (EPA 2025)</i>
LEP	Local Environmental Plan
LGA	local government area
LSC	Land and Soil Capability
LSPS	Local Strategic Planning Statement
M	
Mℓ	megalitre
m	metre
mbgl	metre below ground level
Metropolitan Plan	Greater Newcastle Metropolitan Plan
μm	micrometre
μg	microgram
mm	millimetre
mm/s	millimetre per second
MP	Member of Parliament
Maitland ESS	<i>Maitland Environmental Sustainability Strategy</i>
MAOP	maximum allowable operating pressure
MNES	Matters of National Environmental Significance
MPa	megapascal
N	
NSR	noise sensitive receiver
NSW	New South Wales
NTU	Nephelometric Turbidity Unit
NVIA	Noise and Vibration Impact Assessment
NVMP	Noise and Vibration Management Plan

O	
OSOM	over-size/over-mass
P	
PCT	Plant Community Type
PHA	Preliminary Hazard Assessment
PL8	Pipeline Licence No. 8
PM	particulate matter
PMF	Probable Maximum Flooding
PPV	peak particle velocity
Q	
QHA	Quaternary Hunter Alluvium
R	
RAP	Registered Aboriginal Party
ROW	right-of-way
S	
SIA	Social Impact Assessment
Significant Impact Guideline	<i>Matters of National Environmental Significance – Significant Impact Guidelines 1.1</i> (Department of the Environment 2013)
SSI	State Significant Infrastructure
SEPP	State Environmental Planning Policy
SHI	Statement of Heritage Impact
SMP	Stakeholder Management Plan
SWGA	Surface Water and Groundwater Assessment
T	
t	tonne
TfNSW	Transport for NSW
TIA	Traffic Impact Assessment
W	
WM Act	<i>Water Management Act 2000</i> (NSW)
WQO	water quality objective
WSAM	Williamtown Salt Ash Model

A	
Aquifer	An underground system of rock, sand or gravel that can yield useful supplies of water. Water seeps into the ground and is saturated in pores, fractures and cavities.
Acid sulfate soils	Soils that contain iron sulfides. If these iron sulfides are exposed to air, they react with oxygen to create sulfuric acid. This sulfuric acid may leach into soil and water, causing negative impacts to the environment.
As low as reasonably practical	A principle for risk management, which states that any risks should be reduced to the lowest possible level, as far as it is reasonably practical.
Annual Exceedance Probability	An estimation of the likelihood a flooding event of a given size will occur in any given year. The AEP is expressed as a percentage – for example, a 1% AEP indicates that there is a 1 in 100 chance of occurring in any given year.
Annual Recurrence Interval	Like the AEP, the ARI is an estimation of the likelihood a flooding of a given size will occur in any given year. The ARI is expressed as the long-term average number of years that a flood event of a specific size or larger will occur (for example, a 1 in 100-year ARI).
Australian Height Datum	The Australian reference system for height.
A-weighted decibel	An expression of the relative loudness of sounds as perceived by the human ear.
C	
Cumulative impacts	Impacts arising from the incremental, sustained and combined effects of human actions and natural variations over time. These impacts may be caused by the compounding effects of major projects, as well as past, current and future activities in an area. Cumulative impacts can be either positive or negative.
CO₂-e	Carbon dioxide equivalent is a standard way to compare the emissions of various greenhouse gases based on their global warming potential. The global warming potential of a gas is based on how much heat energy a gas will absorb, compared to the heat energy the same amount of carbon dioxide will absorb over the same period.
Consent authority	The decision-maker for a development application. In the case of State Significant Infrastructure modifications, this is typically the NSW Minister for Planning.
F	
Flash fire	A sudden, intense fire that lasts for a short duration. This kind of fire is caused by the ignition of a combustible material that has dispersed into the air, forming a cloud.
G	
Greenhouse gas	Refers to gases in the atmosphere that traps heat, causing an increase in Earth's surface temperature that drives climate change. For this Modification Report, 'greenhouse gases' refers to the gases addressed under the <i>National Greenhouse and Energy Reporting Act 2007</i> (Cth): Carbon dioxide.

	• Methane. • Nitrous oxide. • Sulfur hexafluoride. • Hydrofluorocarbons. • Perfluorocarbons.
Groundwater dependent ecosystem	Natural ecosystems that require access to groundwater either on a permanent or intermittent basis to ensure their survival.
H	
Hunter Valley Flood Mitigation Scheme	A network of flood mitigation levees, floodgates and drains along the Hunter, Paterson and Williams rivers. The HVFMS is operated by the Department of Planning, Housing and Infrastructure, with support from Hunter Local Land Services.
Horizontal Direct Drilling	A pipeline installation method involving the drilling of an underground bore across infrastructure and waterway crossings. Pipeline segments are then installed through the drilled bore, without the need to dig trenches.
Hydrostatic testing	A test involving the filling of a gas pipeline with water, thereby applying pressure to the gas pipeline. This test identifies issues with a gas pipeline's integrity, such as leaks, deformations or faulty joints.
Heat flux	The amount of thermal energy passing through a given surface area per unit time.
Hydraulic conductivity	A measure of how easily water can move through pore spaces or fractures in soils or rocks. This is typically expressed as K-values.
I	
Inter-generational equity	A principle of ecologically sustainable development which states that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
J	
Jet fire	A fire caused by the ignition of a combustible material that is continuously released at high speed in a particular direction.
M	
Modification	Refers to the Hunter Lateral Pipeline.
Modification area	Refers to the construction and operational footprint of the Hunter Lateral Pipeline.
N	
Nutrient	In the context of water quality, typically refers to the amount of nitrogen and phosphorus present in water. While these nutrients are beneficial to aquatic life in moderation, excessive nutrient levels can lead to negative impacts to water quality (such as algal blooms).
P	
Precautionary principle	A principle of ecologically sustainable development which states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Peak particle velocity	A measure of ground vibration intensity, based on the movement of particles during a vibration wave motion.
Pigging	The process of pushing a specialised device, called a 'pig', between two points on a pipeline – a pig launcher and a pig receiver. Pigging is typically used to inspect, dewater or clean a pipeline.
PM₁₀	Fine particulate matter in the air that is smaller than 10 microns.
Potential archaeological deposits	An area where there is an inferred likelihood of traces or evidence of Aboriginal land use being present under the ground surface.
Plant Community Type	A method to identify and describe of recurring patterns of native plant species based on environmental conditions within NSW (soil, temperature, moisture and other factors).
Probable Maximum Flooding	The largest flood that could conceivably occur at a particular location.
R	
Registered Aboriginal Party	Aboriginal people, organisations or their representatives who have registered an interest in being consulted about the development of an Aboriginal Cultural Heritage Assessment Report. Registered Aboriginal Parties are 'cultural knowledge holders' who hold relevant knowledge about the cultural significance of Aboriginal objects and/or places (both tangible and intangible).
Runoff	Surface water that is not absorbed by soil and flows across land.
Riparian land	Areas along or adjacent to the banks of a waterway, wetland or drainage line.
Recharge rate	The rate at which groundwater in an aquifer is replenished.
S	
Scope 1 emissions	Greenhouse gas emissions from the Hunter Lateral project, and Jemena's activities within the modification area.
Scope 2 emissions	Indirect greenhouse gas emissions resulting from the purchase of electricity, steam, heating and cooling for the modification.
Scope 3 emissions	Indirect greenhouse gas emissions resulting from modification activities from sources not controlled by Jemena. This includes 'upstream' emissions (e.g. employee commuting, purchase and transport of goods and services) and 'downstream' emissions (e.g. processing, use and end-of-life treatment of sold products).
Sensitive receivers	Land uses that may be impacted by the modification. The Modification Report describes two kinds of sensitive receivers – human sensitive receivers (residences, education and childcare centres, aged care facilities and hospitals), and ecological sensitive receivers (wetlands, conservation areas, surface water and groundwater).
Social infrastructure	Facilities, spaces and services that support the quality of life and wellbeing of a community (for example, health, education, aged care and education facilities).
Social locality	The area where people and businesses are likely to experience impacts from a major project.

Strahler stream order	A method to describe the hierarchy of water streams from the top to bottom of a water catchment.
Swept path analysis	A simulation and analysis of the path a vehicle takes when turning. The 'swept path' is the road area covered by the outermost and innermost points of a vehicle making a turn.
SIDRA analysis	The modelling of intersections, or changes to intersections using specialised software to assess its safety and performance for road users.
T	
Tie-in facility	A facility to connect a new gas pipeline to an existing gas pipeline.
Turbidity	A measure of the clarity of water. This is influenced by the presence of fine suspended matter (e.g. clay or silt).
Threatened ecological community	A naturally occurring group of native plants, animals and other organisms that are interacting with each other within a habitat. An ecological community is threatened if the community is at risk of extinction.
V	
Vapour cloud explosion	An explosion caused by the rapid ignition of a cloud of combustible material dispersed into the air.

1 Introduction

Jemena Gas Networks (NSW) Limited (Jemena) is seeking to modify the existing Infrastructure Approval for the Killingworth to Kooragang Island Pipeline (SSI-46360740). This modification is being sought through section 5.25 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The proposed modification is to construct the Hunter Lateral Pipeline (the project), an additional pipeline of 5.3-kilometre (km) length to convey gas from Santos' proposed Hunter Gas Pipeline to Jemena's existing Killingworth to Kooragang Island Pipeline.

The purpose of this Modification Report is to assess any additional economic, social and environmental impacts resulting from the modification. This Modification Report has been prepared with regard for the:

- *State Significant Infrastructure Guidelines – Preparing a Modification Report* (March 2026) (Modification Guidelines).
- Pre-modification application letter, received from the Department of Planning, Housing and Infrastructure (DPHI), April 2025 (PMA-82037956) (Pre-Modification Letter).

This Modification Report must be read in conjunction with the following appended specialist technical reports:

- **Appendix A:** Detailed project description
- **Appendix B:** Consolidated mitigation measures
- **Appendix C:** Preliminary Hazard Assessment (Arriscar 2026)
- **Appendix D:** Surface Water and Groundwater Assessment (Stantec 2026)
- **Appendix E:** Biodiversity Development Assessment Report (OzArk 2026b)
- **Appendix F:** Traffic Impact Assessment (Amber Organisation 2026)
- **Appendix G:** Noise and Vibration Impact Assessment (Construction) (JTA 2026a)
- **Appendix H:** Noise and Vibration Impact Assessment (Operation) (JTA 2026b)
- **Appendix I:** Aboriginal Cultural Heritage Assessment Report (OzArk 2026a)
- **Appendix J:** Social Impact Assessment (Umwelt 2026)
- **Appendix K:** Air Quality Assessment (EMM 2026a)
- **Appendix L:** Greenhouse Gas Assessment (EMM 2026b)

1.1 The existing pipeline

The Killingworth to Kooragang Island Gas Pipeline is an existing gas pipeline owned and operated by Jemena. This pipeline is being operated and maintained in accordance with the provisions set out in its licence (Pipeline Licence No. 8 [PL8]) under the *Pipelines Act 1967* (NSW) (Pipelines Act) and its Infrastructure Approval (SSI-46360740). The existing Killingworth to Kooragang Island Gas Pipeline is 33.3 km long and consists of the following sections:

- Killingworth to Hexham (19.5 km)
- Hexham to Kooragang Island Trunk Regulating Station (11.6 km)
- Kooragang Island Trunk Regulating Station to Walsh Point (1.8 km)
- Lenaghan Lateral Pipeline (0.4 km).

Under previous provisions of the Pipelines Act, the Killingworth to Kooragang Island Gas Pipeline did not require development consent as Part 4 of the EP&A Act. However, the *Pipelines Amendment Act 2006* (NSW) repealed this provision; transitional provisions within this amendment allowed for Licence No. 8 to be deemed as a Part 3A development approval under the EP&A Act.

Subsequently, Part 3A of the EP&A Act was repealed in October 2011 and replaced with the State Significant Development assessment regime. As such, the project was transitioned to SSI in June 2022, and PL8 comprises the Infrastructure Approval (SSI-46360740) for the project.

Two modifications have since been made to this Infrastructure Approval:

- **Modification 1:** Construction and operation of the Lenaghan Lateral Pipeline, approved 9 August 2023.
- **Modification 2:** Correction to Biodiversity Assessment Method credit liability defined in the Infrastructure Approval, approved 3 April 2024.

1.1.1 The modification

This modification, Modification 3 to the Infrastructure Approval seeks to construct and operate a new high-pressure gas pipeline and associated infrastructure at kilometre point (KP) 161.7 of the Killingworth to Hexham section of the Killingworth to Kooragang Island Pipeline. The new 5.3 km-long pipeline will connect the existing Killingworth to Kooragang Island Pipeline to the proposed Hunter Gas Pipeline. The pipeline will be constructed between Millers Forest and Hexham, traversing the City of Newcastle and City of Maitland local government areas (LGA). An overview of the modification is provided in Figure 1.1.

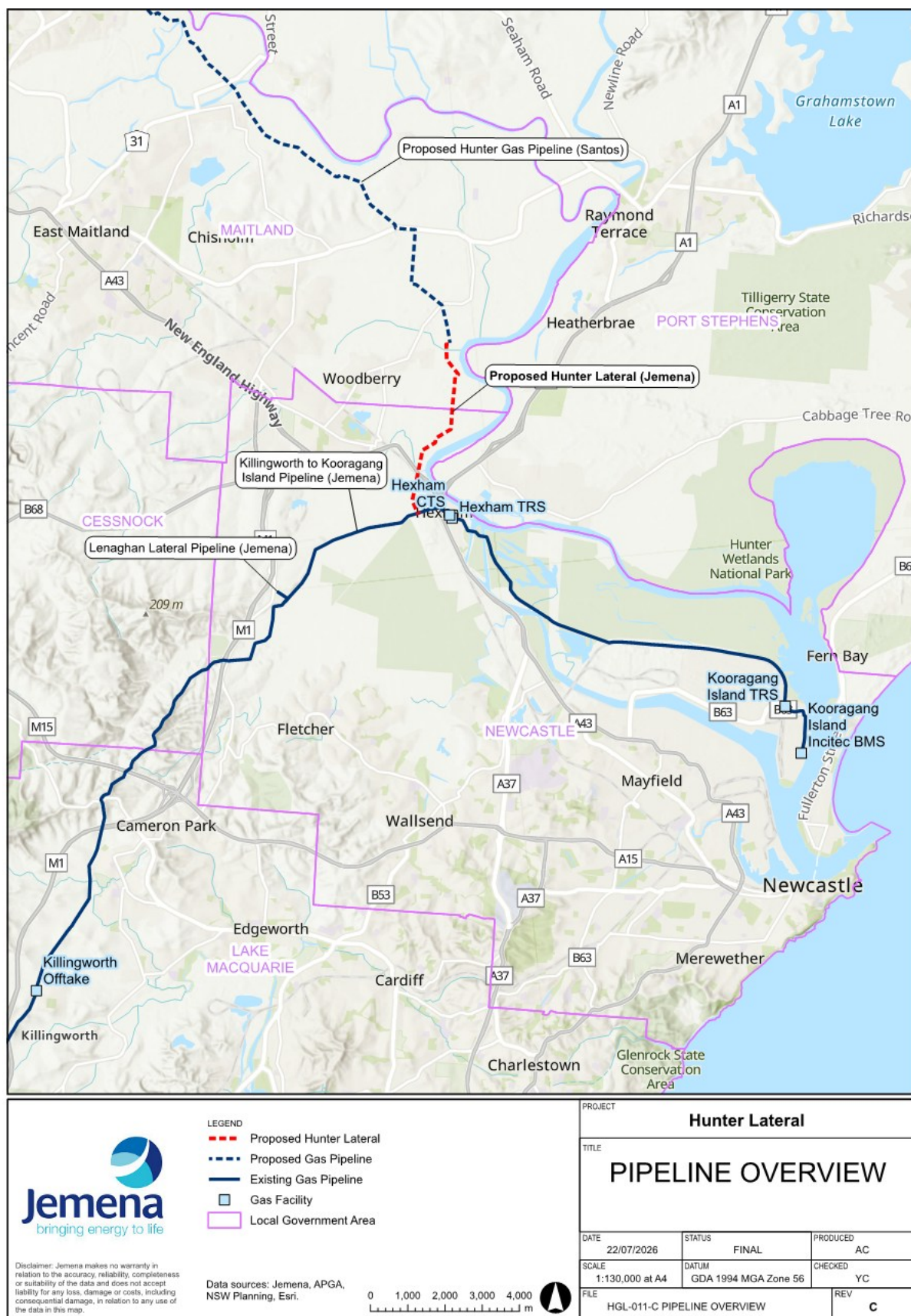


Figure 1.1 Modification overview

As part of the modification process, a Scoping Letter was submitted to the Department of Planning, Housing and Infrastructure (DPHI) in March 2025. The DPHI subsequently provided a Pre-Modification Letter in April 2025. In addition to the assessments proposed in the Scoping Letter, the DPHI requested the following considerations be included in the Modification Application:

- **Community, local council and government agency consultation**, having regard for the *Undertaking Engagement Guidelines for State Significant Projects* (Department of Planning, Housing and Infrastructure 2026).
- **Air quality assessment**, including details of management of construction air quality impacts.
- **Greenhouse gas emissions assessment**, including an assessment of whether the project will trigger the Environment Protection Authority (EPA)'s *NSW Guide for Large Emitters* (NSW EPA 2025) .
- **Cumulative impacts assessment**, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice, and the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPHI 2026a).
- **Social and economic impact considerations**, including gas supply and end users' consideration, having regard to the *Social Impact Assessment Guideline for State Significant Projects* (DPHI 2026b).

An assessment of the project's impacts is provided in Chapter 6.

1.2 The proponent

The proponent of this modification is Jemena, the owner, operator and holder of Pipeline Licence 8 (PL8) for the existing Killingworth to Kooragang Island Pipeline. Jemena will oversee the construction, commissioning and operation of the modification. Proponent details are provided in Table 1.1.

Table 1.1 Proponent details

Company name	Jemena Gas Networks (NSW) Ltd
Australian Business Number (ABN)	87 003 004 322
Business address	Level 16, 567 Collins Street, Melbourne, Victoria 3000

2 Strategic context

2.1 The need for the modification

The project would allow gas from Narrabri in northern NSW and the Wallumbilla Gas Supply Hub in Queensland to be supplied to east coast markets, such as Newcastle and Sydney. The proposed modification is consistent with the NSW *Future of Gas Statement* (Department of Regional NSW 2021), as the Hunter Lateral Pipeline will:

- increase access to a supply of reliable and affordable gas.
- supply industries with intensive energy needs, urban and regional centres, as well as gas electricity generation facilities —thereby contributing to NSW’s economic growth and energy security.
- add competition to the domestic gas market, as it diversifies the gas sources available to the market.

Providing additional gas supply to southern Australia is also crucial to reducing supply gaps forecasted from 2029 onwards. This gap is forecasted in the 2026 *Gas Statement of Opportunities* (GSOO) (AEMO 2026). While there is an improved supply outlook for southern Australia when compared to the 2025 GSOO, the 2026 GSOO still emphasises the need to build gas production, storage and transmission facilities to cover predicted supply shortfalls. The 2026 GSOO also notes that gas infrastructure will need to cater for more concentrated and volatile periods of gas demand. This gas demand would be driven by periods of high electricity demand, low renewable energy generation and the use of gas firming power stations.

As such, the modification would support Australia’s transition to renewable energy sources by providing enhanced gas supply in NSW that is suitable for grid-firming services. Gas grid-firming services provide dispatchable energy during periods of low renewable energy generation, thereby guaranteeing sufficient electricity supply and grid stability for customers in the National Electricity Market.

2.2 Land use planning

State, regional and local planning documents have common land use planning considerations that are relevant to the modification. These include:

- Protecting freight corridors.
- Protecting natural areas and waterways.
- Protecting productive agricultural land.
- Ensuring infrastructure is resilient against natural hazards.

2.2.1 Protecting freight corridors

The southern portion of the modification area is located near two Catalyst Areas identified in the *Hunter Regional Plan 2041* (Hunter Regional Plan) (Department of Planning and Environment 2022), *Greater Newcastle Metropolitan Plan* (Metropolitan Plan) (Department of Planning and Environment 2018) and *Newcastle Local Strategic Planning Statement* (Newcastle LSPS) (City of Newcastle 2020). Catalyst Areas are described in the Metropolitan Plan as “...places of metropolitan significance that need a collaborative approach to the delivery of new jobs and homes”.

The two Catalyst Areas include the Beresfield and Black Hill Catalyst Area to the north of the modification area, and the Newcastle Port Catalyst Area to the south of the modification area. Both catalyst areas will focus on strengthening freight movements, diversifying, and growing trade in the City of Newcastle LGA. These catalyst areas are within the National Pinch Point regionally significant growth area, as defined by the Hunter Regional Plan. The National Pinch Point area includes key national road and rail freight routes between the two catalyst areas, as well as surrounding lands.

All three strategic planning documents prioritise the protection of freight movement from incompatible land uses due to the prevalence of nationally significant freight movements on the Main Northern railway line, Pacific Highway, Pacific Motorway, and New England Highway. These documents also emphasise the need to protect land required for two proposed transport projects that will facilitate more efficient freight movements —the M1 Pacific Motorway Extension (currently under construction), and the Lower Hunter Freight Corridor.

2.2.2 Protecting natural areas and waterways

Per the Metropolitan Plan, Newcastle LSPS and the *Maitland Environmental Sustainability Strategy* (Maitland ESS) (Maitland City Council 2024), the riparian areas of the Hunter River and Francis Greenways Creek are considered regionally significant biodiversity corridors (Figure 2.1). At the same time, the Metropolitan Plan has mapped the southern portion of the modification area as an environment/open space area. This environment/open space area is to be supported by improvements to the blue-green grid connection, south of the modification area.

The Newcastle LSPS and Maitland ESS prioritise the maintenance of functional biodiversity corridors. To support this priority, the Newcastle LSPS and Maitland ESS recommended the use of land use planning controls to reduce the clearing of native vegetation, prohibit inappropriate development near waterways and wetlands, and improve the connectivity and quality of existing green and blue areas.

At the same time, the *Maitland Local Strategic Planning Statement* (Maitland LSPS) (Maitland City Council 2020) and Newcastle LSPS also make the improvement of waterway health within Greater Newcastle a regional priority. These LSPSs contain actions to prevent intensive urban development within the network of water features and green spaces within the Maitland and Newcastle LGAs (described as the ‘blue-green grid’). The LSPSs also encourage best-practice stormwater management and landscaping controls to reduce the impact of stormwater runoff on waterway health.

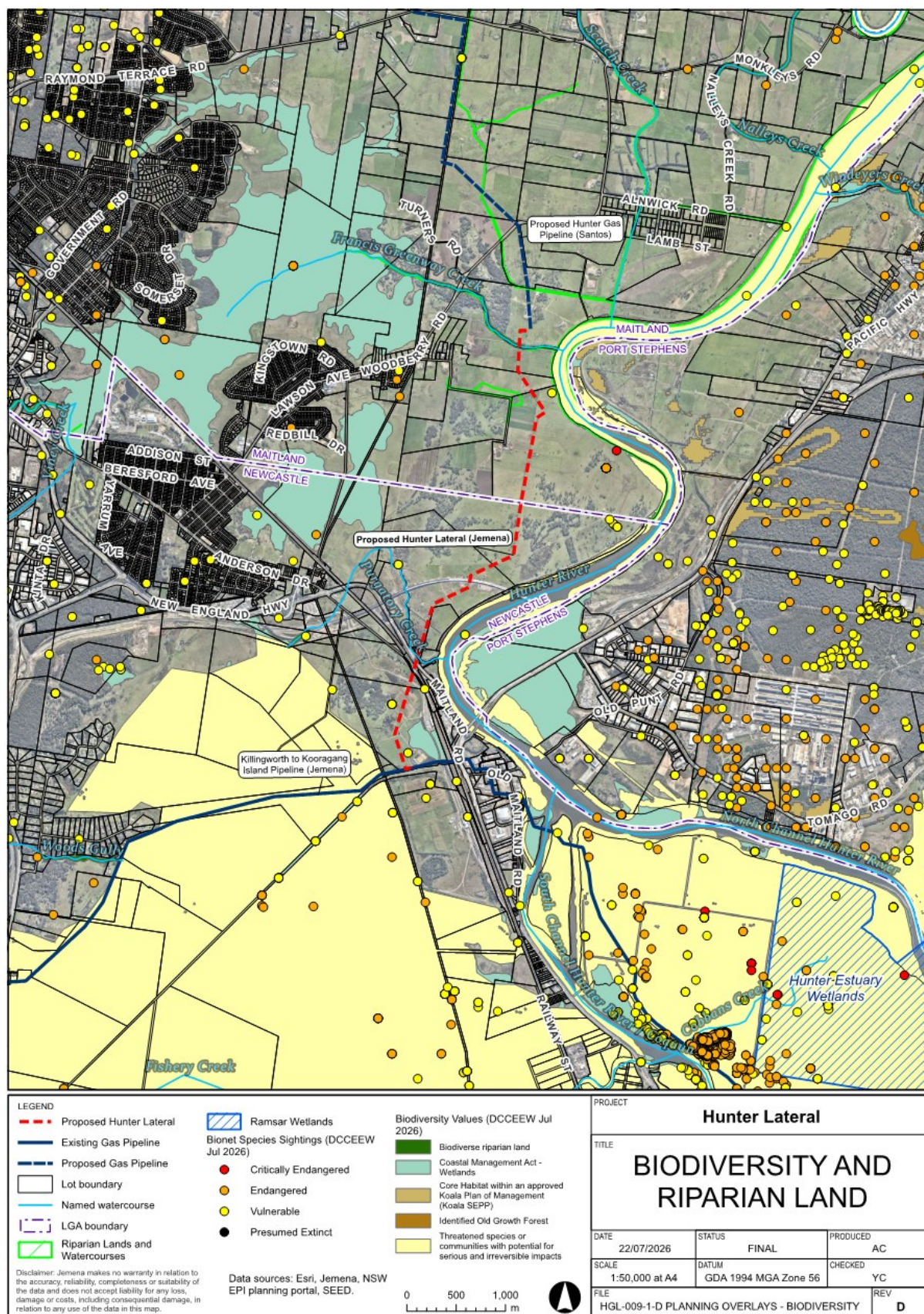


Figure 2.1 Biodiversity and riparian land

2.2.3 Protecting productive agricultural land

The Hunter Regional Plan, Metropolitan Strategy and *Maitland Rural Land Strategy 2041* (Maitland City Council 2023) (Maitland RLS) focus on protecting the productivity and visual amenity of agricultural land. The Hunter Regional Plan and Maitland RLUS seek to do this by discouraging inappropriate land uses on agricultural land —this reduces land use conflicts between agricultural and non-agricultural land uses. At the same time, these strategic planning documents highlight the need to reduce rural land fragmentation by enforcing lot size and residential land use restrictions on agricultural land.

2.2.4 Ensuring infrastructure is resilient against natural hazards

The Maitland LSPS and the City of Newcastle's Know Your Flood Risk mapping (City of Newcastle n.d.) indicates that the modification area is at high risk of flooding. The Metropolitan Plan indicates that developments interfacing with the blue-green grid addresses impacts caused by extreme events. The *Newcastle City-wide Floodplain Risk Management Study and Plan* and *Hunter River Floodplain Risk Management Study and Plan* (WMA Water 2015) recommend that development assessments consider the current and future flood risk of an area, especially when risks change due to the impacts of climate change. Where a development's flood risks cannot be suitably mitigated or a development directly increases an area's flood risk, said developments should not be permitted.

2.3 Site context

The modification area covers approximately 24 hectares (ha) of land located within the localities of:

- Hexham and Tarro, within the City of Newcastle local government area (Newcastle LGA).
- Woodberry and Millers Forest, within the City of Maitland LGA (Maitland LGA).

The modification area consists of 22 land parcels, as outlined in Table 2.1. Of these land parcels, the Hunter Lateral Pipeline will traverse 13 land parcels. The rest of the land parcels will be used for construction workspace and access purposes. While there are no Crown reserves or travelling stock routes within the modification area, Francis Greenways Creek and Purgatory Creek are Crown waterways.

The Mindaribba and Worimi peoples are the traditional custodians of the lands and waters within the modification area.

Table 2.1 Land parcels within the modification area

Lot/Deposited Plan	Ownership	LGA	Proposed infrastructure
5/-DP262053	Private	Maitland	Hunter Lateral Pipeline
Francis Greenways Creek	Crown waterway	Maitland	Hunter Lateral Pipeline
6/-DP262053	Private	Maitland	Hunter Lateral Pipeline
11/-DP1189457	Private	Maitland	Hunter Lateral Pipeline
12/-DP1189457	Private	Maitland	Hunter Lateral Pipeline
12/-DP32585	Transport for NSW	Newcastle	Hunter Lateral Pipeline
131/-DP1092779	Roads and Maritime Services	Newcastle	Hunter Lateral Pipeline

Lot/Deposited Plan	Ownership	LGA	Proposed infrastructure
A/-/DP405828	Private	Newcastle	Hunter Lateral Pipeline
B/-/DP405828	Private	Newcastle	Hunter Lateral Pipeline
Purgatory Creek	Crown waterway	Newcastle	Hunter Lateral Pipeline
1/-/DP119895	Transport for NSW	Newcastle	Hunter Lateral Pipeline
1014/-/DP1193539	Transport for NSW	Newcastle	Hunter Lateral Pipeline
1/-/DP1036152	Transport for NSW	Newcastle	Hunter Lateral Pipeline
104/-/DP1084709	Private	Newcastle	Hunter Lateral Pipeline
106/-/DP1189565	Private	Newcastle	Hunter Lateral Pipeline
1/-/DP707984	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
2/-/DP225218	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
2/-/DP707984	Roads and Traffic Authority of New South Wales	Newcastle	None – existing access track to be used for construction traffic.
1/-/DP1165954	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
B/-/DP405828	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
A/-/DP405828	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
13/-/DP1286735	Transport for NSW	Newcastle	None – existing access track to be used for construction traffic.
10/-/DP1150648	Roads and Traffic Authority of New South Wales	Newcastle	None – existing access track to be used for construction traffic.
1/-/DP1286735	The State of New South Wales	Newcastle	None – existing access track to be used for construction traffic.

2.3.1 Land use and agricultural capability

The modification area comprises grassed, waterlogged pastoral land, characteristic of floodplain terrain. Grazing and agriculture are the predominant land uses within the modification area. The modification area traverses land that is zoned as C2 – Environmental Conservation within the Newcastle LGA, and RU1 – Primary Production within the Maitland LGA.

The land use surrounding the modification area varies; industrial, transport and nature reserve (Hexham Swamp) land uses surround the southern portion of the modification area, while the built-up areas of Beresfield, Woodberry and Tomago are located to the west of the modification area.

The modification area is not considered Biophysical Strategic Agricultural Land (BSAL). NSW Land and Soil Capability (LSC) mapping (Department of Climate Change, Energy, the Environment and Water 2025) suggests that the modification area and its surroundings have a moderate to low capability to sustain intensive agricultural land uses.

2.3.2 Topography

The modification area is characterised by flat terrain, comprising of low-lying floodplains. The modification area's elevation is approximately 0.4 m to 0.8 m Australian Height Datum (AHD).

2.3.3 Geology and groundwater

The modification area is located within the Hunter Unregulated and Alluvial Water Sources groundwater management area. Per the *Soil Landscapes of the Newcastle 1:100,000 Sheet* (Matthei 1995), the modification area is located within the Millers Forest regional soil landscape.

As noted by the Hunter Lateral Pipeline's *Geotechnical Interpretive Report* (SLR 2025a) (Geotechnical Interpretive Report), topsoil within the modification area is generally 0.3 to 0.7 m thick, and is comprised of clay loam, silt and organic material. There is also a high probability of acid sulfate soils within 1 m of the ground surface.

As noted in the *Surface Water and Groundwater Assessment* (Stantec 2026) (SWGA), the alluvial deposits form the primary aquifer for the modification area —these deposits form part of the Quaternary Hunter Alluvial (QHA) aquifer. Groundwater depths are shallow and vary across the modification area, with geotechnical boreholes and test pits within the modification area indicating that depths may range from 0.54 m to 2.6 m below ground level (0.37 m to -1.55 m AHD).

Underlying the alluvial deposits is the Permian-aged sedimentary Tomago Coal Measures bedrock aquifer. The bedrock soil profile includes very fine- to medium-grained grey lithic sandstone, laminated to carbonaceous shale and mudstone, siltstone, coal with sporadic interbedded carbonaceous shale, claystone, sideritic bands and rare pebble para-conglomerate.

The QHA aquifer is the primary aquifer for the modification area, with floodplains and alluvial groundwater systems acting as a groundwater sink into the bedrock aquifer. Groundwater flows upwards from the bedrock aquifer into the QHA aquifer (Kellett, et. al. 1987); it is likely that these aquifers contribute to the base flow of the surface water features within the modification area.

2.3.4 Surface water

The modification area is located approximately between 170 m and 330 m west of the Hunter River (*Coquun*) and is situated within the Hunter River Catchment. The modification area also intersects drainage lines that confluence with the Hunter River (*Coquun*):

- Francis Greenways Creek
- Purgatory Creek
- several unnamed drainage lines.

The Strahler stream order for each surface water feature is provided in Table 2.2, and illustrated in Figure 2.2.

The SWGA noted that Francis Greenways Creek, Purgatory Creek and the Hunter River (*Coquun*) are laterally unconfined, continuous channels (watercourses with floodplains along both banks) with fine-grained, sandy beds.

Table 2.2 Summary of Strahler order for surface water features

Surface water feature	Strahler order
Hunter River (<i>Coquun</i>)	9
Francis Greenways Creek	4
Purgatory Creek	3 and 4
Unnamed drainage channels (central portion of modification area)	0
Unnamed drainage channels (southern portion of modification area)	1 and 2

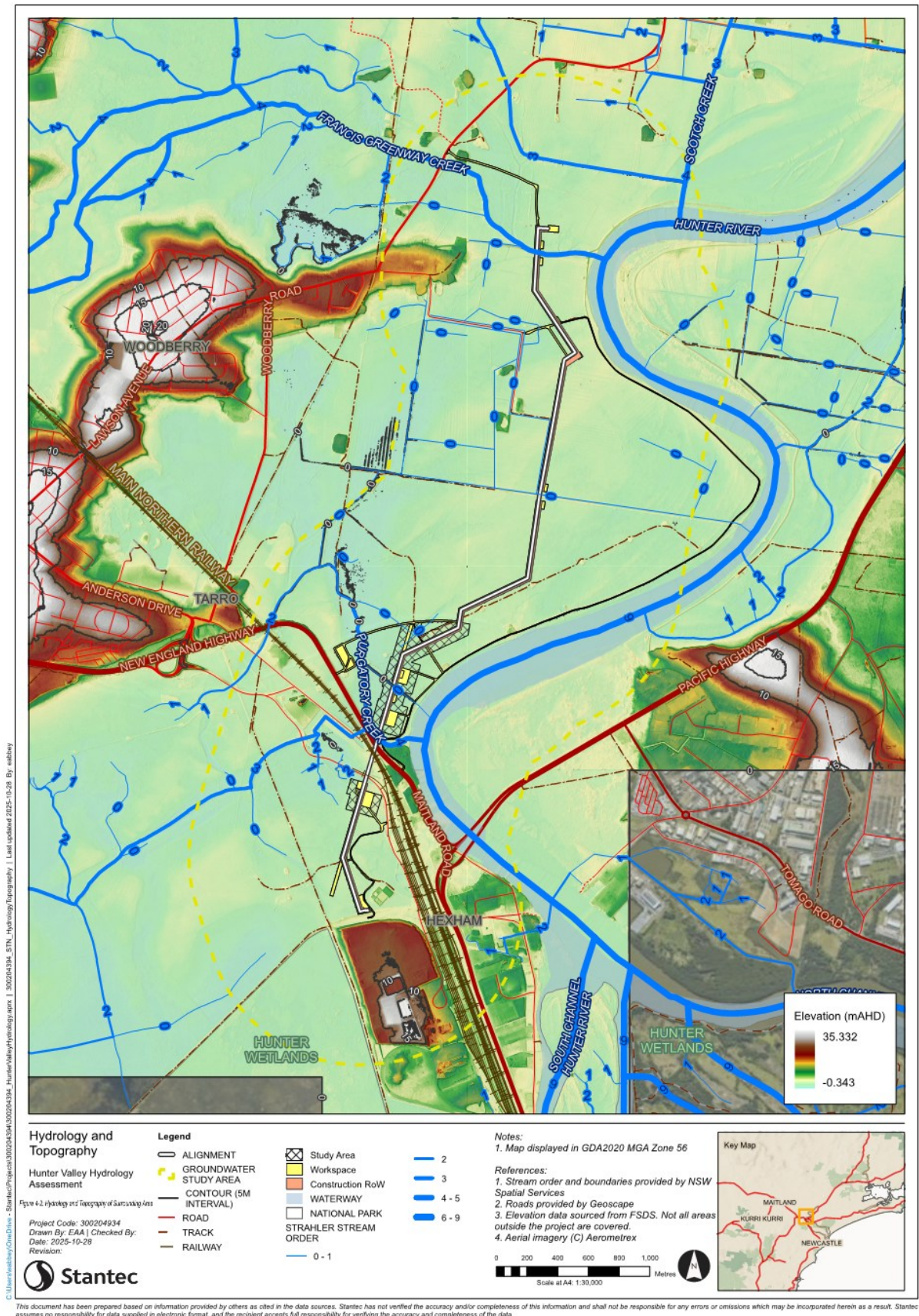


Figure 2.2 Strahler order of surface water features (Stantec 2026)

2.3.5 Infrastructure

The modification area both intersects, and is near several third-party infrastructure assets.

Transport

The modification area will intersect three major transport routes (see Figure 2.3):

- **Main Northern Line/Newcastle Branch Line** – a passenger and freight railway line providing a connection between the Port of Newcastle and Newcastle Interchange, Queensland and Sydney.
- **A1 Maitland Road/New England Highway** – a highway linking Newcastle with Toowoomba, Queensland.
- **M1 Pacific Motorway Extension** – a new dual carriageway that will connect the existing M1 Pacific Motorway and the A1 Pacific Highway at Raymond Terrace. This dual carriageway is currently under construction.

These transport routes are considered national key freight routes, as they provide connections between nationally significant places for freight —this includes the Port of Newcastle and Newcastle Airport.

A portion of the modification area is also located within the proposed **Lower Hunter Freight Corridor**. The Lower Hunter Freight Corridor would provide a dedicated set of rail tracks for freight movements along the Main Northern Line, between Hexham, Beresfield and Fassifern.

Tarro Railway Station is located on Woodberry Road, along the Main Northern Line/Newcastle Branch Line. This railway station is a stop on the Hunter Line, an intercity passenger train line operating between Dungog Station, Scone Station and the Newcastle Interchange. This passenger rail service is operated by NSW TrainLink.

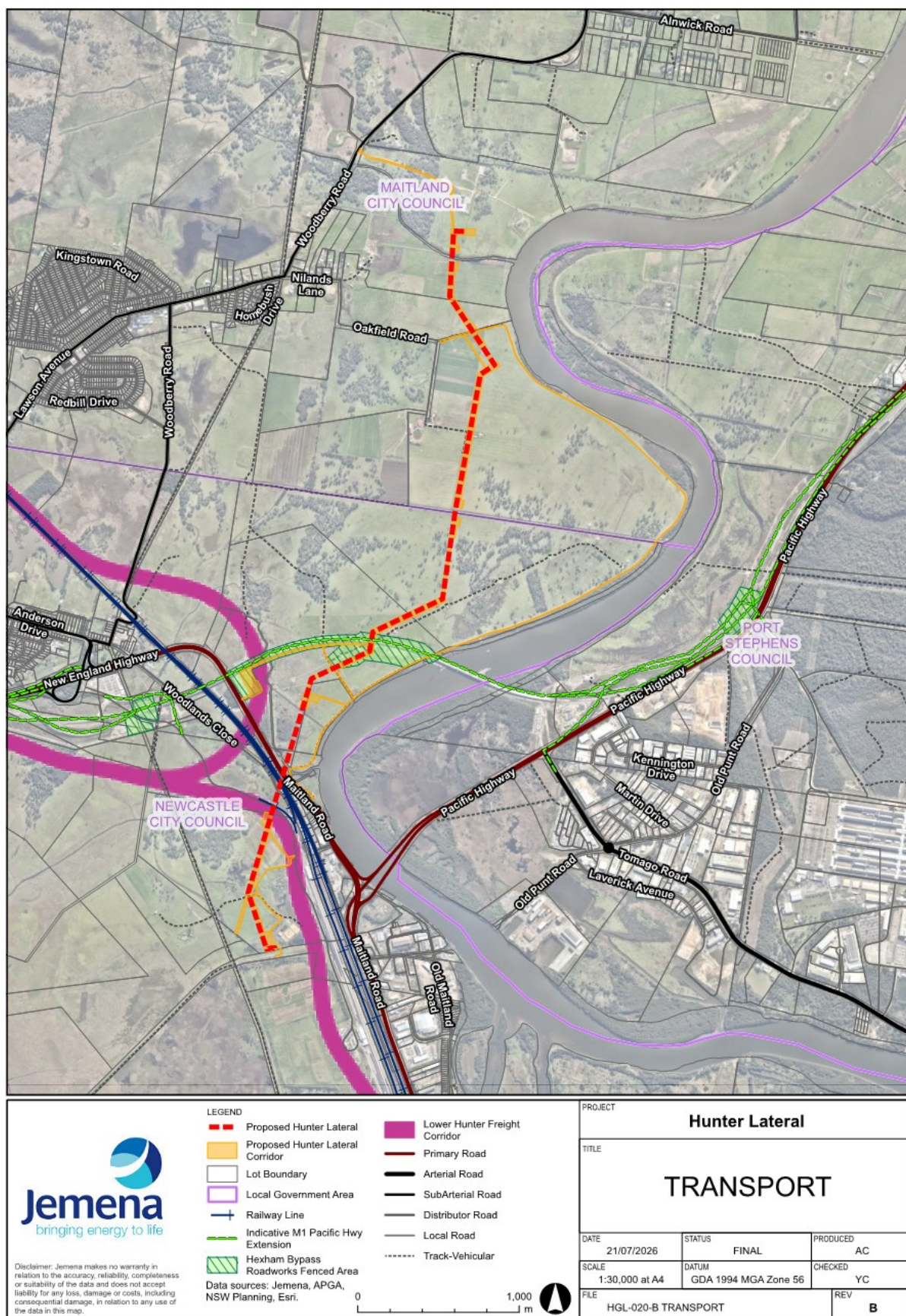


Figure 2.3 Transport Infrastructure

Two public bus services, and several school bus services operate along Woodberry Road and the New England Highway. The operator of these services is CDC NSW. These services are outlined in Table 2.3.

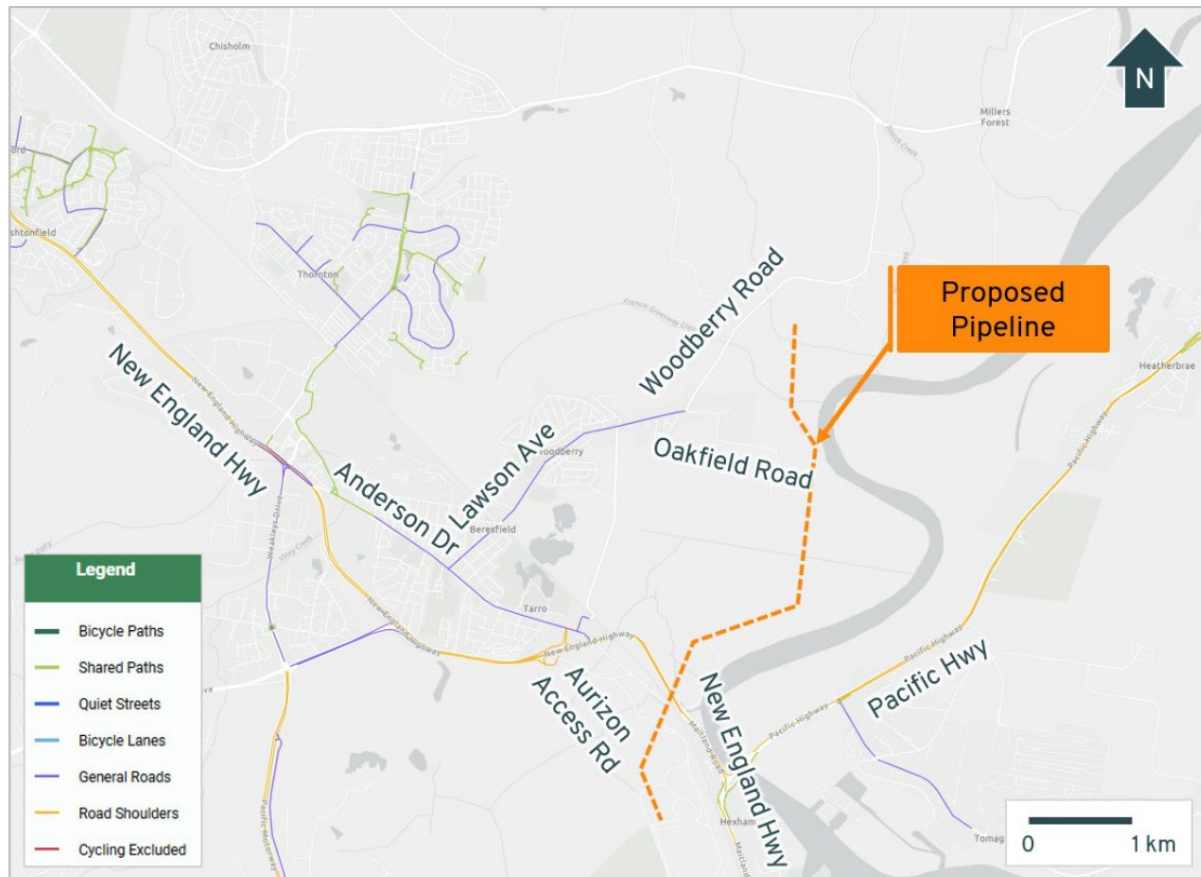
Table 2.3 Public and school bus services

Bus service	Operational hours	Frequency
Public bus services		
145 Newcastle Airport to Green Hills Shopping Centre via Raymond Terrace	6:00 am to 5:00 pm on weekdays and Saturdays, 8:00 am to 4:00 pm on Sundays and public holidays.	60 minutes
181 Rutherford to Woodberry via Maitland, Green Hills Shopping Centre and Beresfield	6:30 am to 9:30 pm on weekdays, 6:45 am to 7:45 pm on Saturdays. 9:00 am to 5:00 pm on Sundays and public holidays.	60-121 minutes
New England Highway school bus services		
1223 Mayfield Christian College [Hunter Christian School] to Chisholm Road	Single afternoon school bus service originating from Hunter Christian School at 2:55 pm	One afternoon service, operating Mondays to Fridays.
1261 Tregenna Street to Maitland High School	Single morning school bus service originating from Tregenna Street at 7:30 am.	One morning service, operating Mondays to Fridays.
1272 Callaghan College to Clarence Town	Single afternoon school bus service originating from St Phillip's College at 3:00 pm.	One afternoon service, operating Mondays to Fridays.
1304 San Clemente High School to Lakeside	Single afternoon school bus service originating from San Clemente High School at 3:05 pm.	One afternoon service, operating Mondays to Fridays.
1323 Tighes Hill Primary School to Howell and Dawson	Single afternoon school bus service originating from Tighes Hill Primary School at 3:05 pm.	One afternoon service, operating Mondays to Fridays.
1492 Bishop Tyrell College to Raymond Terrace	Single afternoon school bus service originating from Bishop Tyrell Anglican College at 3:35 pm.	One afternoon service, operating Mondays to Fridays
1662 Hunter Sports High School to Hexham McDonalds	Single afternoon school bus service originating from Merewether High School at 3:15 pm.	One afternoon service, operating Mondays to Fridays.
2282 Merewether High School to Lions Park	Single afternoon school bus service originating from Merewether High School at 2:20 pm. Operational on Mondays, Tuesdays, Wednesdays and Thursdays only.	One afternoon service, operating Mondays to Thursdays only. Stopping patterns for this bus route varies on Wednesdays.
2283	Single afternoon school bus service originating from Merewether High School at 2:35 pm. Operational on Fridays only.	One afternoon service, operating Fridays only.

Bus service	Operational hours	Frequency
Merewether High School to Lions Park		
2373 Hunter Christian School to Dunmore and Morpeth	Single afternoon school bus service originating from St Phillip's College at 3:00 pm.	One afternoon service, operating Mondays to Fridays.
2472 Gateshead High School to Maitland Station	Single afternoon school bus service originating from Hunter Sports High School at 3:20 pm on Mondays, Wednesdays and Fridays, or 2:35 pm on Tuesdays.	One afternoon service, operating Mondays to Fridays. Stopping patterns for this bus route varies on Tuesdays.
2522 Merewether High School to Bolwarra Heights	Single afternoon school bus service originating from Merewether High School at 3:15 pm.	One afternoon service, operating Mondays to Fridays. Stopping patterns for this bus route varies on Fridays.
S556 Fingal Bay to Hunter Valley Grammar School	Single morning school bus service originating from Fingal Bay Shops/Market Street at 6:44 am.	One morning service, operating Mondays to Fridays
Woodberry Road school bus services		
1492 Bishop Tyrell College to Raymond Terrace	Single afternoon school bus service originating from Bishop Tyrell Anglican College at 3:35 pm.	One afternoon service, operating Mondays to Fridays
2340 Beresfield to Millers Forest Primary School	Single morning school bus service originating from Yarrum Avenue at 7:30 am.	One morning service, operating Mondays to Fridays
2463 All Saints College (St Marys Campus) to MacFarlanes and Raymond Terrace Road	Single afternoon school bus service originating from All Saints College (St Marys Campus) at 4:10 pm. Operational Mondays, Tuesdays, Thursdays and Fridays only.	One afternoon service, operating on Mondays, Tuesdays, Thursdays and Fridays only.
2514 Millers Forest Primary School to Beresfield Primary School, to Minmi Road	Single afternoon school bus service originating from Martins Wharf Road (opposite Millers Forest Primary School) at 2:50 pm.	One afternoon service, operating Mondays to Fridays
2634 All Saints College, St Peters College to Woodberry	Single afternoon school bus service originating from Uniting Church Maitland at 3:54 pm.	One afternoon service, operating Mondays to Fridays
2695 St Bede's High School to Beresfield	Single afternoon school bus service originating from St Aloysius Primary School at 3:24 pm.	One afternoon service, operating Monday to Friday
2696 Woodberry to St Aloysius Primary School	Single morning school bus service originating from Raymond Terrace Road at 7:30 am.	One morning service, operating Mondays to Fridays

Transport for NSW (TfNSW)'s Cycleway Finder Map (2018) indicates that there are **no dedicated cycle paths or shared paths within the modification area**. However, the map indicates road

shoulders of the New England Highway, and a portion of Woodberry Road may be used for cycling traffic. This is illustrated in Figure 2.4.



Source: TfNSW Cycleway Finder

Figure 2.4 TfNSW Cycleway Finder Map (Amber Organisation 2026)

Hunter Valley Flood Mitigation Scheme

The **four drainage lines** intersecting the modification area form part of the Hunter Valley Flood Mitigation Scheme (HVFMS). The modification area also contains, or is near other HVFMS infrastructure, including:

- Four **flood gates** located at Purgatory Creek, Francis Greenways Creek, the New England Highway, adjacent to Hexham Swamp and the Shortland Wetlands.
- The **Hannaway and Tarro levees**, adjacent to the modification area – these levees run parallel to the western bank of the Hunter River.
- A network of **engineered drainage channels, stormwater treatment basins and discharge points** owned and operated by Aurizon, to the south of the modification area.
- The portion of the modification area located south-west of the New England Highway/Maitland Road is a **declared floodplain**, per section 16(1) of the *Hunter Valley Flood Mitigation Act 1956* (NSW) (HVFM Act).

All HVFMS infrastructure intersecting the modification area is illustrated in Figure 2.5. Flood hazards are discussed in Sections 2.3.6 and 6.1.

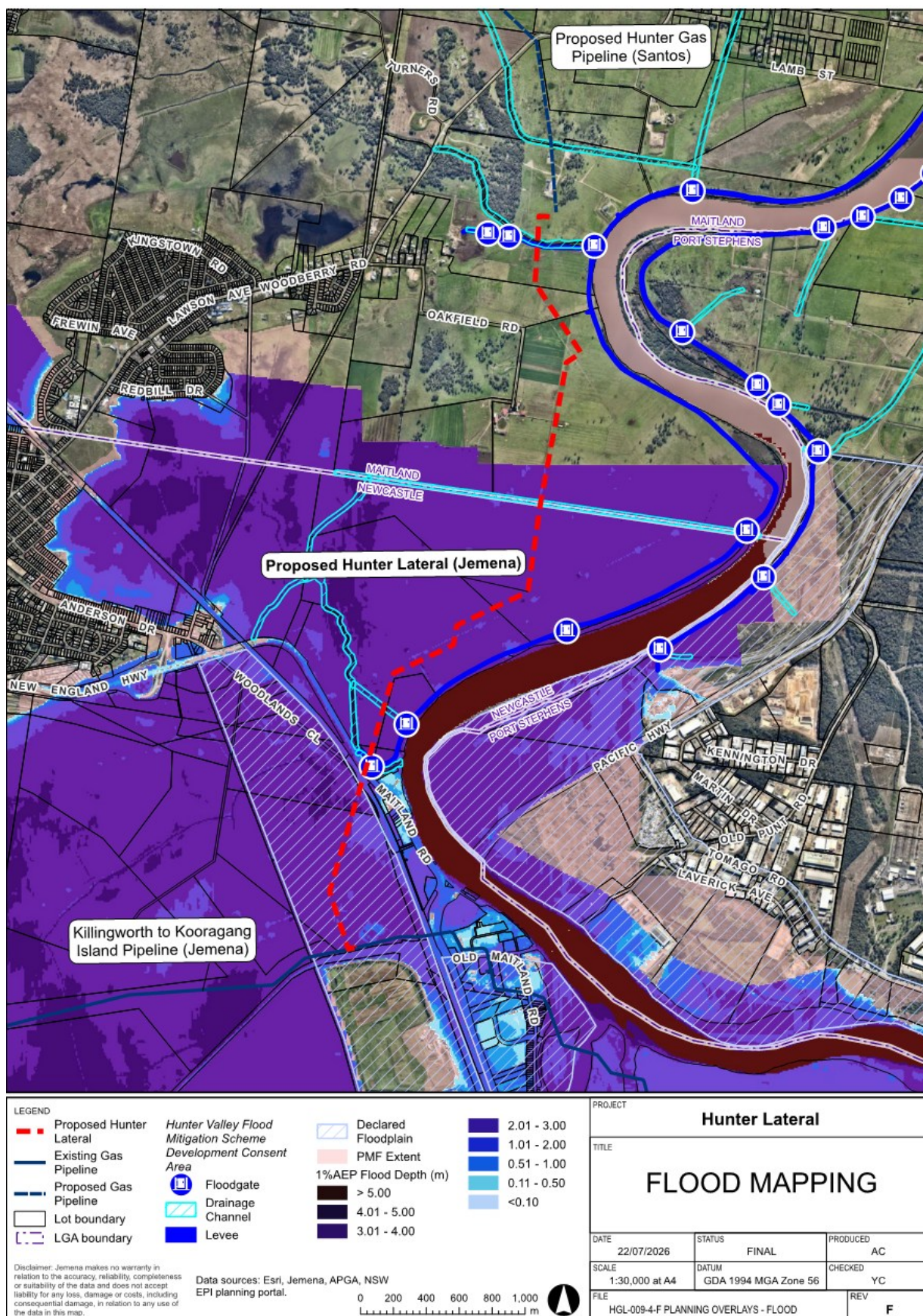


Figure 2.5 HVFMS infrastructure and flood risk mapping

Electricity

The modification area intersects **six transmission and sub-transmission lines** that are owned by Transgrid or Ausgrid, as shown in Figure 2.6. These include the:

- 330 kilovolt (kV) Newcastle to Tomago transmission line (Line 95; Transgrid).
- 330 kV Liddell Power Station to Tomago transmission line (Line 82; Transgrid).
- 132 kV Tomago to Beresfield transmission line (Line 98R; Ausgrid).
- 132 kV Brandy Hill Tee to Tomago transmission line (Line 9C5; Transgrid).
- 132 kV Brandy Hill Tee to Tomago transmission line (Line 9C6; Ausgrid).
- 132 kV Tomago to Stroud (Line 96F; Transgrid).

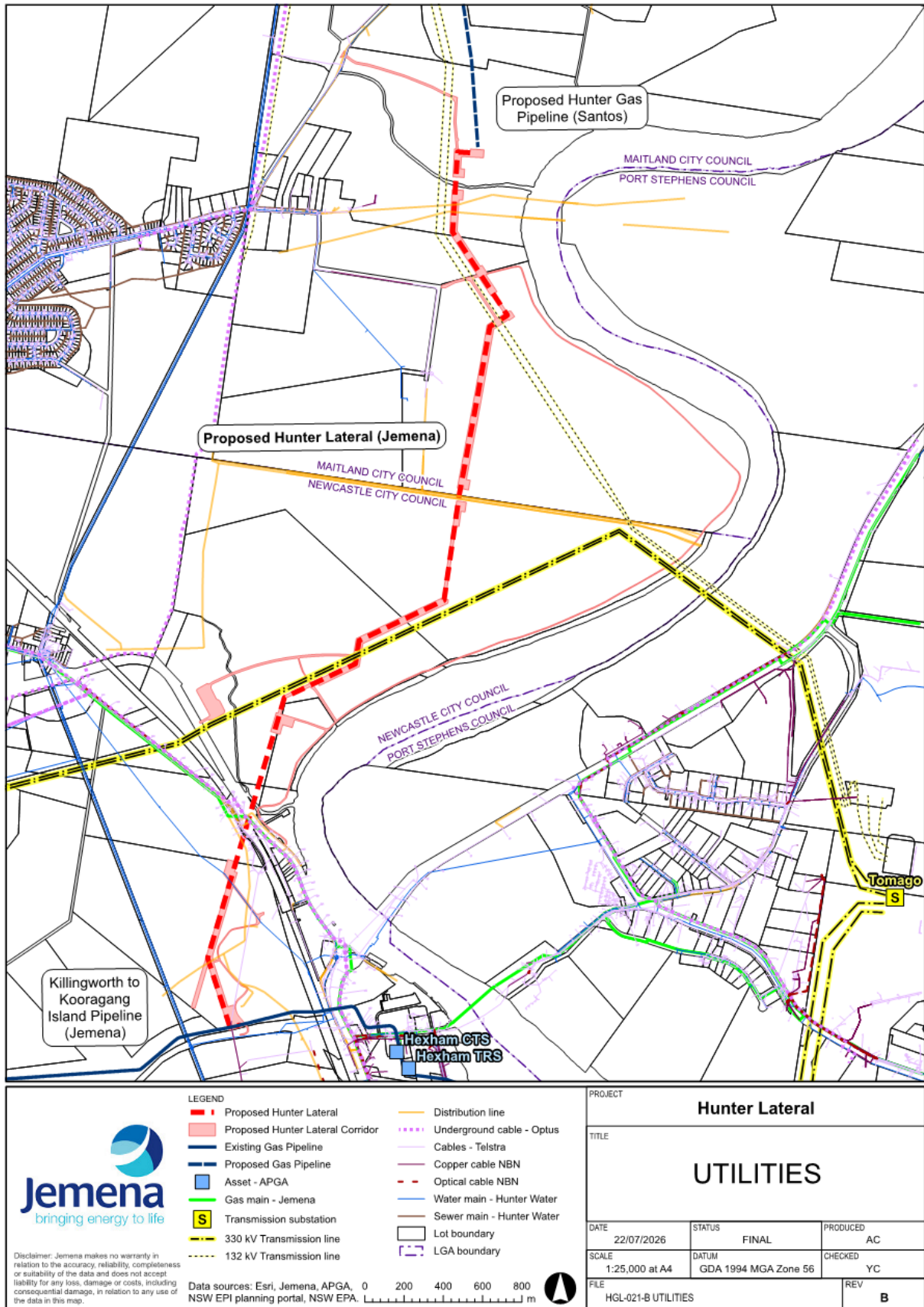


Figure 2.6 Utilities infrastructure

2.3.6 Hazards

There are **four potential hazards within the modification area**. The potential for these hazards to occur have been assessed in Sections 6.1, 6.6 and 6.10 of this Modification Report, summarised below:

- As shown in Figure 2.5, the portion of the proposed pipeline route traversing land within the Newcastle LGA is in a high-risk flood area (based on the City of Newcastle's Know Your Flood Risk portal) (City of Newcastle n.d.). It should be noted that Figure 2.5 only includes flood risk information for the Newcastle LGA. A comprehensive flood study was undertaken for the modification; the results of this flood study are discussed in Section 6.1.
- The modification area is situated within bushfire prone land (BPL) (see Figure 2.7) (NSW Rural Fire Service 2025). The majority of the modification area is mapped as containing Category 3 vegetation. Patches of Category 1 and 2 vegetation also occur within the modification area.
- The modification area is also mapped in the Maitland and Newcastle Local Environmental Plan (LEP) Acid Sulfate Soil Maps as potentially containing acid sulfate soils below the natural ground surface (Class 2) (see Figure 2.8).
- 179 and 3/67 Maitland Road, Hexham (comprising lots 104/-/DP1084709 and 106/-/DP1189565) are listed as notified sites in the EPA's Contaminated Land Register (NSW EPA 2026a). Both land parcels are part of the Queensland Rail National (now known as Aurizon) Hexham Precinct (see Figure 2.8).

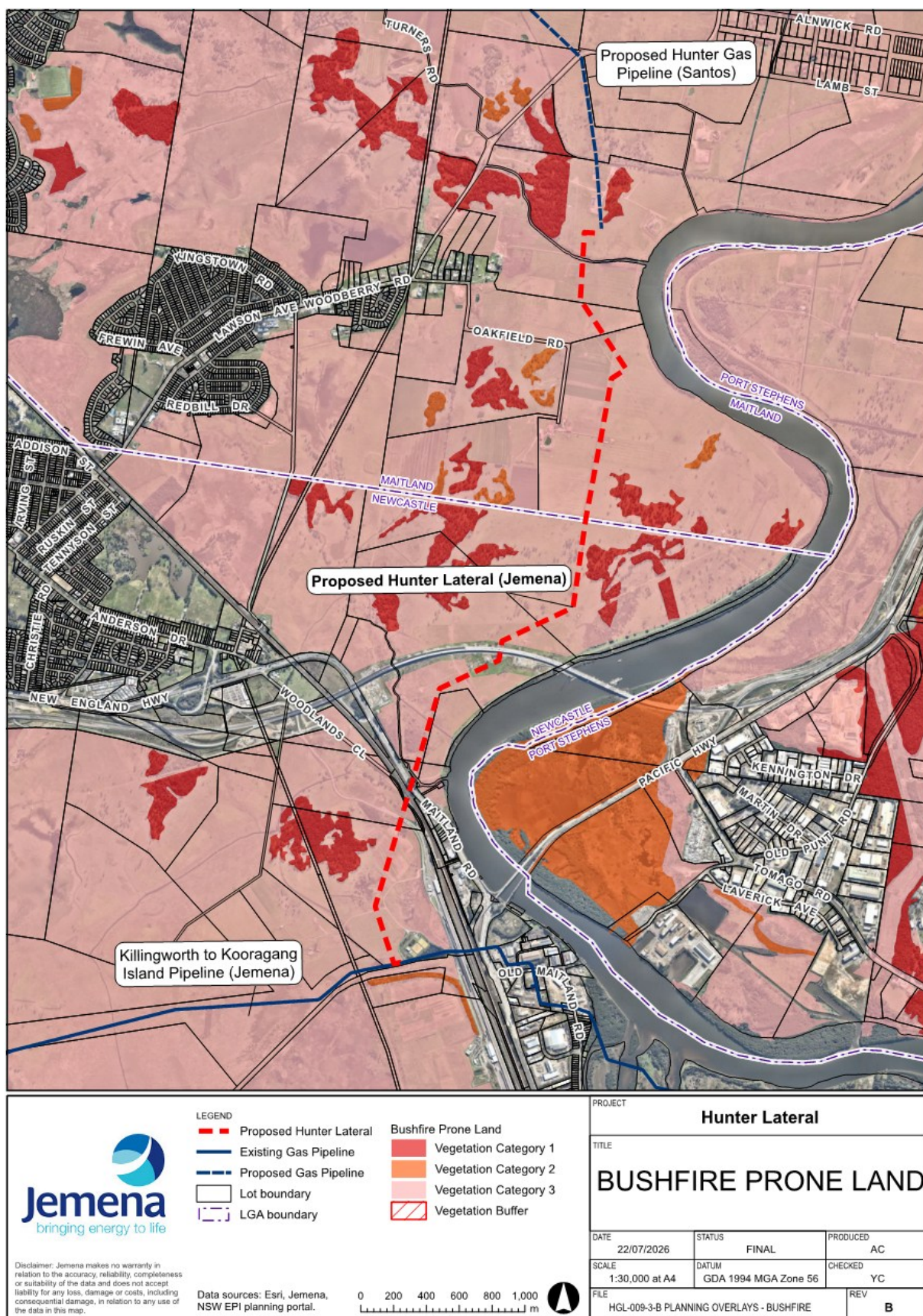


Figure 2.7 Bushfire Prone Areas (NSW Rural Fire Service 2025)

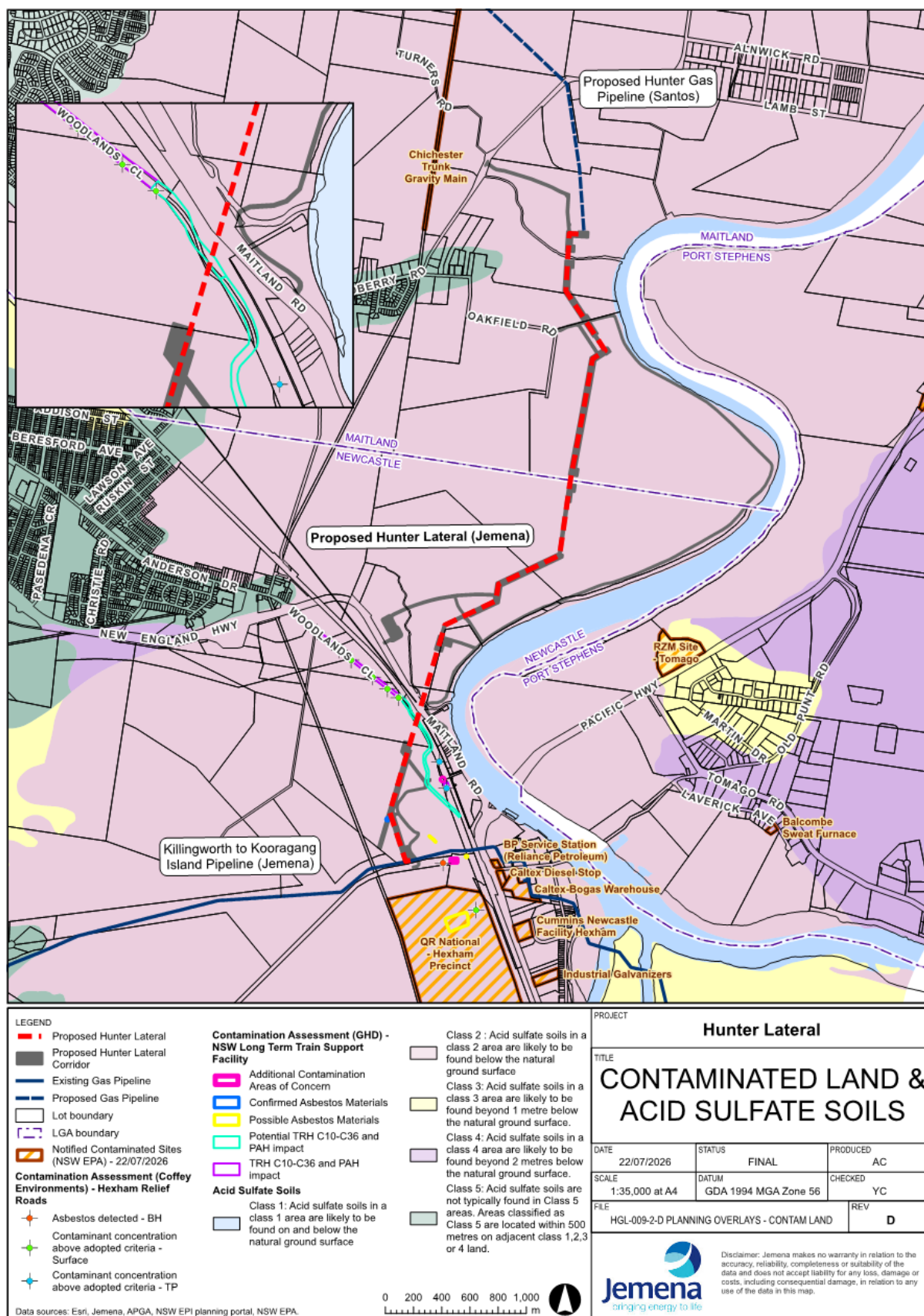


Figure 2.8 Contaminated land and acid sulfate soils

2.3.7 Sensitive receivers

Sensitive receivers are land uses that may be impacted by the modification, these include:

- **Human sensitive receivers**, such as residences, education and childcare centres, aged care facilities, or hospitals. There are 779 sensitive receivers within two kilometres of the modification area, as illustrated in Figure 2.9. These sensitive receivers are located within the built-up areas of Tomago, Beresfield and Woodberry.
- **Ecological sensitive receivers**, such as wetlands, conservation areas, surface water and groundwater features. Ecological sensitive receivers include the Hunter River and drainage lines that intersect the modification area. The Ramsar-listed Hunter Estuary Wetlands is located downstream from the modification area, while a coastal wetland is located directly east of the modification area, intersecting the Main Northern Line corridor.
- **Cultural sensitive receivers**, such as Aboriginal cultural heritage places and historic heritage places. These places are illustrated in Figure 2.10. A description of these heritage places is provided in Sections 6.2 and 6.9 respectively.

Major projects can have positive or negative impacts on a place, community, region or State. An impact may be directly caused by a major project, or be a result of the overlapping effects of multiple projects/major land uses over time. This Modification Report assesses the project's direct and cumulative impacts on sensitive receivers; these impacts are detailed in Section 6.13.

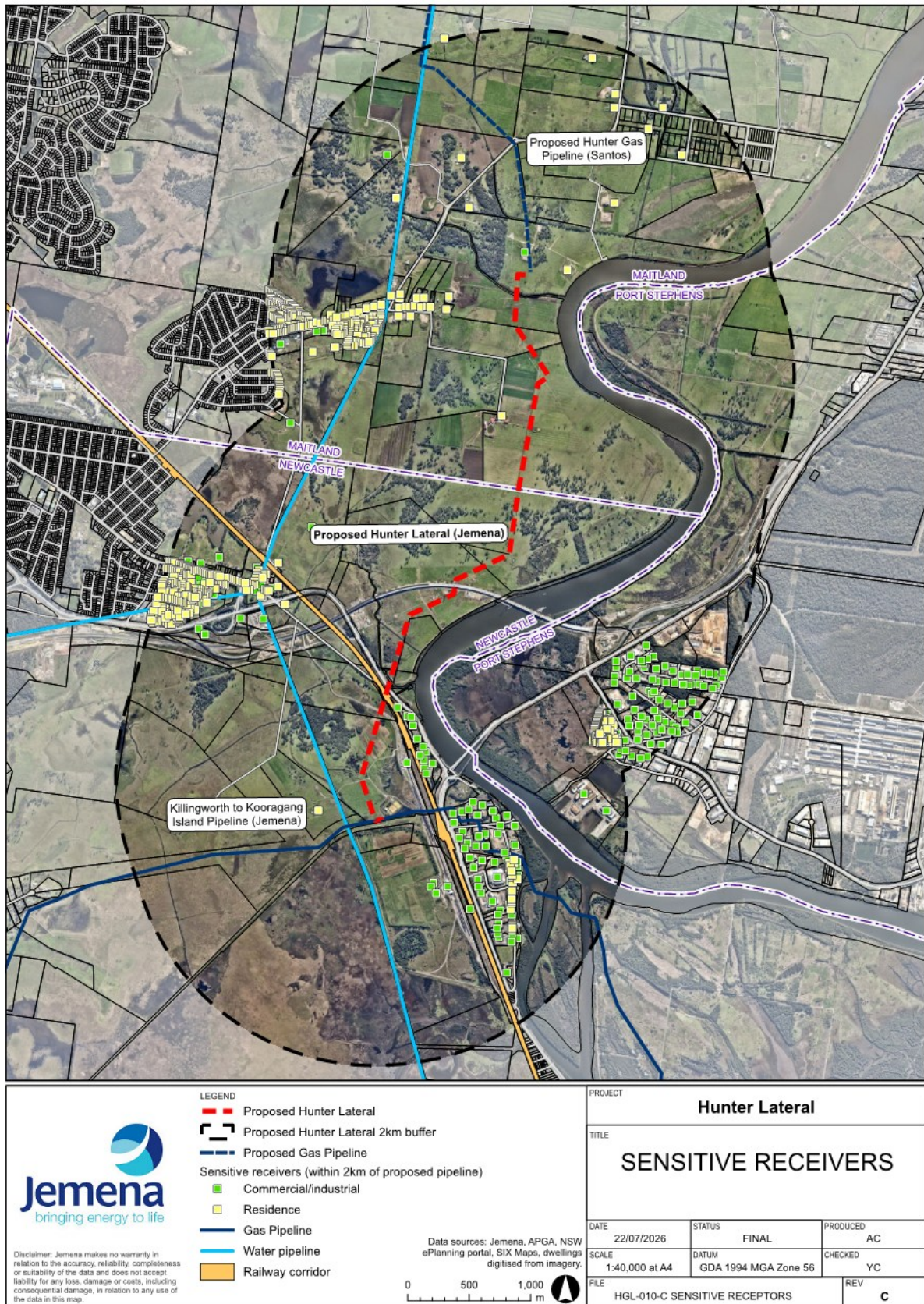


Figure 2.9 Sensitive receivers within 2 km of the pipeline alignment

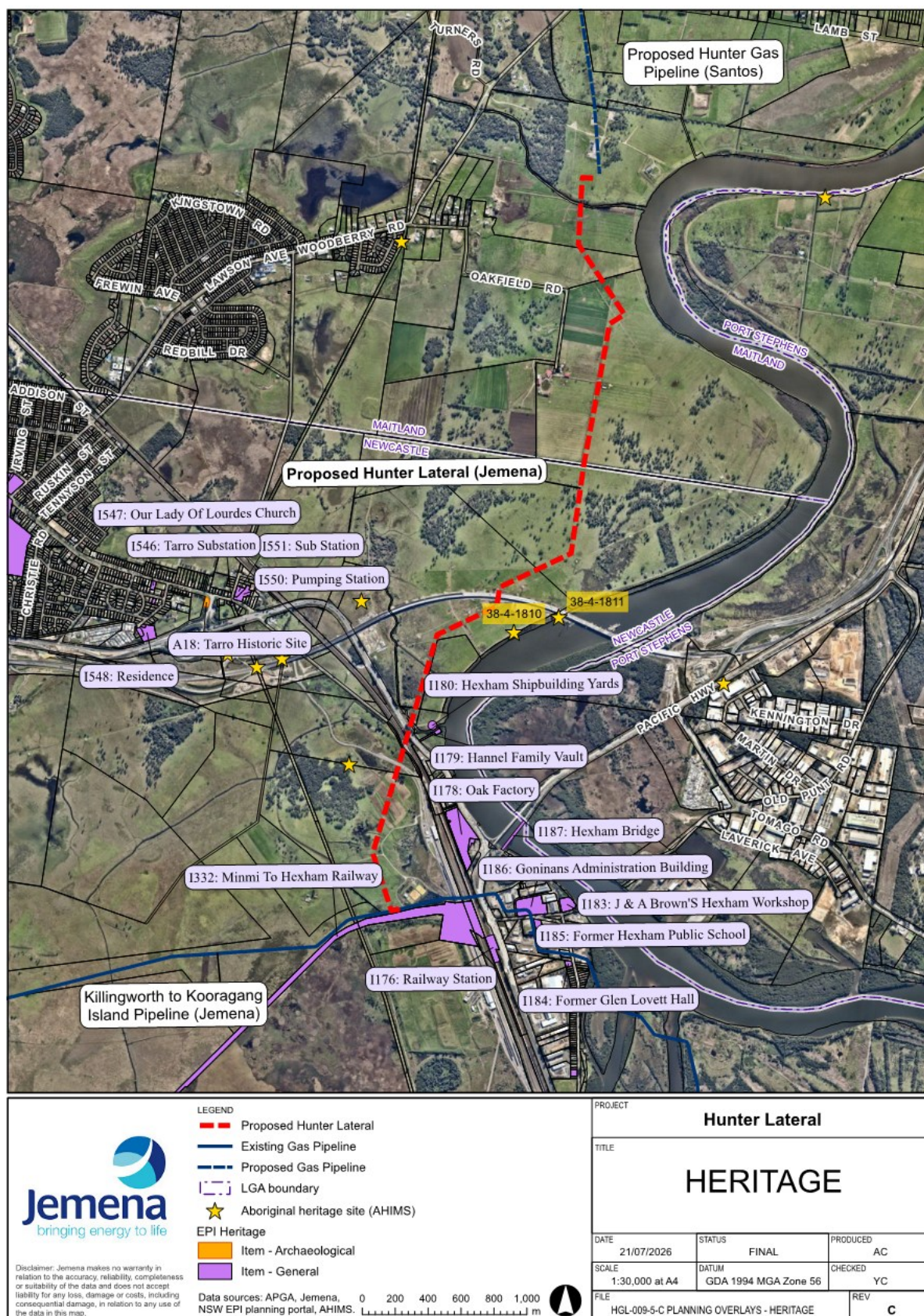


Figure 2.10 Aboriginal and historic cultural heritage places

2.4 Alternatives considered

Due to the nature of the project as a pipeline between the existing Killingworth to Kooragang Island Pipeline and the proposed Hunter Gas Pipeline, there are minimal alternative locations available for the project elsewhere in the region. The modification area is suitable for the project as it:

- provides the shortest, most direct connection between the two pipelines
- avoids existing or future populated areas and sensitive land uses.

2.4.1 Refinements to modification area and alignment

Minor refinements have been made to the modification's alignment, placement of ancillary project infrastructure, and area throughout the project design phase. These refinements have been guided by engagement with affected landowners and stakeholders, and the technical assessments which form part of this Modification Report. This includes ensuring the modification area and alignment:

- avoid or minimise impacts to significant flora, fauna and ecological communities as far as practicable
- ensure that the project causes minimal disruption to the productive use of agricultural land, based on feedback from landowners.

Jemena has also engaged with key transport stakeholders and the owners of third-party utility installations. Where the modification intersects an existing or future transport corridor or utility installation, the modification's alignment has been refined to ensure compliance with engineering standards, codes of practice, and other requirements. This includes ensuring the modification:

- crosses transport corridors at an angle as close of possible to 90 degrees to the transport corridor, with no bends within the transport corridor itself
- is not constructed close to existing bridge structures, electricity transmission line exclusion zones, and railway turn-outs
- achieves the typical minimum depth of cover defined in Australian Standards, engineering standards, and/or other relevant codes of practice.

Compliance with standards and requirements will ensure the integrity of existing transport corridors and utility installations are protected. It will also ensure that the modification will not impede the development of future transport projects, such as the Lower Hunter Freight Corridor.

2.4.2 Adjustments to construction methodology

Adjustments to construction methods have also been made based on landowner and stakeholder feedback. Construction methods have also been adjusted to minimise impacts to the following environmental and planning constraints:

- presence of acid sulphate soils
- identified patches of significant flora, fauna habitat and ecological communities
- presence of existing and future key transport corridors and utility installations
- presence of waterways, wetlands and groundwater aquifers.

The use of trenchless pipeline installation methods for road and waterway crossings will be used for the modification to minimise disruptions to these environmental and planning constraints. The modification will be constructed in accordance with relevant Australian Standards, codes of practice and TfNSW technical directions.

Compliance with standards and requirements will ensure the integrity of existing transport corridors and utility installations are protected. Jemena will continue to engage with key stakeholders to develop the modification's detailed design, and to conduct additional assessments where required.

2.4.3 The 'do nothing' option

If the 'do nothing' option is chosen for the project, the Killingworth to Kooragang Island Pipeline will continue to operate as normal. All adverse environmental and social impacts arising from the modification would be avoided if the project is not developed in the first place. However, the project's benefits, such as securing additional gas supplies for its gas transmission and distribution network will not be realised. This will impact Jemena's ability to provide reliable gas distribution to its domestic and industrial customers within NSW.

3 Modification description

The modification proposes to construct, operate and maintain the Hunter Lateral Pipeline. The Hunter Lateral Pipeline is a high-pressure gas pipeline connecting the proposed Hunter Gas Pipeline (to be developed by Santos) and the Killingworth to Kooragang Island Pipeline. This modification will be constructed within the modification area, as outlined in Section 2.3. Other than connecting Jemena's existing Killingworth to Kooragang Island Pipeline to the Hunter Lateral Pipeline, the modification does not propose to alter the design or purpose of the existing pipeline.

The modification will be designed, constructed, commissioned and operated in accordance with *Australian Standard (AS) 2885: Pipelines – Gas and Liquid Petroleum (AS 2885)*.

3.1 Components

The modification comprises three components: the pipeline, the Hunter Lateral Facility (HLF) and the Jemena Tie-In facility. The HLF and Jemena Tie-In Facility connects the pipeline to the gas transmission network.

No gas storage facilities or compression stations are proposed as part of this modification.

3.1.1 Pipeline

A 5.3 km-long pipeline will be installed between Santos' proposed Hunter Gas Pipeline and KP 161.7 of the Killingworth to Kooragang Island Pipeline. This will increase the total length of the Killingworth to Kooragang Island Pipeline from 33.3 km to 38.6 km.

The pipeline will be constructed out of high-strength steel pipe segments, welded together to create a single continuous pipeline. Pipeline design specifications, in accordance with PL8, are provided in Table 3.1.

Table 3.1 Pipeline specifications

Specification	Detail
Material and grade	API-5L-PSL2-X60 high-strength steel pipes for oil and gas transmission, joined together using electric resistance welding. The welded joints will be coated with a compatible external coating prior to installation.
External coating	Fusion-bonded epoxy coating
Outside diameter	508 millimetres (mm)
Wall thickness	8.48 mm
Length of pipe segments	12 m or 18 m
Maximum allowable operating pressure (MAOP)	6.895 megapascals (MPa)
Operating pressure	5 MPa

The entire length of the pipeline will be located underground. The minimum depths of cover for the pipeline will depend on installation technique and the presence of sensitive receivers or third-party infrastructure. The nominal minimum depths of cover for the pipeline are:

- **Typical (per AS 2885)** – 750 mm below ground level
- **Horizontal Direct Drilling (HDD) for watercourses** – approximately 10 m to 15 m
- **HDD for transport infrastructure crossings** – approximately 15 m to 20 m.

Cathodic protection equipment will be installed at regular intervals along the pipeline. This equipment uses electric currents to protect the pipeline from corrosion caused by the exposure of metal to oxygen and moisture.

3.1.2 Hunter Lateral Facility

The Hunter Lateral Facility (HLF) will be constructed at Millers Forest. The HLF, consisting of a 94 m by 84 m fenced hardstand area, will connect the Hunter Gas Pipeline and the Killingworth to Kooragang Island Pipeline. The HLF will control the flow of gas between the two pipelines. The Jemena portion of the HLF, indicated by a red box in Figure 3.1, will contain a:

- pig launcher
- pipeline isolation valves
- vehicle parking for Jemena personnel
- fencing and security monitoring systems.

When operational, the HLF will be operated automatically.

3.1.3 Jemena Tie-In Facility

The Jemena Tie-In facility, as shown in Figure 3.2, will be constructed at Pipeline Road, Hexham. The facility, consisting of a 34.5 m by 15.2 m fenced hardstand area, will connect the Hunter Lateral pipeline to the existing Killingworth to Kooragang Island Pipeline. The tie-in facility will include a pig receiver and pipeline isolation valves. Fencing and security monitoring systems will also be installed around the tie-in facility.

When operational, the Jemena tie-in facility will be operated automatically. The tie-in facility will be powered by an on-site solar photovoltaic system, supported by batteries.

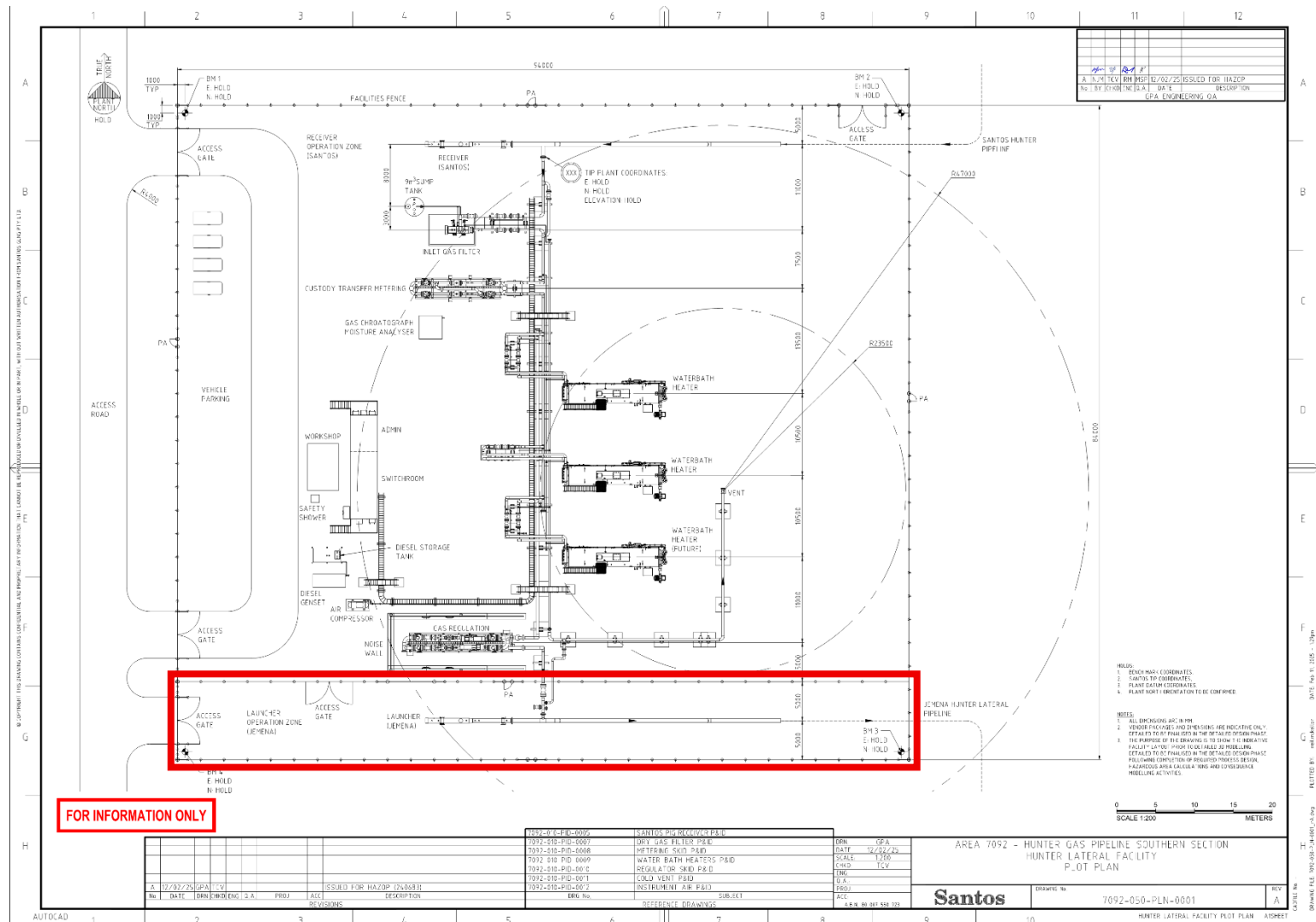


Figure 3.1 Jemena Hunter Lateral Facility (red box)

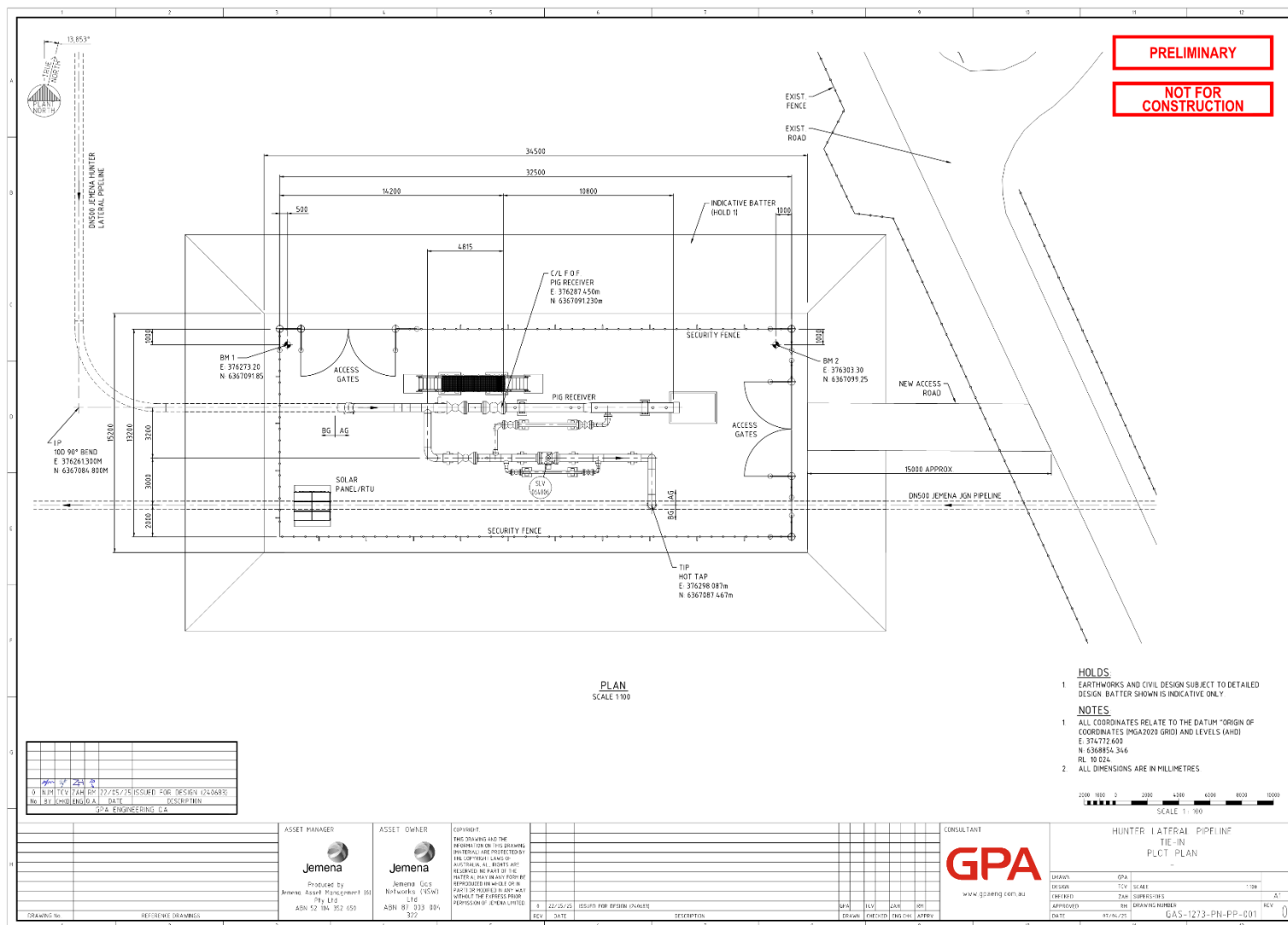


Figure 3.2 Jemena Tie-In Facility

3.2 Construction

3.2.1 Timing and sequencing

Subject to the approval and licensing of this modification and the Santos' Hunter Gas Pipeline, the construction of the modification is expected to commence during the warmer months of 2026 or 2027. The modification's construction is being timed to commence during the warmer months to address flood risk associated with the modification area.

The construction and commissioning of the pipeline is expected to take approximately six months. Construction of the modification will consist of the phases outlined in Table 3.2.

Table 3.2 Construction phases

Phase	Activities	Timing
Early works	• Site surveys • Service proving • Fencing and access works • Setting up of construction offices and laydown area	October (1 month)
Main works	• Vegetation clearing and site grading • Pipe stringing, bending and welding • Non-destructive testing and field joint coating • Trenching and pipe installation • Backfilling and rehabilitation of trenches • Constructing the Jemena Tie-In Facility and HLF	October-January (3 months)
Special crossings	• Horizontal direct drilling (HDD) of pipes across watercourses and transport infrastructure	November -December (2 months)
Pre-commissioning	• Hydrostatic pressure testing • Cleaning and drying of pipeline • Conducting final checks and tests on the pipeline • Handover of pipeline to operator	January- February/March (2 months)

3.2.2 Construction work hours

The construction work hours for the pipeline will be from 6:00 am to 6:00 pm, Monday to Sunday — this exceeds the recommended standard hours for construction work defined in the EPA's *Interim Construction Noise Guideline* (DECC 2009) (Construction Noise Guideline). Work outside of the standard construction work hours will be required for the following reasons:

- **Construction, testing and commissioning work that cannot be paused** – pipeline construction activities (such as HDD), as well as integrity and commissioning tests (including hydrostatic testing) are critical to ensure the safety of the pipeline. These works will need to be conducted over a continuous 48- to 72-hour period, with construction personnel supervising these works on site.
- **Oversize/Overmass (OSOM) deliveries** – OSOM deliveries may be conducted during off-peak hours (including overnight) to reduce the impact of deliveries on the transport network's efficiency.

- **Emergency works** required to avoid the loss of life, damage to property, or environmental harm.

Noise impacts resulting from out-of-hours work will be addressed per the management measures outlined in Section 6.4.

3.2.3 Construction facilities and access

To facilitate the construction of the Hunter Lateral Pipeline, temporary construction facilities will be required:

- **Construction laydown and pipe stockpiling area** – a construction laydown and pipe stockpiling area will be set up on 10/-/DP1150648 (see Figure 3.3). The construction laydown and pipe stockpiling area is located on existing disturbed land, used for the M1 Pacific Motorway Extension. The construction laydown area will contain site offices, equipment, storage consumables storage, as well as spaces for light/heavy vehicle parking and plant staging.
- **Workspace areas** – extra workspaces will be created to accommodate a hydrostatic testing dam, pipe stringing area, acid sulphate soil handling area, truck turnarounds, as well as HDD entry and exit pads.
- **Construction Right-of-Way (ROW)** – a 30 m-wide construction ROW will be established where the pipeline will be installed using the open-cut trench method (see Figure 3.4). The width of the construction ROW has been reduced to 15 m in areas to avoid or minimise impacts to environmental, heritage or third-party utility infrastructure located within the modification area (see Figure 3.5). The construction ROW will include space for topsoil and trench spoil stockpiling, and spaces for construction plant and vehicles.



Figure 3.3 Construction laydown and stockpiling area (10/-/DP1150648)

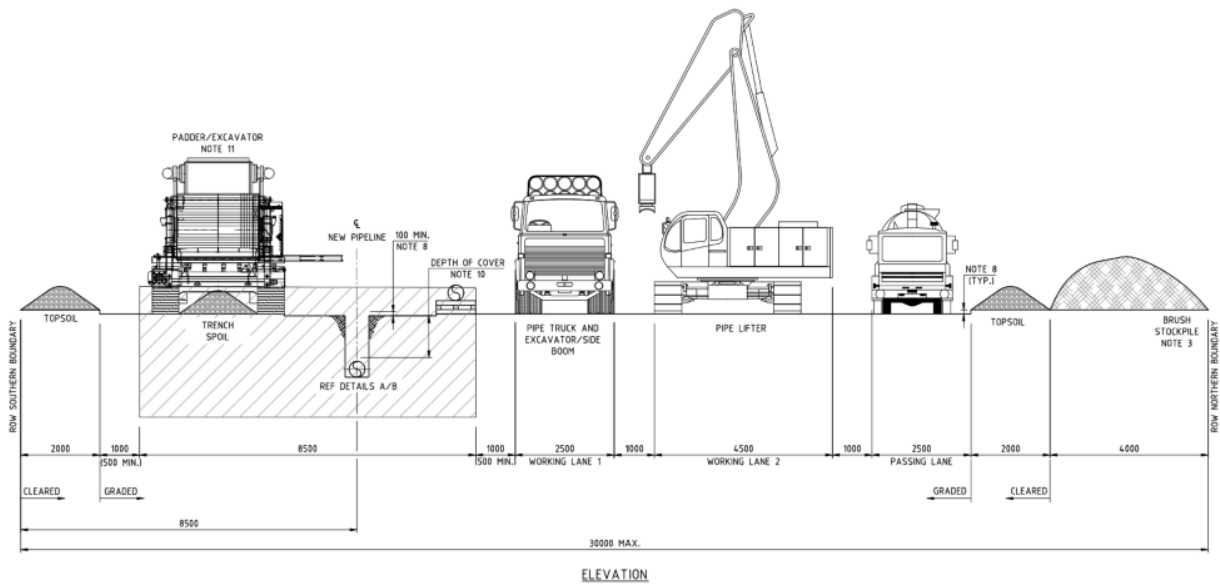


Figure 3.4 30 m Construction Right-of-Way

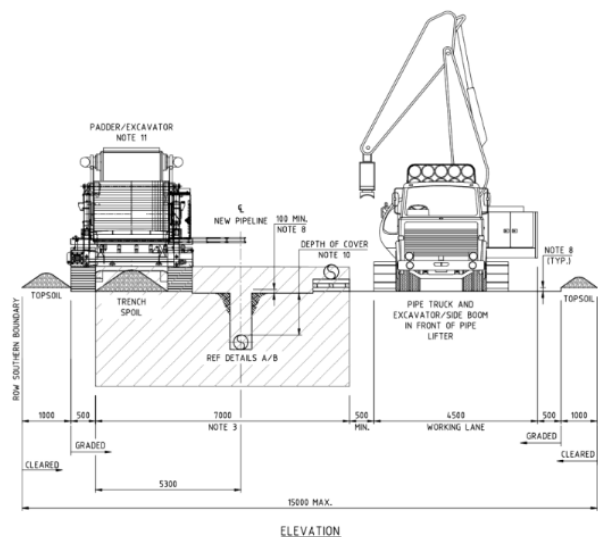


Figure 3.5 15 m Construction Right-of-Way

Construction access to the modification area will be in accordance with the conditions of a temporary construction licence. Five construction access points will be used for the modification:

- **Existing site access off the New England Highway** – provides access to the construction laydown area and KP 2.0 to KP 4.0 of the construction ROW.
- **Landowner's track off Woodberry Road to construction laydown area** – provides access to the HLF construction site and KP 0 to KP 0.2 of the construction ROW.
- **Landowner's track off Oakfield Road** – provides access to KP 0.25 to KP 1.95 of the construction ROW. Additional workspace will be required to accommodate a truck turning point.

- **Aurizon Access Road** – provides access to the Jemena tie-in facility construction site and KP 4.4 to KP 5.3 of the construction ROW.
- **New England Highway/Purgatory Creek** – provides an alternative access to the HDD entry pad at Purgatory Creek and KP 2.0 to KP 4.0 of the construction ROW.

Construction access points and the internal access route along the construction ROW will be built to allow all-weather access.

All temporary construction facilities (except the site access points) will be dismantled and the modification area rehabilitated following completion of construction and commissioning of the Hunter Lateral Pipeline.

3.2.4 Methodology

Early works

Upon modification approval, the site will be prepared to accommodate the main construction activities. Early works will include the following activities:

- Service proving throughout the modification area
- Geotechnical surveys
- Weed and pest surveys
- Surveys of built and natural features within the modification area
- Installation of temporary fencing and gates along the construction ROW
- Establishing temporary construction facilities and access, as outlined in Section 3.2.3.

Vegetation clearing and site grading

Vegetation and topsoil within the construction ROW will be progressively cleared in preparation to install the pipeline strings. Exposed soil within the construction ROW will also be graded to level the site, ensuring proper drainage prior to trenching or HDD work. Topsoil will be windrowed and stored within the construction ROW; the topsoil will be stockpiled separately and used for site rehabilitation activities.

Pipe stringing and welding

The pipeline segments are delivered to the construction ROW and strung out, with the segments placed end-to-end. A welding crew then progressively work along the pipeline segments, welding them together to make one contiguous pipeline. Each of the welded joints are coated or wrapped for corrosion protection.

Open-cut trenching

Open-cut trenching will be the primary installation method for the pipeline. To achieve the minimum depth of cover outlined in Section 3.1.1, a trench that is 800 mm wide will be excavated. Excavated spoil will be stored along the construction ROW (separated from the topsoil), to be backfilled into trenches once installation works are complete.

To support the pipeline, bedding material will be placed at the bottom of the trench. The welded pipeline will then be lowered into the trench using a side boom crane. The trench will then be backfilled using the excavated spoil, before being compacted to minimise the risk of soil movements damaging the installed pipeline.

As the modification area is located within a low-lying coastal area, trenches may intersect the natural water table in several locations. Additionally, parts of the modification area adjacent to the Hunter River (*Coquun*) contain acid sulphate soils. Dewatering activities may cause sulfuric acid generation, which will surface water quality. Where ground water is encountered, a wet-trench installation method using concrete weight coated pipe segments will be used. This installation method avoids the need to dewater trenches in these areas, avoiding the risk of sulfuric acid generation.

Backfilled trenches will then be progressively reinstated by returning the topsoil back across the Construction ROW, enabling grass to re-establish.

Horizontal direct drilling

HDD will be used to install pipe segments across watercourses and major transport infrastructure.

The HDD installation method will be used at these locations (with approximate distances):

- Francis Greenways Creek (KP 0.2 to KP 0.25, 50 m)
- Unnamed channel (KP 1.95 to KP 2.0, 50 m)
- Unnamed channel, Purgatory Creek, New England Highway, Main North Railway Line, Woodlands Close, Railway siding, Aurizon Access Road (KP 3.65 to KP 4.35, 700 m).

An entry and exit pad will be constructed at both ends of each HDD extent. At the entry pad, the HDD drill creates an underground borehole of the same diameter as the pipe segments. Pre-welded pipeline segments are then pulled through the bore, completing the installation of the pipe segments. Drilling mud and fluid from the HDD process will be managed and disposed in accordance with the mitigation measures outlined in Section 6.10.

Construction of the Jemena Tie-In Facility and HLF

The construction of both facilities will entail the construction/installation of:

- Concrete hardstand areas, steel mounting structures and permanent stormwater drainage
- Permanent fencing, gates and lighting
- Piping skids and interface piping
- Pig launching and receiving facilities
- Underground cabling between the metering skids and the control and amenities hut
- Solar photovoltaic and battery system
- Monitoring equipment.

3.3 Commissioning

Commissioning activities for the pipeline include:

- **Hydrostatic testing** to identify leaks within the pipeline. The hydrostatic testing will use water stored in a hydrostatic testing dam located at the southern portion of the project site; this water will be trucked in from an off-site location.
- **Calibration and testing activities** at the Jemena tie-in facility and HLF.
- **Inspections** of the pipeline and its associated infrastructure to establish a referential 'baseline condition' for subsequent operational inspections.
- **Clean up, reinstatement and rehabilitation** of the construction ROW and extra workspaces.

3.4 Operation and maintenance

The modification is designed to have an operational life of 50 years; the Hunter Lateral Pipeline will be operational 24 hours a day, seven days a week.

Under normal operating conditions, the Hunter Lateral Pipeline will be operated remotely. Routine inspections of the Hunter Lateral Pipeline, its associated easements, and the supporting infrastructure will be required to ensure its integrity. This includes:

- Weekly inspections and maintenance of the HLF.
- Vehicle (weekly) and aerial patrols (fortnightly) of easements for weeds, overgrown vegetation, erosion and subsidence, as well as unauthorised third-party activities.
- Maintenance surveys, such as odorant surveys (1–5 yearly), leakage surveys (1–5 yearly), cathodic protection surveys (every 4–6 months), direct current voltage gradient surveys and internal pipeline inspections (every 5–10 years).

A total of one or two full-time equivalent (FTE) personnel would typically be required to conduct operational activities, as required.

Operation access points to the Hunter Lateral Pipeline will be through the same access points outlined in Section 3.2.3.

The pipeline will be protected by easements benefitting Jemena; the easements will typically be 25 m wide. The easements will protect the pipeline from unauthorised encroachment and provide Jemena the right to access and undertake activities to operate and maintain the pipeline. In accordance with the requirements of PL8, AS 2885 and the *Pipelines Regulation 2023* (NSW), marker posts and signage will be placed at regular intervals along the pipeline easement.

4 Statutory context

This section outlines the Commonwealth, NSW and local statutory provisions that are relevant to this modification.

4.1 Power to grant consent

As the Killingworth to Kooragang Island Pipeline is SSI, modification of its existing Infrastructure Approval (SSI-46360740) is being sought through Section 5.25 of the EP&A Act. **The Minister for Planning (or their delegate) is the consent authority for SSI modifications.**

4.2 Permissibility

The pipeline route is zoned as RU1 – Primary Production within the Maitland Local Environment Plan 2012 (Maitland LEP), and SP2 – Railway and C2 – Conservation within the Newcastle Local Environmental Plan 2012 (Newcastle LEP) (see Figure 4.1).

Gas pipelines are a prohibited land use within these zones as the land use is not specified in items 2 (permitted without consent) or 3 (permitted with consent) of the zones' land use tables. However, Section 2.75(1) of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP) permits without consent the development of a pipeline on any land, if the pipeline is subject to a licence under the Pipelines Act.

In this case, Section 2.7(1) provides that Chapter 2 – Infrastructure of the Transport and Infrastructure SEPP prevails if there is an inconsistency between the chapter and other environmental planning instruments (including LEPs). At the same time, a pipeline licence under the Pipelines Act must be granted which is substantially consistent with an SSI infrastructure approval per Section 5.24(1)(g) of the EP&A Act. As such, **the pipeline is therefore considered permissible with consent.**

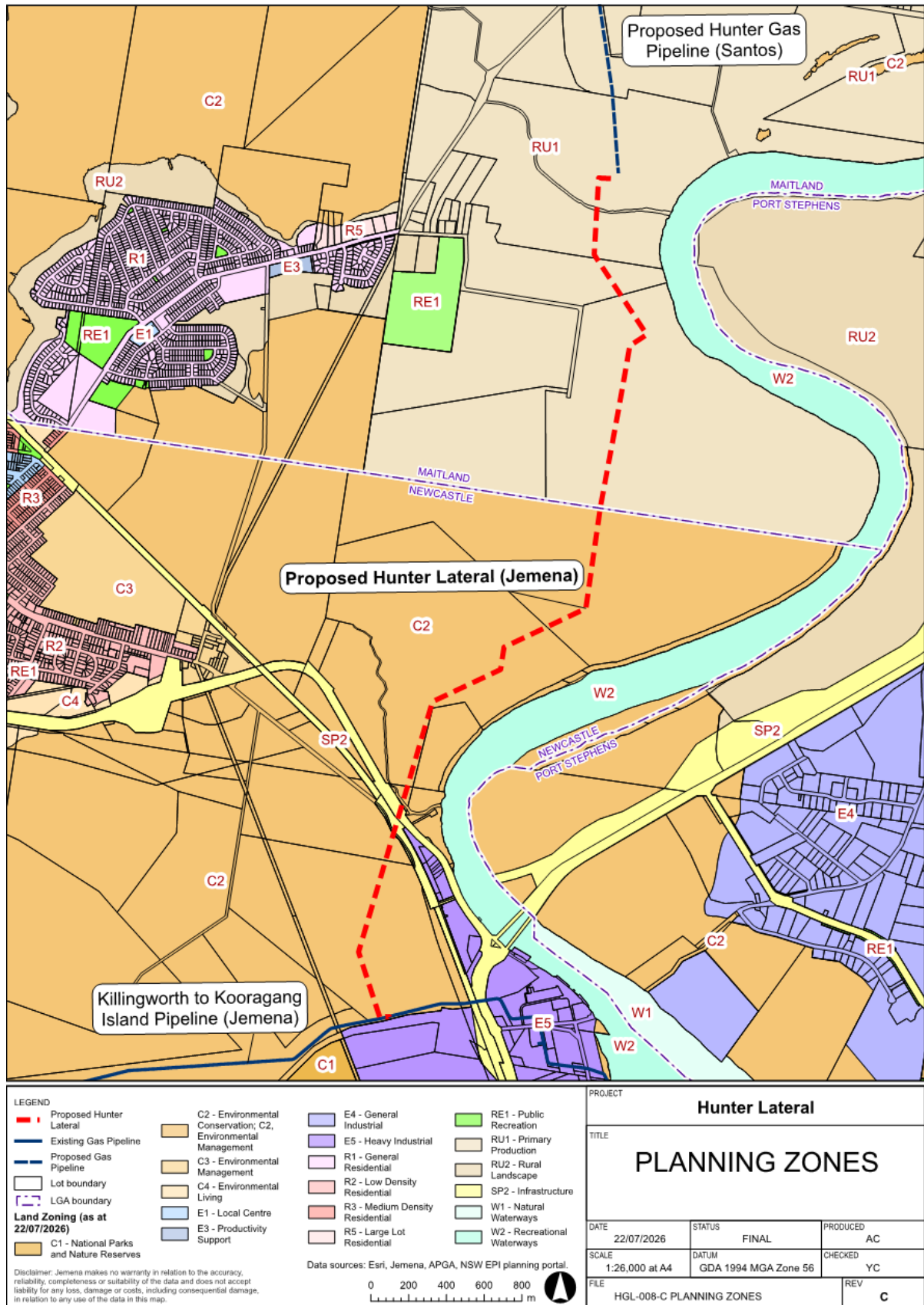


Figure 4.1 Planning Zones (DPHI 2026)

4.3 Other approvals

4.3.1 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

Pursuant to Section 68 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), if an action is expected to have an impact on any of the 12 Matters of National Environmental Significance (MNES), the action must be referred to the Australian Minister for the Environment. The Minister will then determine if the action is a 'controlled action'.

The modification's impacts to the 12 MNES have been assessed based on the criteria outlined in the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (Department of the Environment 2013) (Significant Impact Guidelines); the results of this assessment are outlined in Table 4.1.

The modification is not expected to cause significant impacts to any of the 12 MNES; **a referral under the EPBC Act is not required for the modification.**

Table 4.1 Matters of National Environmental Significance

MNES	EPBC Act section	Summary of impact	Significant impact?
World Heritage properties	12	The modification will not impact any World Heritage properties.	No
National Heritage places	15B	The modification will not impact any National Heritage places.	No
Wetlands of international importance (Ramsar wetlands)	16	The modification is located immediately upstream of the Shortland Wetlands (component of the Hunter Wetlands Centre), and 5.5 km upstream of the Kooragang component of the Hunter Estuary Wetlands Ramsar Site. The modification does not propose any works within the Ramsar wetland or works to change the hydrology of the Hunter River. Jemena will also implement management and monitoring measures to ensure the modification does not cause a substantial and measurable change in the water quality of the wetland; this is further discussed in Section 6.6.	No
Listed threatened species and ecological communities	18	Appendix E of the Biodiversity Development Assessment Report (BDAR) (OzArk 2026) noted that none of the native vegetation within the modification area meets the criteria to be classified as a TEC under the EPBC Act. The modification area is also not generally considered important habitat for any EPBC Act-listed threatened species. The likelihood of the modification causing significant impacts to these threatened species is considered low.	No
Listed migratory species	20	Appendix E of the BDAR notes that the modification area is unlikely to constitute important habitat for any EPBC Act-listed migratory species. As such, it is unlikely that the modification area contains an ecologically significant population of migratory species.	No

MNES	EPBC Act section	Summary of impact	Significant impact?
Nuclear actions	21	The modification is not a nuclear action requiring assessment under the EPBC Act.	No
Commonwealth marine environment	23	The modification will not impact any Commonwealth marine environments.	No
Great Barrier Reef Marine Park	24B	The modification will not impact the Great Barrier Reef Marine Park.	No
Water resources in relation to large coal mining or coal seam gas developments	24D	The modification is neither a coal mining nor a coal seam gas development.	No
Actions on, or impacting Commonwealth land	26	The modification is not located on, nor will it impact Commonwealth land.	No
Actions impacting Commonwealth heritage places overseas	27B	The modification will not impact any overseas Commonwealth heritage places.	No
Actions by the Australian Government, or an Australian Government agency	28	The modification is not being undertaken by, or on behalf of the Australian Government.	No

4.3.2 Consistent approvals

Authorisations which must be provided consistent with an SSI infrastructure approval are listed in Table 4.2.

Table 4.2 Consistent approvals

Approval	Comment	Modification Report section
Consent to impact a public road Section 138, <i>Roads Act 1993 (NSW)</i>	The proposed pipeline will cross under Maitland Road (part of the Pacific Highway) and the M1 Pacific Motorway Extension (see Figure 2.3). While works in, on and over a public road would typically require consent under Section 138 of the Roads Act, Section 138(5) exempts actions conducted under the Pipelines Act from needing consent to impact a public road.	Traffic Impact Assessment (TIA) (Amber Organisation 2026)
Pipeline licence variation Section 18, Pipelines Act	A variation to Licence No. 8 will be sought to include lands required for the Hunter Lateral Pipeline. If Modification 3 to include the Hunter Lateral Pipeline is approved, the variation to Licence No. 8 will need to be consistent with the approved modification.	Modification Report

4.3.3 Non-integrated approvals

Required approvals for the modification which fall outside of the SSI integrated approvals process are outlined in Table 4.3.

Table 4.3 Non-integrated approvals

Approval	Comment
Licence to use Crown land Grant of easements Divisions 5.6 and 5.9, <i>Crown Land Management Act 2016 (NSW)</i>	The pipeline crosses under Purgatory and Francis Greenway Creeks, which are identified as Crown waterways. The modification proposes to install pipeline segments without interfering with the Crown waterway, using HDD. The modification does not seek to enclose or dig up any of the Crown waterways. A 25 m easement will be required to provide free access to the pipeline. Under Section 61 of the Pipelines Act, the Minister for Energy can grant easements on land in favour of the licensee for construction and use of a licensed pipeline.
Consent for works adjacent to a levee bank or flood work on a floodplain Section 256, <i>Water Management Act 2000 (NSW)</i> (WM Act)	The modification area is adjacent to the Hannaway and Tarro levees. The modification area also traverses a declared floodplain. Consent for works will be acquired through the SSI modification process, consistent with the processes outlined in the <i>Development within the Hunter Valley Flood Mitigation Scheme – Development Control Guidelines</i> (DPIE 2021).
Permission to perform works within or in the vicinity of rail infrastructure NSW TrainLink regulations	The pipeline crosses a section of the Main Northern Railway (see Figure 2.3). Any works on, or under the railway requires permission from NSW TrainLink and the Transport Asset Manager for NSW prior to works commencing.
OSOM vehicle permit Chapter 4, <i>Heavy Vehicle National Law 2013 (NSW)</i>	Use of OSOM vehicles on the road network during the construction phase will be required. An access permit for OSOM vehicles is required from the National Heavy Vehicle Regulator if the vehicle does not meet the mass and dimension criteria to qualify for exemptions, and/or the vehicle's route is not pre-approved for OSOM vehicle movements.

4.3.4 Approvals that do not apply

If this modification did not form part of an SSI infrastructure approval, the following approvals would have been required for the modification:

- Water use approval, controlled activity approval and water management work approval – Sections 89, 90 and 91, WM Act
- Approval for works or activities that impact heritage-listed items; excavation permit – Sections 60 and 139, *Heritage Act 1977 (NSW)*
- Aboriginal heritage impact permit – Section 90, *National Parks and Wildlife Act 1974 (NSW)*
- Bushfire safety authority – Section 100B, *Rural Fires Act 1997 (NSW)*.

4.4 Pre-conditions

Mandatory conditions that must be satisfied before the consent authority can approve a modification to the Infrastructure Approval are listed in Table 4.4.

Table 4.4 Pre-conditions

Statutory reference	Consideration	Modification Report sections
EP&A Act		
Section 1.3 Objects of Act	Relevant objects of the EP&A Act: Promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of NSW's natural and other resources,	Chapter 7
	- Facilitate ecologically sustainable development (ESD) (ESD principles are defined in section 193 of the EP&A Regulation) - Protect the environment, including the conservation of threatened flora, fauna, ecological communities and their habitats	Section 7.1.1
	- Promote productivity through the development and management of the State and its resources - Promote the orderly and economic use and development of land	Chapter 7
	Sustainably manage built and cultural heritage, including Aboriginal cultural heritage	Section 6.2 Section 6.9
	Promote good design and amenity of the built environment	Section 6.4 Section 6.5
	Promote proper construction and maintenance of buildings, including the protection of occupants' health and safety	Section 6.1
	Provide opportunity for participation in environmental planning and assessment.	Chapter 5
	Promote a proportionate and risk-based approach to environmental planning and assessment	Chapter 6
Environmental Planning and Assessment Regulation 2021 (NSW)		
Section 193 Principles of ESD	- The precautionary principle - Inter-generational equity - Conservation of biological diversity and ecological integrity - Improved valuation, pricing and incentive mechanisms.	Section 7.1.1
Biodiversity Conservation Act 2016 (NSW)		
Section 7.17 Biodiversity assessment and offsets – Modifications of planning approvals or activities	A BDAR must be submitted for a modification application, even if a BDAR was submitted for the original development. The BDAR for the modification must also take into account any measures already taken to avoid, minimise and offset impacts on biodiversity values in connection with the original development.	Section 6.7 Appendix E

4.5 Mandatory matters for consideration

Per Section 5.22(2) of the EP&A Act, environmental planning instruments do not apply to SSIs, unless they relate to:

- the declaration of infrastructure as SSI or Critical State Significant Infrastructure
- suspending laws to allow development to be carried out in accordance with an environmental planning instrument or development consent.

Despite this, the Modification Report has considered the mandatory matters for consideration defined in the following environmental planning instruments:

- *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP)
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP)
- *Newcastle Local Environmental Plan 2012* (Newcastle LEP)
- *Maitland Local Environmental Plan 2011* (Maitland LEP).

Table 4.5 Mandatory matters for consideration

Statutory reference	Consideration	Modification Report section
Resilience and Hazards SEPP		
Section 2.7(4) Development on certain land within coastal wetlands and littoral rainforests area Section 2.8(1) Development of land in proximity to coastal wetlands or littoral rainforest	The modification area includes a small portion of land that is mapped as a coastal wetland (see Figure 2.1). If the pipeline was not an SSI, the approval authority must be satisfied that measures have or will be taken to protect a coastal wetland's: • biophysical integrity • hydrological integrity • ecological integrity • quantity and quality of surface and groundwater flows to and from areas adjacent to the coastal wetland.	Section 6.6 Section 6.7
Section 2.10 Development on land within the coastal environment area Section 2.11 Development on land within the coastal use area Section 2.12 Development in coastal zone generally—development not to increase risk of coastal hazards	The approval authority must consider whether the development will adversely impact (and has adequately avoided, mitigated or managed its impacts to): • the area's biodiversity, ecology, surface water and groundwater • the area's values and natural coastal processes • water quality • marine and native flora, fauna and their habitats • existing public open spaces and safe access • built environment and Aboriginal cultural heritage • scenic qualities and visual amenity of the coast • potential for the project to overshadow or cause a loss of views from public spaces (including considerations for the bulk, scale and size of the development). • the area's existing coastal hazards risk.	Section 6.1 Section 6.2 Section 6.6 Section 6.7
Section 4.6 Contaminated land	No consent is to be granted unless an approval authority is satisfied that the land for development is suitable in its	Section 6.10

Statutory reference	Consideration	Modification Report section
	contaminated state or will be suitable after remediation for development.	
Section 6.17 Heavy and hazardous industries	No consent is to be granted unless an approval authority is satisfied that the development: - includes adequate measures to contain water at risk of contamination arising from the development - has, or will obtain approvals to undertake bushfire hazard reduction work required on site.	Section 6.6
Transport and Infrastructure SEPP		
Section 2.99 Excavation in, above, below or adjacent to rail corridors Section 4.9 Excavation in, above, below or adjacent to future infrastructure corridors	When considering concurrence, the rail authority (for rail corridors) or TfNSW (for infrastructure corridors) must consider the development's impacts on existing or proposed infrastructure within corridors: - Safety or structural integrity. - Safe and effective operation. - Measures to avoid or minimise these impacts.	Section 3.2
Section 2.119 Development with frontage to classified road	No consent is to be granted unless an approval authority is satisfied that: - vehicle access to the land is provided by a road other than the classified road - the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development - the development is of a type that is not sensitive to traffic noise or vehicle emissions.	Section 6.3
Newcastle LEP and Maitland LEP		
Clause 5.21 of the Newcastle and Maitland LEPs Flood planning	No consent is to be granted unless the approval authority must be satisfied that the development: - will not adversely affect flood behaviour and function of the land - will not adversely affect the efficient evacuation of people in the event of a flood - incorporates measures to manage risk to life in the event of a flood - will not cause avoidable erosion, siltation, destruction of riparian vegetation, or reduce the stability of riverbanks or watercourses.	Section 6.6
Clause 6.1 of the Newcastle LEP Clause 7.1 of the Maitland LEP Acid sulfate soils	No consent is to be granted unless an acid sulfate soils management plan has been prepared for the development and provided to the approval authority.	Section 6.6
Clause 6.2 of the Newcastle LEP	Before granting development consent, the consent authority must consider the development's:	Section 6.2 Section 6.6 Section 6.9

Statutory reference	Consideration	Modification Report section
Clause 7.2 of the Maitland LEP Earthworks	• detrimental effect on existing drainage patterns and soil stability • effect on the likely future use or redevelopment of the land • quality and source of the fill, as well as the quality and destination of soil to be excavated • effect on the existing and likely amenity of adjoining properties • likelihood of disturbing relics • proximity to and potential for adverse impacts on any watercourse, drinking water catchment or environmentally sensitive area.	
Clause 7.4 of the Maitland LEP Riparian land and watercourses	No consent is to be granted unless the approval authority is satisfied that the development will avoid, minimise or mitigate impacts to riparian land and watercourses.	Section 6.6

5 Engagement

This chapter provides an overview of the engagement undertaken to inform the modification's design, along with plans for future engagement. It details how Jemena has planned and delivered engagement in accordance with the NSW Government's *Undertaking Engagement Guidelines for State Significant Projects* (Department of Planning, Housing and Infrastructure 2026) (the NSW Engagement Guidelines) and how stakeholder feedback has shaped the project.

5.1 Engagement requirements

The EP&A Act requires that opportunities for community participation are provided in planning and assessment of state significant projects. Given the Killingworth to Kooragang Island Pipeline was transitioned to SSI in June 2022, community and stakeholder engagement is being undertaken in accordance with the NSW Engagement Guidelines.

Under the NSW Engagement Guidelines, engagement may commence during scoping or as part of an earlier planning process. Engagement should continue throughout the assessment, construction and operation of a project.

For the Hunter Lateral Project, engagement is occurring throughout all project phases, with a focus on regulators, decision makers, elected representatives, local landowners, and relevant Traditional Owner and special interest groups in the Hexham area.

Jemena is committed to engaging stakeholders in a manner that is open and inclusive, easy to access, relevant, timely and meaningful, and to:

- **Identify individuals and groups** who are interested in or affected by the project
- **Consider the influence participants may have** on elements of the project
- **Plan early and deliver activities** that are appropriate, proportionate, effective and practical to support robust engagement
- **Gather and analyse feedback**, and **report back** on how feedback has influenced project decisions.

Jemena considers relationships with stakeholders and host communities as critical to its business. As such, Jemena actively seeks feedback from stakeholders to improve its engagement and communications strategy. The organisation has developed its own engagement principles for the Project, as outlined in Section 5.3.1. These principles are informed by the International Association of Public Participation (IAP2)'s core values, as outlined below:

Public participation is based on the belief that those who are affected by a decision have a right to be involved in the decision-making process.

Public participation includes the promise that the public's contribution will influence the decision.

Public participation promotes sustainable decisions by recognising and communicating the needs and interests of all participants, including decision-makers

Public participation seeks out and facilitates the involvement of those potentially affected by or interested in a decision.

Public participation seeks input from participants in designing how they participate.

Public participation provides participants with the information they need to participate in a meaningful way.

Public participation communicates to participants how their input affected their decision.

The engagement activities related to the modification aligns with the Inform and Consult elements of the IAP2 Public Participation Spectrum.

Additionally, all consultation with impacted landholders relating to the modification is compliant with the following codes of conduct:

- Australian Pipelines and Gas Association (APGA)'s *Guideline for Stakeholder Engagement* (2015) (APGA Engagement Guideline)
- Ministerial Council on Mineral and Petroleum Resources (MCMPR)'s *Principles for Engagement with Communities and Stakeholders* (2005).

5.2 Stakeholders

A Stakeholder Management Plan (SMP) has been developed to define how stakeholder engagement is to be managed throughout all phases of the project. Implementation of this SMP and internal communication of its key elements are critical to the project's success.

The SMP defines stakeholders as individuals, groups or organisations who may affect, be affected by, or perceive themselves to be affected by the project. The process for identifying these stakeholders is outlined in Section 5.2.1.

5.2.1 Stakeholder mapping

As of December 2025, approximately 70 external stakeholders have been identified for Project. These stakeholders are shown in Table 5.1. These stakeholders include:

- Australian and NSW ministers, government entities, and local governments
- Traditional Owners
- Landholders and occupiers
- Market participants and industry groups
- Third-party utility providers
- Environment and special interest groups
- Local community.

Consideration has been given to every stakeholder's level of interest in – and influence on – the modification, along with their sentiment towards the modification. This enables an assessment of how each stakeholder relationship should be managed to ensure appropriate, proportionate and effective engagement – this is discussed further in Section 5.2.2.

Table 5.1 Key stakeholder groups

Key stakeholder group	Organisation/ individual
Elected officials	Australian ministers and MPs

Key stakeholder group	Organisation/ individual
	NSW ministers and MPs Local government mayors and councillors
NSW Government entities	Aboriginal Affairs NSW (Hunter Central Coast) Fire and Rescue NSW Heritage NSW Hunter Local Land Services NSW DCCEEW (Pipelines) NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) NSW Department of Planning, Housing and Infrastructure (DPHI) NSW Department of Primary Industries and Regional Development (DPIRD) NSW Environment Protection Authority (EPA) NSW National Parks and Wildlife Services NSW Rural Fire Service Transport for NSW
Local government	City of Newcastle Maitland City Council
Traditional Owners	Awabakal LALC Mindaribba LALC Woromi LALC
Neighbouring landowners and occupiers	Landowners and occupiers along the proposed route Neighbouring landowners and occupiers
Market participants and industry groups	Australian Pipelines and Gas Association Santos Transport for NSW
Third-party utility providers	AusGrid Hunter Water Transgrid
Environment and special interest groups	Committee for the Hunter Hexham Community Centre Hunter Bird Observer Club Hunter Community Environment Centre Hunter Environment Advisory Group Hunter Environmental Institute Hunter Farm Forestry Network Hunter Region Landcare Hunter River Organic Growers Association Hunter Wetlands Centre Australia Kooragang Volunteers NSW Farmers Association (Hunter Branch) The Hunter and Central Coast Development Corporation The Hunter Joint Organisation Wilderness Society Newcastle

Key stakeholder group	Organisation/ individual
Local community	Hexham, Millers Forest, Beresfield, Tarro and Woodberry communities

5.2.2 Stakeholder management

Jemena allocates a primary stakeholder manager to each stakeholder identified in Table 5.1. The primary stakeholder manager is a member from the Jemena project team for this modification; this benefits the stakeholder as the project team member would be well-informed about the modification's construction and operational requirements.

The role of the primary stakeholder manager is to provide a single point of contact between Jemena and the stakeholder for any feedback and complaints. This ensures any communications between Jemena and all stakeholders are coordinated, consistent and accountable.

Records of all substantive interactions between Jemena (either through the primary stakeholder manager or other team members) and stakeholders are kept using a record management system. These records allow Jemena to capture and act on feedback received. The records also inform Jemena's work to design, construct and operate the modification.

5.3 Engagement strategy

Engagement activities have been designed to be proportionate to the modification's small scale, generally low-level environmental impacts, and location along 15 land parcels on sparsely populated primary production and conservation land.

Considering the nature and location of the modification, the engagement strategy prioritised targeted engagement with specific stakeholders. This targeted approach was suitable as it focused Jemena's time and resources on providing a space for stakeholders to have what may be sensitive discussions about the modification. In accordance with the SMP, Jemena has ensured that stakeholders are able to have open and honest discussions about the modification by:

- **engaging stakeholders early** in the modification's planning process to identify and manage the likely impacts of the modification
- **considering individual stakeholder's communication and engagement preferences**
- **'closing the loop' for all feedback received** by documenting and responding to feedback received in a timely manner – including how feedback has shaped the design and planning of the modification.

5.3.1 Engagement principles

The following key principles have guided stakeholder engagement for the modification:

- **Open and effective engagement.** Jemena will undertake open and effective engagement which will involve the provision of timely information, as well as promoting open, two-way communication between itself and landholders, occupiers and other stakeholders.
- **Providing clear and accurate information.** Jemena is committed to providing clear and accurate information to stakeholders at all stages of the modification. This includes when

additional information about the modification comes to hand or the modification's design and construction progresses.

- **Working collaboratively with stakeholders.** Jemena will work collaboratively with stakeholders and provide opportunities for input into decisions which could affect their lives, their livelihood or the surrounding environment. Jemena will seek to achieve mutually beneficial outcomes with stakeholders.
- **Inclusiveness through early and continued engagement.** Jemena will continue to consult extensively with stakeholders throughout the modification's design and construction. Engagement should enable trusting and open working relationships to be established between Jemena and stakeholders.
- **Integrity.** Jemena will work in a manner which fosters mutual respect and trust.

5.3.2 Engagement objectives

The engagement objectives for the modification are to:

- **provide the community and stakeholders with accessible information** about the proposed modification, including expected project activities, timeframes and impacts
- **build local knowledge about the modification** and its local and regional benefits
- **respond to community and stakeholder enquiries, feedback and suggestions** about the modification
- **ensure engagement is aligned with statutory requirements** and best practice guidelines, including:
 - NSW Engagement Guidelines (Department of Planning, Housing and Infrastructure 2026)
 - IAP2 Quality Assurance Standard (International Association for Public Participation 2015)
 - *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a).

5.3.3 Engagement negotiables and non-negotiables

In line with the NSW Engagement Guidelines, information about decisions relating to the modification that stakeholders can directly influence have been clearly articulated throughout the engagement process.

Feedback received from stakeholder engagement has assisted the Jemena project team to better understand opportunities and impacts. Feedback received has influenced decisions relating to:

- The modification's alignment.
- The identification, mitigation and management of the modification's impacts.
- Engagement methods and timelines.

5.4 Engagement plan

This section summarises the key engagement phases and activities undertaken as part of the modification's SMP.

5.4.1 Engagement phases

In line with the NSW Engagement Guidelines (Department of Planning, Housing and Infrastructure 2026), stakeholder engagement will occur throughout the project lifecycle of the modification. The sections below outline the phased approach to engagement that has been adopted for the modification.

Pre-engagement

The scoping phase involved the preparation of the SMP, which outlines the objectives, scope and strategy for engagement activities. Key activities that were undertaken during the preparation of the SMP included:

- Stakeholder identification in the form of a stakeholder list.
- Stakeholder analysis to understand levels of influence, interest and expectations.
- Identification of potential risks and opportunities relating to stakeholder engagement.
- Definition of the modification's engagement scope, including negotiables and non-negotiables.
- Establishment of a project website, email address and phone line.
- Preparation of communications collateral, including fact sheets and project updates.
- Internal team briefings to ensure the Jemena project team is aware of engagement key messages and requirements.

Design and planning phases

Once pre-engagement activities were completed, Jemena commenced stakeholder engagement activities to guide the design and planning of the modification. Key activities that were undertaken during this engagement phase included:

- Initial kitchen table conversations with landholders within the modification area to understand their sentiment about the pipeline and finalise the modification's alignment through their land parcels.
- Remote meetings with NSW government entities and local government stakeholders to seek feedback on the modification's compliance with statutory requirements.
- Phone and email updates to landholders about the modification's progress, and changes to the modification.
- Distribution of a project update and fact sheet about the modification to surrounding landowners.

Construction, commissioning and operational phases

The SMP will be revised prior to construction, commissioning and operational activities. Revisions of the SMP will allow Jemena to tailor communications and engagement methods to suit the relevant phase of the modification. Accordingly, engagement collateral will be updated in a timely manner and circulated to stakeholders as new information arises. Important information will also be published on the Project website and provided directly to relevant stakeholders where appropriate.

Monitoring and evaluation

Throughout all engagement phases of the SMP, the Jemena project team evaluated the effectiveness of communications and engagement activities. Feedback received about the modification from have been documented and a response provided in a timely manner.

Amendments to the SMP, including the tailoring of engagement methods and key messages will also be made as the modification progresses through the development assessment process. This ensures that stakeholder engagement continues to align with the principles and objectives outlined in Section 5.3.

5.4.2 Engagement methods

Jemena has sought to provide multiple engagement channels for stakeholders to provide feedback about the modification. These channels are outlined in Table 5.2.

Table 5.2 Engagement methods

Method	Details
Digital and broadcast communications	
Website	A project-specific web page with up-to-date information, including fact sheets, maps and contact information for modification feedback and enquiries. www.jemena.com.au/gas/jemena-gas-network/hunter-lateral
Project email address	A dedicated project email address for stakeholders to contact the Jemena project team. hunterlateral@jemena.com.au
Email updates	Emails sent from the project email addresses to stakeholders, including one containing the November 2025 Project Update.
Phone line	A dedicated project phone line was established for stakeholders to call the Jemena project team. The project team also used the phone line to call and text stakeholders to provide brief messages and updates about the modification's progress. - Dedicated project number: 0409 740 618 - Jemena's general enquiries number: 1300 081 989 (standard business hours)
Print communications	
Fact sheet	A fact sheet outlining key project information, including maps, timelines, processes and contact information. This fact sheet was provided as part of a November 2025 email update to stakeholders.
Project update	An update containing information about the modification, including what decisions stakeholders can influence and how they can have their say. This update was provided as part of a letterbox drop within the Hexham, Woodberry, Tarro and Millers Forrest areas.
Letterbox drop	Letterbox drop at 750 addresses within the Hexham, Woodberry, Tarro and Millers Forrest areas. The letterbox drop provided surrounding landowners with a copy of the November 2025 Project Update to stakeholders. This also included an invite to participate in the Social Impact Assessment for the modification.
Direct engagement	
Meetings	The primary form of communication and negotiation for the modification. Meetings were either conducted in-person or online. Throughout the Design and Planning engagement phase, meetings were conducted with NSW government entities, local government, landholders and occupiers. Meetings were also organised to negotiate access and compensation agreements with the owners of the six land parcels that comprise the modification area. These meetings have been held on a regular basis since early 2025. Third-party utility and transport operators were also engaged, where the modification intersects any third-party assets.

Method	Details
	Offers for briefings were also provided to City of Newcastle and Maitland City Council staff and councillors. This offer was made in December 2025.
Hunter Gas Pipeline community information sessions	The Jemena project team has either attended or provided project information during in-person Community Information Sessions relating to Santos' Hunter Gas Pipeline project. Jemena attended three Community Information Sessions held in Maitland on the following dates: • 14 October 2024. • 25 March 2025. • 25 March 2026.
Other	
Social Impact Assessment	As part of the Social Impact Assessment, Umwelt (the consultant undertaking the assessment) attempted to call nine businesses and service providers near the modification area. These phone calls were made to understand the social impacts relating to the modification. Umwelt has also reviewed records from other engagement activities undertaken by Jemena to inform the development of the social baseline.
Aboriginal Cultural Heritage Assessment	As part of the Aboriginal Cultural Heritage Assessment process, OzArk (the consultant undertaking the assessment) conducted a site visit with Registered Aboriginal Parties (RAPs) that have expressed interest in the modification. OzArk has also consulted with RAPs on the methodology and findings of the Aboriginal Cultural Heritage Assessment.
Media	Jemena uses media as a method of communicating key project milestones and relevant information. Media enquiries are managed according to Jemena's Media Engagement Policy.

5.5 Feedback received

Based on the feedback received, the following groups expressed the most interest in the modification:

- Affected landowners and occupiers.
- Traditional Owners.
- NSW and local government entities.
- Third-party utility providers.

There was less interest in the modification from neighbouring landowners and the broader community.

5.5.1 Landholders

Key themes that have emerged from landowner feedback are outlined in Table 5.3.

Engagement between Jemena and all affected landowners has been constructive. Throughout the design and planning engagement phase, landowners have provided feedback about the modification's location and construction methodology. Feedback received from landowners have been incorporated into the modification's design and construction methodology, as demonstrated in Section 2.4.

The building of constructive relationships with the six affected landowners has resulted in all affected landowners voluntarily granting access to their land for modification design and planning purposes. This is the modification's preferred pathway to gain land access, as it:

- removes the need for Authorities to Survey under the Pipelines Act. While this authority can provide Jemena the right to survey land for the modification, it can also harm Jemena's ability to build mutually beneficial relationships with affected landowners.
- allows Jemena to continue good-faith negotiations with affected landowners in relation to construction and operational land access arrangements.

Table 5.3 Landowner feedback

Theme	Details	Jemena's response
Flood and drainage impacts	Addressing the modification's vulnerability to floods, as assessed through a specialist hydrology report.	• Implementation of a Soil and Erosion Management Plan, and other mitigations per the Hydrology Report.
Potential land use conflicts	Loss of property value due to encumbrances on title through easements. Business/farm impacts throughout construction.	• Compensation to be negotiated with landowners utilising accredited property valuers. • Property Management Plan to be prepared in consultation with landowners for construction.
	Impacts to fencing, water and access tracks.	• Alignment and location of the pipeline and easement updated in consultation with landowner. • Property Management Plan to be agreed with landowner for construction.
	Location of pipeline and associated easement in relation to dwellings and existing infrastructure, as well as within paddocks.	• Alignment and location of pipeline and easement updated in consultation with landowner. • Property Management Plan to be agreed with landowner for construction.
Interfaces with third-party infrastructure	Modification impacts to HVFMS infrastructure	• Avoidance of drainage and creeks where HVFMS infrastructure is located, through trenchless construction methods.

5.5.2 Third-party utility providers

Third party utility providers have also been engaged throughout the modification's design and planning phase, as demonstrated in Table 5.4. As noted in Section 2.4, the modification's alignment or construction methodology have been changed based on feedback received from utility providers.

Easement and utility crossing agreements will be negotiated with relevant third-party utility providers prior to construction, where required.

Table 5.4 Third-party utility provider feedback

Theme	Details	Jemena's response
	Impacts and distance from railway land.	• Trenchless crossing of rail in accordance with ARTC and Aurizon requirements.

Theme	Details	Jemena's response
Interfaces with third-party infrastructure	Depth of cover and crossing methodology of rail infrastructure.	No surface works or access to railway land through construction (trenchless only, with entry and exit locations outside of railway land).
	Interfaces with the Hexham Bypass under construction.	- Realignment of pipeline following feedback received from TfNSW and the Hexham Bypass Project Team. - Inclusion of setbacks and perpendicular crossing of assets.
	Modification impacts to HVFMS infrastructure	Avoidance of drainage and creeks where HVFMS infrastructure is located, through trenchless construction methods.

5.5.3 Government

Jemena has been engaging regularly with several NSW and local government entities throughout 2025.

Elected officials and local government

Project fact sheets and project updates have been provided to relevant elected officials and local government throughout the design and planning consultation phase. Briefings were also offered to local government entities.

No substantive feedback was received from elected officials and local government entities. It is expected that the City of Newcastle and Maitland City Council will provide submissions on the modification as part of the SSD assessment process. Jemena will continue to engage with both local councils and provide responses as part of the Response to Submissions phase of the SSD assessment process.

NSW government entities

Jemena's project team have been in regular contact with the DCCEE (Pipelines) and DPHI. Meetings between Jemena and these NSW government entities were focused on the modification's design, impacts and statutory approval requirements. This includes the development approval and pipeline licence variation required to enable the development of the modification.

Key themes that have emerged from NSW government entity feedback are outlined in Table 5.5. This includes additional feedback relating to the modification received during the DPHI's Maitland community meeting on proposed changes to the Pipelines Act. This meeting was convened on 20 August 2025, and feedback was relayed to Jemena by the DPHI.

Table 5.5 NSW government entity feedback

Theme	Details	Jemena's response
Biodiversity impacts	Impacts related to the downstream Hunter Estuary Wetland Ramsar site.	- Implementation of a Biodiversity Management Plan. - Implementation of a Soil and Water Management Plan per the Hydrology Report.

Theme	Details	Jemena's response
Flood and drainage impacts	Impacts to HVFMS infrastructure, and compliance with the HVFMS requirements.	- Avoidance of drainage and creeks where HVFMS infrastructure is located, through trenchless construction methods. - Implementation of a Soil and Water Management Plan per the Hydrology Report.
Statutory compliance	Land surveys required to substantiate a Pipeline Licence variation.	Alignment of Land Access Agreement Framework to ensure compliance with Pipeline Act requirements.

In addition to the DCCEE and DPHI, other NSW government entities are expected to provide submissions on the modification as part of the SSD assessment process. Jemena will continue to engage with these entities and provide responses as part of the Response to Submissions phase of the SSD assessment process.

5.5.4 Traditional Owners

Registered Aboriginal Parties (RAPs) who wished to be consulted about the modification area's Aboriginal cultural heritage values were identified as part of Aboriginal Cultural Heritage Assessment activities. These activities are detailed in **Appendix I: Aboriginal Cultural Heritage Assessment Report** (OzArk 2026a) (ACHAR). A total of 30 groups or individuals registered to be consulted as RAPs for the modification.

RAPs were consulted on the assessment methodology and the draft Aboriginal Cultural Heritage Assessment Report (ACHAR). A site survey of the modification area was also conducted between 1 and 2 October 2025, with two RAPs present.

Feedback received throughout the Aboriginal Cultural Heritage Assessment process is summarised in Table 5.6. A detailed discussion of the feedback received from Traditional Owners is provided in Section 6.2.

Table 5.6 Traditional Owners feedback

Theme	Details	Jemena's response
Aboriginal cultural heritage	Presence of a known Aboriginal cultural heritage place within the modification area. Presence of intangible cultural connections associated with the Hunter River (<i>Coquun</i>). Sensitivity of cultural knowledge associated with the modification area.	- Salvage of the cultural heritage place, if the place is still intact. - Amend the Cultural Heritage Management Plan (CHMP) for SSI-46360740. - Implement an unexpected finds and ancestral remains procedure.

5.5.5 Community

Despite community engagement efforts through letterbox drops and direct emails to community groups, no feedback has been received from the broader community to date.

As the modification is proposing a connection to Santos' Hunter Gas Pipeline, Jemena has attended three community information sessions in Maitland relating to the pipeline. While no direct feedback

about the modification was received, Jemena has considered the feedback received about the Hunter Gas Pipeline in the design and planning of the modification.

Table 5.7 Community feedback

Theme	Details	Jemena's response
Cumulative impacts	Cumulative impacts arising from multiple SSDs in the area.	Implementation of noise, traffic and dust management measures during the modification's construction.
Potential land use conflicts	Uncertainty about the location of the proposed Hunter Gas Pipeline within land parcels.	- Kitchen table conversations and land access agreements with all affected landowners. - Alignment of Land Access Agreement Framework to ensure compliance with Pipeline Act requirements.
	Concerns relating to easements on land.	- Compensation for easements to be negotiated with landowners utilising accredited property valuers. - Property Management Plan to be prepared in consultation with landowners for construction.
Construction methodology and timing	Project timing Uncertainty about whether the Hunter Gas Pipeline will be proceeding.	Regular updates about the modification's progress through multiple engagement channels.

5.6 Continuing good stakeholder engagement

Jemena will continue to undertake targeted stakeholder engagement activities throughout the detailed planning and construction of the modification, in line with the SMP. Prior to commencing construction activities, the SMP will be updated to provide a tailored communications and engagement strategy to support the modification's construction.

Table 5.8 Stakeholder engagement management measures

Reference	Mitigation measure	Timing
SE1	The SMP will be updated to include the following: - Identification of any additional key stakeholders that may have an interest in the modification as it is constructed and operated. - Procedures to ensure continuous, regular engagement with landowners, near neighbours, community service providers and Aboriginal groups. - Clear communication procedures with host landholders and near neighbours to advise them of after-hours construction activities and transport movements, and to consult on the modification as it progresses. - A complaints and grievances mechanism to receive, investigate, act and report back on community complaints and feedback received about the modification. - Monitoring and evaluation measures to ensure the SMP is supporting effective stakeholder engagement and communications.	Detailed design Planning Construction

6 Assessment and mitigations of impacts

The development of the Hunter Lateral Pipeline may result in potential environmental and social impacts, both positive and negative. This Modification Report has identified several key planning and environmental considerations which warrant further assessment; these considerations have been identified through stakeholder engagement and the Modification Report development process (see Chapters 2 and 5):

- Hazards from floods and bushfires, as well as the operation of the pipeline
- Potential disturbance of threatened flora, fauna and ecological communities.
- Impacts to surface water and groundwater quality, as well as watercourses and drainage lines.
- Impacts to traffic and the transport network (especially freight corridors).
- Potential land use conflict arising from the modification to agricultural and conservation land.
- Cumulative impacts arising from the modification and other major projects in the region.

The Modification Report has also assessed planning and environmental considerations that would typically arise from the construction and operation of a high-pressure gas transmission pipeline. This includes:

- Noise and vibration impacts
- Aboriginal cultural heritage impact
- Social and economic impacts
- Air quality and greenhouse gas emissions
- Historic heritage.

The likelihood and magnitude of these impacts have been assessed as part of the Modification Report and associated technical reports, outlined in Table 6.1. Where required, these reports have also provided measures to avoid, minimise and manage any identified impacts.

Table 6.1 Outline of assessed impacts' form and level of assessment

Impact	Level of assessment	Form of assessment	Cumulative impacts
Hazards	Detailed	Preliminary Hazard Assessment (Appendix C)	No
Surface water and groundwater	Detailed	Surface Water and Groundwater Assessment (Appendix D)	Yes
Biodiversity	Detailed	Biodiversity Development Assessment Report (Appendix E)	No
Traffic	Detailed	Traffic Impact Assessment (Appendix F)	Yes
Noise and vibration	Detailed	Noise and Vibration Impact Assessment (Appendix G and H)	Yes
Land	Standard	Literature review (Sections 6.10 and 6.11)	No
Aboriginal cultural heritage	Detailed	Aboriginal Cultural Heritage Assessment (Appendix I)	Yes

Impact	Level of assessment	Form of assessment	Cumulative impacts
Social and economic	Standard	Social Impact Assessment (Appendix J)	Yes
Air quality and greenhouse gas emissions	Standard	Air Quality Assessment (Appendix K) Greenhouse Gas Assessment (Appendix L)	No
Historic heritage	Standard	Literature review (Section 6.9)	No

6.1 Hazards

In accordance with the Scoping Report's proposed assessments, a **detailed assessment** of the **project's hazards**, in the form of a Preliminary Hazard Assessment (PHA) (Arriscar 2026) has been undertaken for the modification. The PHA can be found in **Appendix C**.

The PHA has evaluated the likelihood of risks associated with the operation of the Hunter Lateral Pipeline. The PHA has also quantified the consequences of these risks to human health and property.

Risks have been identified and assessed in accordance with:

- *Hazardous Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Safety Planning*
- *HIPAP No. 6 – Guidelines for Hazard Analysis*
- *HIPAP No. 10 – Land Use Safety Planning.*

In addition, a **detailed assessment of flooding hazards**, in the form of a Surface Water and Groundwater Assessment (SWGA) (Stantec 2026) has been undertaken for the modification. The SWGA can be found in **Appendix D**. The SWGA modelled flooding impacts to the modification area across five flooding scenarios:

- 1 in 20-year Annual Recurrence Interval (ARI) (5% Annual Exceedance Probability [AEP])
- 1 in 50-year ARI (2% AEP)
- 1 in 100-year ARI (1% AEP)
- 1 in 100-year ARI, plus 20% rainfall increase and 0.4 m sea level rise
- Probable Maximum Flooding (PMF).

6.1.1 Methodology

Pipeline risk assessment

A **full quantitative risk assessment** of the modification was conducted as part of the PHA. The PHA evaluated hazards involving aboveground infrastructure (the Hunter Lateral Facility, Jemena Tie-In Facility), and the underground pipeline itself. The PHA assumed that aboveground infrastructure is to be located at an elevation of 1 m above ground level, and the underground pipeline will have a minimum cover depth of 750 mm.

The key steps of a quantitative risk assessment and key findings of the PHA are discussed below.

Hazard identification

Hazards are identified based on external and site events that may cause adverse impacts to human health and property beyond the modification area. These hazards are identified based on the details of the modification, chemical properties of methane, known ways that a gas pipeline could fail, and the potential consequences of natural gas release. Where a hazard's initial risk level is not 'low' and cannot be managed so that the hazard's residual risk level is as low as reasonably practical (ALARP), the hazard is carried forward for consequence, frequency and likelihood estimation.

One credible hazard was identified for further risk analysis —the release of high-pressure natural gas from the Hunter Lateral Pipeline. This hazard is considered credible as there are multiple ways a gas pipeline can rupture, resulting in the release of natural gas. This includes actions by a third party, ground movements, corrosion or mechanical failure.

Consequence estimation

All consequences of a pipeline rupture which pose a significant impact to human health and property were then identified. The extent and severity of each consequence was also modelled using risk simulation software (Safeti 9.11).

The following fatal consequences to human health and property were identified and modelled for the consequence estimation process:

- **Jet fires:** a continuous stream of burning fuel released under pressure in a particular direction. Heat radiation (including direct exposure to a jet fire) can have fatal consequences to human health.
- **Flash fires:** a sudden, intense fire that lasts for a very short duration as a fuel is dispersed into the air. Heat radiation from direct exposure to a flash fire can have fatal consequences to human health.
- **Vapour cloud explosions:** the ignition of large quantities of fuel that has formed a vapour cloud in the air. Blast injuries (overpressure) from a vapour cloud explosion can be fatal to humans.

Four types of pipeline rupture scenarios were also considered in the consequence estimation:

- **Pinhole:** ≤ 25 mm in diameter
- **Small Hole:** > 25 mm to ≤ 75 mm in diameter
- **Large Hole:** > 75 mm to ≤ 110 mm in diameter
- **Full-Bore Rupture:** > 110 mm in diameter.

For the pinhole, small hole and large hole rupture scenarios, two locations of failure were considered – the top of the pipe, and the middle of the pipe (on the side).

Frequency and likelihood estimation

The likelihood and frequency of identified risks and consequences were then estimated based on the best available historical data. The PHA estimated the likelihood and frequency of:

- Ruptures within the underground pipeline and aboveground infrastructure.
- Each pipeline rupture scenario for the underground pipeline and aboveground infrastructure.

- Immediate and delayed ignition of leaking fuel within the underground pipeline and aboveground infrastructure.

Risk analysis and assessment

A risk analysis and assessment were conducted based on the consequence and likelihood estimations for each hazard, and the sum of the results across all hazards. The results of the risk analysis were then compared against the individual fatality, individual injury, property damage, accident propagation and societal risk criteria defined in HIPAP No. 4 and HIPAP No. 10.

Societal risk, which assesses the risk of multiple fatalities occurring in any single event, is illustrated in Figure 6.1. Societal risk is benchmarked against the FN-curve; F is the frequency of which an incident may kill N, the number of people.

Table 6.2 Worst-case individual fatality risk

Land use criteria	Risk criteria (fatalities per year)	PHA findings
Hospitals, childcare facilities, old age housing developments	5E-07 (5×10^{-7}) 5 in 10 million	The modification does not reach the DPHI's lowest risk criteria threshold of 5 in 10 million per year.
Residential developments, places of continuous public occupancy	1E-06 (1×10^{-6}) 1 in a million	
Commercial developments (offices, shops etc.)	5E-06 (5×10^{-6}) 5 in a million	
Sporting complexes and active open space areas	1E-05 (1×10^{-5}) 1 in 100,000	
Limit of risk exposure for adjacent industrial land uses. Preferably contained within the facility boundary.	5E-05 (5×10^{-5}) 5 in 100,000	

Table 6.3 Worst-case individual injury risk criteria

Injury risk scenario	Risk criteria (fatalities per year)	PHA findings
4.7 kilowatt per square metre (kW/m^2) heat flux	5E-05 (5×10^{-5}) 5 in 100,000	In a worst-case scenario involving a jet fire, the risk contour for a 4.7 kW/m^2 heat flux extends: • 608 m around the underground pipeline. • 689 m around the Hunter Lateral Facility. • 688 m around the Jemena tie-in facility. The risk contour includes dwellings along Nilands Lane, the future M1 Pacific Motorway Extension, Pacific Highway, the Main North railway line and industrial land uses at Hexham.
7 kPa explosion overpressure	5E-05 (5×10^{-5}) 5 in 100,000	In a worst-case scenario involving a vapour cloud explosion, the risk contour for a 7 kPa overpressure extends:

Injury risk scenario	Risk criteria (fatalities per year)	PHA findings
		49.3 m around the underground pipeline. While the contour extends beyond the proposed pipeline easement, the contour only affects agricultural and conservation land. 637 m around the Jemena tie-in facility. The contour also includes a portion of the Main North railway line and the Pacific Highway. 639 m around the Hunter Lateral Facility. The contour encompasses an agricultural land use located south-west of the Hunter Lateral Facility.

Table 6.4 Worst-case property damage and accident propagation criteria

Injury risk scenario	Risk criteria (fatalities per year)	PHA findings
23 kW/m² heat flux	5E-05 (5 x 10 ⁻⁵) 5 in 100,000	In a worst-case scenario involving a jet fire, the risk contour for a 23 kW/m² heat flux extends: 276 m around the underground pipeline. 455 m around the Hunter Lateral Facility. 454 m around the Jemena tie-in facility. The risk contour includes a small number of dwellings along Nilands Lane, the future M1 Pacific Motorway Extension, Pacific Highway and the Main North railway line.
14 kPa explosion overpressure	5E-05 (5 x 10 ⁻⁵) 5 in 100,000	The PHA notes that explosion overpressures can reach up to 10 kPa but do not reach 14 kPa for any of the pipeline rupture scenarios. The risk contour for a 10 kPa overpressure extends: 32.8 m around the underground pipeline. While the contour extends beyond the proposed pipeline easement, the contour only affects agricultural and conservation land. 594 m around the Jemena tie-in facility. The contour also includes a portion of the Main North railway line and the Pacific Highway. 596 m around the Hunter Lateral Facility. The contour encompasses an agricultural land use located south-west of the Hunter Lateral Facility.

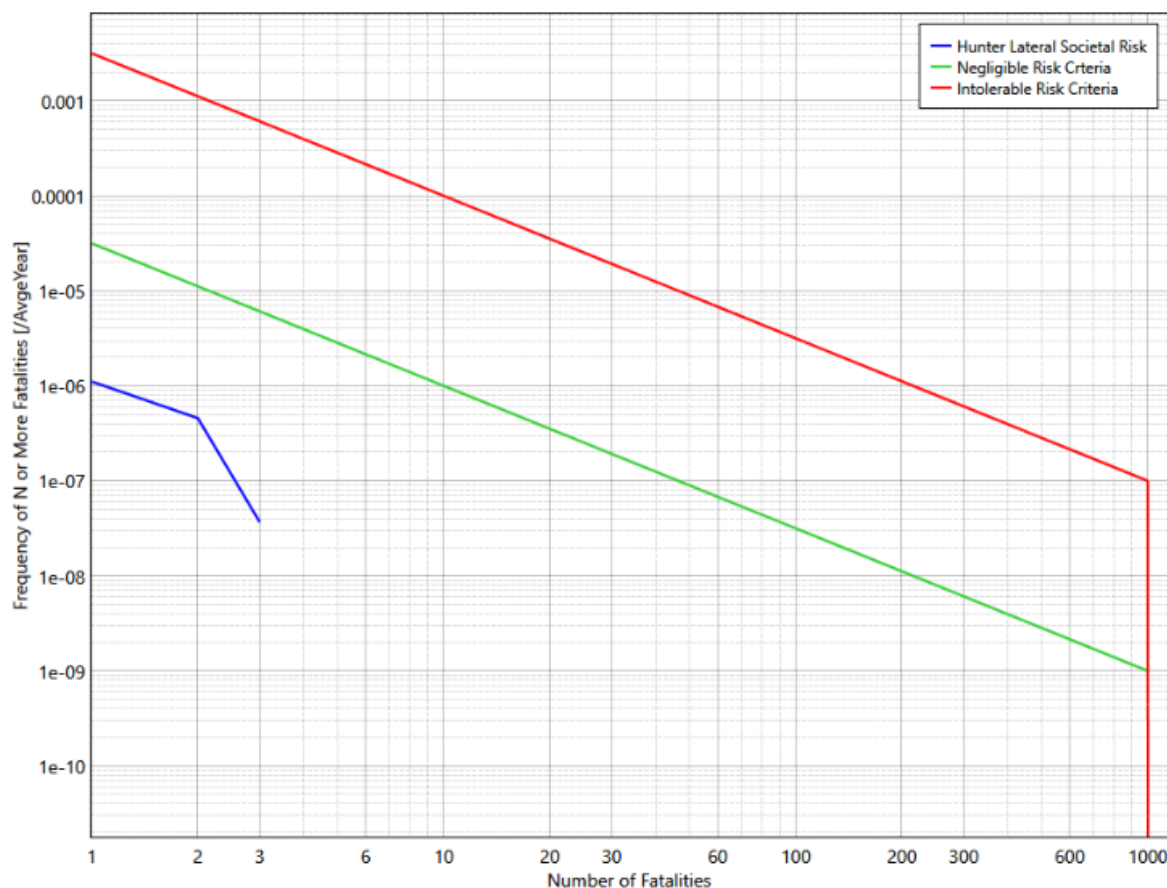


Figure 6.1 Societal risk assessment (Arriscar 2026)

Flood risk assessment

Appendices B and C of the SWGA describe the flood modelling and flood risk assessment process. For the Hunter Lateral Pipeline project, a review of existing regional-scale flood modelling was undertaken to understand the inherent flood risks within the modification area. A summary of the process is provided below.

Flood model selection

A desktop review of existing flood models for the Hunter River catchment was conducted. The purpose of the review is to identify a suitable baseline hydraulic model that describes flood behaviour throughout the modification area.

A total of six models were identified as potentially suitable for flood behaviour analysis, of which the Williamstown Salt Ash Model (2024 Updates) (WSAM) was ultimately selected for further analysis. The WSAM is a regional-scale model extending from Nelsons Plains in the north, Hunter River mouth in the south, Anna Bay in the east and Stockton in the west. The WSAM appears to be derived from two flood studies —the *Lower Hunter Valley Supplementary Flood Study (1998)*, and the *Green Rocks to Newcastle Flood Study (1994)*. The 1998 study used a regional-scale model that was calibrated to seven historical flood events. This included the 1955 floods, which remains the largest flood in the Hunter River Catchment.

Unlike the other flood models considered for assessment, the WSAM integrates recent LiDAR data into its modelling —this includes high-resolution LiDAR data captured in 2020. The WSAM also integrates updated asset and infrastructure data from councils, contributing to an improved hydraulic representation of flooding behaviour. As such, the WSAM's accuracy and resolution allows for a defensible surface water and flood behaviour assessment of the modification area.

Flood model analysis

The WSAM was then run using the five baseline events (flooding scenarios) available in the model:

- 1 in 20-year ARI (5% AEP)
- 1 in 50-year ARI (2% AEP)
- 1 in 100-year ARI (1% AEP)
- 1 in 100-year ARI, plus 20% rainfall increase and 0.4 m sea level rise
- PMF.

The model's outputs describe flood hazard and behaviour throughout the modification area for each baseline event. The outputs were then used to identify flood-related risks to the Hunter Lateral Pipeline's construction and operation, as well as to downstream sensitive receivers.

Flood hazard assessment

The modelled depth and velocity of flood waters throughout the modification area is classified according to the flood hazard curve (Figure 6.2). The description for each flood hazard classification is listed in Table 6.5.

Table 6.5 Flood hazard classifications

Hazard classification	Description
H1	Generally safe for vehicles, people and buildings. Relatively benign flood conditions. No vulnerability constraints.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles, children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for people or vehicles. Buildings require specially engineering, design and construction.
H6	Not suitable for people, vehicles or buildings. All building types considered vulnerable to failure.

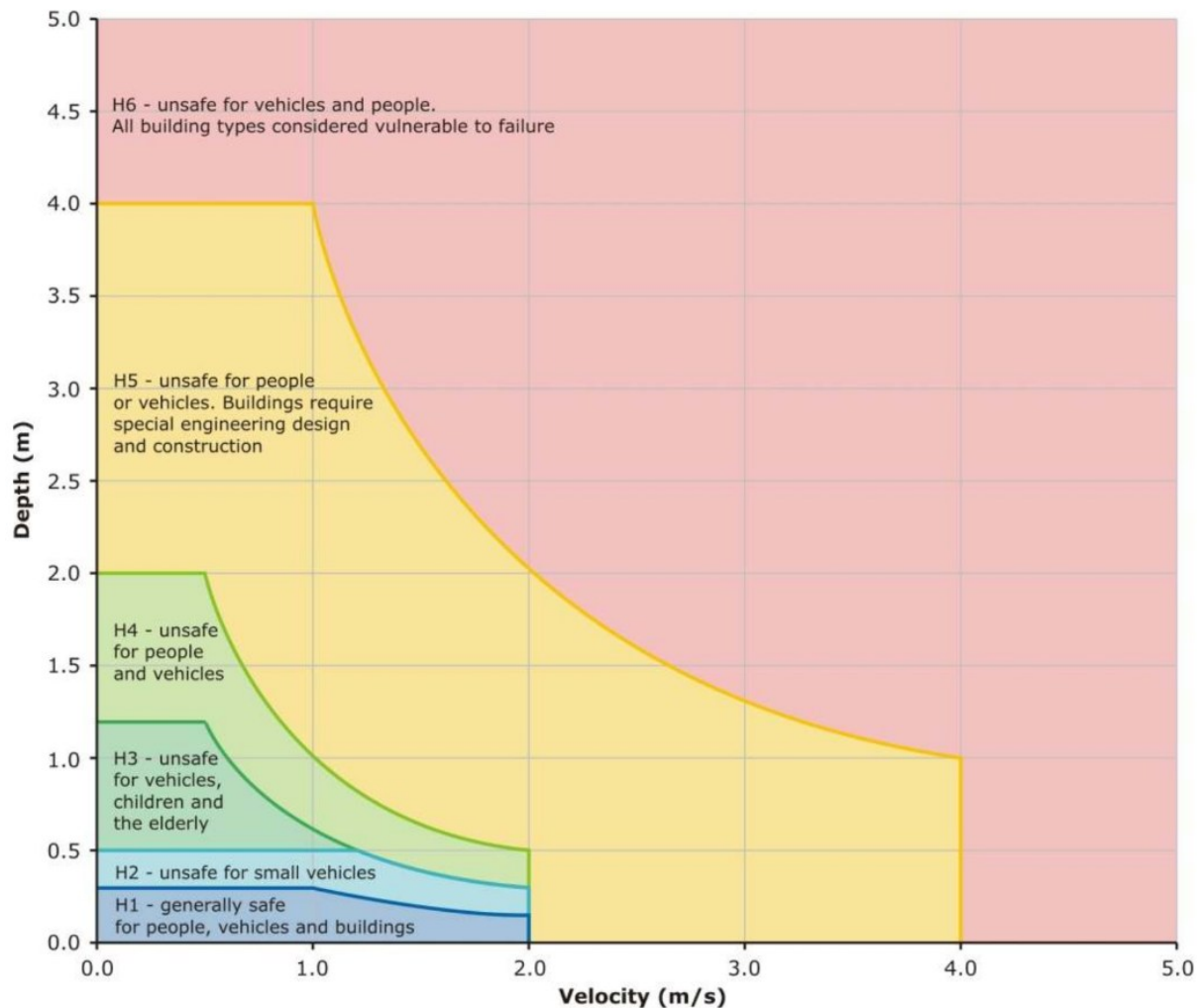


Figure 6.2 Flood Hazard Curve Classifications (McLuckie et al 2014)

6.1.2 Assessment

Pipeline hazards

The PHA concluded that the overall risk posed by the modification to the community is low.

This is because the modification does not meet the risk criteria thresholds for individual fatalities, injuries, property damage and accident propagation. The modification also does not present a significant societal risk as the risk for an event causing multiple fatalities falls below the 'negligible' criterion defined in HIPAP No. 4.

The PHA has provided some general mitigation measures to ensure the Hunter Lateral Pipeline complies with the requirements of AS 2885. This is provided in Section 6.1.3.

Flooding hazards

The SWGA noted that the modification area is prone to regional flooding. The WSAM indicates that the modification area would be inundated in all five flooding scenarios, due to its nature as a low-lying floodplain. Flood waters would overtop the levees surrounding the Hunter River, fill the floodplain and then flow southwards.

Flood depth tends to be lower in the portion of the modification area south of the New England Highway. The deepest flood waters surrounding the modification area would be located on land surrounding the two diverging channels at Purgatory Creek (located west of the modification area).

The SWGA also observed that there would be increased flood velocity along the crest of the levee adjacent to the Hunter River and the southern boundary of the levee along Francis Greenway Creek's true right side.

Average and maximum flood water depths and velocities for each flooding scenario is provided in Table 6.6. Maps showing the flood depth and velocity for each flooding scenario are provided in Appendix C of the SWGA.

Table 6.6 Maximum and average flood water depths and velocities (Stantec 2026)

Flooding scenario		1 in 20-year ARI	1 in 50-year ARI	1 in 100-year ARI	1 in 100-year ARI + 20%	PMF
Depth (m)	Maximum	3.37	4.26	5.04	5.56	8.86
	Average	1.50	2.48	3.30	3.82	7.14
Velocity (m/s)	Maximum	1.52	1.74	2.01	2.16	2.62
	Average	0.45	0.73	0.94	1.02	1.45

The entire modification area would be exposed to H4 and H5 flood hazard levels in the most-frequent flooding scenario in the WSAM (1 in 20-year ARI). When rarer flooding scenario models were assessed (1 in 100-year ARI, 1 in 100-year ARI + 20% and PMF scenarios), the portion of the modification area adjacent to Purgatory Creek and Francis Greenways Creek would be exposed to the HZ6 flood hazard level.

In the 1 in 20-year ARI and 1 in 50-year ARI scenarios, the portion of the modification area south of the New England Highway would generally be exposed to a lower flood hazard level than the rest of the modification area. Even so, the relatively high flood hazard levels across the modification area means that the area is not generally safe for vehicles or humans to traverse. The southern portion of the modification area may be traversed by large vehicles during a 1 in 20-year ARI scenario.

Flooding within the modification area can compound any adverse effects to surface water and groundwater during construction. These impacts are discussed in Section 6.6. Mitigation measures for flood risks are provided in Section 6.1.3.

6.1.3 Mitigation measures

Table 6.7 Hazard mitigation measures

Reference	Mitigation measure	Timing
HZ1	The Hunter Lateral Pipeline will be designed to have sufficient depth of cover to prevent pipeline damage arising from ground movement or traffic loads.	Detailed design
HZ2	Jemena will ensure that the detailed design of the Hunter Lateral Pipeline will incorporate the 'Flood Impacts' mitigation measures outlined in Table 8-6 of the SWGA. This includes:	Detailed design

Reference	Mitigation measure	Timing
	- Elevating ground-level critical pipeline components are elevated above the 1 in 100-year ARI + 20% rainfall increase flood level. A 0.5 m freeboard for critical pipeline components will also be included. - For electrical fixtures, installing fixtures above the Flood Planning Level (FPL) where practical, or installing fixtures on separate earth-leakage protected circuits if the fixture is located below the FPL. - The FPL is the 1% AEP flood level, with a freeboard of 500 mm. - Selecting construction materials that suit the flood hazard level for the modification area.	
HZ3	'Flood Impacts' mitigation measures for construction works, per Table 8-6 of the SWGA, will be incorporated into a project Construction Environmental Management Plan (CEMP). Mitigation measures will include: - Ensuring major works for the Hunter Lateral Pipeline is conducted during the dry season. - Subscribing to flood watch, flood warning and rainfall/river height monitoring notifications from the Bureau of Meteorology (BOM). - Installing portable flood barriers or bunds around laydown areas when a flood watch or flood warning is issued by the BOM.	Construction
HZ4	A Safety Management Study (SMS) consistent with AS/NZS 2885.6:2018 requirements will be conducted. The SMS will identify threats to the pipeline and identify appropriate measures to mitigate identified threats.	Construction Commissioning
HZ5	A Flood Emergency Management Plan (FEMP) will be prepared to manage human risks throughout the modification area. The FEMP will detail warning triggers, shut-down procedures and evacuation arrangements.	Construction
HZ6	An Emergency Response Plan (ERP) will be developed and implemented to address all pipeline-related emergency events. The ERP will detail response and recovery strategies and procedures for all pipeline-related emergencies, including: - Loss of containment. - Full-bore ruptures. - Fires. - Natural events.	Commissioning
HZ7	Jemena will ensure that the Hunter Lateral Pipeline's integrity is continuously monitored and maintained in accordance with a pipeline management system. This includes ensuring the pipeline corridor is managed in accordance with section 7 of AS 2885.	Operation

6.2 Aboriginal cultural heritage

Consistent with the Scoping Letter, a **detailed assessment**, in the form of an **Aboriginal Cultural Heritage Assessment Report (ACHAR)**, was prepared by OzArk Environment and Heritage Pty Ltd (OzArk) (2026a). The ACHAR can be found in **Appendix I**.

The purpose of the ACHAR is to identify Aboriginal cultural heritage values within the modification area, in consultation with Registered Aboriginal Parties (RAPs). Aboriginal cultural heritage values may include:

- tangible objects** (e.g. artefacts, landforms, human remains or culturally modified trees)
- intangible cultural values** (e.g. landscapes and places of significance to Aboriginal people).

The ACHAR has applied the following guidelines in its assessment of Aboriginal cultural heritage values within the modification area:

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b)
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011)
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a) (ACHCRs).

6.2.1 Methodology

The ACHAR was developed using a four-stage engagement process with RAPs, consistent with the requirements of the ACHARs. This is supported by desktop research and predictive modelling of Aboriginal cultural heritage values within the modification area.

Desktop assessment and predictive modelling

A desktop assessment of the modification area's natural features, as well as its historical and archaeological context was conducted. The desktop assessment and predictive modelling were used to inform the ACHAR's survey methodology for the modification area.

The desktop assessment involved searches of the Commonwealth Heritage List, National Native Title Register, Aboriginal Heritage Information Management System (AHIMS), and the Maitland and Newcastle LEPs. The findings of previous archaeological studies near the modification area were also reviewed to ascertain what are the most commonly occurring Aboriginal cultural heritage sites within the region. The desktop assessment noted that:

- Stone artefact sites were the most prevalent site types within the broader region.
- Unmodified stone flakes were the most common artefacts found within the broader region.
- There is one registered Aboriginal cultural heritage site within the modification area, consisting of an isolated find and an associated potential archaeological deposit (38-4-1810).

The likelihood of Aboriginal cultural heritage site types being present within the modification area was then modelled, based on the information derived from the desktop assessment.

Identification of interested RAPs

RAPs who wished to be consulted about the modification area's cultural values were identified through:

- An advertisement placed in the *Newcastle Herald* on 24 April 2025
- Letters sent to individuals and groups whose contact details have been provided by government agencies and Local Aboriginal Land Councils (LALCs).

A total of 30 groups or individuals registered to be consulted as RAPs for the modification.

Development of assessment methodology

Each RAP was sent information about the modification and OzArk's proposed assessment methodology for the ACHAR for their feedback. All RAPs were provided 28 days to provide comments on the assessment methodology and advise if there were any specific cultural values in the modification area that should be assessed in the ACHAR.

A total of six responses were received on the assessment methodology; none of the responses received required changes to be made to the survey methodology. The Woromi Traditional Owners Indigenous Corporation (Woromi TOIC) advised OzArk that the modification area has cultural value to the Woromi people, although no specific objects or locations were nominated by any RAPs. They also raised concerns regarding the sensitivity of cultural knowledge associated with the modification area.

Aboriginal cultural heritage information collection

A site survey of the modification area was conducted over two days —1 and 2 October 2025. The site survey was undertaken by OzArk personnel, with representatives from the Woromi TOIC and Midaribba LALC present. The site survey did not identify any previously undiscovered Aboriginal cultural heritage sites. The RAPs present during the site survey also indicated that the low-lying landforms were not ideal habitation locations, and that archaeological sites were more likely to be present at the margins of the wetlands surrounding the modification area.

ACHAR development

A draft ACHAR was circulated to all RAPs for comment on 18 December 2025. The draft ACHAR contains the findings of the desktop assessment and site survey. The ACHAR also assesses the significance and potential for harm to occur to Aboriginal cultural heritage sites from the modification, and recommends measures to avoid or minimise harm where practical.

A total of four comments were received pertaining the draft ACHAR. Three of these comments endorsed the ACHAR's observations and recommendations, while one comment highlighted intangible cultural connections associated with the modification area's proximity to the Hunter River (*Coquun*).

6.2.2 Assessment

Site 38-4-1810

Site 38-4-1810 is located within the modification area, as illustrated in Figure 6.3. Site 38-4-1810 consists of a single silcrete artefact located on top of the Tarro Levee and access track. This cultural heritage site will be totally impacted by the development of the Hunter Lateral Pipeline. Impact to this cultural heritage site is already permitted through Aboriginal Heritage Impact Permit (AHIP) 4421, for the purpose of development the M1 Pacific Motorway Extension.



Figure 6.3 Known Aboriginal heritage sites (OzArk 2026a)

The site visit did not include an inspection of Site 38-4-1810 as it was located in an inaccessible portion of the ongoing M1 Pacific Motorway Extension Project construction area. The most recent observation of Site 38-4-1810 was made by Jacobs, the cultural heritage consultant for the M1 Pacific Motorway Extension Project. Jacobs noted that the site could not be reidentified during their 2020 follow-up site survey, and that the site condition was poor.

The ACHAR further noted that Site 38-4-1810 should not be considered as containing potential archaeological deposits. Site 38-4-1811, approximately 280 m east of Site 38-4-1810, is located along the same levee and access track that has been constructed from imported fill material. However, unlike Site 38-4-1810, Site 38-4-1811 is not considered a site for potential archaeological deposits. As such, the ACHAR considers that there is a low potential for Site 38-4-1810 to have potential archaeological deposits.

The ACHAR has assessed Site 38-4-1810 as having a **high cultural value** for the site, as it represents tangible evidence of Aboriginal cultural use of the landscape. However, the site also has:

- **low archaeological or scientific value**, as it is a single artefact existing within a disturbed local environment. The archaeological or scientific value of the site is further lowered as the isolated find associated with the site could not be reidentified during Jacobs' follow-up survey
- **low aesthetic value** as the site exists within an extensively modified landscape. The isolated find is also small and does not manifest itself in the landscape.
- **low historic value**, as the site is not associated with any known historic heritage values.

As the cultural heritage site is already approved for impact as part of the M1 Pacific Motorway Extension Project, there are few opportunities to conserve the Aboriginal cultural heritage values within the modification area. **If Site 38-4-1810 remains valid on AHIMS, the ACHAR recommends salvaging and temporarily storing the artefact associated with the cultural heritage site.**

Intangible cultural values

While there are intangible Aboriginal cultural heritage values within the broader region where the project is located, no specific locations of intangible cultural heritage within the modification area have been identified by RAPs. A comment on the draft ACHAR received from a RAP highlighted that the modification area holds intangible cultural heritage significance due to its proximity to the Hunter River (*Coquun*).

OzArk acknowledged that there are general aesthetic qualities associated with the adjacent Hunter River (*Coquun*). **However, the ACHAR notes that no places or themes associated with intangible cultural values have been identified during the ACHAR process.**

6.2.3 Mitigation measures

The ACHAR has provided some specific mitigation measures for Site 38-4-1810. The ACHAR has also provided general management measures if undiscovered Aboriginal cultural heritage is found within the modification area.

Table 6.8 Aboriginal cultural heritage management measures

Reference	Mitigation measure	Timing
AH1	The CHMP for SSI-46360740 will be amended to include provisions for impacts to Site 38-4-1810.	Prior to construction
AH2	If the status of Site 38-4-1810 remains valid on AHIMS, a surface salvage of the site will be attempted in accordance with the procedures in Section 5.5.1 of the CHMP. - No further management of the site is necessary if the site is marked as 'destroyed' on AHIMS. - After salvage works are completed, arrangements will be made to temporarily store Site 38-4-1810 during construction in a secure area.	Prior to construction
AH3	If Site 38-4-1810 is salvaged, the proponent will determine an appropriate location to rebury the Aboriginal cultural heritage artefact in consultation with the RAPs. Consultation will be conducted and logged in accordance with the CHMP.	Prior to construction
AH4	An unexpected finds and ancestral remains procedure will be included as part of the Hunter Lateral Pipeline's CEMP. The procedure will be consistent with the recommendations of Section 9.2.3 and 9.2.4 of the ACHAR.	Prior to construction

6.3 Traffic and transport

Consistent with the Scoping Letter, a **detailed assessment**, in the form of a **Traffic Impact Assessment (TIA)**, was prepared by Amber Organisation (Amber) for the modification (2026). The TIA can be found in **Appendix F**.

The purpose of the TIA is to assess the modification's impacts to the function and safety of the road network. This includes:

- evaluating the condition and capacity of the existing road network
- assessing whether proposed project site access points, light and heavy vehicle routes to the modification area are safe
- whether additional road treatments are required within the road network or at site access points.

6.3.1 Methodology

The TIA evaluated the direct transport impacts arising from the modification's construction and operation. The TIA also assessed the modification's contribution to cumulative transport impacts within the broader region; this is discussed in Section 6.13.

Data collection and analysis

Roads within the local area that will be affected by the modification were identified. The typical traffic volume of each road (described as vehicle movements per day/per hour) was then ascertained by collating and analysing TfNSW traffic volume data. The capacity of each road was also ascertained based on its road classification, design (e.g. number of lanes, speed limits) and the type of traffic using the road.

Route assessment

An assessment of the construction routes and access points suitability for heavy and light vehicle traffic was conducted. The route assessment assumes that all construction plant (including plant requiring transport using OSOM vehicles) will originate from the Port of Newcastle.

The proposed routes were first compared with the following maps hosted on the National Heavy Vehicles Regulator (NHVR)'s National Network Map portal:

- **NSW Restricted Access Vehicle maps** – the maps show all roads that have been approved for certain Class 2 B-double/combination heavy vehicles, provided they meet the General Mass Limits, Concessional Mass Limits or Higher Mass Limits requirements set out in the:
 - *National Class 2 Heavy Vehicle B-double Authorisation Notice*
 - *NSW Class 3 Zero Emission Vehicle Mass and Dimension Exception Notice*
 - *NSW Higher Mass Limits Declaration*.

The General Mass Limits and Concessional Mass Limits 25/26 m B-double Routes map was reviewed.

- **NSW Class 1 Load Carrying Vehicles Network map** – the map shows all roads that have been approved for Class 1 OSOM vehicles, provided that the vehicle meets the dimension and mass requirements set out in the:
 - *Multi-State Class 1 Load Carrying Vehicle Mass Exemption Notice 2023*.
 - *National Class 1 Load Carrying Vehicle Dimension Exemption Notice 2024*.
- **NSW Class 1 Special Purpose Vehicle Network maps** – the map shows all roads that have been approved for Class 1 heavy vehicles built for a purpose other than carrying goods that meet the mass and dimension specifications set out in the *National Class 1 Special Purpose Vehicle (up to 40 t total mass) Mass and Dimension Exemption Notice*. For this TIA, the Level 4 and 12 Tonne Axle Approved Routes map was reviewed; Level 4 vehicles include four-axle all-terrain cranes up to 45.8 tonnes, and five-axle all-terrain cranes up to 50 tonnes.

Roads are typically considered suitable for use by heavy vehicles if the route is mapped as 'approved' within the NSW Restricted Vehicle Access maps. If a road is not rated as part of the NSW Restricted Vehicle Access maps, the width of the road is used to determine its suitability for two-way heavy vehicle movements (typically 6 m – 7 m).

The route assessment considered the following access routes between the Port of Newcastle, the construction laydown area and the five site access points:

- **Site Access 1** – access route off Raymond Terrace Road
- **Site Access 2** – access route off Raymond Terrace Road, traversing Woodberry Road, Nilands Lane and Oakfield Road
- **Site Access 3** – Port of Newcastle to Site Access 3 via New England Highway
- **Site Access 4** – access route off New England Highway, traversing the Aurizon Access Road
- **Site Access 5** – direct access off New England Highway

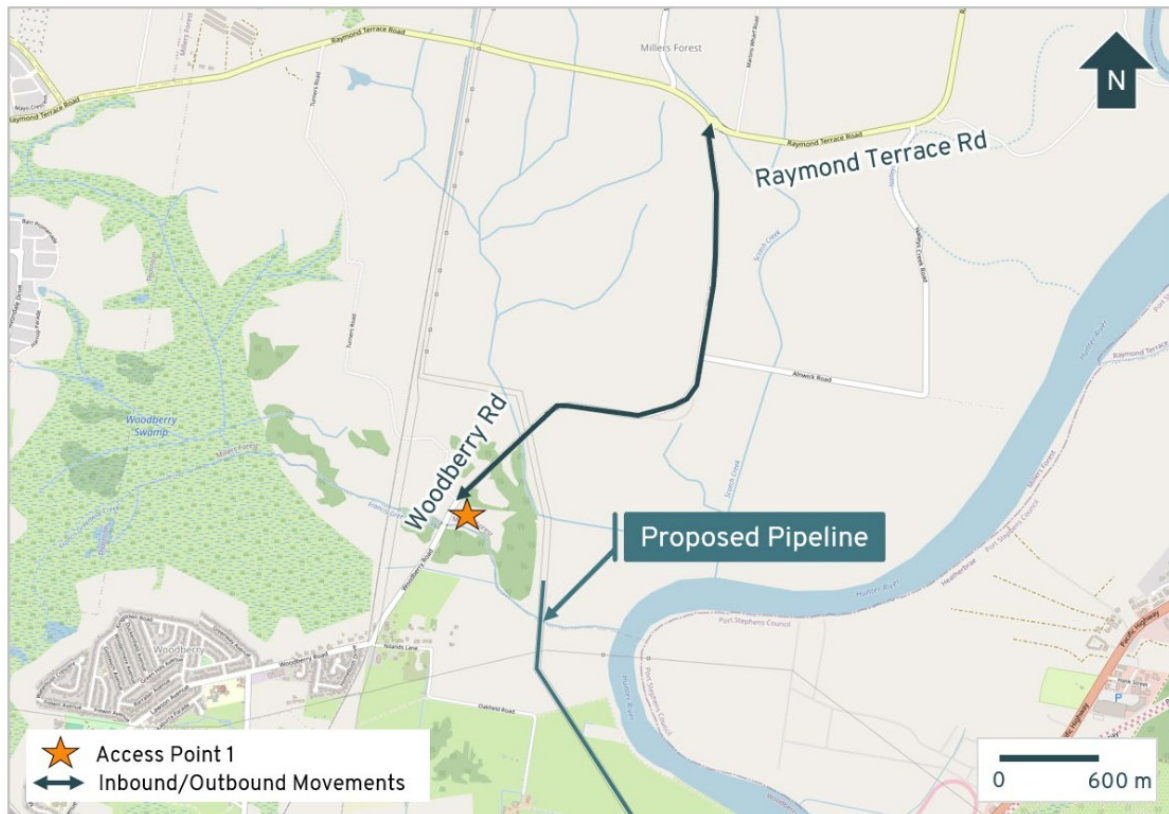


Figure 6.4 Access route to/from Access Point 1 (Amber Organisation 2026)

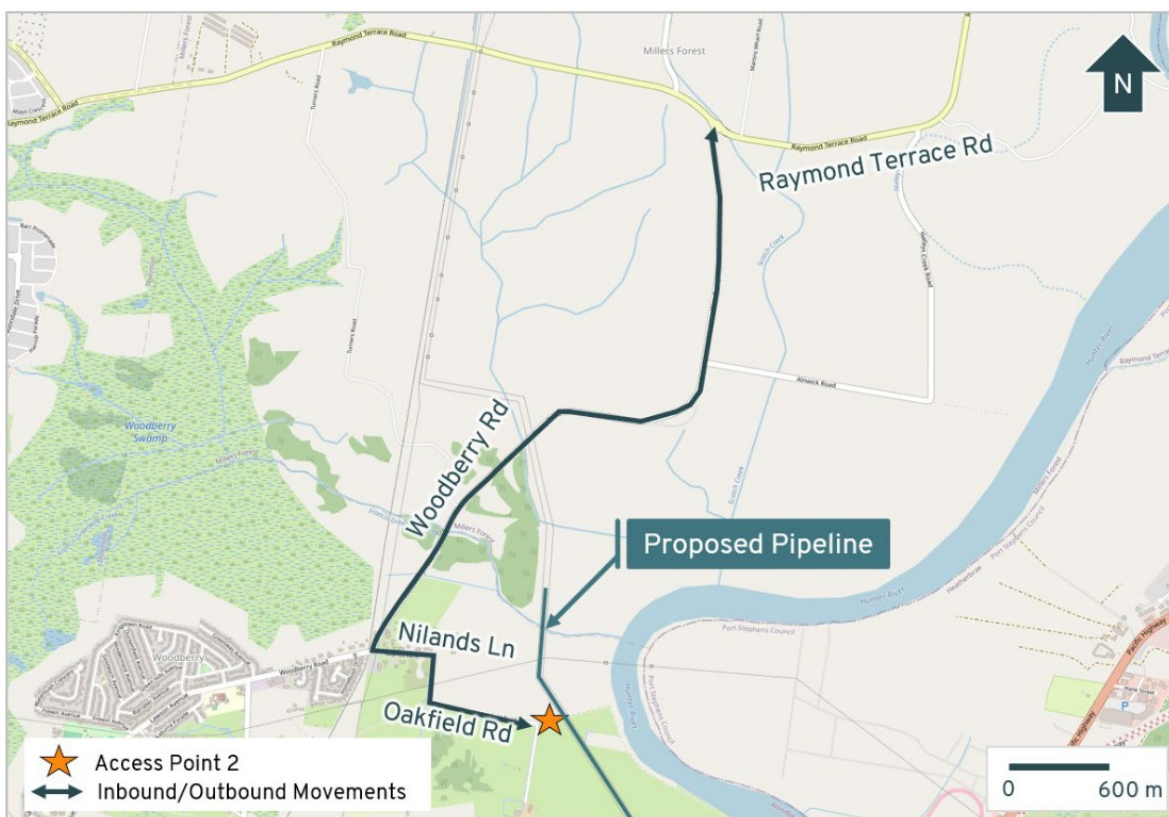


Figure 6.5 Access route to/from Access Point 2 (Amber Organisation 2026)

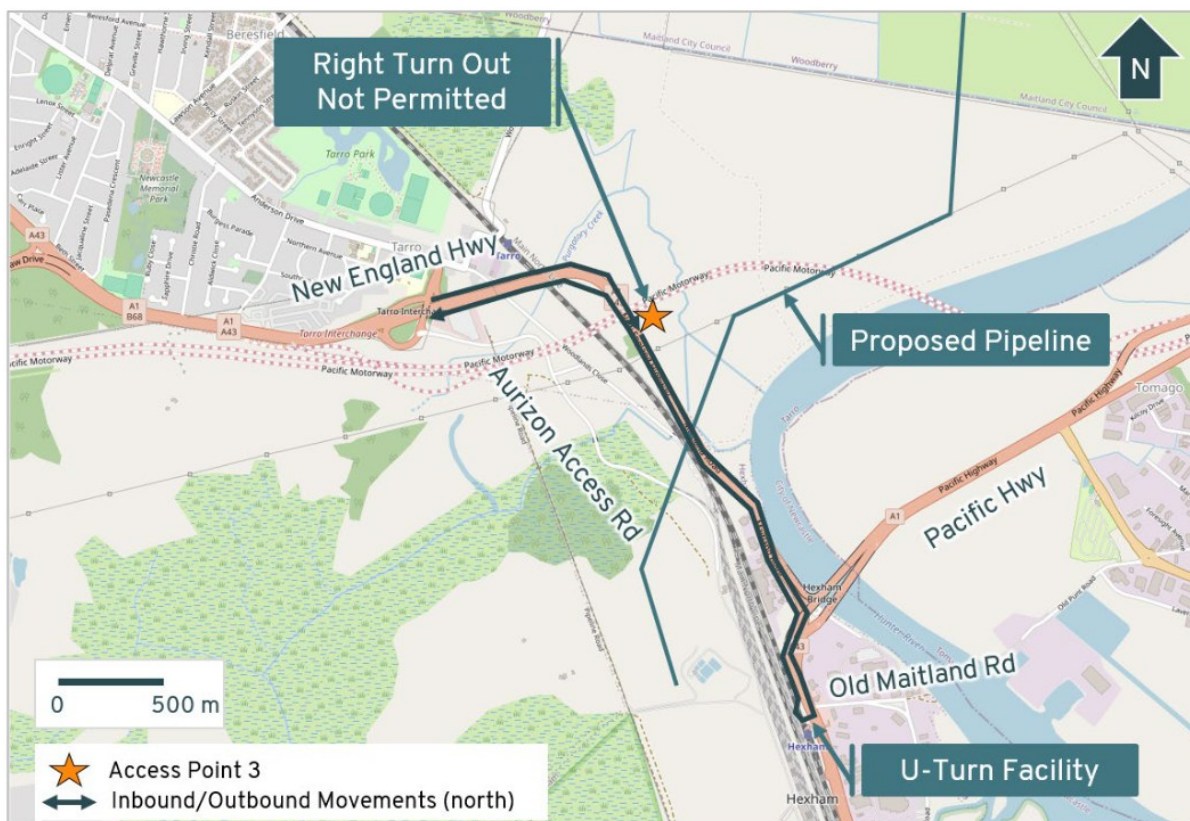


Figure 6.6 Northern access routes to/from Access Point 3 (Amber Organisation 2026)

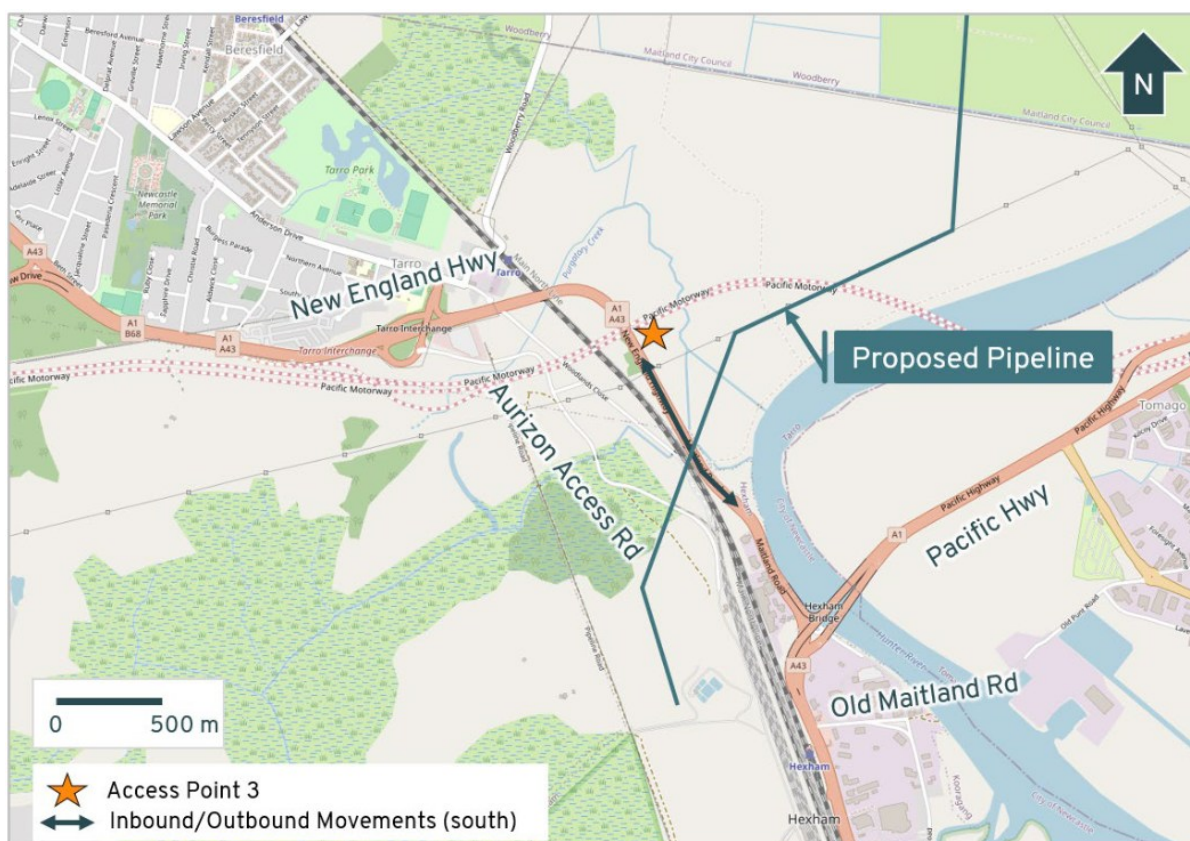


Figure 6.7 Southern access route to/from Access Point 3 (Amber Organisation 2026)

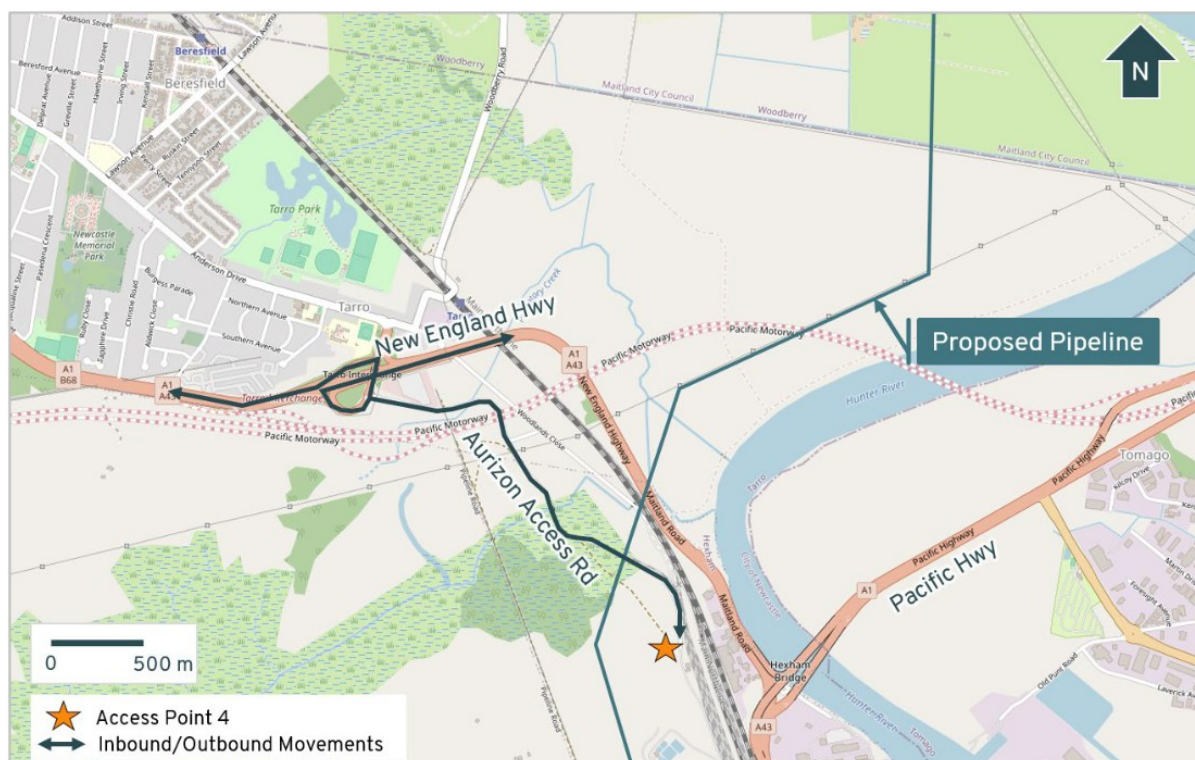


Figure 6.8 Access route to/from Access Point 4 (Amber Organisation 2026)

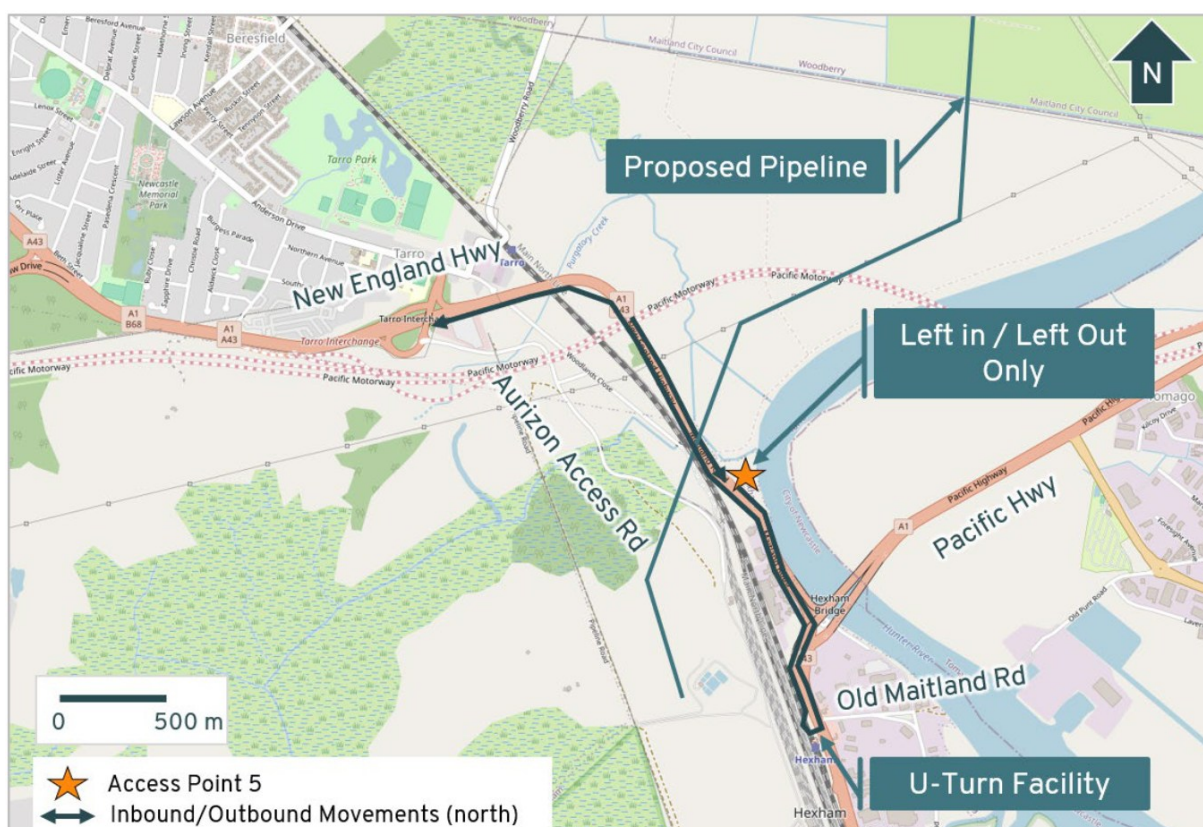


Figure 6.9 Northern access route to/from Access Point 5 – North (Amber Organisation 2026)

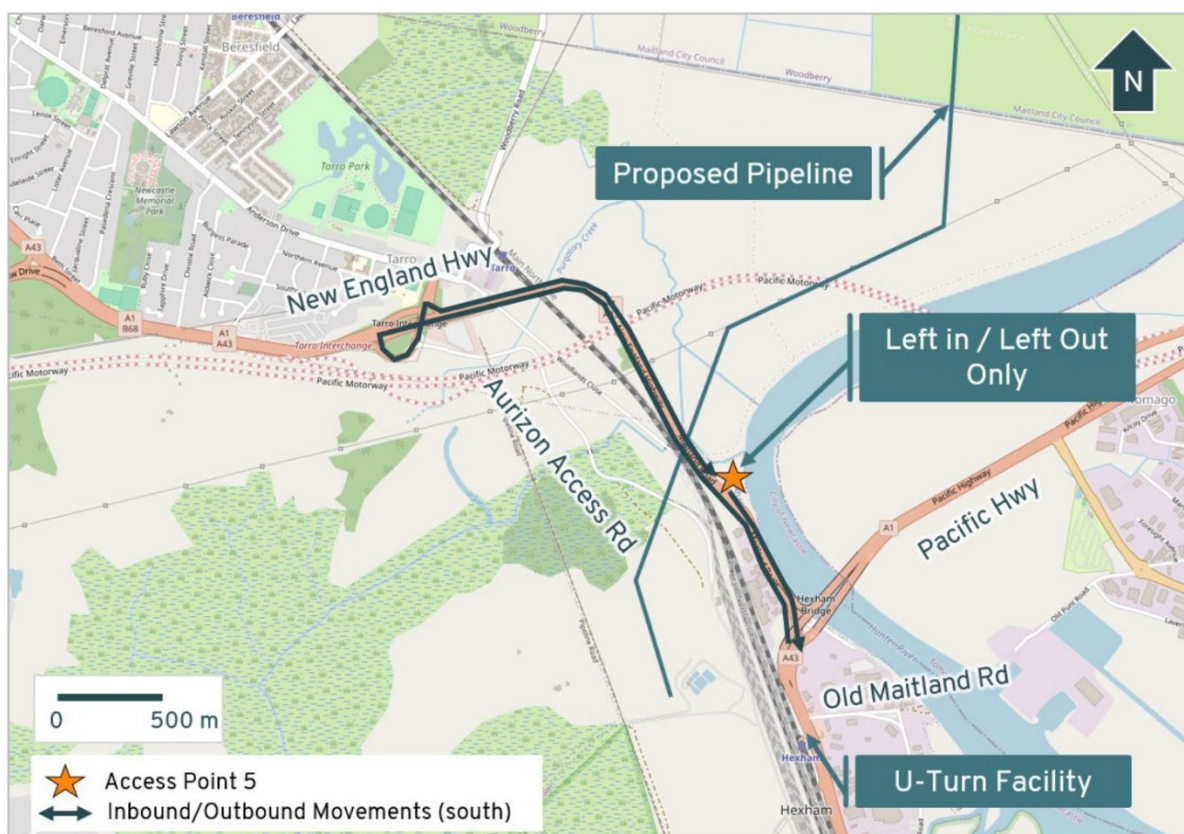


Figure 6.10 Southern access route to/from Access Point 5 (Amber Organisation 2026)

A swept path analysis was also conducted for site access points and for road intersections where an intersecting road is not part of the NSW Restricted Vehicle Access maps. The swept path analysis was conducted using the dimensions of a typical 26 m B-double vehicle; the results of the analysis is provided in the TIA.

Traffic assessment

Impacts arising from the traffic generated by the modification is assessed by comparing the traffic generated by the modification with the capacity of the existing local road network. Traffic generated by the modification's construction and operation were estimated for each vehicle type. This estimation is based on information provided by Jemena about the kind and volume of traffic generated by the modification's construction and operation. The estimated traffic movements were then split between the five construction access points to the modification area.

Access review

The safety of intersections leading to each site access point for vehicles was evaluated. This was done by assessing the ability for intersections to safely handle the additional traffic volume arising from the modification's construction. The sightlines for each access point were also calculated to ensure they meet the minimum Safe Intersection Sight Distance (SISD) defined in the *Austroads Guide to Road Design (Austroads Guide) Part 4a: Unsignalised and Signalised Intersections*. The SISD for each access point was calculated according to a road's operating speed, grade, and the time needed for drivers to observe and stop a vehicle when a conflict is observed at an intersection.

For the modification, the following inputs were used for the SISD analysis:

- The modification area is generally flat, with an assumed longitudinal grade of 0%
- A reaction time of 2.0 seconds is applicable for an operating speed less than 110 km/h, with a reaction time of 2.5 seconds for an operating speed of 110 km/h or over.
- A deceleration coefficient of 0.36.
- Operating speed is estimated to be the posted speed limit, plus 10 km/h.

6.3.2 Assessment

The TIA concluded that the proposed construction access arrangements for the modification area will be suitable to accommodate the required light and heavy vehicles for the modification's construction. This is provided that a Traffic Management Plan (TMP) is developed and implemented prior to the modification's construction. Further, the existing local road network will be able to accommodate the traffic generated from the modification's construction and operation.

Route assessment

Two proposed heavy vehicle access routes were assessed between the Port of Newcastle and Site Access 3, where the construction laydown area is located. The roads that form part of the two heavy vehicle access routes form part of the NSW Restricted Vehicle Access maps. As such, heavy goods vehicles from the Port of Newcastle can access Site Access 3 using the proposed access routes.

The NSW Class 1 Special Purpose Vehicle Network (Level 4 and 12 Tonne Axle Approved Routes Map) indicated that the New England Highway is an 'approved with conditions' route. Conditions have also been imposed on Special Purpose Vehicles traversing bridges along the New England Highway. These conditions prohibit travel for vehicles exceeding 2.5 m wide or 22 m long between sunrise and sunset during public holiday periods. Two bridges—the New England Highway/Main Northern Line and the Hexham Bridge—are also subject to restrictions.

Hence, local roads leading to the other site access points can accommodate heavy vehicles, provided traffic management measures are adopted at certain intersections and roads. These traffic management measures are discussed in Table 6.9.

Table 6.9 Route assessment results (Amber Organisation 2026)

Site Access	Route assessment result	Required traffic management measures	Suitable for heavy vehicles?
1	Raymond Terrace Road and Woodberry Road form part of the approved B-double network. Based on the swept path assessment, traffic management measures are required at the intersection of Site Access 1 and Woodberry Road.	Traffic management measures at Site Access 1/Woodberry Road intersection to prevent an entry/exit movement from happening at the same time.	Yes, after traffic management measures are implemented
2	Woodberry Road and Nilands Road form part of the approved B-double network. However, Oakfield Road is not part of the network – the typical width of Oakfield Road is 3.5 m to 5 m, which is narrower than the road width required for two-way heavy vehicle movements. Traffic management measures will be required along Oakfield Road, as well	Traffic management measures along Oakfield Road, Nilands Lane/Oakfield Road and Oakfield Road/Site Access 3 intersections, to prevent an entry/exit movement from happening at the same time.	Yes, after traffic management measures are implemented

Site Access	Route assessment result	Required traffic management measures	Suitable for heavy vehicles?
	as the Nilands Lane/Oakfield Road and Oakfield Road/Site Access 3 intersections.		
3	Site Access 3 intersects the New England Highway, which forms part of the approved B-double network. Turn treatments, in the form of a left turn slip lane is already provided for turning vehicles.	Continue to ensure that right-out movements are not permitted from the Site Access 3/New England Highway intersection. Obey heavy vehicle conditions and restrictions that apply to the New England Highway.	Yes, after traffic management measures are implemented
4	The Aurizon Access Road does not form part of the approved B-double network. However, the typical width of the road is between 7 m to 11 m, which is considered suitable for two-way heavy vehicle movements. Traffic management measures will be required at the Site Access 4/Aurizon Access Road intersection.	Traffic management measures at the Site Access 4/Aurizon Access Road intersection to prevent an entry/exit movement from happening at the same time.	Yes, after traffic management measures are implemented
5	Site Access 5 intersects the New England Highway, which forms part of the approved B-double network. However, traffic management measures will be required at the Site Access 5/New England Highway intersection.	Traffic management measures at the Site Access 5/New England Highway intersection to: - prevent an entry/exit movement from happening at the same time - restrict vehicle movements to left-in/left-out movements only - obey heavy vehicle conditions and restrictions that apply to the New England Highway.	Yes, after traffic management measures are implemented

The TIA has not conducted a route assessment of OSOM vehicles; it has been assumed that OSOM vehicles will use the heavy vehicle access routes to site access points. The TIA considers that the road widths and intersections along the routes will be able to accommodate OSOM vehicles, provided suitable management measures are adopted as part of a Traffic Management Plan (TMP).

The TIA also noted that:

- The New England Highway is an 'approved with conditions' route on the NSW Class 1 Load Carrying Vehicles Network map – the condition requires operators of OSOM vehicles to contact the Hexham Straight Widening and Black Hill to Tomago projects a minimum of five days before OSOM vehicles traverse the New England Highway.
- A restriction applies to the Irrawang Bridge —where Raymond Terrace Road crosses the Hunter River. Due to this restriction, OSOM vehicles cannot access the modification area from the north-east (via Seaham Road).

Traffic assessment

The TIA estimates that the modification's construction will create up to 100 additional two-way vehicle trips per day. This includes:

- 66 light vehicle trips (of which 33 trips will be undertaken during peak hours)
- 28 heavy vehicle trips
- 6 OSOM vehicles trips.

The TIA further noted that the number of trips generated by the modification will vary depending on the construction phase. As some of the heavy and OSOM vehicle trips involve the transportation of specialist construction plant and pipeline segments, these vehicles may not create daily trips to and from the modification area. Some of these vehicles may remain on site for as long as they are required before leaving the site, generally outside of peak hours.

The TIA concluded that the minor increase in traffic during the modification's construction can be accommodated safely and efficiently within the existing road network —this includes the New England Highway and Pacific Highway, which are national key freight routes. This is subject to the adoption of the traffic management measures outlined in Chapter 7 of the TIA.

The modification is expected to cause negligible traffic impacts when it is operational.

Access review

The TIA noted that turn treatments already exist where local roads or site access points intersect with State roads. These turn treatments are outlined in Table 6.10.

The access review considers that these existing turn treatments will be adequate for the modification's construction traffic. The TIA also notes that while there are no existing left turn treatments for the Aurizon Access Road/Site Access 4 intersection, the existing intersection layout and low speed environment (40 km/h) will continue to allow safe vehicle movement.

Table 6.10 Existing turn treatments at intersections (Amber Organisation 2026)

Road intersection	Direction	Turn treatment
New England Highway/Site Access 3	Left	Auxiliary Left Turn Lane for construction vehicles only.
	Right	Channelised Right Turn for construction vehicles only.
New England Highway/Aurizon Access Road	Right	Channelised Right Turn
New England Highway/Site Access 5	Left	Informal short left turn lane using the existing U-turn facility.
	Right	Channelised Right Turn via the existing U-turn facility.
Raymond Terrace Road/Woodberry Road	Left	Roundabout – turn treatments not required.
	Right	
Aurizon Access Road/Site Access 4	Left	No turn treatments provided; the TIA considers that the low-speed environment at this intersection will continue to allow safe vehicle movement.
	Right	

Based on the SISD analysis, each site access point also meets the required SISD for vehicles to safely enter the local road network. The result of the analysis for each site access point is provided in Table 6.11.

Table 6.11 SISD analysis results (Amber Organisation 2026)

Intersection	Operating speed (km/h)	Required SISD (m)	SISD achieved?
Woodberry Road/Site Access 1	90 km/h	214 m	Yes
Oakfield Road/Site Access 2	110 km/h	300 m	Yes
New England Highway/Site Access 3	70 km/h	151 m	Yes
Aurizon Access Road/Site Access 4	70 km/h	151 m	Yes
New England Highway/Site Access 5	70 km/h	151 m	Yes

6.3.3 Mitigation measures

Reference	Mitigation measure	Timing
TF1	A construction TMP will be developed for the modification, in accordance with the recommendations provided in Chapter 7 of the TIA. The TMP will include management and monitoring measures to: • schedule deliveries to minimise simultaneous entry/exit heavy vehicle movements at site access points • develop driver communication protocols and deploy traffic controllers to manage vehicle movements • ensure compliance with conditions and restrictions that apply to roads • ensure safe driving behaviour, through a driver's code of conduct • address complaints and feedback related to construction traffic • notify relevant stakeholders and the local community of after-hours heavy and OSOM vehicle movements.	Prior to construction
TF2	Engagement with the following key stakeholders will be conducted to ensure the modification does not create adverse impacts to ongoing major projects, transport infrastructure and road safety: • CDC NSW, the operator of the Newcastle region's public and school buses. • The M1 Pacific Motorway Extension project team • Sydney Trains, freight rail operators and TAM NSW, which are relevant stakeholders for the Main Northern Line.	Prior to construction Throughout construction

6.4 Noise and vibration

Consistent with the Scoping Letter, **detailed assessments**, in the form of **two Noise and Vibration Impact Assessments (NVIA)**, were prepared by JTA Health, Safety and Noise Specialists (JTA) in

December 2025. The NVIAs assessed noise and vibration impacts arising from construction (the Construction NVIA; (JTA 2026a)) and operational activities (the Operations NVIA; (JTA 2026b)). This includes noise and vibration impacts arising from construction traffic and out-of-hours activities. The Construction and Operation NVIAs can be found in **Appendices G and H** respectively.

As noted in Section 3.2.2, proposed construction hours for the modification will be from 6:00 am to 6:00 pm, Monday to Sunday. Works outside of these hours will also be required for deliveries, testing and commissioning works. The modification will operate 24 hours a day, seven days a week once commissioned.

6.4.1 Methodology

Selection of noise sensitive receivers

Noise and vibration impacts were assessed for sensitive land uses located within 1.5 km of the pipeline alignment – this included residential dwellings and recreational areas. 12 noise sensitive receivers (NSRs) were selected as a representative sample for further noise and vibration analysis; the locations of these 12 NSRs are illustrated in Figure 6.11. Of these 12 NSRs, four were selected for unattended noise measurements (indicated with orange dots in Figure 6.11). Three of these NSRs are also host landowners (321 Woodberry Road, 39 Nilands Lane and 135 Oakfield Road).

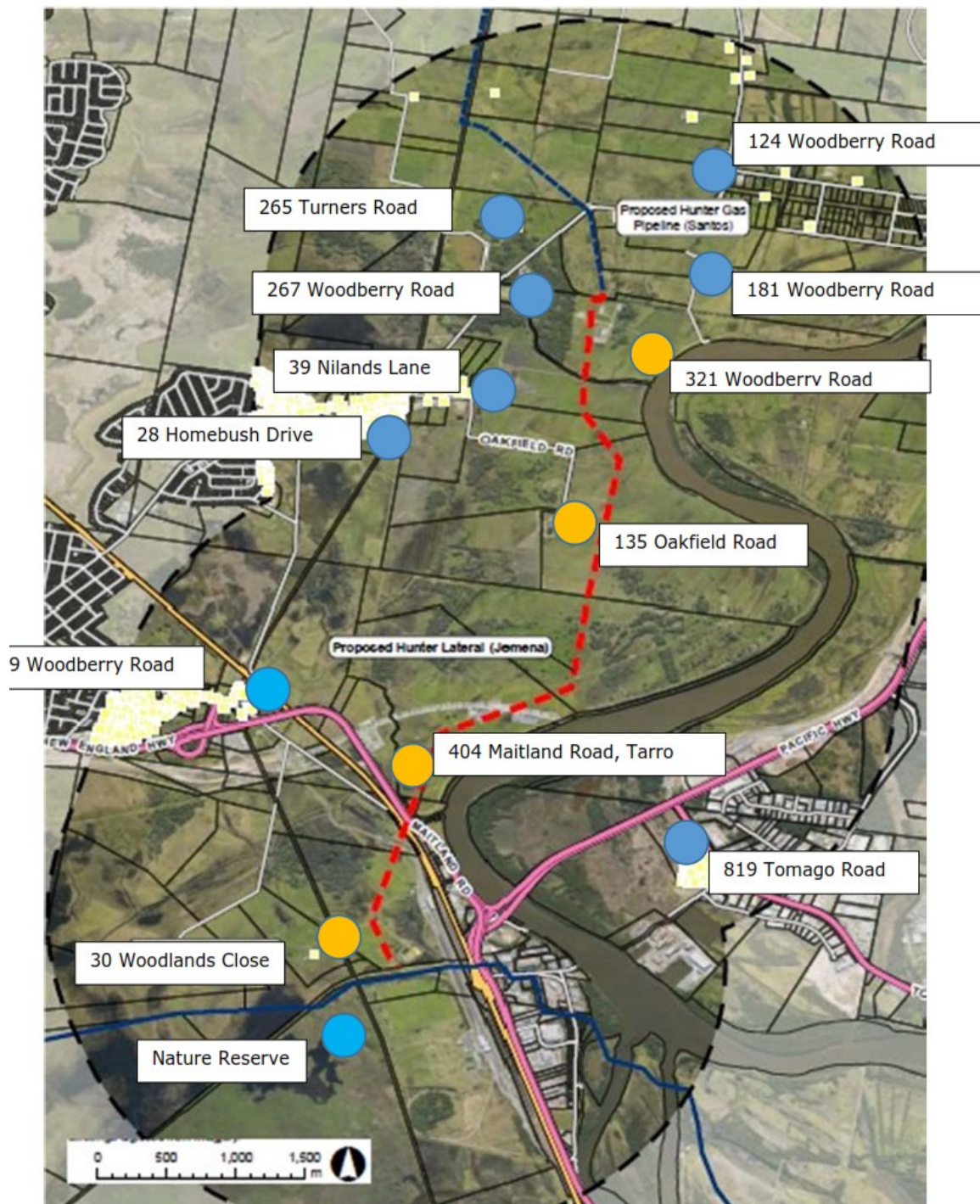


Figure 6.11 Noise Sensitive Receiver locations (JTA 2026a)

Noise and vibration measurements

Outdoor unattended noise and vibration measurements were conducted at the four NSRs closest to the pipeline alignment. Measurements at the four NSRs were collected across eight days, between 14 May 2025 and 21 May 2025. These noise measurements were undertaken to survey the existing

environment around the modification area, and to establish baseline noise and vibration levels for assessment.

Noise and vibration limits

Construction and operation noise and vibration limits for each of the 12 NSRs were then established based on baseline noise and vibration levels, current land use and time of day. The project noise limit helps identify when additional management and monitoring measures are required for excessive noise and/or vibration impacts. Project noise limits were established in accordance with the following guidelines:

- *Interim Construction Noise Guideline* (DECC 2009)
- *Noise Policy for Industry* (EPA 2017)
- *AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors* (2016)
- *NSW Road Noise Policy* (DECCW 2011)
- *Road Noise Criteria Guideline* (TfNSW 2025a)

The noise limits include considerations for the potential for sleep disturbance in nearby dwellings and noise from construction traffic. The NVIAs uses these descriptions to describe the time of day for noise impacts:

- **Day** – 7 am to 6 pm, Monday to Friday and 8 am to 1 pm, Saturday
- **Evening** – 6 pm to 10 pm, Monday to Sunday
- **Night** – 10 pm to 7 am, Monday to Sunday

Construction and operation vibration limits were established based on the following guidelines:

- *Assessing Vibration: a technical guideline* (DEC 2006) – this guideline provides vibration management levels for human comfort. The NVIAs adopt the land use-based preferred vibration dose values for intermittent vibration.
- *4150-3: Vibrations in buildings – Part 3: Effects on structures* (Deutsches Institut für Normung 2016 (German Institute for Standardisation) (DIN)) – this guideline provides vibration management levels for structural and cosmetic building integrity. The NVIAs adopt a maximum peak particle velocity (PPV) limit of 20 millimetres per second (mm/s).

Noise modelling

Noise emissions arising from construction and operational activities were then modelled. The noise model included information about noise sources (e.g. infrastructure, equipment, plant and vehicles), the area's topography, locations of residential dwellings and non-residential buildings. The results of the noise modelling were then compared with the noise limits for each NSR.

Construction noise modelling was conducted for the following construction phases:

- **Stage 1:** Site establishment and access roads: Vegetation clearing and grading
- **Stage 2.1:** Trenching along the pipeline route (trenchless technologies will be used in environmentally sensitive areas or watercourses)
- **Stage 2.2:** Pipeline installation and welding
- **Stage 2.3:** Backfilling trench and HDD; this includes 24-hour continuous HDD tunnelling activities. Installation of ancillary infrastructure

- **Stage 3:** Commissioning and land rehabilitation activities

Operational noise modelling was conducted for three operating scenarios:

- Normal operations
- Maintenance
- High noise intermittent events.

Additionally, a sleep disturbance assessment was conducted for all representative NSRs, based on the modelled night noise levels for Stage 2.3 works. An additional 10 dB was added to the modelled night noise level at each NSR. This is to account for 'maximum noise level events' such as reversing alarms, metal impacts, as well as pipe and soil handling. The results of the assessment were then compared with the Noise Policy for Industry's threshold for sleep disturbance (L_{AFmax} 52 dB(A)) or the prevailing night noise limit + 15 dB, whichever is greater.

Vibration modelling

Vibration impacts were modelled based on information of project vibration sources (e.g. infrastructure, equipment, plant and vehicles).

The Construction NVIA assessed vibration impacts to human comfort arising from trenching and HDD works at the closest building (150 m and 500 m respectively). Vibration impacts to structural and cosmetic building integrity were also assessed between 10 m to 400 m.

The Operations NVIA assessed vibration impacts arising from maintenance works and the normal operation of the tie-in facilities. Vibration impacts to human comfort were assessed between 100 m and 150 m.

6.4.2 Assessment

Construction

As shown in Table 6.13, **the noise modelling indicates that construction noise emission levels will generally be in accordance with the noise limit for each representative NSR assessed in the Construction NVIA.** However, there is a risk of elevated construction noise impacts for seven NSRs. Of these seven NSRs, four NSRs may experience discernible construction noise impacts as the noise limit exceedances for these NSRs are above 3 dB(A). The severity of these noise impacts will be dependent on the progress of the modification and the time of day.

The sleep disturbance assessment noted that the **same four NSRs are either at or above the maximum noise level assessment trigger** (L_{AFmax} 52 dB(A)). The Construction NVIA has recommended additional noise mitigation measures for these representative NSRs.

It is noted that host landowners constitute three of the four representative NSRs that may experience discernible construction noise impacts (321 Woodberry Road, 39 Nilands Lane and 135 Oakfield Road).

Noise contour maps for each construction stage are provided in the Construction NVIA.

Construction ground-borne noise and vibration impacts to NSRs were considered negligible due to the distance between the modification area and the NSRs. This is demonstrated in Table 6.16, Table 6.17 and Table 6.18.

Operations

As shown in Table 6.15, **the noise modelling indicates that operational noise emission levels will be in accordance with the noise limit for each NSR**. Operational vibration impacts are also not considered significant due to the distance between the modification area and the NSRs.

6.4.3 Mitigation measures

Table 6.12 Noise and vibration management measures

Reference	Mitigation measure	Timing
NV1	Develop a Construction Noise and Vibration Management Plan (NVMP), in accordance with the measures outlined in Appendix V of the Construction NVIA. The Construction NVMP will outline a framework to guide the: • preparation of Construction Method Statements, with measures to minimise noise and vibration impacts when specific works are undertaken • monitoring and reporting on noise and vibration impacts, especially at the two NSRs that will be most affected by construction noise impacts • actions to identify the reasons and remedy any non-compliance with noise and vibration limits. The Construction NVMP will also include management and monitoring measures for noise and vibration, including: • Scheduling works and providing respite periods for sensitive receivers. • Installing temporary hoardings around work areas with no gaps. • Selecting quieter construction methods, plant and equipment. • Encouraging good work behaviours (for example, avoiding excessive engine braking, minimising shouting and loud conversations).	Prior to construction
NV2	In the Community and Stakeholder Engagement Plan (CSEP), include: • a complaints and grievances mechanism, which includes a structured procedure for responding and documenting complaints • a procedure to provide advance notice of noisy works and works outside of standard construction hours to near neighbours across multiple communication channels • provision for a community engagement liaison to maintain regular communication with near neighbours.	Prior to construction
NV3	Conduct additional noise and vibration measurements during the pipeline's commissioning phase, to verify the findings of the Operations NVIA.	Commissioning

Table 6.13 Construction noise propagation model (JTA 2026a)

NSR		Predicted noise levels (L _{Aeq} dB(A)) by construction stage										
		Stage 1 – Site preparation		Stage 2.1 – Earthworks and clearing		Stage 2.2 – Civil works		Stage 2.3 – Ancillary infrastructure and trench filling			Stage 3 – Clean-up and commissioning	
		Day	Night	Day	Night	Day	Night	Day	Evening	Night	Day	Night
124 Woodberry Road <i>Non-host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	33	25	35	25	32	23	33	29	29	33	25
265 Turners Road <i>Non-host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	45	32	47	32	44	30	43	36	36 ●	45	32
181 Woodberry Road <i>Non-host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	41	34	43	34	40	32	41	38	38 ●	41	34
267 Woodberry Road <i>Non-host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	61 ▲	38 ●	63 ▲	38 ●	60 ▲	36 ●	59 ▲	42 ●	42 ▲	61 ▲	38 ●
321 Woodberry Road <i>Host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	49	44 ▲	51 ●	44 ▲	48	42 ▲	50	48 ▲	48 ▲	49	44 ▲
39 Nilands Lane <i>Host</i>	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	47	42 ▲	48	42 ●	45	40 ▲	48	46 ▲	46 ▲	47	42 ▲
28 Homebush Drive <i>Non-host</i>	Noise limit	55	40	55	40	55	40	55	45	40	55	40
	Predicted noise	38	31	40	31	37	29	38	35	35	38	31
135 Oakfield Road	Noise limit	50	35	50	35	50	35	50	40	35	50	35

NSR		Predicted noise levels (L _{Aeq} dB(A)) by construction stage										
		Stage 1 – Site preparation		Stage 2.1 – Earthworks and clearing		Stage 2.2 – Civil works		Stage 2.3 – Ancillary infrastructure and trench filling			Stage 3 – Clean-up and commissioning	
		Day	Night	Day	Night	Day	Night	Day	Evening	Night	Day	Night
Host	Predicted noise	53 ●	42 ▲	55 ▲	42 ▲	52 ●	40 ▲	52 ●	46 ▲	46 ▲	53 ●	42 ▲
Woodberry Road Non-host	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	35	29	36	29	33	27	35	33	33	35	29
819 Tomago Road Non-host	Noise limit	55	40	55	40	55	40	55	45	40	55	40
	Predicted noise	37	31	39	31	36	29	37	35	35	37	31
30 Woodlands Close Non-host	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	47	34	49	34	46	32	46	38	38 ●	47	34
Nature Reserve Non-host	Noise limit	50	35	50	35	50	35	50	40	35	50	35
	Predicted noise	46	31	48	31	45	29	45	35	32	46	31

● indicates a marginal exceedance of less than 3 dB

▲ indicates an exceedance above 3 dB

Table 6.14 Sleep disturbance assessment (JTA 2026a)

NSR		Modelled night noise levels (L _{Aeq} dB(A))	Additional 10 dB assumption
124 Woodberry Road Non-host	Noise limit	52	52
	Predicted noise	29	39
265 Turners Road	Noise limit	52	52

NSR		Modelled night noise levels (L _{Aeq} dB(A))	Additional 10 dB assumption
Non-host	Predicted noise	36	46
181 Woodberry Road Non-host	Noise limit	52	52
	Predicted noise	38	48
267 Woodberry Road Non-host	Noise limit	52	52
	Predicted noise	42	52 ●
321 Woodberry Road Host	Noise limit	52	52
	Predicted noise	48	58 ▲
39 Nilands Lane Host	Noise limit	52	52
	Predicted noise	46	56 ▲
28 Homebush Drive Non-host	Noise limit	52	52
	Predicted noise	35	45
135 Oakfield Road Host	Noise limit	55	55
	Predicted noise	46	56 ▲
Woodberry Road Non-host	Noise limit	63	63
	Predicted noise	33	43
30 Woodlands Close Non-host	Noise limit	52	52
	Predicted noise	38	48

● indicates the noise level is at the threshold for sleep disturbance

▲ indicates an exceedance of the sleep disturbance threshold

Table 6.15 Operational noise propagation model (JTA 2026b)

NSR		Predicted operational noise levels (L _{Aeq} dB(A))		
		Normal Night	Maintenance Day	High noise intermittent Night
124 Woodberry Road <i>Non-host</i>	Noise limit	52	53	52
	Predicted noise	18	26	26
265 Turners Road <i>Non-host</i>	Noise limit	52	53	52
	Predicted noise	24	28	28
181 Woodberry Road <i>Non-host</i>	Noise limit	52	53	52
	Predicted noise	26	32	32
267 Woodberry Road <i>Non-host</i>	Noise limit	52	53	52
	Predicted noise	30	38	38
321 Woodberry Road <i>Host</i>	Noise limit	52	53	52
	Predicted noise	36	36	36
39 Nilands Lane <i>Host</i>	Noise limit	52	53	52
	Predicted noise	30	25	26
28 Homebush Drive <i>Non-host</i>	Noise limit	52	58	52
	Predicted noise	20	36	36
135 Oakfield Road	Noise limit	52	53	52

NSR		Predicted operational noise levels (L _{Aeq} dB(A))		
		Normal Night	Maintenance Day	High noise intermittent Night
Host	Predicted noise	23	22	22
Woodberry Road Non-host	Noise limit	53	54	53
	Predicted noise	11	24	24
819 Tomago Road Non-host	Noise limit	53	54	53
	Predicted noise	11	36	36
30 Woodlands Close Non-host	Noise limit	52	53	52
	Predicted noise	7	32	32
Nature Reserve Non-host	Noise limit	52	53	52
	Predicted noise	6	33	33

Table 6.16 Ground-borne noise propagation (JTA 2026a)

Equipment	PPV (mm/s)	Noise level at site (L _{Aeq} 15-min)	Noise level at nearest NSR – 150 m (L _{Aeq} 15-min)	Compliance with ground-borne noise limits	
				Evening (L _{Aeq} 15-min) – 40 dB(A)	Night (L _{Aeq} 15-min) – 35 dB(A)
Grader	0.21	31	< 6 dB(A)	Yes	Yes
Rockbreaker	0.089	24	< 6 dB(A)	Yes	Yes
Dozer (earthworks)	0.089	24	< 6 dB(A)	Yes	Yes

Equipment	PPV (mm/s)	Noise level at site (L_{Aeq} 15-min)	Noise level at nearest NSR – 150 m (L_{Aeq} 15-min)	Compliance with ground-borne noise limits	
				Evening (L_{Aeq} 15-min) – 40 dB(A)	Night (L_{Aeq} 15-min) – 35 dB(A)
HDD/micro tunnel boring machine plant	0.089	24	< 6 dB(A)	Yes	Yes
25 t dump truck	0.076	22	< 6 dB(A)	Yes	Yes
10 – 20 t rockbreaker	0.035	16	< 6 dB(A)	Yes	Yes
Dozer (clearing)	0.035	16	< 6 dB(A)	Yes	Yes

Table 6.17 Construction vibration model comparison with comfort criteria (JTA 2026a)

Scenario	Distance of closest receiver	Vibration at closest receiver ($m/s^{1.75}$)	Preferred PPV compliance ($0.13 m/s^{1.75}$)	Maximum PPV compliance ($0.20 m/s^{1.75}$)
Trenching	150 m	$0.02 m/s^{1.75}$	Yes	Yes
HDD works	500 m	$0.006 m/s^{1.75}$	Yes	Yes

Table 6.18 Construction vibration model comparison with structural criteria (JTA 2026a)

Equipment	Source data		Predicted vibration level at a distance (mm/s)							PPV limit compliance (20 mm/s at nearest receiver – 50 m)
	PPV (mm/s)	Distance (m)	10 m	50 m	100 m	150 m	200 m	300 m	400 m	
HDD rig	3	10	3.00	0.27	0.09	0.09	0.03	0.02	0.01	Yes
40 t excavator	2.5	10	2.50	0.22	0.08	0.08	0.03	0.02	0.01	Yes
Rockbreaker	1	10	1.00	0.09	0.03	0.03	0.01	0.01	0.00	Yes

Equipment	Source data		Predicted vibration level at a distance (mm/s)							PPV limit compliance (20 mm/s at nearest receiver – 50 m)
	PPV (mm/s)	Distance (m)	10 m	50 m	100 m	150 m	200 m	300 m	400 m	
100 t mobile crane	1.9	7.6	1.26	0.11	0.04	0.04	0.01	0.01	0.00	Yes
Concrete trucks	1.5	10	1.50	0.13	0.05	0.05	0.02	0.01	0.01	Yes
Franna	0.5	10	0.50	0.04	0.02	0.02	0.01	0.00	0.00	Yes
Truck-mounted crane	1.9	7.6	1.26	0.11	0.04	0.04	0.01	0.00	0.00	Yes
Generators	0.1	10	0.10	0.01	0.00	0.00	0.00	0.00	0.00	Yes
Air compressors	0.1	10	0.10	0.01	0.00	0.00	0.00	0.00	0.00	Yes

6.5 Air quality

Consistent with the additional assessment requirements outlined in the Pre-Modification Application Letter, a **detailed assessment** in the form of a **Construction Air Quality Impact Assessment (CAQIA)** (EMM 2026a) was conducted by EMM Consulting Pty Ltd (EMM). The CAQIA can be found in **Appendix K**.

The CAQIA assessed the severity of air quality impacts on nearby sensitive receivers throughout the project's construction period. This includes the assessment of dust impacts on amenity, human health and local ecology.

6.5.1 Methodology

The CAQIA was conducted in accordance with the *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM Guidance) (IAQM 2024).

Step 1: Screening for detailed assessment

The IAQM Guidance specifies that a detailed construction dust assessment should be undertaken if any of the following criteria is fulfilled:

- a **human receiver is located within 250 m** of the modification area boundary
- an **ecological receiver is located within 50 m** of the modification area boundary
- a **human or ecological receiver is located within 50 m of a road used by construction vehicles**, and up to **250 m from a work site entrance**.

As the Hunter Lateral Pipeline project meets all the criteria, a detailed construction dust assessment has been undertaken as part of the CAQIA.

Step 2: Dust impact assessment

The dust impact assessment is a three-step process —understanding the scale and nature of construction works, defining the sensitivity of the area around the modification, and determining the inherent risk of dust impacts.

Understanding the scale and nature of works

In accordance with the IAQM Guidance, construction activities within the modification area have been divided into four activity types: demolition, earthworks, construction and track-out (transport of dust and dirt from the construction site onto the public road network). The inherent magnitude of potential dust impacts arising from each activity was then assessed based on the range of criteria provided in the IAQM Guidance. The result of this assessment is tabulated in Table 6.19.

Table 6.19 Construction dust emissions potential (EMM 2026a)

Activity	Construction activities	Potential dust emissions magnitude
Demolition	No demolition works proposed.	Not applicable
Earthworks	• Extent of works: – construction footprint - approximately 24 ha • Potentially dusty soils, soil type - quartz rich sand, silt and clay	Large

Activity	Construction activities	Potential dust emissions magnitude
Construction	- Construction (per the IAQM Guidance's definition) would be minimal with the following occurring: - concrete segments to be poured with imported concrete - prefabricated steel pipe segments will be imported and assembled at trenches - use of HDD to install pipeline segments at infrastructure and waterway crossings. - Primary construction material - steel and premixed concrete.	Small
Track-out	- Five potential track-out routes: - Woodberry Road, Millers Forest - Oakfield Road, Woodberry - New England Highway (southbound), Tarro - New England Highway (southbound), Hexham - Aurizon Access Road, Hexham. - Between 20-50 daily outward movements of heavy vehicles for staff and deliveries.	Medium

Defining the sensitivity of the area around the modification

Four kinds of effects on receivers have been defined in the IAQM Guidance: **dust soiling, human health and ecological effects**. Each effect was assessed individually, based on the following criteria:

- Specific sensitivities of receivers in the area
- Proximity and number of those receivers in the area
- Local background concentration of particulate matter with a diameter of 10 micrometres (μm) or smaller (PM_{10}). An annual mean PM_{10} measurement ($15 - 17.5 \mu\text{m}/\text{m}^3$) based on 2017 to 2024 air quality data from the Beresfield Air Quality Monitoring System was used as the baseline for local background concentration.
- Site-specific factors of an area, such as natural features (e.g. trees) that could reduce the risk of wind-blown dust.

The sensitivity of a receiver to an effect is ranked according to a scale from low to high.

For this analysis, an estimate¹ of the number of human receivers within four distance bands; less than 20 m, 20-50 m, 50-100 m and 100-250 m have been used for this sensitivity analysis. The estimated number of human receivers for each distance band based on construction activity types is outlined in Table 6.20. For this assessment, the following number of human receivers per building were assumed:

- residential (home): 1 (by convention in the IAQM Guidance)
- commercial (small): 2

¹ The IAQM Guidance does not require a precise count of human receivers within each distance band. The guidance recommends that professional judgement is used to determine the approximate number of buildings within each distance band. Judgement is also used to determine the number of human receivers for buildings which are not dwellings.

- commercial (medium): 10
- commercial (large): 20
- utilities: 2

Ecological receivers were identified through the BDAR (OzArk 2026b). These receivers are outlined in Section 6.7.

Table 6.20 Estimated number of human receivers (EMM 2026a)

Activity type	Distance band	Estimated number of human receivers
Demolition	Not applicable	
Earthworks and Construction	Less than 20 m	0
	20-50 m	2
	50-100 m	13
	100-250 m	47
Track-out	Less than 20 m	0
	20-50 m	33
	50-100 m	-
	100-250 m	-

Definition of inherent risks and impacts

The magnitude of dust impacts is then combined with the sensitivity of the local area for each of the activity types to determine the inherent (no mitigations applied) risk of dust impacts to the local area. A risk rating was assigned for each activity type, based on the lookup tables in the IAQM Guidance. The inherent risk ratings for each activity type are provided in Table 6.21.

Step 3: Recommended site-specific mitigation measures

Based on the inherent dust risk ratings identified for each activity type, mitigation measures to avoid or reduce the risk of dust impacts were identified. The objective of this step is to prevent any significant residual effects on receivers by implementing effective mitigation measures.

Step 4: Determine if any significant residual effects are likely

Once appropriate mitigation measures have been identified, construction activities were assessed for any significant residual impacts on receivers.

6.5.2 Assessment

Table 6.21 outlines the inherent risk of dust impacts for each construction activity type. While no construction activities have a high dust impact risk, track-out activities may have a medium risk of causing dust soiling and human health impacts to sensitive receivers. Earthworks may have a medium risk of causing impacts to ecological sensitive receivers.

Table 6.21 Inherent risk of dust impacts (EMM 2026a)

Activity type	Dust emissions magnitude	Sensitivity of local area			Inherent dust impact risk		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	-	-	-	-	-	-	-
Earthworks	Large	Low	Low	Medium	Low	Low	Medium
Construction	Small	Low	Low	Medium	Negligible	Negligible	Low
Track-out	Medium	Medium	Medium	Low	Medium	Medium	Low

Residual significant residual effects

The CAQIA has provided a set of general mitigation measures (Chapter 4 of the CAQIA) to avoid or reduce dust impacts on surrounding sensitive receivers. These mitigation measures will be incorporated into the modification's CEMP, to be developed prior to construction.

The CAQIA concluded that construction dust is unlikely to represent a significant impact for the modification, assuming the mitigation measures outlined in the CAQIA are implemented. **Therefore, the residual risk for dust impacts on the surrounding local area following mitigation will not be significant.**

6.5.3 Mitigation measures

Table 6.22 Air quality management measures

Reference	Mitigation measure	Timing
AQ1	Air quality management measures will be included in the project's CEMP, based on the recommendations provided in Chapter 4 of the CAQIA. The CEMP will include measures to: - Notify surrounding sensitive receivers about the modification, works to be undertaken, as well as contact details for feedback and complaints. - Keep site barriers clean using wet methods. - Ensure proper maintenance of equipment engines, and prevent engines from running at idle where possible. - Confine and stage vegetation and topsoil clearing to the area required for construction. - Revegetate exposed areas and earthworks as soon as practicable. - Limit works during hot, dry and windy conditions, and when dust is seen leaving the site. - Ensure vehicle loads entering or exiting the modification area are covered. - Clean any material tracked out onto public loads using water-assisted dust sweepers.	Prior to construction
AQ2	Air quality monitoring measures will be included in the project's CEMP, based on the recommendations provided in Chapter 4 of the CAQIA. The CEMP will include measures to: - Carry out daily site inspections and monitoring of local meteorological forecasts. - Recording site inspection results in a site inspection register.	Prior to construction

Reference	Mitigation measure	Timing
	Maintain and log dust-related complaints in a complaints register	

6.6 Surface water and groundwater

Consistent with the Scoping Letter, a **detailed assessment**, in the form of a **Surface Water and Groundwater Assessment (SWGA)**, was prepared by Stantec (2026). The SWGA can be found in **Appendix D**.

The SWGA assessed the modification's impacts to surface water and groundwater quality. The SWGA also evaluated the potential for construction activities to impact groundwater dependent ecosystems (GDEs).

The SWGA was supported by geotechnical assessments undertaken by SLR Consulting Australia Pty Ltd (SLR) along the Hunter Lateral Pipeline's proposed alignment. Geotechnical assessments were conducted in two phases throughout May 2025 and September 2025. A total of eight boreholes and six test pits were installed along the alignment.

6.6.1 Methodology

Surface water

The assessment of surface water quality comprises four steps:

- Identifying relevant environmental values and water quality objectives (WQOs) for the modification area and downstream receiving environment.
- Establishing the baseline water quality of the Hunter River (*Coquun*) and its estuary.
- Identifying potential risks to surface water quality from the modification's construction and operation.
- Identifying potential mitigations for the modification to avoid or reduce impacts to surface water quality.

Environmental values

The environmental values for surface water within the modification area were identified, based on the NSW Water Quality and River Flow Objectives. Relevant environmental values include:

- Aquatic ecosystems
- Visual amenity
- Primary contact recreation
- Secondary contact recreation
- Livestock water supply
- Irrigation water supply
- Industrial water supply
- Drinking water – groundwater
- Cultural and spiritual values
- Human consumption.

Water quality objectives (WQOs) were then established based on the identified environmental values for surface water for the modification area. WQOs are a set of parameters used to measure water quality levels. The parameters for each WQO were tailored to the modification area, based on the:

- *NSW Water Quality Objectives* (DEH 2006)
- *Australian & New Zealand Guidelines for Fresh & Marine Water Quality* (DCCEW 2023) – default guideline values for slightly to moderately disturbed ecosystems.

Establishing existing conditions

The receivers of surface water were identified in the SWGA. There are three broad categories of receivers who use surface water resources at, or downstream, of the modification area:

- Landholder domestic use (domestic rights)
- Recreational users (e.g. swimming and boating)
- Industry uses (which includes agricultural irrigation and stock watering, as well as industrial operational needs).

Datasets from water quality monitoring sites upstream, adjacent to, and downstream of the modification area were then assessed against the WQOs. Datasets were compiled from the following surface water quality monitoring programs:

- Hunter Valley Annual Surface Water Quality Program
- NSW DCCEW Estuarine Water Quality Monitoring Program
- Maitland City Council – Maitland Water Quality Monitoring.

When compared with the WQOs, surface water conditions upstream and downstream from the modification area generally do not meet the benchmark requirement for several key parameters. This includes frequent and/or consistent:

- **Excess nutrient concentrations** (total nitrogen, oxidised nitrogen, total phosphorous).
- **Elevated turbidity and salinity.**
- **Low dissolved oxygen**, below the WQO parameter.
- **Low pH**, below the WQO parameter.

This is reflective of catchment-wide water quality pressures from agriculture, urban development and historic industrial land uses. A comparison of the WQO benchmarks against data from water quality monitoring stations are outlined in Table 6.23.

Table 6.23 Water quality benchmarks (Stantec 2026)

Site code	Ammonia nitrogen (µg/ℓ)	Oxidised nitrogen (µg/ℓ)	Total nitrogen (µg/ℓ)	Filterable reactive phosphorous (µg/ℓ)	Total phosphorus (µg/ℓ)	Chlorophyll-a (µg/ℓ)	Dissolved oxygen (%)	Turbidity (NTU)	pH	Conductivity (µg/ℓ)
WQO (estuary)	< 15	< 30	< 300	< 30	< 30	< 4	80-110	0.5-10	7.0-8.5	< 900 for high flow 4,800-51,000 for other
Estuary sites										
HNT-Z-2	No data	No data	No data	No data	No data	10.34 ▲	100.62	11.41 ▲	7.9	21,333.88
HNT-Z-SA2	19.85 ▲	42.39 ▲	414.30 ▲	23.67	37.00 ▲	2.50	88.02	4.96	7.9	51,611.86 ▲
HNT-Z-HNT2	14.59	33.05 ▲	413.93 ▲	21.55	41.26 ▲	4.15 ▲	94.01	5.29	8.0	52,141.77 ▲
Broader catchment										
Queens Wharf	70 ●	No data	No data	No data	186.96 ●	No data	83.49	85.30 ●	7.9	1,046.67
Moonan Flat	No data	99.10 ●	566.88 ●	36.68 ●	102.37 ●	No data	91.35	26.36 ●	7.9	222.94
Muswellbrook	No data	312.22 ●	801.20 ●	395.19 ●	100.70 ●	No data	83.32	24.25 ●	7.9	445.72
Moses Crossing	No data	158.65 ●	851.85 ●	27.06	269.92 ●	No data	87.53	52.38 ●	8.0	731.6
Singleton	No data	159.61 ●	659.40 ●	20.65	97.76 ●	No data	90.93	58.5 ●	8.0	610.81
Luskintyre	No data	158.62 ●	732.43 ●	21.3	105.87 ●	No data	95.29	56.53 ●	8.0	739.53

▲ indicates exceedances at monitoring sites adjacent and downstream of the modification area.

● indicates exceedances at upstream monitoring sites. While not directly comparable to estuarine WQOs, these sites provide context about catchment-wide water quality trends. This data also provides context about potential cumulative impacts.

Potential risks to surface water quality

The SWGA discussed the potential for construction and operational activities to affect surface water quality. Processes and contamination sources that have the potential to influence surface water quality are outlined in Table 6.24 and Table 6.25.

In addition to the identified contamination sources, the SWGA also noted the following inherent geological features of the modification area that may impact surface water quality:

- **Acid sulfate soils** – the Intrusive Site Investigation (SMEC 2025b) generally classified soil samples from bores within the modification area as either ‘no-risk/non-reactive’ or ‘no-risk/no sulfur’. However, acid sulfate soil management is required for the modification area due to the amount of expected soil disturbance (more than 1,000 tonnes), and the amount of sulfur found in most samples (more than 0.03% sulfur-equivalent).
- **Flooding** - the SWGA highlighted that the potential effects of construction activities on surface water quality may be compounded by flooding within the modification area. Flooding has the potential to transport contaminants downstream and increase the risk of erosion.

Table 6.24 Construction - potential contaminant sources (Stantec 2026)

Construction contaminant source	Rationale
On-site construction fuels, chemicals and construction materials	• Risk of spills during refuelling and chemical handling at construction laydown area. • Mobilisation of contaminants during flooding.
Storage areas for fuels, chemical and materials	• Storage of drilling fluids at the HDD pads; risk of spills or leaks during routine operations. • Mobilisation of contaminants during flooding, creating a ‘first flush’ condition.
Construction waste, litter and debris	• Construction waste and litter may enter waterways if not contained. • Mobilisation of debris and waste during flooding.
Soil erosion and sediment laden surface water	• Trenching and grading across floodplain, handling of soil for acid sulfate soil treatment increases disturbance area of project. • High velocity floodwaters and extensive flooding may increase sediment transportation and erosion potential. • Low slope surface containing soil with potential mild erosive characteristics (clay loam).
Non-potable water sources used for construction activities	• Lower-quality non-potable water can impact receiving environment if runoff occurs. • Flooding increases the chance of runoff reaching waterways.
Increased use of informal accessways	• Increased traffic on levee access tracks and farm tracks may cause rutting and sediment runoff. • Tracks are likely to be vulnerable to erosion due to high velocity stormwater flows along routes. • Likely transportation of sediment to waterways during flood events.
Vegetation disturbance and/or clearance	• Reduction in waterway bank stability from clearing. • Loss of riparian vegetation cover increases erosion vulnerability of modification area, particularly during periods of wet-season high flows.

Construction contaminant source	Rationale
	Vegetation disturbance/clearance may encourage weed growth and promote increased surface water runoff.
Construction – trenching, storage and treatment of excavated material	- Oxidation of exposed acid sulfate soil during trenching activities, requiring lime treatment. - Acidic runoff and metal mobilisation spread widely. - Stockpiles at laydown area; sedimentation and leachate risk.
Waterway erosion	- Risk of waterway bank disturbance due to proximity of HDD entry and exit pads to waterways. - Increased potential for scour at levee crossings.
Levee disturbance	- Access tracks and HDD entry/exist pads near levee structures could undermine levee integrity if not managed appropriately. - Overtopping risk increases if levees are compromised, but levees are already overtopped during all modelled flood scenarios.
Damage to turkey nest dam	- Risk of dam overtopping or damage, causing water to be released. Water is unlikely to impact the flow regime during a flood event. - Damage may cause lost time for operation.

Table 6.25 Operations - potential contaminant sources (Stantec 2026)

Operations contaminant source	Rationale
Storage areas for fuels, chemical and materials	Storage on site for maintenance and operationally required chemicals; risk of spills or leaks during routine operations.
Increased use of informal accessways	Increased traffic on levee access tracks and farm tracks may cause rutting and sediment runoff.
Damage to pump house	Risk of damage to pump houses during flooding events due to the high inherent flood hazard of the modification area.

Groundwater

The assessment of groundwater quality comprises four steps:

- Desktop study of the modification area's existing groundwater condition, including identifying existing groundwater users and GDEs.
- Reviewing relevant studies of groundwater within a 1 km radius of the modification area.
- Modelling dewatering requirements based on the characteristics of the QHA aquifer.
- Identifying potential risks to groundwater quality from the modification's construction and operation – this includes assessing the modification's aquifer impacts in accordance with the *Aquifer Interference Policy* (DPI 2012).

Existing conditions

A desktop search of known GDEs and bores were conducted for the modification area and a one-kilometre radius surrounding the modification area. Two categories of receivers of groundwater were identified in the SWGA – these include:

- Nearby wetlands and associated waterways, including GDEs.
- One stock and domestic bore located approximately 550 m west of the northern portion of the modification area.

A list of known and potential GDEs within and surrounding the modification area is provided in Table 6.26 and mapped in Figure 6.12.

Table 6.26 Known and potential groundwater dependent ecosystems (Stantec 2026)

GDE Potential	Bureau of Meteorology – GDE Atlas	NSW Department of Climate Change, Energy, the Environment and Water – HEVAE
Known (aquatic)	• Hexham Swamp: floodplain wetlands • Hunter Wetlands National Park: nature reserve and surrounding wetlands	-
Very high	-	Hunter Wetlands National Park
High (terrestrial and aquatic)	• Hunter River (Coquun) • Coastal Floodplain Wetlands on the floodplains of the Hunter River (Coquun) • Grey mangrove swamps flanking the Hunter River (Coquun) • Swamp forest on coastal lowlands of the Central Coast • Swamp woodlands of the Tomaree Peninsula • Woodland of coastal sands of the Central Coast	-
Medium and High	-	• Estuarine Swamp Oak Twig-rush Forest • Estuarine Sea Rush Swamp Oak Forest • Estuarine Reedland on the banks of the Hunter River (Coquun) • Samphire saltmarsh flanking the Hunter River (Coquun) and wetlands • Grey Mangrove River Forest flanking the Hunter River (Coquun) • Sporobolus virginicus Saltmarsh • Lower Hunter Tuckeroo Riparian Rainforest, on the banks of the Hunter River (Coquun) • Southern Lower Floodplain Freshwater Wetland
Medium (potential instream)	-	• Hunter River • Francis Greenways Creek

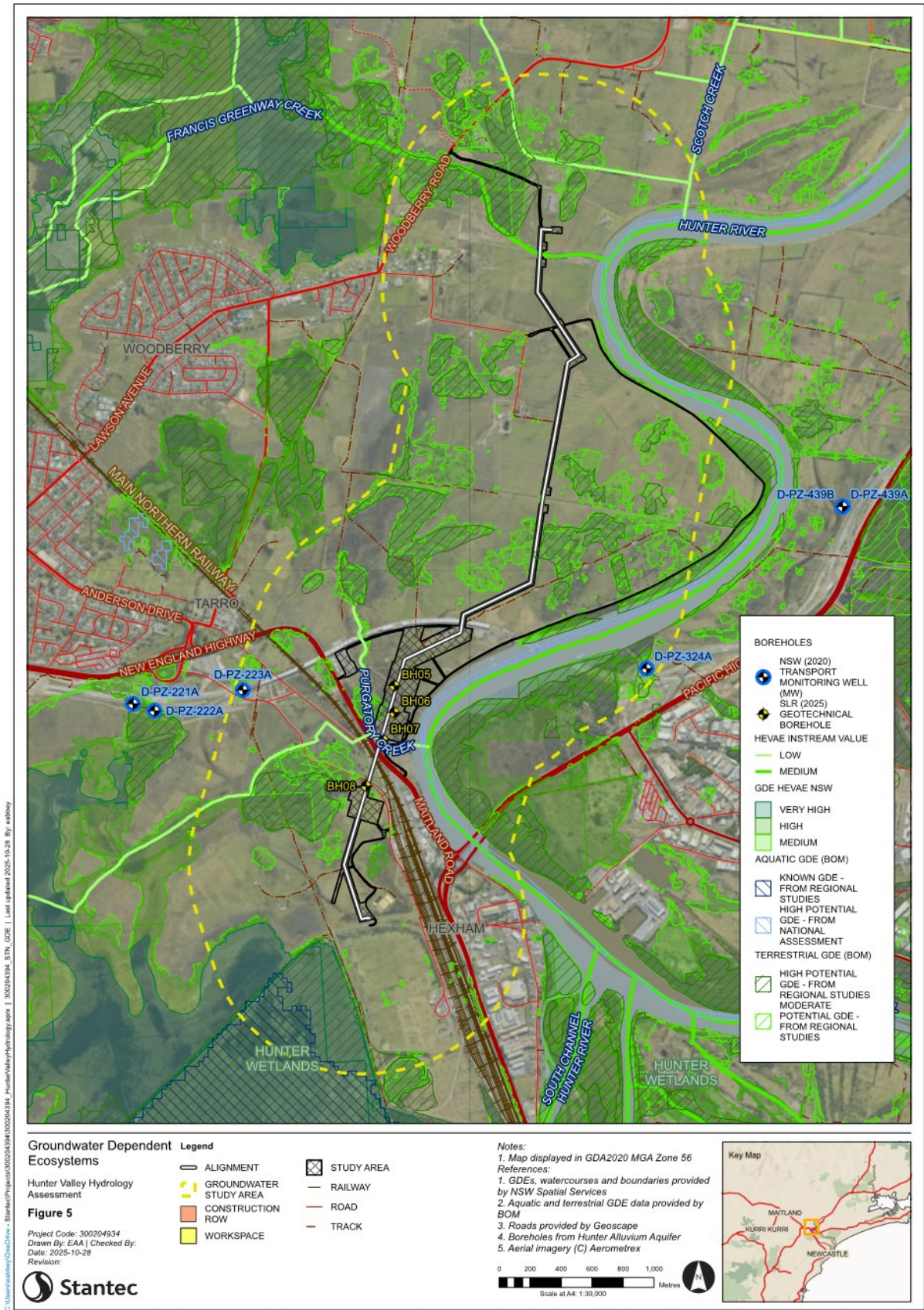


Figure 6.12 Known groundwater dependent ecosystems (Stantec 2026)

The SWGA correlated the groundwater findings of the M1 Pacific Motorway Extension Project's *Surface Water and Groundwater Quality Working Paper* (TfNSW 2021a) (Water Quality Working Paper), as well as the Hunter Lateral Pipeline's *Geotechnical Interpretive Report* (SLR 2025a) and *Intrusive Site Investigation* (SLR 2025b).

The groundwater depth within the modification area is shallow. Measured groundwater depths in open boreholes and test pits ranged from 0.54 to 2.6 metres below ground level (mbgl) (0.37 to -1.55 m AHD). The SWGA further inferred that groundwater level and flow within the modification area may be influenced by the tides from the nearby South Pacific Ocean.

The SWGA inferred the quality of groundwater within the modification based on the Water Quality Working Paper. The SWGA notes that groundwater quality within the modification area would be similar to the findings of the Water Quality Working Paper, due to the modification area's low-lying landscape and proximity to surface water features (e.g. the Hunter River (*Coquun*)). The groundwater within the modification area is likely to be:

- **Mildly acidic** – the Geotechnical Interpretive Report recorded a pH range of 5.0 to 5.9 across three boreholes (BH02, BH03 and BH04). This is consistent with the Water Quality Working Paper, which noted median pH values between 5.3 to 6.7 for the QHA aquifer.
- **Brackish to saline** – groundwater monitoring bores installed for the M1 Pacific Motorway Extension Project recorded a median electrical conductivity range of 6,587 to 18,199 microSiemens per centimetre ($\mu\text{S}/\text{cm}$).
- **Exceeding water quality criteria for nutrients and metal concentrations** – The groundwater quality of the QHA aquifer is variable and dependent on land use, topography and proximity to surface water features (see *Establishing existing conditions* above for a discussion about existing surface water quality). The M1 Pacific Motorway Extension Project groundwater monitoring bores recorded:
 - nitrogen, phosphorous and ammonia concentrations exceeding the Australian and New Zealand Environment and Conservation Council (ANZECC)'s *Guidelines for Fresh and Marine Water Quality* (2000) 'lowland rivers physical and chemical stressors' criteria
 - at select locations, arsenic, nickel and zinc levels above the ANZG freshwater 95% toxicant default guideline values.

Modelling dewatering requirements

Three simple steady-state analytical models of dewatering requirements were developed to simulate conservative dewatering requirements for trench excavation. The models showed how much water will be discharged from trenching activities and the radius of influence (the maximum distance from a pumping well where groundwater drawdown will be detectable).

The models were based on the known characteristics of the QHA aquifer, with assumptions made about the thickness, recharge rate and homogeneity of the aquifer. The models also accounted for the minimum, maximum and mean K-values (hydraulic conductivity) of the soil within the modification area, based on particle size distribution reports contained within the Geotechnical Interpretive Report.

The modelled estimated steady-state discharge and radii of influence, based on the maximum, minimum and mean K-values are outlined in Table 6.27.

Table 6.27 Estimated steady-state discharge and radius of influence (Stantec 2026)

K-value (metres per day [m/d])	Discharge (megalitres [Mℓ])	Radius of influence (m)
Minimum – 0.15 m/d	0.6 Mℓ	255 m
Maximum – 5.77 m/d	5.8 Mℓ	1,018 m
Mean – 0.45 m/d	1.2 Mℓ	376 m

A discussion on the impacts of groundwater discharge on groundwater users and GDEs is provided in Section 6.6.2.

Potential risks to groundwater quality

Construction processes and their associated groundwater impacts were evaluated as part of the SWGA. A summary of these processes and impacts has been provided in Table 6.28.

In addition to the identified construction processes in Table 6.24, the SWGA also noted the following inherent geological features of the modification area that may impact groundwater quality:

- **Acid sulfate soils** – the Intrusive Site Investigation (SMEC 2025b) generally classified soil samples from bores within the modification area as either ‘no-risk/non-reactive’ or ‘no-risk/no sulfur’. However, acid sulfate soil management is required for the modification area due to the amount of expected soil disturbance (more than 1,000 tonnes), and the amount of sulfur found in most samples (more than 0.03% sulfur-equivalent).
- **Salinity** – a review of the Water Quality Working Paper and National Land and Water Resources Audit data as part of the SWGA has identified areas with dryland salinity characteristics. This includes Purgatory Creek (between Hexham Bridge and Tomago Road); the southern half of the modification area also has a high dryland salinity risk.

Table 6.28 Potential impacts to groundwater (Stantec 2026)

Construction process	Potential impacts
Dewatering	• Temporary lowering of water table. • Potential oxidation of acid sulfate soils, leading to acid-leaching soils. • Mobilisation of sediments and contaminants resulting from groundwater discharge.
Backfilling with imported fill	• Leaching of contaminants into soils and groundwater
General construction activities	• Spills and leakages from mobile plant and equipment.

6.6.2 Assessment

Surface water impacts

The SWGA’s risk assessment of the potential construction contamination sources listed in Table 6.24 have noted the following moderate-risk sources:

- Soil erosion and sediment-laden surface water
- Increased use of informal accessways
- Vegetation disturbance and/or clearance
- Construction, including the trenching, storage and treatment of excavated material
- Waterway erosion.

These works can impact surface water quality through increased turbidity and sediment mobilisation, particularly under heavy rainfall or flooding conditions.

All other construction contamination sources were considered a low risk to surface water quality. Additionally, all operational contamination sources were considered a low risk to surface water quality. No high-risk construction or operational contamination sources were identified.

The SWGA concluded that the modification's risk to surface water quality throughout its construction is low, and any impacts to surface water quality would be temporary. The reasons for this conclusion are that the:

- continuous exceedances of WQOs within the Hunter River estuary are likely driven by catchment-scale issues and land uses, as noted in Section 6.6.1.
- relatively small scale of the modification (when compared to other projects within the region, and other gas transmission projects in NSW), means the modification inherently poses a lower risk to surface water quality.

It is noted that this low-risk rating is dependent on Jemena implementing the recommended management and monitoring measures provided in Table 8-6 of the SWGA. This table includes modification-specific measures around acid sulfate soils and flood management.

The SWGA also found that the modification's operation will not result in permanent changes to waterways or surface water flows within the region. The SWGA recommended that erosion and sediment controls and flood contingency guidelines are implemented to protect the modification's infrastructure. This includes adherence to the *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) guideline (the Blue Book).

Groundwater impacts

Groundwater quality

The SWGA concluded that the primary risks to groundwater quality associated with the Hunter Lateral Pipeline would be from:

- **Acid sulfate soils** – there is a high risk that exposure of sub-soils from excavation activities and the temporary lowering of the water table may cause the iron sulfide minerals contained within these sub-soils to oxidise. This reaction forms sulfuric acid, which can leach from the exposed sub-soils into groundwater. This can result in adverse impacts on the surrounding environment, GDEs and waterways.
- **Sediment and contaminant mobilisation** – sediment and contaminants from spills and leakages from plant, equipment and fill material may leach into the soil and groundwater aquifers. This can have adverse impacts on the surrounding environment, GDEs and waterways.

Groundwater quantity

The SWGA also concluded that the modification is unlikely to affect the quantity of groundwater available to groundwater bore users, surrounding GDEs, vegetation and surface water features in the long term. Dewatering activities were considered unlikely to result in significant lowering of the water table for extended periods of time. Additionally, nearby surface water features may buffer the discharging of groundwater by contributing local storage to the aquifer.

It is expected that the normal operation of the Hunter Lateral Pipeline will not cause any groundwater impacts, as no ongoing dewatering or soil exposure activities are proposed. This is provided adequate soil backfilling mitigation measures are implemented in accordance with the recommendations provided in the SWGA.

Aquifer impact considerations

While a controlled activity approval under the WM Act is not required for SSI modifications, the SWGA assessed the modifications against the aquifer impact considerations defined in the *Aquifer Interference Policy* (DPI 2012) (Aquifer Interference Policy). These aquifer impact considerations form the assessment framework to determine that 'no more than minimal harm' will be done to groundwater sources, per Section 97(4) of the WM Act.

The SWGA has classified the QHA as a 'less productive' groundwater source —as such, the modification's groundwater impacts have been assessed against the Minimal Impact Considerations for Less Productive Groundwater Sources (see Table 1 of the Aquifer Interference Policy). Table 6.29 outlines the modification's responses to the minimal impact considerations —**it is considered that the modification will cause no more than minimal harm to groundwater sources**, in accordance with the WM Act.

Table 6.29 Minimal impact considerations - less productive groundwater sources (Stantec 2026)

Feature	Minimal impact considerations for aquifer interference activities – Alluvial Water Sources	Response
Water table	Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: • High-priority groundwater dependent ecosystem; or • High-priority culturally significant site; listed in the schedule of the relevant water sharing plan; or A maximum of a 2 m decline cumulatively at any water supply work unless make good provisions should apply.	There is a low risk of groundwater change from temporary shallow dewatering activities. The Hunter Valley Wetlands, 600 m to the south of the alignment, are likely considered a high-priority GDE. Due to the temporary and shallow nature of dewatering required, impacts are unlikely to occur at the Hunter Valley Wetlands. The closest water supply (for domestic and stock) bore is installed to 26 m and over 550 m from the alignment. Shallow, temporary dewatering is unlikely to impact the bore user.
Water pressure	A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the base of the water source to a maximum of a 2 m decline, at any water supply work.	See first point. Pressure heads in the stock and domestic water bore are unlikely to be impacted due to the temporary nature of the works, and that the bore is likely targeting a deeper and more permeable sequence of the QHA aquifer.

Feature	Minimal impact considerations for aquifer interference activities – Alluvial Water Sources	Response
Water quality	Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. No mining activity to be below the natural ground surface within 200 m laterally from the top of the high bank or 100 m vertically beneath (or the three-dimensional extent of the alluvial water source – whichever is the lesser distance) of a highly connected surface water source that is defined as a 'reliable water supply'.	See first point, and, groundwater quality of the QHA aquifer is likely to be brackish to saline and given the shallow and discontinuous nature, is likely of low connectivity to a 'reliable water supply'. Groundwater that could be dewatered is likely of low quality.

6.6.3 Mitigation measures

Table 6.30 Surface water and groundwater management measures

Reference	Mitigation measure	Timing									
SG1	Jemena will implement the mitigation measures outlined in Table 8-6 of the SWGA through an Erosion and Sediment Control Plan and Stormwater Management Plan. This includes measures to: • manage stormwater flows throughout the modification area • implement erosion and sediment controls • avoid water contamination resulting from litter, hydrocarbon and chemical spills • ensure the stability of waterways and levees.	Throughout construction									
SG2	An Acid Sulfate Soil Management Plan (ASSMP) will be prepared for the modification. The ASSMP will include the groundwater dewatering mitigation measures outlined in Table 8-6 of the SWGA.	Prior to construction									
SG3	A surface water and groundwater monitoring regime will be integrated into the modification's CEMP. The monitoring regime will ensure the modification meets the performance benchmark outlined in Table 8-7 of the SWGA. Table 8-7 is replicated below. <table><tr><th>Parameter</th><th>Release criteria</th></tr><tr><td>Litter or waste</td><td rowspan="2">No release</td></tr><tr><td>Coarse sediment</td></tr><tr><td>Turbidity</td><td>Discharge turbidity value shall be less than 50 NTU and/or no greater than 10% above receiving waters immediately downstream of discharge.</td></tr><tr><td>Hydrocarbons, tannins and paint</td><td>No visible trace</td></tr></table>	Parameter	Release criteria	Litter or waste	No release	Coarse sediment	Turbidity	Discharge turbidity value shall be less than 50 NTU and/or no greater than 10% above receiving waters immediately downstream of discharge.	Hydrocarbons, tannins and paint	No visible trace	Prior to construction Throughout construction
Parameter	Release criteria										
Litter or waste	No release										
Coarse sediment											
Turbidity	Discharge turbidity value shall be less than 50 NTU and/or no greater than 10% above receiving waters immediately downstream of discharge.										
Hydrocarbons, tannins and paint	No visible trace										

Reference	Mitigation measure	Timing
	Suspended solids Discharges shall be less than 50 mg/l Total Suspended Solids (TSS) or equivalent turbidity as determined by laboratory analysis through the correlation of turbidity with the suspended solids limit.	
	pH pH value 6.5 – 8.5, except where and to the extent that the natural waters lie outside of this range.	
SG4	Jemena will incorporate a spill management procedure in the ERP. This procedure will include steps to be taken in the event of a hydrocarbon or chemical spill on site.	Prior to construction

6.7 Flora and fauna

Consistent with the Scoping Letter, a **detailed** assessment, in the form of a Biodiversity Development Assessment Report (BDAR), was prepared by OzArk (2026b). The BDAR can be found in **Appendix E**.

The BDAR provided an account of what biodiversity values were present within the modification area and assessed the potential for the modification to adversely affect these biodiversity values. The BDAR also provided management measures to avoid, reduce and offset any impacts to biodiversity values.

The BDAR was prepared in accordance with the *Biodiversity Assessment Method (BAM) 2020* (DPIE 2020) and Section 6.8 of the *Biodiversity Conservation Regulation 2017 (NSW)*. The BDAR was prepared by Dr David Orchard (BAAS21028), an accredited assessor under the Biodiversity Offsets Scheme (BOS).

6.7.1 Methodology

Desktop assessment

OzArk conducted desktop assessments to identify any threatened florae and faunae and any other native vegetation that may be present within the modification area. This desktop assessment was conducted using existing information sources, mapping and aerial imagery, including:

- The Biodiversity Assessment Method-Calculator (BAM-C)
- NSW BioNet Atlas – Threatened Biodiversity Data Collection (TBDC) and Vegetation Classification Database
- Vegetation association reports
- Australian Virtual Herbarium
- Atlas of Living Australia
- NSW State Vegetation Type Mapping (NSW SVTM)
- Google and SIX Maps aerial imagery.

Initial field assessment

A general field survey of the modification area was then conducted between 3 and 4 September 2025. The field survey was undertaken to:

- identify broad- and finer-scale Plant Community Types (PCTs) present within the modification area
- map the coverage of native vegetation throughout the modification area; where vegetation patches cannot be ground-truthed, these vegetation patches have been assumed to be native vegetation
- ascertain the integrity of native vegetation within the modification area, based on their composition, structure and function
- identify potential habitat constraints for threatened florae and faunae.

The following activities were undertaken during the general field survey:

- Rapid traverses of the entire modification area to provisionally map vegetation zones and PCTs.
- Plot-based vegetation integrity surveys to confirm the presence of PCTs.
- Identification of habitat constraints for threatened fauna species potentially present within the modification area, based on information from the TBDC.

Native vegetation

The general field survey has established the presence of **9.08 ha** of native vegetation within the modification area, comprised of two PCTs. Patches of both PCTs have also been assessed as forming part of the *Biodiversity Conservation Act 2016* (NSW) (BC Act)-listed endangered ecological community (EEC). None of the PCTs are considered part of any *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)-listed TECs.

A description of these PCTs is provided in Table 6.31. The locations of these PCTs are also illustrated in Figure 6.13 through Figure 6.16.

Table 6.31 PCTs within the modification area (OzArk 2026b)

PCT	Description	Extent (ha)	Condition zones
3967 Northern Lower Floodplain Eleocharis Wetland	Location within modification area Areas of poorly drained soil forming shallow wetlands or ponds following inundation. 3967_Grassland is located within the shallowest treeless wetlands within the modification area. Composition Variable species composition. The most diverse areas include the Sea Clusledge (<i>Bolboschoenus caldwellii</i>), either in localised clumps or in low densities throughout. These PCT examples may also include Water Couch (<i>Paspalum distichum</i>), Broadleaf Cumbungi (<i>Typha orientalis</i>) and/or Water Ribbons (<i>Cynogeton procerum</i>). No hollow-bearing trees were present in any of the Vegetation Integrity plots for this PCT. Condition All examples of the PCT have been disturbed, with invasive species threatening to outcompete native florae. The most degraded examples of this PCT are dominated by exotic pasture species or weeds. Association with EECs and TECs All examples of this PCT have been associated with the BC Act-listed <i>Freshwater Wetlands on Coastal</i>	1.10 ha	3967_Moderate
			3967_Low
			3967_Grassland

PCT	Description	Extent (ha)	Condition zones
	<i>Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> EEC. This is due to the presence of indicator flora species within examples of the PCT. Examples of this PCT are not associated with an EPBC Act-listed TEC.		
4028 Estuarine Swamp Oak Twig-rush Forest	Location within modification area Areas of remnant or regrowth Swamp Oak (<i>Casuarina glauca</i>) forest. Examples of this PCT can also be found near rushland (<i>Juncus spp.</i>), with or without Swamp Oak trees. 4028_Derived and 4028_Pasture have also been assigned to areas of highly disturbed pasture that may have once supported Swamp Oak forest. Composition The highest-quality example of the PCT consists of a small patch of riparian vegetation with an open canopy of Swamp Oak, a sparse subcanopy of Tuckeroo (<i>Cupaniopsis anacardioides</i>), scattered examples of the straggling shrub Cockspur Thorn (<i>Maclura cochinchinensis</i>), and an understorey in which Couch (<i>Cynodon dactylon</i>) and Common Reed (<i>Phragmites australis</i>) are the most common native species. A small number of forbs and rushes also occur in this zone, along with the vine Common Silkpod (<i>Parsonsia straminea</i>). The understorey in less well-preserved examples of the PCT may be dominated by invasive perennial weeds or retain high cover of native rushes. Vines and shrubs are normally absent in these examples. No hollow-bearing trees were present in any of the Vegetation Integrity plots for this PCT. Condition Examples of this PCT have undergone extensive disturbance. Less well-preserved examples of this PCT may be dominated by invasive weeds and exotic pasture. Association with EECs and TECs 4028_Moderate, 4028_Lowest and 4028_Juncus have been associated with the BC Act-listed <i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland</i> EEC. While PCT 4028 may be associated with the EPBC Act-listed <i>Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland</i> TEC, examples of PCT 4028 within the modification area does not meet the key diagnostic criteria and condition class thresholds for the TEC. Therefore, no PCT 4028 vegetation patches are considered part of the TEC.	7.98 ha	4028_Moderate
			4028_Lowest
			4028_Derived
			4028_Pasture

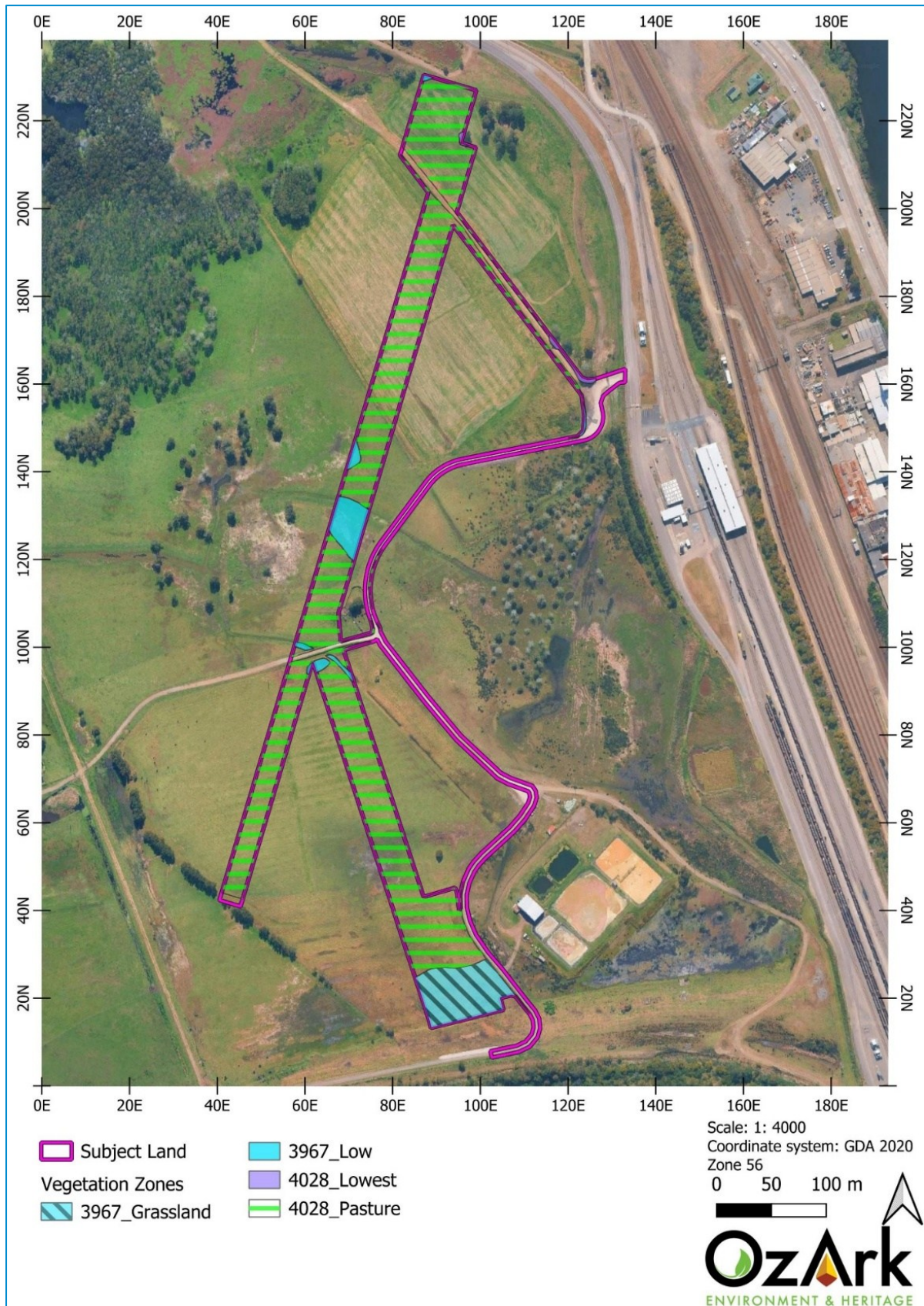


Figure 6.13 PCTs within the modification area (1) (OzArk 2026b)

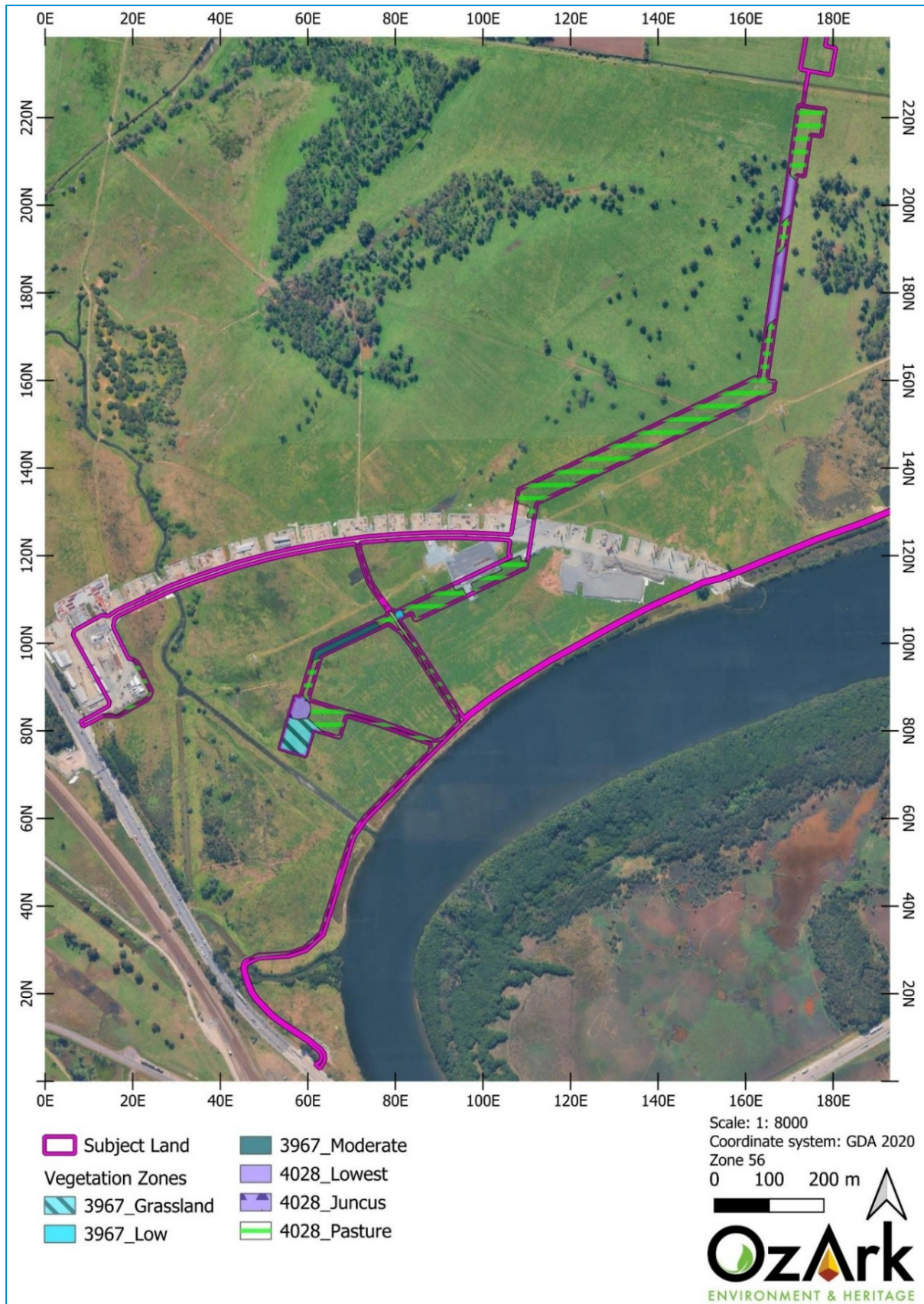


Figure 6.14 PCTs within the modification area (2) (OzArk 2026b)

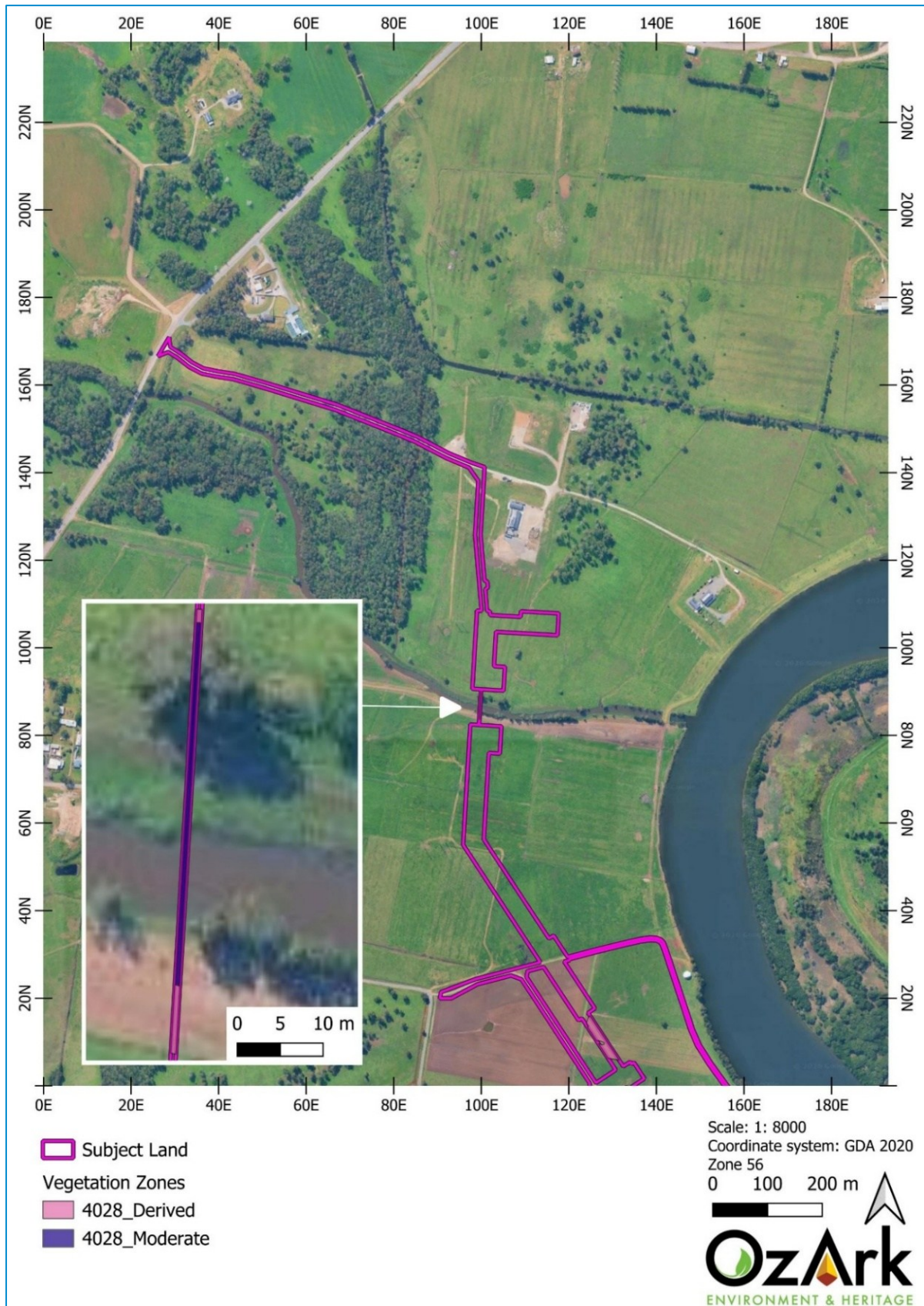


Figure 6.16 PCTs within the modification area (4) (OzArk 2026b)

Threatened flora and fauna species

In total, 44 'ecosystem credit' flora and fauna species were identified through the BAM-C. The BAM-C has identified these flora and fauna species based on the modification's impact to their habitat within the modification area. No species have been excluded from further assessment as they were positively or tentatively detected during the initial field assessment and/or desktop assessment.

37 fauna and five flora 'species credit' species were also identified through the BAM-C. The BAM-C has identified these species as they may be present within the modification area. Of these species credit species, 19 species were excluded from further assessment due to the presence of habitat constraints, geographic limitations or degraded habitat.

A detailed breakdown of ecosystem credit and species credit species is provided in Section 5.1 of the BDAR.

Targeted surveys

Targeted surveys of the candidate flora and fauna species identified through the BAM-C were then conducted throughout the modification area. The surveys were conducted at various times between end-November 2025 and early-February 2026. Table 6.32 outlines how each candidate species was surveyed. A detailed breakdown of survey efforts has also been provided in Section 2.3 of the BDAR.

These targeted surveys have been timed, designed and conducted based on relevant BAM survey guides. The TBDC and/or Australian Government guidelines were used where BAM survey guides are not available for a specific species.

Where a candidate species has been detected within the modification area, the presence and suitability of potential habitat within the modification area is then assessed using habitat information from the TBDC. If the modification area also contains potential breeding habitat, the modification's impacts and offset obligations is then further assessed in accordance with the BAM 2020.

As shown in Table 6.32, the modification area may contain suitable breeding habitat for two species, requiring further impact and offsets assessment:

- **Hunter Valley Delma (*Delma vescolineata*)** – this reptile species has been assumed present within the modification area. The TBDC notes that the Hunter Valley Delma is normally associated with PCT 4028. As such, it has been assumed that all PCT 4028 vegetation patches within the modification area are potential breeding habitat for this species.
- **Southern Myotis (*Myotis macropus*)** – this bat species has been detected within the modification area based on targeted surveys. Patches of PCTs 3967 and 4028 occurring within 200 m of waterways are also potential breeding habitat for this species.

Additionally, two bat species and one avian species were detected within the modification area. However, the modification area does not contain suitable breeding habitat for these species; these species have been excluded from further assessment:

- **Little Bent-winged Bat (*Miniopterus australis*)** – this bat species was recorded foraging and commuting over the modification area. A few individuals may also roost in culverts within the modification area. However, the modification area does not contain natural or artificial structures that would potentially provide a maternity site for this species. Therefore, the species would not be breeding within the modification area.

- **Large Bent-winged Bat (*Miniopterus orianae oceanensis*)** – like the Little Bent-winged Bat, this bat species was recorded foraging and commuting over the modification area. A few individuals may also roost in culverts within the modification area. However, the modification area does not contain natural or artificial structures that would potentially provide a maternity site for this species.
- **White-bellied Sea Eagle (*Haliaeetus leucogaster*)** – while this avian species was recorded during the initial field assessment, no evidence of breeding activity was observed within the modification area.

Three other bat species were also positively or tentatively detected through ultrasonic recordings within the modification area. However, none of these species were captured by subsequent harp-trapping. Hence, these species have also been excluded from further assessment.

Table 6.32 Surveying methods and results (OzArk 2026b)

Species	BC Act	EPBC Act	Survey methods	Survey period	Present?	Further assessment/offsetting?
Florae						
Charmhaven Apple <i>Angophora inopina</i>	v	V	58.0 km parallel botanical transects.	December 2025	No	No
Maundia triglochinoides <i>Maundia triglochinoides</i>	v	-				
Biconvex Paperbark <i>Melaleuca biconvexa</i>	v	V				
Tall Knotweed <i>Persicaria elatior</i>	v	V				
Zannichellia palustris <i>Zannichellia palustris</i>	e	-				
Faunae						
Bush Stone-curlew <i>Burhinus grallarius</i>	e	-	• 11 days of diurnal birding (53.2 hours). • Seven nights of spotlighting (29.0 km). • One night of call playback at one location.	September 2025 – January 2026	No	No

Species	BC Act	EPBC Act	Survey methods	Survey period	Present?	Further assessment/offsetting?
			58.0 km parallel botanical transects.			
Eastern Pygmy-possum <i>Cercartetus nanus</i>	v	-	- Seven nights of spotlighting (19.3 km). 13 hollow watches at dusk. 588 camera trap nights.	November 2025 – January 2026	No	No
Hunter Valley Delma <i>Delma vescolineata</i>	e	E	Assumed present; no species-specific guidelines exist.	N/A	Yes	Yes
Wallum Froglet <i>Crinia tinnula</i>	v	-	- Four nights of aural/visual surveys. 17 audio detector nights.	January 2026 – February 2026	No	No
Pied Oystercatcher <i>Haematopus longirostris</i>	e	-	11 days of diurnal birding (53.2 hours). 58.0 km parallel botanical transects.	September 2025 – January 2026	No	No
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	v	Ma	- Seven days of diurnal birding (48.1 hours). - Three days of nest watching.	September 2025 – December 2025	Yes, but no breeding activity observed.	No
Little Eagle <i>Hieraaetus morphnoide</i>	v	-	Two days of diurnal birding (16.0 hours).	September 2025	No	No
Green and Golden Bell Frog <i>Litoria aurea</i>	e	V	- Four nights of aural/visual surveys. 17 audio detector nights.	January 2026 – February 2026	No	No
Square-tailed Kite <i>Lophoictinia isura</i>	v	-	11 days of diurnal birding (53.2 hours). - Three days of nest watching.	September 2025 – January 2026	No	No
Little Bent-winged Bat	v	-	20 passive recorder nights.	December 2025 – January 2026	Yes, foraging/commuting.	No

Species	BC Act	EPBC Act	Survey methods	Survey period	Present?	Further assessment/offsetting?
<i>Miniopterus australis</i>			16 nights of harp trapping.			
Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i>	v	-	20 passive recorder nights. 16 nights of harp trapping.	December 2025 – January 2026	Yes, foraging/commuting.	No
Southern Myotis <i>Myotis macropus</i>	v	-	59 passive recorder nights. 16 nights of harp trapping.	November 2025 – January 2026	Yes	Yes
Eastern Osprey <i>Pandion cristatus</i>	v	-	- Six days of diurnal birding (43.0 hours). - Three days of nest watching.	November 2025 – December 2025	No	No
Southern Greater Glider <i>Petauroides volans</i>	e	E	- Seven nights of spotlighting (29.0 km). - Three hollow watches at dusk. 588 camera trap nights.	November 2025 – January 2026	No	No
Squirrel Glider <i>Petaurus norfolcensis</i>	v	-	- Seven nights of spotlighting (19.3 km). 13 hollow watches at dusk. 588 camera trap nights.	November 2025 – January 2026	No	No
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	v	-	- Four nights of spotlighting (7.9 km). 528 camera trap nights.	December 2025 – January 2026	No	No
Koala <i>Phascolarctos cinereus</i>	e	E	- Seven nights of spotlighting (29.0 km). - Three Koala Spot Assessment Technique surveys.	November 2025 and January 2026	No	No
Little Tern <i>Sternula albigrons</i>	e	E	11 days of diurnal birding (53.2 hours).	September 2025 – January 2026	No	No

Species	BC Act	EPBC Act	Survey methods	Survey period	Present?	Further assessment/offsetting?
			58.0 km parallel botanical transects.			
Mahony's Toadlet <i>Uperoleia mahonyi</i>	e	E	- Four nights of aural/visual surveys. 17 audio detector nights.	January 2026 – February 2026	No	No
Eastern Cave Bat <i>Vespadelus troughtoni</i>	v	V	59 passive recorder nights. 16 nights of harp trapping.	November 2025 – January 2026	No	No

Key: v/V – Vulnerable, e/E – Endangered, Ma – Marine

Impact assessment

The modification's direct and indirect impacts relating to the clearing of native vegetation and the loss of habitat have been assessed in accordance with Section 6.3(A) of the BC Act.

Prescribed impacts, defined in Section 6.1 of the *Biodiversity Conservation Regulation 2017* (NSW) (BC Regulation) have also been considered. The following prescribed impacts were considered relevant to the modification:

- **Human-made structures** – the modification area contains several human-made structures. This includes culverts across watercourses and drainage lines.
- **Non-native vegetation** – large areas of non-native vegetation occur within the modification area. Non-native vegetation is present where land has been cleared for agricultural or infrastructure activities, and where weeds have colonised disturbed ground.
- **Habitat connectivity** – as the modification area has been extensively cleared and is situated within a disturbed landscape, the modification will pose minor additional impacts to habitat connectivity.
- **Waterbodies, water quality and hydrological processes** – the modification area intersects the Francis Greenways and Purgatory creeks, as well as four drainage lines. The modification area also supports areas of swamp habitat that may become inundated during rainfall events. These areas may provide temporary habitat for a range of water-dependent species. The modification area also runs parallel to the Hunter River (*Coquun*).
- **Vehicle strikes** – as noted in Section 6.3, there will be a minor increase in construction traffic resulting from the modification. Threatened flora and fauna are susceptible to vehicle strikes, particularly terrestrial mammals and frogs.

The modification's direct and indirect impacts were then assessed using the avoid, minimise and offset hierarchy. As outlined in Section 2.4, measures have already been taken to avoid and minimise impacts. The following measures have been considered in the BDAR:

- Locating the modification on land that has already been heavily disturbed by agricultural or infrastructure development activity.
- Refining the modification area to reduce impacts to watercourses and native vegetation — resulting in a 67% reduction to native vegetation impact.
- Using the HDD installation technique to avoid impacts to watercourses.

Where residual direct, indirect or prescribed impacts have been identified, the BDAR has provided further measures to mitigate these impacts. The BDAR has also assessed the modification's potential to cause serious and irreversible impacts (SAII) on a threatened species or ecological community. SAI risks have been assessed according to the principles outlined in Section 6.7 of the BC Regulation.

If there are direct or prescribed residual impacts which are unavoidable despite the implementation of mitigation measures, the BDAR has calculated the ecosystem and species credits required to offset these impacts. These calculations were made using the BAM-C.

6.7.2 Assessment

Direct and indirect impacts

The BDAR has determined that the modification's construction will cause some residual direct impacts to PCTs, TECs, threatened fauna species or their habitat. As noted in Section 6.7.1, no threatened flora species was detected within the modification area. Therefore, no direct impacts to threatened flora species from the modification's construction and operation is expected.

The modification may cause some indirect impacts to PCTs, TECs, threatened flora and fauna species, or their habitat. This includes:

- The total removal of native vegetation associated with PCTs 3967 and 4028 within the modification area.
- Transportation of weeds and pathogens, causing harm to native vegetation outside the modification area.
- Impacts to soil or hydrology, leading to the degradation of native vegetation outside the modification area.

Prescribed impacts

The likelihood and consequence of the prescribed impacts outlined in Section 6.7.1 have also been assessed, as outlined in Table 6.33. **The modification will generally cause minor impacts to threatened fauna species and TECs.**

Section 6.7.3 provides a summary of the measures proposed in the BDAR to avoid or reduce any residual prescribed impacts.

Table 6.33 Prescribed impact assessment (OzArk 2026b)

Prescribed impact	Extent	Duration	Consequences	Further assessment?
Human-made structures	None expected. Jemena is not proposing the removal of any existing human-made structures.	None expected.	None expected.	No

Prescribed impact	Extent	Duration	Consequences	Further assessment?
Non-native vegetation	Difficult to quantify accurately, as some areas of disturbed land are devoid of vegetation. Approximately 15 ha of non-native vegetation occurs within the modification area.	Long-term or permanent. Non-native vegetation within the modification area will be removed. While existing weed invasions would likely be eradicated, new weed invasions are likely.	Minor impact. Minimal impact to threatened species that opportunistically forage in non-native vegetation, as the modification area contains a large proportion of non-native vegetation.	No
Habitat connectivity	Reduction in areas of remnant Swamp Oak forest and Juncus wetland between Purgatory Creek and the M1 Pacific Motorway Extension Project. Loss of approximately 0.01 ha of moderate condition Swamp Oak forest and associated Common Reed reedland along Francis Greenway Creek, widening an existing vegetation connectivity gap from approximately 60 m to approximately 100 m.	Long-term or permanent. Vegetation removal will result in connectivity impacts for the life of the modification.	Minor impact. Reduced connectivity for less-mobile threatened species (species that move across the ground).	No
Waterbodies, water quality and hydrological processes	While watercourses intersecting the modification area will not be directly impacted by the modification, works will be conducted near these watercourses. The modification area also contains land with a shallow water table.	Long-term or permanent operational impact. Vegetation removal would likely result in short- and long-term impacts to water features and hydrological processes. Short-term construction impact. Dewatering activities may impact the water table and GDEs, although the groundwater is expected to recharge following construction. This is discussed in Section 6.6.2 and the SWGA.	Minor impact for streams and wetlands. Reduction in groundwater availability may impact threatened species, particularly species dependent on waterbodies for foraging. However, the adjacent Hunter River (<i>Coquun</i>) estuary will not be impacted by the modification. Moderate for groundwater. Temporary impacts to the water table may limit GDEs' access to water, increasing stress and impeding biological processes. Dewatering may also cause sedimentation and contamination of waterways, as well as exposure of acid sulfate soils.	No

Prescribed impact	Extent	Duration	Consequences	Further assessment?
Vehicle strikes	All terrestrial threatened species are susceptible to vehicle strikes. However, it is expected that vehicle strike rates within the modification area will be low as the threatened species detected within the modification area are aerial in nature.	Short-term construction impact. Construction traffic may cause a minor increase in the probability of a vehicle strike, although this is expected to only last throughout the construction period.	Minor impact expected to threatened species. While potential injury or death of threatened faunae may result, mitigation measures will be implemented to reduce the occurrence of vehicle strikes.	No

Serious and irreversible impacts (SAIL)

Using the BAM-C, OzArk identified five candidate SAIL threatened species relevant to the modification:

- Curlew Sandpiper (*Calidris ferruginea*).
- Swift Parrot (*Lathamus discolor*).
- Little Bent-winged Bat (*Miniopterus australis*).
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*).
- Eastern Cave Bat (*Vespadelus troughtoni*).

The BDAR considers that the modification has a low potential to cause SAIL to these threatened species. The modification area either does not contain habitat features necessary to support the species or is not mapped as important habitat for the species. As such, the modification will not:

- cause a further decline of a species of TEC that is, or suspected to be in a rapid rate of decline
- reduce the population size of a species or TEC that has, or suspected to have a very small population size
- impact the habitat of a species or TEC that has or suspected to have a very limited geographic distribution or is unlikely to respond to measures to improve its habitat.

Section 6.7.3 provides a summary of the measures proposed in the BDAR to avoid or reduce these residual impacts, as well as protect biodiversity values outside the modification area.

Offset obligations

Unavoidable vegetation clearing will cause a total loss of PCT patches that are associated with TECs, and the habitat for two threatened species within the modification area. This clearing will need to be offset by retiring ecosystem and species credits through the BOS. The modification's offset obligations are summarised in Table 6.34 and Table 6.35.

Per Section 9.3(1) of the BAM 2020, impacts in Category 1 areas (areas that do not contain native vegetation) do not need to be assessed for ecosystem credits. Category 1 areas are located at the northern portion of the modification area —the Category 1 area encompasses 11/- and 12/-

/DP1189457 and 5/-/ and 6/-/DP262053, except for the riparian areas of Francis Greenways Creek. Excluded impacts are mapped in Figure 5 of the BDAR.

Table 6.34 Ecosystem credits obligation (OzArk 2026b)

PCT	Vegetation zone	TEC	Current extent (ha)	Impact area (ha)	Ecosystem credits	Matching credit profile
3967 Northern Lower Floodplain Eleocharis Wetland	3967_Moderate	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.20 ha	0.20 ha	5	IBRA region: Hunter. Offset trading group: Coastal Freshwater Lagoons ≥70% and <90%. PCT class: Coastal Freshwater Lagoons. PCT vegetation formation: KF_CH8 Freshwater Wetlands. No hollow-bearing trees present.
	3967_Low		0.22 ha	0.22 ha	2	
	3967_Grassland		0.68 ha	0.68 ha	10	
	Subtotal		1.10 ha	1.10 ha	17	
4028 Estuarine Swamp Oak Twig-rush Forest	4028_Moderate	Swamp Oak Floodplain	0.01 ha	0.01 ha	1	IBRA region: Hunter. Offset trading group: Coastal Floodplain Wetlands ≥50% and <70% PCT class: Coastal Floodplain Wetlands. PCT vegetation formation: KF_CH9 Forested Wetlands. No hollow-bearing trees present.
	4028_Lowest	Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.34 ha	0.34 ha	4	
	4028_Juncus		0.13 ha	0.13 ha	1	
	4028_Derived	Not listed	0.12 ha	0.12 ha	0	
	4028_Pasture		7.38 ha	7.38 ha	0	
	Subtotal		7.98 ha	7.98 ha	6	
Total			9.08 ha	9.08 ha	23 ecosystem credits	

Table 6.35 Species credits obligation (OzArk 2026b)

Threatened species	Impact area (ha)	Species credits	Kingdom and IBRA region
Hunter Valley Delma <i>Delma vescolineata</i>	7.98 ha of habitat	13	Animalia <i>IBRA region:</i> Hunter
Southern Myotis <i>Myotis macropus</i>	8.39 ha of habitat	27	Animalia <i>IBRA region:</i> Hunter
Total		40 species credits	

6.7.3 Mitigation measures

Table 6.36 Flora and fauna management measures

Reference	Mitigation measure	Timing
FF1	Jemena will develop a Biodiversity Management Plan (BMP) which will incorporate the mitigation measures outlined in Table 26 of the BDAR. These measures include the: - Prevention of over-clearing by demarcating 'no-go zones', inducting construction workers on the legislative consequences of unauthorised vegetation clearing, and ensuring authorised vegetation removal does not cause unnecessary damage to surrounding vegetation and threatened faunae. - Prevention of significant weeds and pests from establishing within the modification area by using clean fill, and ensuring machinery is clean and free from soils and weeds before entering work sites. - Protection of native fauna and their habitat by relocating any dead wood or hollows to the edge of the modification area, and relocating any fauna found in the modification area to adjoining habitat prior to vegetation clearing works.	Prior to construction
FF2	Jemena will incorporate measures in the CEMP to ensure: - Stockpiling of materials, equipment and topsoil does not occur outside the modification area or in no-go zones. - No parking occurs outside of the modification area, or in no-go zones.	Prior to construction
FF3	The management measures outlined in Section 6.6.3 will be implemented. This includes developing an ESCP and ASSMP, monitoring the quality of surface water and ground water, as well as providing spill response procedures in the ERP.	Prior to construction Throughout construction
FF4	Jemena will retire the required ecosystem and species credits through the BOS. Credits will be retired in accordance with the offset rules set out in the BC Regulation.	Prior to construction

6.8 Greenhouse gas

Consistent with the additional assessment requirements outlined in the Pre-Modification Application Letter, a **standard** assessment in the form of a Greenhouse Gas Assessment (GHG Assessment) (2026b) was conducted by EMM. The GHG Assessment can be found in **Appendix L**.

The GHG Assessment provided an account of direct and indirect greenhouse gas emissions arising from the modification. The GHG Assessment also evaluated whether the modification has the potential to breach the large emitters threshold of 25,000 tonnes (t) carbon dioxide equivalent (CO₂-e), warranting detailed assessment in accordance with the *NSW Guide for Large Emitters* (NSW EPA 2025) (Large Emitters Guide).

6.8.1 Methodology

The GHG Assessment only assessed emissions that would result from the Hunter Gas Pipeline ('project only' emission scenario). This is because the modification will not change how the existing Killingworth to Kooragang Island Pipeline will operate.

The GHG Assessment accounted for greenhouse gas emissions that would be emitted during the construction phase (2026 to 2027 financial year) and operation of the project (2027-2028 to 2049-2050 financial years). While the project is expected to operate beyond 2050, calculations have been made up to 2050, when NSW is expected to meet its goal for net-zero greenhouse gas emissions.

Types of greenhouse gases

Six kinds of greenhouse gases, as addressed under the *National Greenhouse and Energy Reporting Act 2007* (Cth), was considered in the assessment. Three of these greenhouse gases were prioritised for assessment based on the nature of the project:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)

These greenhouse gases vary in terms of how much and how long they can trap heat in the atmosphere. As such, the GHG Assessment uses a common unit —'CO₂-e'— as a uniform measurement of a project's contribution to global warming due to its greenhouse gas emissions.

Emission sources

The GHG Assessment evaluated the impacts of direct and indirect greenhouse gas emissions, defined through three 'scopes', as illustrated in Figure 6.17:

- **Scope 1 emissions** – direct emissions from sources within the Hunter Lateral project, and Jemena's activities within the modification area.
- **Scope 2 emissions** – indirect emissions associated with the purchase and consumption of electricity, steam, heat or cooling for the project, but do not form part of the development.
- **Scope 3 emissions** – all other indirect emissions that occur due to project activities from sources not controlled by Jemena. This includes 'upstream' emissions (e.g. employee commuting, purchase and transport of goods and services) and 'downstream' emissions (e.g. processing, use and end-of-life treatment of sold products).

While the GHG Assessment was focused on assessing Scope 1 and 2 emissions, the assessment has also considered the impact of Scope 3 emissions.

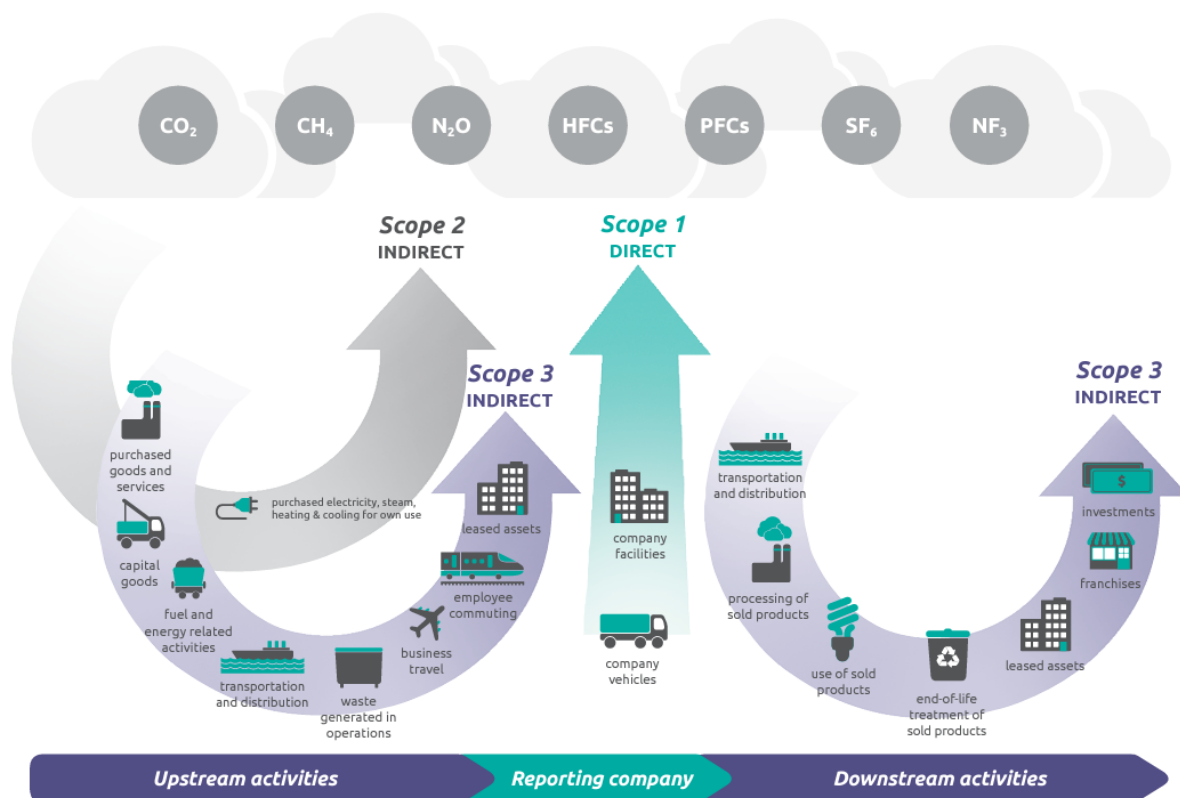


Figure 6.17 Overview of greenhouse gas emissions scopes (EMM 2026b)

The GHG Assessment focused on evaluating the most significant sources associated with the project. These sources include:

- **Scope 1 emissions**
 - Liquid fuel combustion (diesel) – stationary
 - On-site land use changes (loss of carbon sink due to vegetation clearing)
 - Gas pipeline leakage
- **Scope 3 emissions**
 - Liquid fuel combustion (diesel) – stationary
 - Liquid fuel combustion (diesel) – transport
 - Embodied emissions in construction materials

Several emissions sources were excluded from the assessment either because the resulting greenhouse gas emissions from the source would not be material to the project, to prevent double counting of emissions, or data is not available. These excluded sources include:

- **Scope 1 emissions**
 - Consumption of liquid fuels other than diesel
 - Consumption of oils and greases
 - Employee travel (operation)
 - Intermittent gas release during maintenance and internal cleaning of pipeline
- **Scope 2 emissions**

- Electricity consumption (construction and operation) – minimal mains electricity will be used throughout construction and operation.
- **Scope 3 emissions**
 - Consumption of liquid fuels other than diesel
 - Consumption of oils and greases
 - Manufacture of construction vehicles and equipment
 - Employee travel (construction)
 - Waste generation
 - Consumption of gas by end users

Emissions estimation

Estimations for each significant emissions source were then calculated using emissions factors from the:

- *Australian National Greenhouse Accounts Factors* (DCCEE 2025b) (2025 NGA Factors Workbook)
- *Greenhouse Gas Assessment Workshop for Road Projects* (TAGG 2013).

The total greenhouse gas emission for the Hunter Lateral Pipeline project is the sum of all estimated emissions from each emissions source.

6.8.2 Assessment

The Hunter Lateral Pipeline project is estimated to emit 1,987 t CO₂-e per year throughout the construction period (2026-2027 financial year). The project is also expected to emit 62 t CO₂-e per year throughout its operational life. This equates to a total of 1,426 t CO₂-e of greenhouse gas emissions throughout the 2027-2028 to 2049-2050 financial years. As noted in Section 6.8.1, while the project is expected to operate beyond 2050, GHG emission calculations have been provided up to 2050, when NSW is expected to meet its goal for net-zero greenhouse gas emissions.

A breakdown of emissions by scope is provided in Table 6.37 and Table 6.38. A graphical representation of project greenhouse gas emissions over time are provided in Figure 6.18 and Figure 6.19.

As the project does not exceed the large emitters threshold of 25,000 t CO₂-e per year throughout its construction and operational life, **the project is not subject to detailed assessment requirements that are defined in the Large Emitters Guide.**

Table 6.37 Construction greenhouse gas emissions (EMM 2026b)

Emissions scope	Emissions source	Annual greenhouse gas emissions (t CO ₂ -e/year)	Proportion of greenhouse gas emissions against individual scope total (%)
Scope 1	Diesel use – stationary	908	45.7%
	Diesel use – transport	81	4.1%
	Loss of carbon sink – vegetation clearing	998	50.2%
Scope 1 total		1,987	100%

Emissions scope	Emissions source	Annual greenhouse gas emissions (t CO ₂ -e/year)	Proportion of greenhouse gas emissions against individual scope total (%)
Scope 3	Diesel use – stationary	224	7.6%
	Diesel use – transport	20	0.7%
	Embodied emissions – construction materials	2,671	90.6%
	Materials – transport	33	1.1%
Scope 3 total		2,948	100%
All scopes total		6,870	

Table 6.38 Operational greenhouse gas emissions (EMM 2026b)

Emissions scope	Emissions source	Year-on-year greenhouse gas emissions (t CO ₂ -e/year)	Total project life greenhouse gas emissions (t CO ₂ -e)
Scope 1	Gas leakage	62	1,416
All scopes total			1,426

Scope 1 and scope 2 emissions

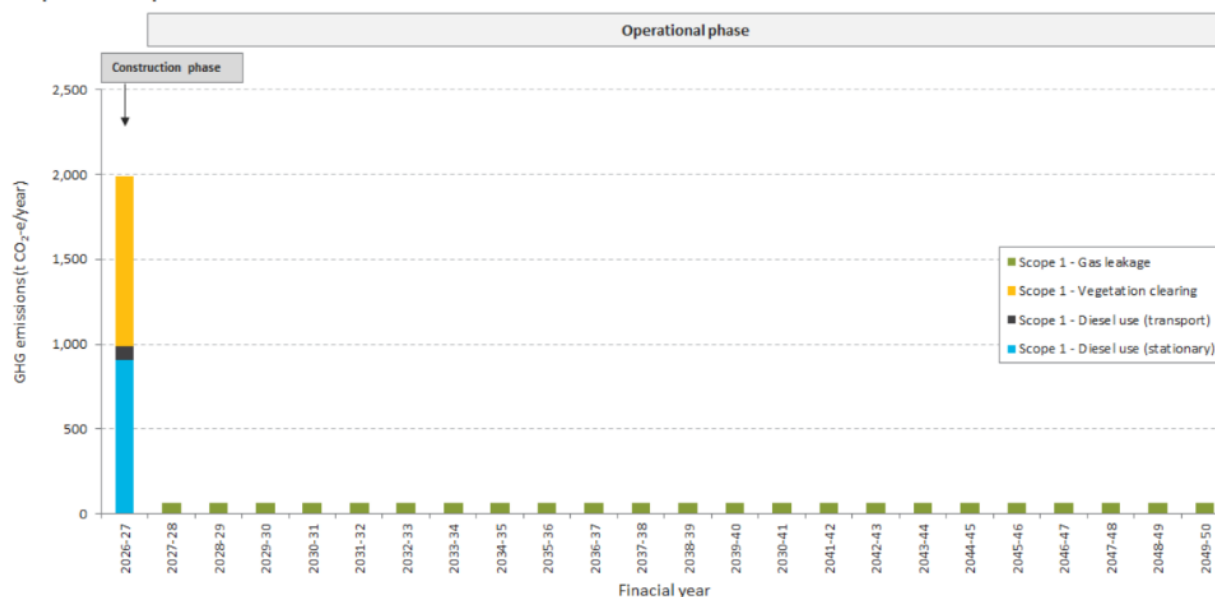


Figure 6.18 Scope 1 and 2 emissions (2026-2027 and 2049-2050 financial years) (EMM 2026b)

Scope 3 emissions

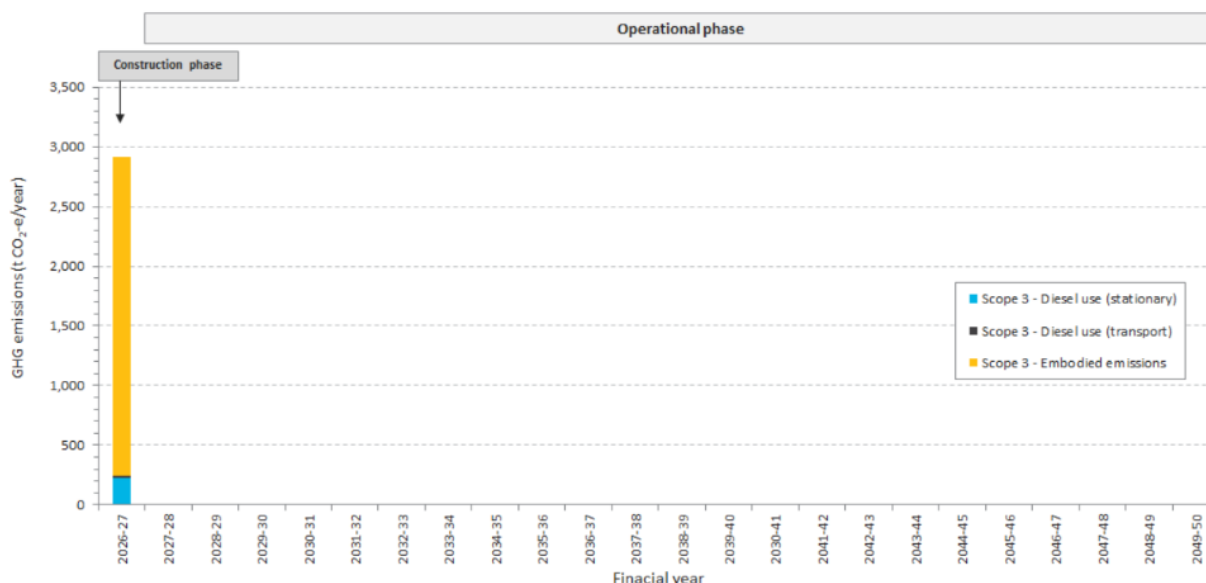


Figure 6.19 Scope 3 emissions (2026-2027 and 2049-2050 financial years) (EMM 2026b)

6.8.3 Mitigation measures

Table 6.39 Greenhouse gas emissions management measures

Reference	Mitigation measure	Timing
GH1	Fuel efficiency management measures will be included in the project's CEMP, based on the recommendations provided in Section 3.7 of the GHG Assessment. The CEMP will include measures to: - Minimise haul distances and double handling of materials. - Maintenance of vehicles and haul roads. - Minimising engine idling. - Conducting pre-start inspections.	Prior to construction
GH2	The project will utilise materials from local sources and low carbon materials where practical.	Design Construction
GH3	In accordance with the mitigation measures defined in Section 6.6.3, disturbed areas will be progressively rehabilitated throughout construction.	Throughout construction Commissioning
GH4	A leak detection monitoring program will be established while the pipeline is in operation. Formal leak detection surveys will be conducted every 1-5 years.	Construction Operation

6.9 Historic heritage

Consistent with the Scoping Letter, a **standard assessment** in the form of a **desktop assessment of historic heritage sites within the modification area** was conducted by MVC Services.

6.9.1 Methodology

A search of the following historic heritage databases was conducted in December 2025:

- World Heritage List
- National Heritage List
- Commonwealth Heritage List
- State Heritage Inventory
- Schedule 5 of the Maitland LEP and Newcastle LEP.

Where historic heritage sites have been identified within, or in close proximity to the modification area, the modification's impacts to the heritage site's historical, aesthetic, social and scientific significance was reviewed. The following forms of impacts were considered for this modification:

- **Direct (physical) impacts** – the removal or alteration of an item or its surroundings (when they contribute to the significance of the heritage item), or the excavation of areas with archaeological potential.
- **Potential direct impacts** – incidental physical impacts to heritage items resulting from construction, operational or decommissioning activities (e.g. damage resulting from vehicle movements).
- **Indirect impacts** – damage to heritage items caused by actions occurring outside the curtilage of the heritage item. This includes vibration and settlement impacts, as well as landscape and visual impacts resulting from the modification.

The degree of impact to historic heritage sites is assessed in accordance with Heritage NSW's *Material Threshold Policy* (2020). The different scales of impact are shown in Table 6.40.

Table 6.40 Historic heritage scales of impact (Heritage NSW 2020)

Impact	Definition
Total loss of significance	Major adverse impacts to the point where the place would no longer meet the criteria for listing on the State Heritage Register/LEP.
Adverse impact	Major (that is, more than minor or moderate) adverse impacts to State or local heritage significance.
	Moderate adverse impacts to State or local heritage significance.
	Minor adverse impacts to State or local heritage significance.
Little to no impact*	An alteration to State or local heritage significance that is so minor that it is considered negligible. <i>* Little to no impact (as opposed to no impact) acknowledges that any change will result in some level of impact/alteration to State heritage significance</i>
Positive impact	Alterations that enhance the ability to demonstrate the State or local heritage significance of a State Heritage Register/LEP-listed place.

6.9.2 Assessment

Three historic heritage sites listed in the Newcastle LEP are located near the modification area. A description of these heritage sites is provided in Table 6.41, and their locations illustrated in Figure 2.10.

Table 6.41 Historic heritage sites

Heritage site	Description	Significance
Minmi to Hexham Railway	A major private colliery railway constructed by John Eales between 1854-1857. This freight (and later, passenger) railway provided a link between his Minmi Colliery and coal loading facilities at Hexham. This heritage site is located immediately south of the proposed Jemena Tie-In Facility.	This heritage site is listed in the Newcastle LEP due to its state and local significance: • Historical significance and association – the railway contributed to the development of the Minmi and Hexham townships, as well as other satellite coal producing and industrial regions around Newcastle. The railway supported the transport of a substantial proportion of NSW's coal and coke output, and the growth of associated industrial, rail and shipping activities. • Aesthetic significance – the railway route demonstrates adaptation to the natural environment in which it is set. This includes its construction on raised embankments due to the swampy and low-lying terrain of the land traversed by the railway. • Research/scientific significance – there is a high possibility that remains of the railway (such as its embankments), coal mining and industrial activities exists close to the railway line. The site includes a 100 m curtilage on either side of the railway to allow for the possibility of archaeological remains to be present within close proximity to the railway. • Rareness/representativeness – this site is one of few remnants of a private colliery railway line in NSW from the mid-nineteenth century. The presence of remnants of this railway (e.g. embankments and railway cuttings) in the landscape also contributes to its rarity.
Hexham Shipbuilding Yards	A mangrove swamp containing straight cuts, commensurate with 19th century shipbuilding. This heritage site is located at the south-east corner of the modification area, where it intersects Purgatory Creek.	This heritage site is listed in the Newcastle LEP due to its local significance. While the State Heritage Inventory did not provide details on the specific aspects that make this heritage site significant, the Statement of Heritage Impact for the Hexham Straight Widening (Hexham Straight SHI) (Jacobs 2021) provides an assessment of the heritage place's local significance: • Historical significance – the SHI noted that this heritage site is associated with the development of the Hexham area and shipbuilding along the Hunter River. • Research/scientific significance – the SHI noted that there is a moderate possibility that artefacts relating to the heritage site may be present. A site inspection conducted for the SHI noted the presence of building material and material culture along the banks of Purgatory Creek.
Hannel Family Vault	A lone family crypt belonging to the Hannel family. The crypt is still intact. The heritage site is located adjacent to Purgatory Creek and the Hunter River (<i>Coquun</i>).	This heritage site is listed in the Newcastle LEP due to its local significance. While the State Heritage Inventory did not provide details on the specific aspects that make this heritage site significant, the Hexham Straight SHI (Jacobs 2021) provides an assessment of the heritage place's local significance: • Historical significance and association – the SHI noted that this heritage site is associated with John Hannel, an important person in the development of sporting associations within the region throughout the 19th century. John Hannel was also part of the Hannel family; the family contributed significantly to the development of Newcastle ('HANSELL FAMILY: Last Survivor Dies' 30 December 1938).

Heritage site	Description	Significance
		Rareness/representativeness – the SHI noted that the vault’s location outside of a cemetery is rare. The site is also broadly representative of an above-ground burial vault.

Impacts

A summary of the modification’s proposed impacts to historic heritage sites is provided in Table 6.42. It is expected that the modification will have little to no impact on any historic heritage sites when it is operational.

Table 6.42 Impacts to historic heritage sites

Heritage site	Works with potential impacts to heritage item	Overall significance of impact
Minmi to Hexham Railway	Construction activities will not intrude on the heritage site’s curtilage. As such, it is considered that construction activities will not directly impact the heritage site. Vibration impacts – as noted in the Construction NVIA, vibration impacts from construction vehicles and plant are below the recommended structural integrity threshold of 20 mm/s at 50 m. The Operations NVIA also note that vibrations from maintenance and operational activities are lower than the DIN 4150-3 limits for structural integrity. As such, it is not expected that the modification will indirectly impact the heritage site.	Little to no impact
Hexham Shipbuilding Yards	Construction activities – No trenching works are proposed in this location. The pipeline will be installed across Purgatory Creek using trenchless installation technologies. Vehicles will also the existing access road to travel to and from the modification area. As such, no impacts to this heritage site are expected.	Little to no impact
Hannel Family Vault	Construction activities – No trenching works are proposed in this location. The pipeline will be installed across Purgatory Creek using trenchless installation technologies. Vehicles will also the existing access road to travel to and from the modification area. As such, no impacts to this heritage site are expected. Vibration impacts – The modification area is approximately 70 m northwest of the heritage curtilage. Per the Construction NVIA, vibration impacts from construction vehicles and plant are below the recommended structural integrity threshold of 20 mm/s at 50 m. The Operations NVIA also note that vibrations from maintenance and operational activities are lower than the DIN 4150-3 limits for structural integrity. As such, it is not expected that the modification will indirectly impact the heritage site.	Little to no impact

6.9.3 Mitigation measures

Table 6.43 Historic heritage management measures

Reference	Mitigation measure	Timing
HH1	An unexpected finds procedure will be included as part of the CEMP. The procedure will be consistent with the notification requirements outlined in Section 146 of the <i>Heritage Act 1977</i> (NSW).	Prior to construction
HH2	The proponent will ensure construction and operational vehicles and plant will be located within clearly demarcated work zones or access roads leading to the modification area.	Throughout construction

6.10 Land contamination

Consistent with the Scoping Letter, a **standard** assessment in the form of a desktop evaluation of land contamination records was conducted by MVC Services. This is in addition to the SWGA, which has been summarised in Section 6.6.

6.10.1 Methodology

The modification area's history and potential for land contamination were assessed in accordance with *Managing Land Contamination: Planning Guidelines* (DUAP and NSW EPA 1998) (Contaminated Land Guidelines). The Contaminated Land Guidelines outline information requirements for the consent authority to make an initial evaluation of the modification area's potential for land contamination.

A desktop search of the following databases and reports was conducted to gain an understanding of the modification area's land use history:

- the EPA's list of notified and regulated contaminated land sites (NSW EPA 2026b) (14 July 2026), conducted on 23 July 2026.
- the EPA's Contaminated Land Record of Notices (NSW EPA 2026a), conducted on 12 February 2026
- land contamination reports for major projects adjacent to the modification area
- NSW Spatial Services' Historical Imagery Viewer.

Desktop search

As noted in Section 2.3.6, the southern portion of the modification area includes two land parcels (104/-/DP1084709 and 106/-/DP1189565) that are listed as notified sites in the EPA's Contaminated Land Register. Both land parcels form part of the QR National (now known as Aurizon) Hexham Precinct—the precinct provides facilities and tracks for coal trains to be maintained and refuelled. The EPA has subsequently determined that contamination on both land parcels is not significant enough to warrant regulation under the *Contaminated Land Management Act 1997* (NSW) (CLM Act).

Historical land uses

Historical imagery for the southern portion of the modification area was reviewed to understand whether any activities that could lead to contamination issues have taken place in the past. Historical imagery from 1954, 1976, 1998 and 2019 shows the following activities and land use changes have

occurred within the southern portion of the modification area, as illustrated in Figure 6.20 to Figure 6.23:

- Observed presence of a coal-loading facility, dam and railway sidings to the north-west of Maitland Road, near Purgatory Creek. The coal-loading facility and railway sidings were demolished by 1976, while the dam appears to be altered on two occasions, in 2001 and 2015.
- Observed presence of the Hexham Coal Preparation Plant to the south of the modification area in 1966, and its demolition by 1993.
- Observed presence of the New England Highway by 1954.
- Observed closure and lifting of the Minmi-Hexham Railway to the south of the modification area after 1989.
- Observed development of a sewage treatment plant at the southern boundary of the modification area from 1998 onwards.

The historical imagery suggests that most of the southern portion of the modification area was used for agricultural purposes. However, the modification area and its surroundings was also used for intensive transportation and coal storage purposes. Per Table 1 of the Contaminated Land Guidelines, railway yards are considered an activity that may cause contamination.

To understand the extent of contamination that has resulted from this past land use, land contamination assessments for other major projects intersecting the modification area were reviewed; see following section.

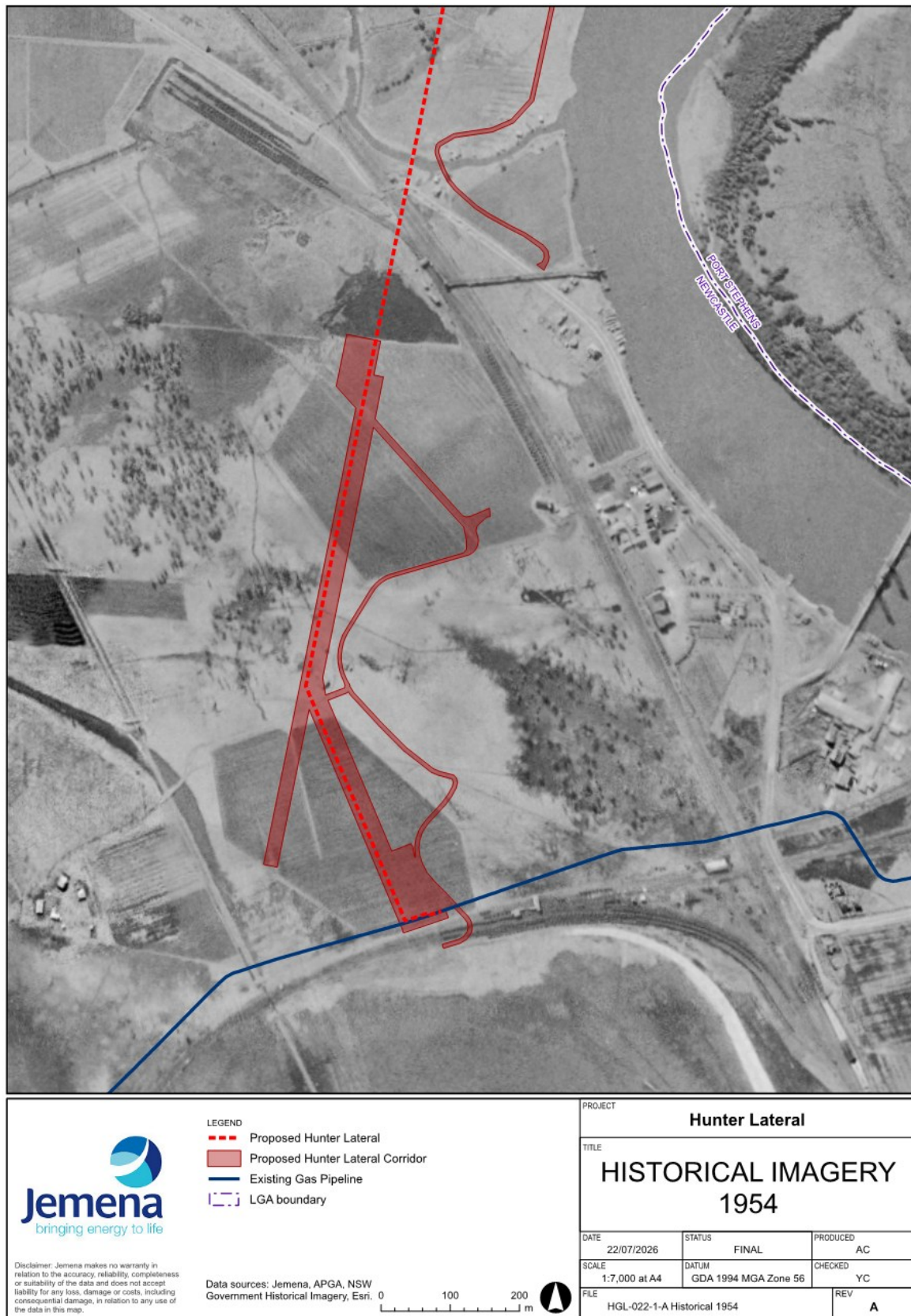


Figure 6.20 1954 aerial imagery of southern portion of modification area (Department of Customer Service - Spatial Services 1954)



Figure 6.21 1976 aerial imagery of southern portion of modification area (Department of Customer Service - Spatial Services 1976)



Figure 6.22 1998 aerial imagery of southern portion of modification area (Department of Customer Service - Spatial Services 1998)



Figure 6.23 2019 aerial imagery of southern portion of modification area (Neamap 2019)

Land contamination records

Published land contamination assessments for major projects that intersect with the modification area were reviewed. The following assessments for two major projects have been reviewed:

- *Contamination Assessment for the Proposed Hexham Relief Roads Project* (Coffey 2012) (Hexham Relief Roads Contamination Assessment)
- *Report on Preliminary Contamination Assessment – Proposed Train Support Facility, Woodlands Close, Hexham* (Douglas Partners 2012) (Hexham TSF Contamination Assessment).

The Hexham TSF Contamination Assessment noted that it was unlikely that widespread soil contamination exists within the project area for the Hexham Train Support Facility. Soil contamination that was present on their project area were normally associated with the location of past and existing land uses. The Hexham TSF Contamination Assessment noted two Areas of Environmental Concern (AECs) associated with the soil and groundwater within the modification area:

- Potential and confirmed presence of elevated **Polycyclic Aromatic Hydrocarbons** (PAH) and **Total Recoverable Hydrocarbons** (TRH), in the form of medium- to heavy-chain hydrocarbons (C₁₀-C₃₆) along Woodlands Close (see Figure 6.25).
- Confirmed **asbestos-containing materials** at the former bailing shed, located north of the sewage treatment plant (see Figure 6.24).

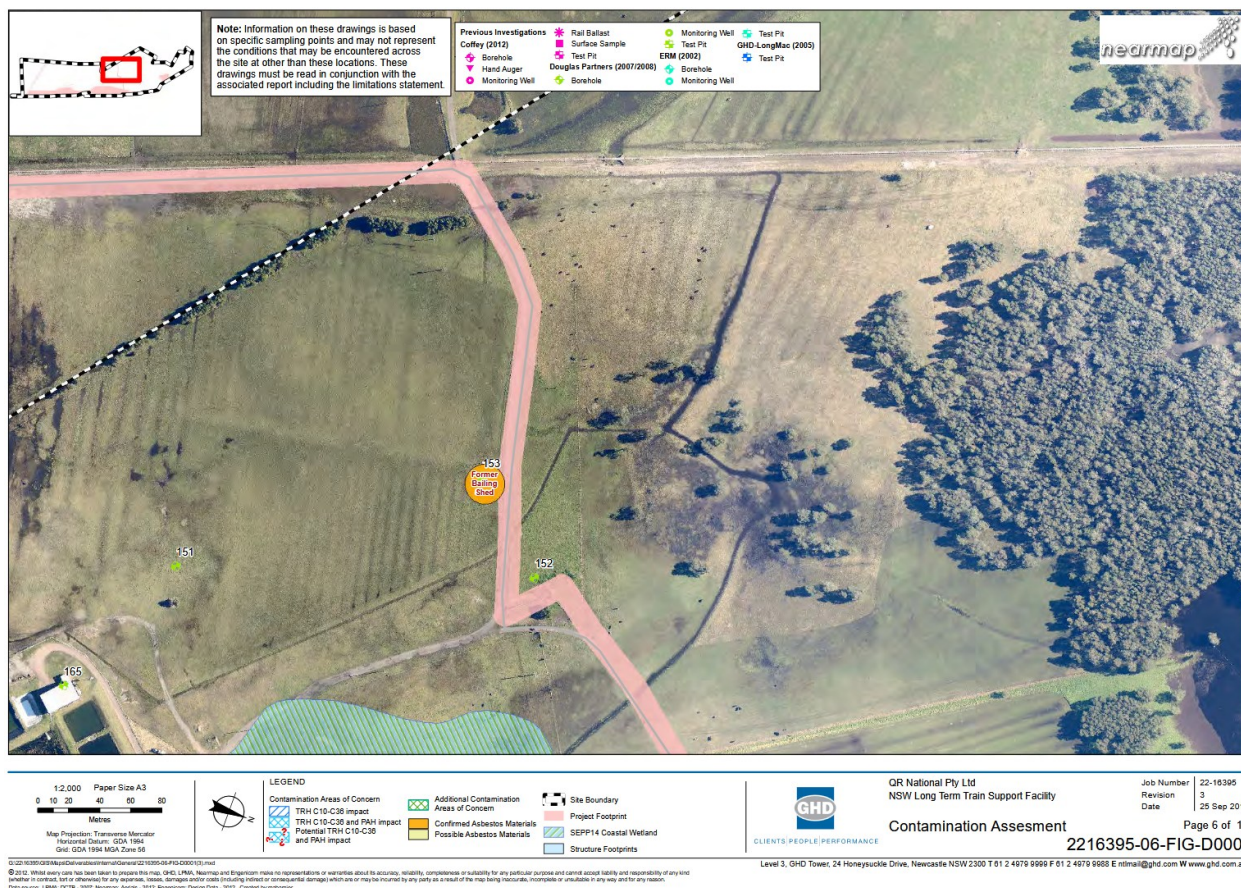


Figure 6.24 Asbestos containing materials at the former balling shed (Douglas Partners 2012)

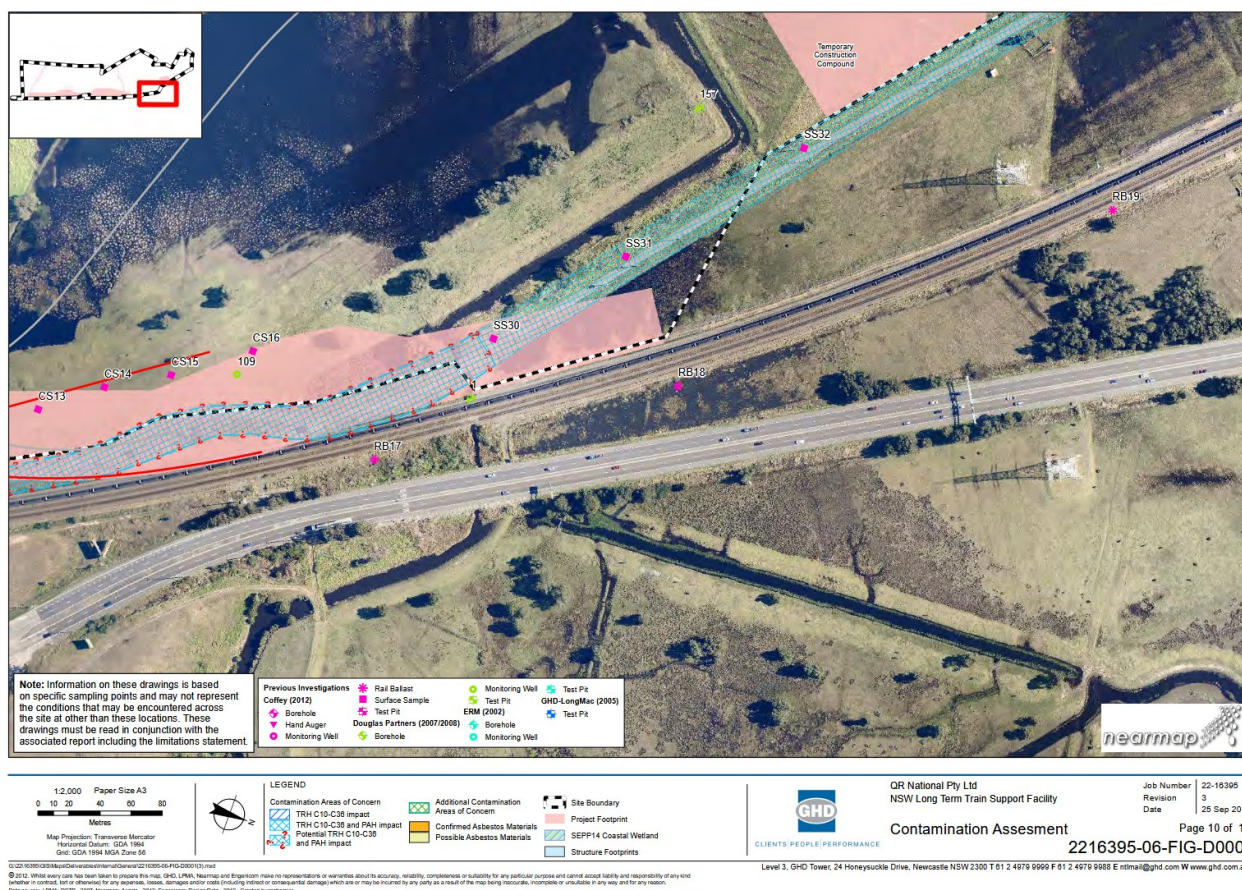


Figure 6.25 Potential/confirmed contaminated land along Woodlands Close (Douglas Partners 2012)

The Hexham TSF Contamination Assessment also noted widespread elevated levels of nutrients and faecal coliforms, based on surface water and groundwater samples. The contamination assessment attributed this result to the presence of cattle grazing and effluent irrigation activities. Slightly elevated levels of heavy metals were also detected in surface water and groundwater —the assessment suggests that this is consistent with regional groundwater and surface water quality. The assessment recommended the implementation of measures to manage potential human health and environmental risks associated with contaminated surface water and groundwater.

The Hexham Relief Roads Contamination Assessment also considered that the likelihood for widespread soil contamination within the Hexham Relief Roads project area is low. The contamination assessment noted three AECs with a low-medium or higher likelihood of contamination that intersect the modification area, as illustrated in Figure 6.26:

- **AEC 2A – Use of imported fill for the construction of Woodlands Close** – Like the Hexham TSF Contamination Assessment, the Hexham Relief Roads Contamination Assessment noted elevated PAHs, benzo[a]pyrene and Total Petroleum Hydrocarbons (TPH) in the form of medium- to heavy-chain hydrocarbons (C₁₀-C₃₆) along Woodlands Close. The concentrations of PAHs in this area suggests that the source of contamination is associated with off-site fill materials used to construct the access road.
- **AEC 3 – Former building footprints** – There is evidence of demolished building footprints immediately east of the modification alignment, where the alignment intersects with the Main Northern Railway (KP 4.2 – KP 4.25). While no asbestos-containing materials were detected

in surface samples collected near these building footprints, two fragments of potential asbestos-containing material were collected from a dilapidated building located south-east of the sewage treatment plant.

- **AEC 8 – Effluent irrigation on Lot 113** – The Hexham Relief Roads Contamination Assessment noted that effluent irrigation has occurred within the southern portion of the modification area. As a result, there were elevated concentrations of ammonia, metals and faecal coliforms in surface water and groundwater samples.

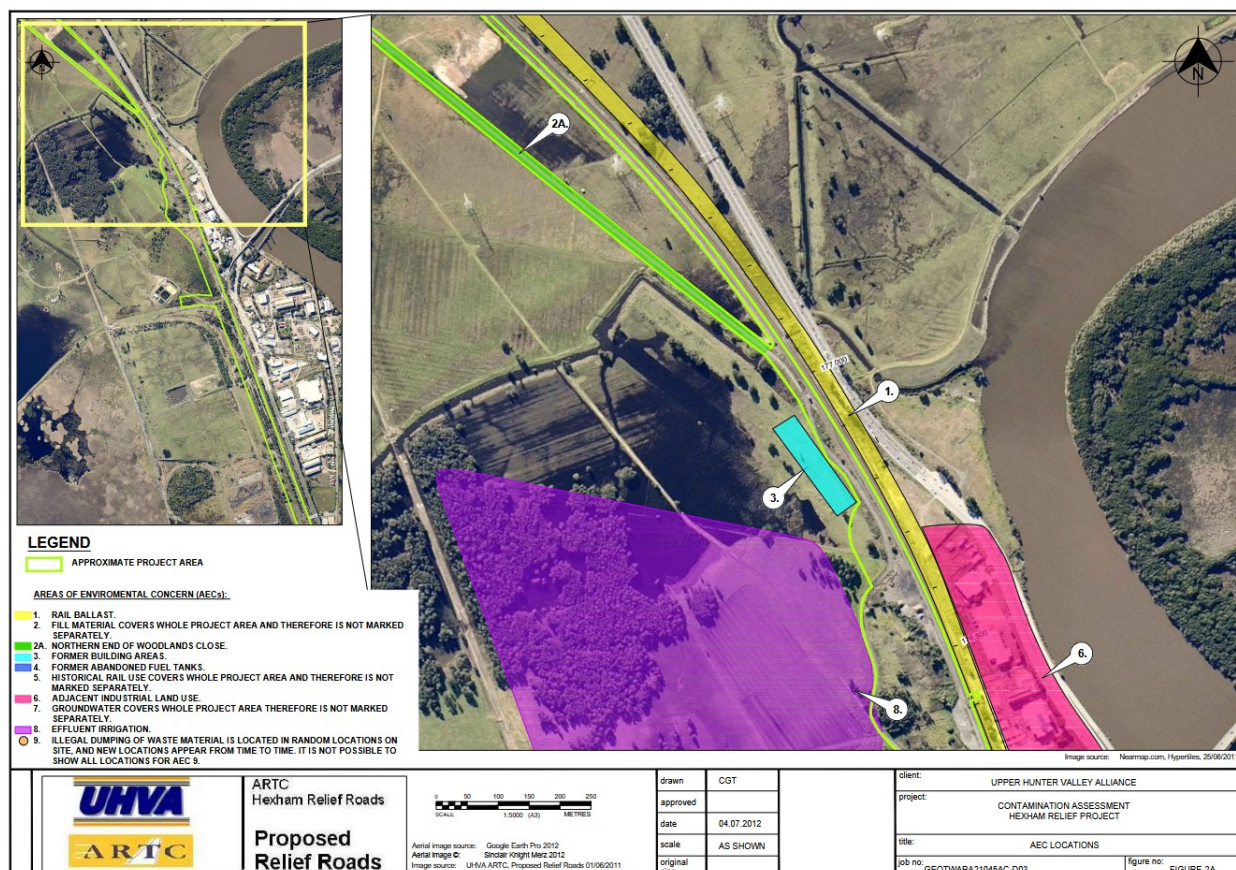


Figure 6.26 AECs affecting the Hexham Relief Roads Project (Coffey 2012)

Consistent with the findings of the Hexham TSF Contamination Assessment, the assessment notes that surface water and groundwater contamination is widespread within the Hexham Relief Roads project area. The assessment also noted that the contaminated surface water and groundwater pose a potential risk to human health for construction workers. The assessment suggested that this widespread contamination is the result of cattle grazing and effluent irrigation activities, as well as the long history of industrialisation within the Hexham area.

6.10.2 Assessment

The review of major project contamination assessments and assessment of past land uses suggest that localised land contamination may be present within the southern portion of the modification area. There is no evidence to suggest that widespread land contamination is present within the southern portion of the modification area. Potential contaminants that may be present in soil within the modification area include:

- elevated concentrations of PAHs, benzo[a]pyrene and TPHs
- asbestos-containing materials.

As noted in the contamination assessments and the SWGA, surface water and groundwater within the modification area contains elevated levels of heavy metals, nutrients and faecal coliforms. The nature of past land uses within and surrounding the modification area, as well as estuary-wide pressures on water quality means that there is historical surface water and groundwater contamination throughout the broader catchment. In addition, the presence of acid sulphate soils within the modification area may also contribute to the worsening of groundwater and surface water quality downstream of the modification area if not managed appropriately.

In addition to the mitigation measures for surface water and groundwater outlined in Section 6.6.3, it is recommended that Jemena:

- avoids any areas identified previously as AECs where practical
- conduct further assessments to determine the existing extent and severity of soil contamination within the southern portion of the modification area
- incorporate measures in the CEMP to:
 - manage human health risks arising from contaminated groundwater
 - classify, treat, track and dispose special/restricted/hazardous wastes in accordance with the *Protection of the Environment Operations Act 1997* (NSW) (PoEO Act).

6.10.3 Mitigation measures

Reference	Mitigation measure	Timing
LC1	Any areas previously identified as AECs in previous contamination assessments will be avoided where practical.	Planning
LC2	The CEMP will incorporate the acid sulphate soil, surface water and groundwater mitigation and monitoring measures outlined in Section 6.6.3.	Planning Prior to construction
LC3	Further soil assessments will be undertaken where AECs cannot be avoided by the modification. If any part of the modification area contains contaminated soil, a Remediation Plan will be developed to remediate any localised contaminated soil.	Planning Prior to construction Throughout construction
LC4	The CEMP will incorporate measures to protect construction workers from health effects arising from contaminated groundwater and surface water.	Planning Prior to construction
LC5	Any special, restricted or hazardous construction waste (including contaminated soil and water) will be classified, treated and disposed in accordance with the requirements of the PoEO Act and relevant EPA guidelines.	Planning Throughout construction

6.11 Agricultural capability

As the modification area contains land zoned for agricultural purposes, a **standard assessment** in the form of a **desktop assessment of the modification area's agricultural capability** was conducted by MVC Services.

6.11.1 Methodology

Agricultural capability desktop research

A desktop search of the following databases and reports were conducted to provide a baseline of the modification area's agricultural capability:

- NSW Land and Soil Capability (LSC) Mapping (DCCEEW 2025a)
- Strategic Regional Land Use Policy – Biophysical Strategic Agricultural Land (BSAL) and Critical Industry Clusters (CIC) (DPHI 2025).

The modification area is not considered BSAL, nor does it form part of a CIC. The LSC mapping indicated that most of the modification area has an overall LSC classification of Class 5 (moderate to low capability land). This is due to the modification area's vulnerability to waterlogging, consistent with its nature as a floodplain.

As shown in Figure 6.27, the modification area is considered to have a moderate to low capability for high impact agricultural activities (for example, cropping). The *Land and Soil Capability Assessment Scheme* (OEH 2012) document indicates that Class 5 land is generally more suitable for grazing or occasional pasture establishment.

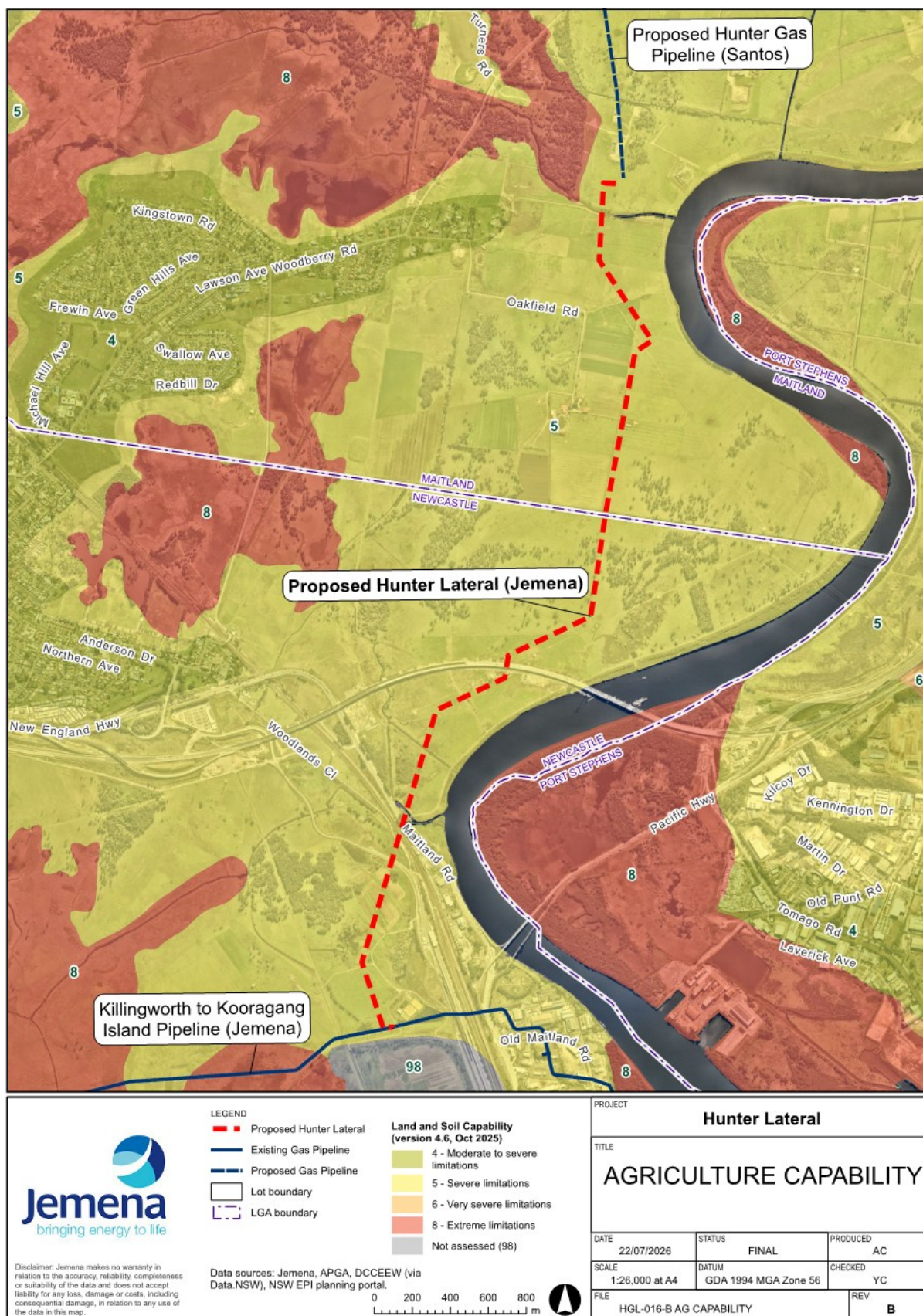


Figure 6.27 Land and soil capability within the modification area (DCCEEW 2025a)

Assessment of the modification's impacts on agricultural capability

Construction and operational activities that may impact the modification area's agricultural capability was considered as part of this desktop assessment. These activities have been outlined in Chapter 3.

6.11.2 Assessment

As indicated by the LSC mapping, the modification area has an inherently low agricultural capability due to its vulnerability to waterlogging. In addition, agricultural capability within southern portion of the modification area is constrained by the presence of contaminated groundwater and surface water (see Section 6.6). It is unlikely that the modification area will be able to sustain large-scale intensive cropping activities. However, the modification area can sustain low-impact activities such as livestock grazing – the modification area is actively being used as grazing land by several landholders.

The modification's construction will impact access to grazing land. As the modification will be built progressively, these impacts will only be temporary, for the duration required to install pipe segments and rehabilitate work areas. Erosion and sediment control measures will be installed to protect the agricultural capability of the modification area and downstream landholdings from sedimentation-associated impacts. This includes reinstating all work areas prior to the operation of the modification.

The modification will not fragment existing agricultural land by introducing incompatible land uses, such as housing and commercial uses. The modification also does not propose the subdivision of agricultural land which give rise to dwelling entitlements.

When operational, the modification will be protected by an easement benefitting Jemena. This easement will restrict the activities and land uses that can be undertaken within close proximity to the pipeline. These restrictions are required to protect the integrity of the pipeline and to preserve Jemena's access to the easement. However, this will not restrict the ability for grazing activities to occur within the modification area. This is provided that grazing and agricultural activities are conducted in accordance with:

- AS 2885
- *Guideline – Designing, Constructing and Operating Assets near Jemena Gas Pipelines* (Jemena 2021)
- *Guideline – Planting of Vegetation near Gas Pipelines* (Jemena 2022).
- Easement instruments registered on land titles within the modification area.

Hence, the modification will have a **negligible impact on agricultural productivity when it is constructed and operated**. This is provided that the mitigation measures in Section 6.6.3 are implemented.

6.11.3 Mitigation measures

Reference	Mitigation measure	Timing
AG1	An Erosion and Sediment Control Plan will be developed, in accordance with the mitigation measures outlined in the SWGA.	Prior to construction
AG2	The CSEP will include targeted engagement activities with host landholders to ensure landholders understand: • the location of Jemena easements for the modification • what activities and land uses are allowed within the easement	Prior to construction Construction

Reference	Mitigation measure	Timing
	how Jemena can be contacted to discuss agricultural issues in relation to the easement.	
AG3	The CEMP will include measures to manage and monitor noxious weeds and pests, in accordance with the <i>Biosecurity Act 2015</i> (NSW).	Prior to construction

6.12 Social impacts

Consistent with the additional assessment requirements outlined in the Pre-Modification Application Letter, a **standard assessment** in the form of a **Social Impact Assessment (SIA)** (2026) was prepared by Umwelt (Australia) Pty Ltd (Umwelt). The SIA can be found in **Appendix J**.

6.12.1 Methodology

The SIA was prepared in accordance with the *Social Impact Assessment Guideline for State Significant Projects* (DPHI 2026b) (SIA Guideline). The SIA considered all potential social impacts that may occur throughout the life of the modification. The SIA also considered both positive and negative social impacts arising from the modification. The social impacts of the modification were assessed through a four-step process.

Setting a social locality

A social locality is first defined for the modification. A social locality is the area where people and businesses are likely to experience impacts from a major project or modification. Per the SIA Guideline, the social locality of a major project is defined by:

- the project's scale and nature
- who may be affected by a project
- whether any vulnerable or marginalised people may be affected by a project
- built or natural features on or near a project, as well as the tangible and intangible values associated with these features
- relevant social, cultural, demographic trends or social changes
- the history of a project and the surrounding area, including any other developments that have/may be occurring in the area.

The SIA has defined the Millers Forest, Woodberry, Tarro and Beresfield suburbs as the social locality for this modification.

Setting a social baseline

A social baseline is then established based on the modification's social locality. This social baseline outlines the social context within the social locality without the modification. The social baseline also forms the basis to predict the extent and magnitude of the modification's social impacts.

The SIA used the 'community capitals' framework to develop the social baseline. This approach outlines seven broad categories that promote the long-term wellbeing of local communities. Based on these categories, primary and secondary data were reviewed to define the modification's social baseline. A summary of the social baseline is provided in Table 6.44.

Table 6.44 Summary of social baseline findings (Umwelt 2026)

Community capital	Potential challenges	Potential opportunities
Political	Significant community opposition to Santos' Hunter Gas Pipeline.	Potential cooperation between states, the Australian Government and industry to accelerate gas field development and prevent supply shortages.
Natural	- Proximity to sensitive waterways and Ramsar wetlands. - Cumulative impacts from creek confluences. - Crown land tenure existing over Greenways Creek and Purgatory Creek. - High-risk flood zone within the modification area.	Gas transported through the pipeline can support the growth of renewable energy.
Human	- Higher median ages in certain areas of the social locality may limit the availability of local workers for project roles. - Elevated unemployment rates in some localities (e.g. Woodberry).	- The social locality has higher rates of certificate attainment compared to the NSW average. - The Maitland and Newcastle LGAs have lower median ages compared to the NSW median.
Social	- Potential disruption to community cohesion due to polarised views on gas projects. - More stable population within the three suburbs, which may indicate that established communities may be more sensitive to changes introduced by the modification.	Greater community participation within the Newcastle LGA, allowing for enhanced collaboration and communication.
Economic	- Significant rental stress is present in the Millers Forest and Woodberry suburbs. - Rising rents and house prices across the City of Maitland and City of Newcastle LGAs.	- Lower mortgage stress across the social locality. - Greater labour force participation at the LGA level, indicating a greater potential market.
Physical	- Potential strain on health services due to population influx during construction. - Strain on existing infrastructure due to other major projects within the social locality. - Resident concerns about the modification's impact on local roads, as travel by car is more common in the social locality.	- The presence of the Port of Newcastle, Australia's largest east coast port. - Availability of short-term accommodation to support temporary housing needs. - Presence of significant transport infrastructure to support construction traffic. - The modification and other proposed/existing gas pipelines can enhance local energy security, support economic growth and attract further investment into the social locality.
Cultural	Risk of impacts to Aboriginal cultural heritage impacts during construction and operation.	Collaboration with Traditional Owners around the Hunter River (<i>Coquun</i>), as an area of cultural significance for Aboriginal communities.

Stakeholder identification and engagement

Stakeholder engagement was also conducted to further define the social baseline. Stakeholder engagement also provides context around the local community's sensitivity to social impacts, and what social impacts are important to them.

As noted in Chapter 5, Jemena has already conducted targeted stakeholder engagement activities as part of this Modification Report. Umwelt has conducted additional targeted engagement activities to substantiate with key stakeholders to substantiate the SIA's findings. These included:

- **An outline of SIA-related engagement opportunities** with Umwelt, contained in Jemena's project update email and letterbox drop newsletters.
- **Phone calls** with nine businesses and service providers near the modification area. Three contact attempts were made via phone and email to provide sufficient opportunities to engage.

Umwelt has also reviewed records from past engagement activities undertaken by Jemena (see Chapter 5) to inform the development of the social baseline.

While Umwelt and Jemena have made efforts to reach out to key stakeholders, the SIA noted that there was a low level of interest from key stakeholders to participate in SIA-related engagement. As such, the SIA relied on past engagement records compiled by Jemena and secondary data sources to inform the development of the social baseline.

Social impact evaluation

The **inherent** likelihood and magnitude of potential social impacts was ranked according to the criteria outlined in Table 6.45 and Table 6.46, as well as the social impact significance matrix illustrated in Table 6.47. Potential social impacts arising from the modification were predicted based on the social baseline and knowledge of impacts arising from other pipeline developments in similar contexts. Impacts to the eight social impact categories defined in the SIA Guideline were considered as part of the evaluation:

- **Way of life** – including how people live, how they get around, how they work, how they play, and how they interact each day.
- **Community** – including composition, cohesion, character, how the community functions, resilience, and people's sense of place.
- **Accessibility** – including how people access and use infrastructure, services and facilities.
- **Culture** – both Aboriginal and historic, including shared beliefs, customs, practices, obligations, values and stories, and connections to Country, land, waterways, places and buildings.
- **Health and wellbeing** – including physical and mental health especially for people vulnerable to social exclusion or substantial change, psychological stress resulting from financial or other pressures, access to open space and effects on public health.
- **Surrounding amenity** – including ecosystem services such as shade, pollution control, erosion control, public safety and security, access to and use of the natural and built environment, and aesthetic value and amenity.

- **Livelihoods** – including people’s capacity to sustain themselves through employment or business.
- **Decision-making systems** – including the extent to which people can have a say in decisions that affect their lives, and have access to complaint, remedy and grievance mechanisms.

The SIA considered social impacts across the life of the modification, including construction, operation and decommissioning.

Table 6.45 Likelihood levels for social impacts (Umwelt 2026; DPHI 2026b)

Likelihood level	Matrix reference	Definition
Almost certain	A	Definite or almost definitely expected (for example, an impact has occurred on similar projects)
Likely	B	High probability
Possible	C	Medium probability
Unlikely	D	Low probability
Very unlikely	E	Improbable or remote probability

Table 6.46 Magnitude level for social impacts (Umwelt 2026; DPHI 2026b)

Magnitude level	Matrix reference	Definition
Transformational	1	Substantial change experienced in community wellbeing, livelihood, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community.
Major	2	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	3	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Minor	4	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	5	Little noticeable change experienced by people in the locality.

Table 6.47 Social impact significance matrix (Umwelt 2026; DPHI 2026b)

	Magnitude				
	Minimal	Minor	Moderate	Major	Transformational
Likelihood	1	2	3	4	5

		Magnitude				
		Minimal	Minor	Moderate	Major	Transformational
Almost certain	A	Low	Medium	High	Very high	Very high
Likely	B	Low	Medium	High	High	Very high
Possible	C	Low	Low	Medium	High	High
Unlikely	D	Negligible	Low	Low	Medium	High
Very unlikely	E	Negligible	Negligible	Low	Medium	Medium

Impact management

If a negative social impact has an inherent significance rating of Medium or higher, the SIA outlined measures to reduce and monitor these impacts. The residual significance of these social impacts was then re-assessed using the social impact significance matrix.

The SIA also proposed measures to reinforce positive social impacts that may arise from the modification.

6.12.2 Assessment

The SIA identified a total of 19 social impacts relating to the modification, as listed in Table 6.48. Of these, six of these impacts have a significance rating of Medium or higher. These have been summarised below:

- **Improved energy security across NSW** – the modification will support the delivery of gas from Santos' Narrabri Gas Project to the domestic gas market. This additional gas will ensure a reliable gas supply is available for gas consumers within Australia's east coast.
- **Local employment and training opportunities** – a strong construction industry exists within the social locality, providing a strong base to fulfil construction workforce needs for the modification. The construction industry accounts for 7.8% of the City of Newcastle LGA workforce, and 9.0% of the Maitland LGA workforce. However, the presence of other major projects within the social locality and the broader region may increase competition for construction workers.
- **Local procurement of supplies and services** – procuring local materials and services for the modification's construction and operation will support local businesses. The proximity of the modification to the City of Newcastle's urban centre suggests that Jemena will have access to businesses which can support the modification's construction.
- **Damage to Country and loss of Aboriginal cultural heritage values** – construction activities have the potential to displace or harm Aboriginal cultural heritage places.
- **Increased local spending within the social locality** – the influx of construction workers may generate increased demand for retail, food and beverage services within the social locality. Other businesses and services located within the broader region may also benefit from passing trade as construction workers travel to and from the modification area.
- **Amenity impacts from construction noise** – construction activities, including transportation of materials and operating heavy machinery may generate elevated noise levels that disrupt

daily life for nearby residents. Prolonged exposure to excessive noise can affect the health and wellbeing of residents.

In addition to the mitigation measures outlined in this Modification Report, the SIA also recommended measures to reinforce positive social impacts and minimise negative social impacts:

- **Implementing a Local Participation Plan (LPP)** – the LPP will provide measures to incentivise local employment and procurement. The LPP will also include measures to provide training and up-skilling opportunities to ensure the construction workforce is job-ready.
- **Local buying and spending incentives** – encourage the construction workforce to spend money within the local community. This strengthens the relationship between the modification, local businesses and the broader community.

Table 6.48 Summary of social impacts (Umwelt 2026)

Social impact category	Impact on people	Timing	Affected stakeholder groups	Inherent significance	Management measures	Residual significance
Accessibility Way of Life	Improved energy security and reliability across NSW.	Operation	Broader public	High (+)	Communicating Jemena's service catchment through Jemena's website, alongside update of modification activities.	High (+)
Livelihoods	Increased local expenditure due to presence of construction workforce	Construction	Local businesses and service providers Broader community	Medium (+)	Developing a LPP that targets 40% local employment (20 FTE personnel) during the peak construction period.	Medium (+)
Livelihoods Way of life Community Accessibility	Local employment and training opportunities across project phases.	Construction	Unemployed/Looking for work/Job seekers Broader community	Medium (+)	- Developing a LPP that targets 40% local employment (20 full-time equivalent [FTE] personnel) during the peak construction period. - Targeted business information sessions to outline job opportunities.	Medium (+)
		Operation	Unemployed/Looking for work/Job seekers	Low (+)	-	Low (+)
	Opportunities to procure suppliers and services in the social locality.	Construction	Local businesses and service providers Broader community Broader businesses and service providers	Medium (+)	- Developing a LPP that prioritises local business procurement. - Targeted business information sessions to outline job opportunities.	Medium (+)
Livelihoods Way of life Community Accessibility	Improved community infrastructure and social development through the ongoing implementation of a community grants program.	Planning Construction Operation	Local community groups	Low (+)	Advertising the established Community Grants Program and ways to apply for grants.	Medium (+)

Social impact category	Impact on people	Timing	Affected stakeholder groups	Inherent significance	Management measures	Residual significance
Cultural	Damage to Country and loss of Aboriginal cultural values due to potential for Project construction activities to displace and destroy Aboriginal artefacts.	Construction Operation Decommissioning	Aboriginal and/or Torres Strait Islander Groups/Corporations	Medium (-)	- Ongoing engagement with RAPs. - Implementing the recommendations outlined in the amended ACHAR.	Low (-)
Surrounding social amenity	Loss of social amenity due to noise and vibration associated with construction activities.	Construction	Neighbouring landholders Proximal landholders	Medium (-)	Implementation of a complaints and grievances mechanism.	Medium (-)
			Broader community	Negligible (-)	-	Negligible (-)
Accessibility Way of Life	Increased traffic congestion from the commute of the construction workforce and goods transportation to and from the site.	Construction	Host Landholders Neighbouring Landholders Proximal Landholders Broader Community	Low (-)	- Developing a TMP. - Letterbox drops to landholders and residents along transport routes to provide information on upcoming construction activities and schedule. - Scheduling high-traffic construction activities outside of school pick-up and drop-off hours, where possible.	Low (-)
Surrounding Social Amenity Decision-making Systems	Change in surroundings and damage to areas of environmental value due to land clearing and burial of the pipelines.	Construction	Host Landholders Environmental Groups Neighbouring Landholders Proximal Landholders	Low (-)	- Mitigation through management actions recommended in the BDAR. - Offsetting unavoidable residual impacts through the Biodiversity Offsets Scheme.	Low (-)
Surrounding Social Amenity Health and Wellbeing	Increased anxiety/stress surrounding perceived fire or explosion risk associated with the pipeline and potential for	Operation	Neighbouring Landholders Proximal Landholders Broader Community	Low (-)	Ongoing implementation of the CSEP, including providing timely information about the modification and management	Low (-)

Social impact category	Impact on people	Timing	Affected stakeholder groups	Inherent significance	Management measures	Residual significance
Way of Life	gas leakage, breach, or explosion.				strategies to reduce risks associated with the modification. Maintaining the pipeline in accordance with the Pipelines Act, Australian Standards and PL8.	
Surrounding Social Amenity Health and Wellbeing Way of Life	Reduced public safety associated with the pipeline and potential for gas leakage, breach, or explosion.	Operation	Neighbouring Landholders Proximal Landholders Broader Community	Low (-)	Maintaining the pipeline in accordance with the Pipelines Act, Australian Standards and PL8.	Low (-)
Community	Disruption to sense of place due to temporary influx of construction workforce.	Construction	Neighbouring Landholders Proximal Landholders Broader Community	Low (-)	Developing a LPP that targets 40% local employment (20 FTE personnel) during the peak construction period.	Low (-)
Community	Disruption to the level of community cohesion as a result of opposing views towards the modification.	Planning Construction Operation Decommissioning	Broader Community	Low (-)	-	Low (-)
Health and Wellbeing	Diminished health and wellbeing associated with construction and operation of the gas pipeline may result in air pollution and non-potable water contamination.	Construction Operation	Neighbouring Landholders Proximal Landholders Broader Community	Low (-)	- Implementing air and water quality monitoring measures consistent with the recommendations of the SWGA and CAQIA (see Sections 6.5.3 and 6.6.3). - Implementing a spill response plan. - Providing alternative water supply during emergencies.	Low (-)

Social impact category	Impact on people	Timing	Affected stakeholder groups	Inherent significance	Management measures	Residual significance
					Maintaining ongoing engagement with the community per the CSEP.	
Livelihoods	Impacts on local livelihoods associated with changing land use.	Construction Operation	Host Landholders Proximal Landholders Local Businesses and Service Providers	Negligible (-)	Host landholder agreements.	Negligible (-)
Livelihoods	Potential decrease in property values.	Construction Operation	Host Landholders Proximal Landholders	Negligible (-)	-	Negligible (-)
Accessibility Way of Life	Construction workforce may place strain on existing rental and home purchase markets.	Construction	Broader Community	Negligible (-)	Using short-term accommodation only for construction personnel.	Negligible (-)
Accessibility Way of Life	Construction workforce may place strain on existing health facilities and services.	Construction	Health Care Providers Broader Community	Negligible (-)	- Developing a LPP that targets 40% local employment (20 FTE personnel) during the peak construction period. - Providing an on-site first aid officer or nurse.	Negligible (-)
Cumulative Accessibility	Cumulative impact on accommodation and services in the locality, due to construction coinciding with other projects.	Construction	Accommodation providers Broader community	Negligible (-)	- Using short-term accommodation only for construction personnel. - Planning accommodation requirements early and coordinating with local accommodation providers.	Negligible (-)
Surrounding social amenity	Loss of visual amenity and rural character associated with land clearing during the	Construction Operation	Neighbouring Landholders Proximal Landholders	Negligible (-)	-	Negligible (-)

Social impact category	Impact on people	Timing	Affected stakeholder groups	Inherent significance	Management measures	Residual significance
	construction phase, prior to rehabilitation occurring.		Broader Community			

(+) denotes positive impacts, while (-) denotes negative impacts

6.12.3 Mitigation measures

Reference	Mitigation measure	Timing
SO1	A LPP will be developed for the modification, in accordance with the SIA's recommendations. The LPP will include measures to: • Maximise local employment and procurement from local communities and businesses. • Support training, up-skilling and capacity of the local workforce, in collaboration with local stakeholders and training providers. • Develop 'stretch' local employment and procurement commitments in collaboration with relevant stakeholders. • Extend employment and procurement opportunities to women, Aboriginal people and people with disabilities, through appropriate target-setting. • Develop a preferred supplier panel for Aboriginal-owned businesses. • Monitor and evaluate the effectiveness of measures outlined in the LPP.	Prior to construction
SO2	A local buy and spend incentive will be introduced for the construction workforce.	Throughout construction
SO3	Negative social impacts will be avoided or minimised by implementing the mitigation measures outlined in this Modification Report and associated technical reports. These measures will be incorporated into a CEMP, to be developed prior to construction activities commencing.	Prior to construction
SO4	A first aid officer or nurse will be provided for the modification to provide frontline medical treatment to construction workforce.	Throughout construction
SO5	The SMP will be updated to include the following measures: • Promote Jemena's community grants program to communities in proximity to the modification • Ensure information about the modification (including its benefits, service catchment and measures to mitigate any risks) are communicated to the community.	Prior to construction Throughout construction

6.13 Cumulative impacts

Cumulative impacts can occur when impacts arising from the modification overlap or interact with impacts arising from other surrounding projects or land uses. Specifically, cumulative impacts can arise from the:

- compounding effects of multiple projects in an area or region (for example, the development of multiple major projects at the same time)
- accumulation of effects from past, current and future development and land uses (for example, construction fatigue from the consecutive or sequential development of major projects, with little to no breaks in between).

As such, cumulative impacts result in a larger overall effect on local communities, businesses and/or the environment. Cumulative impacts can affect single or multiple environmental or social values.

6.13.1 Methodology

A Cumulative Impact Assessment (CIA) was conducted for the project, in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPHI 2026a) (CIA Guidelines). The methodology used to develop this CIA includes:

- Defining a study area and assessment timespan for the CIA. These are based on the project's characteristics and potential impacts.
- Identifying proposed and approved major projects, modifications and land uses with the potential for cumulative impacts.
- Assessing the possibility, extent and consequence of cumulative impacts, based on data from technical studies, as well as information from other major projects and land uses.
- Proposing mitigation measures to avoid, minimise or offset any identified cumulative impacts.
- Weighing the merits of the project against any residual cumulative impacts.

Study area and assessment timeframe

The study area for the CIA consists of a five-kilometre radius around the modification area. The assessment timeframe for the CIA included the modification's construction period and operational lifespan.

Selection of relevant major projects and land uses

For the CIA, a major project or land use is defined as either a proposed, approved or modified:

- State Significant Development, SSI or Critical State Significant Infrastructure
- controlled action per the EPBC Act
- 'designated development' requiring an environmental impact statement, per Division 5.1 of the EP&A Act.

An initial list of major projects and land uses were identified from the following sources:

- NSW Resources' MinView
- The Australian DCCEE's EPBC Act Public Portal
- DPHI's Major Projects website
- City of Newcastle Development Applications (DA) Register
- City of Maitland DA Register
- Port Stephens Council DA Register.

To determine if a major project or land use should be considered in the CIA, these projects and land uses were screened using the criteria defined in Table 6.49.

Table 6.49 Project selection criteria for CIA

Criterion	Description
Location	• The major project or land use overlaps with the Hunter Lateral Pipeline project. • The major project or land use occurs in proximity (within three kilometres) of the Hunter Lateral project.
Timing	• The timing of a major project or land use's construction or operational activities overlaps with the Hunter Lateral project's construction activities. • A major project or land use's construction or operational activities will occur consecutively to the Hunter Lateral project's construction activities.
Status	A major project or land use is: • Approved projects that have either not commenced construction, is currently under construction, or has been recently completed. • Projects that are currently proposed or being assessed • Future strategic projects proposed by the Australian, NSW and local governments.

Criterion	Description
Scale	A major project or land use involves one or more of the following substantial temporary or permanent impacts to: • traffic conditions • noise • historic and Aboriginal cultural heritage • existing land use • landscape and visual qualities.

Projects that have been considered as part of this CIA are outlined in Table 6.50, and illustrated in Figure 6.28.

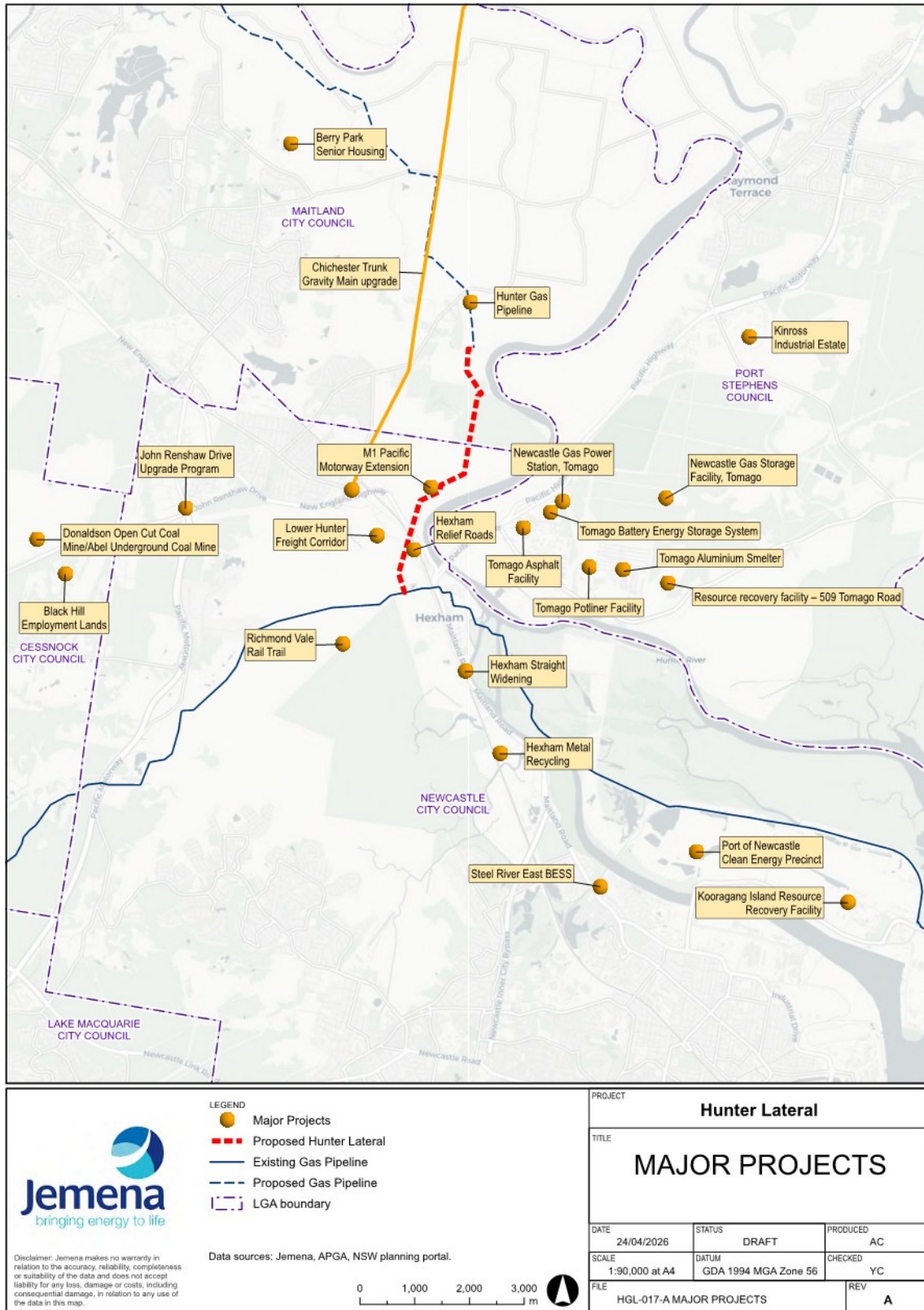


Figure 6.28 Major projects and land uses within 5 km of the modification area

Table 6.50 Relevant projects within 5 km of the modification area

Project name and proponent	Project description	Distance from modification	Interface with modification
Decommissioning			
Donaldson Open Cut Coal Mine/Abel Underground Coal Mine Yancoal Australia	The Donaldson Open Cut Coal Mine (Donaldson Mine) and Abel Underground Coal Mine (Abel Mine) are mines within the Donaldson Complex. The Donaldson Mine was operational between 2001 and 2014 and has since been decommissioned and rehabilitated. The Abel Mine was operational between 2007 and 2016 and has since been placed in 'care and maintenance'. Yancoal is exploring future mining opportunities for the Abel Mine as part of the Tasman Extension Project; while the project has received the required statutory approvals, it is unclear when mining operations will commence.	6 km west	- Negligible traffic impacts expected from remediation operations. - Negligible competition for accommodation and skilled workers.
Operational			
Newcastle Gas Storage Facility, Tomago AGL	The Newcastle Gas Storage Facility is an operational natural gas storage facility located in Tomago, supported by a 5.5 km-long pipeline to a receiving station at Hexham. The gas storage facility receives and stores gas from the Wilton-Newcastle trunk line.	5 km north-east	No direct interface with the modification.
Tomago Potliner Facility Regain Services Pty Ltd	The Tomago Potliner Facility is an operational recycling facility housed within the existing Tomago Aluminium smelter facility at Tomago. The facility recycles the spent pot linings used in aluminium production into materials (e.g. carbon and minerals) that can be used by other industries. Due to the COVID-19 pandemic and the lack of raw materials, commissioning of the project was not complete until April 2024. Since its original SSD approval in August 2009, there have been four modifications made to the SSD approval. The latest modification, Modification 4, proposed the addition of a container cleaning and transit area to the facility. This modification has been approved, but it is unclear if construction has commenced; construction is expected to take three months. For the purposes of this CIA, an overlap with the modification's construction timeframe has been assumed.	3 km east	Competition for skilled workers.
Chichester Trunk Gravity Main upgrade Hunter Water Corporation	The Chichester Trunk Gravity Main (CTGM) Upgrade is an ongoing Hunter Water Corporation capital works programme to replace sections of the original CTGM with new underground pipes. These works are being undertaken to improve the integrity of drinking water supply throughout the Greater Newcastle region.	Adjacent	The modification area runs parallel to the Chichester Trunk Gravity Main.

Project name and proponent	Project description	Distance from modification	Interface with modification
	The Tarro to Shortland section of the CTGM was replaced in 2011, and the Tarro to Duckenfield section of the CTGM was replaced in 2018-2019. These sections of the CTGM are now operational.		
Hexham Relief Roads Australian Rail Track Corporation	The Hexham Relief Roads consist of five 10.9 km-long relief roads (train lines) running parallel to the existing Main Northern Railway. The Hexham Relief Roads was constructed in 2013 and has been operational since 2014. As part of the project, private access roads to adjacent properties were also constructed.	Adjacent	- The modification will intersect the Hexham Relief Roads. - The modification will use access roads developed for the Hexham Relief Roads.
Hunter Gas Pipeline Santos	The Hunter Gas Pipeline is a proposed high pressure gas pipeline between the Wallumbilla Gas Supply Hub in Queensland to Newcastle. Development consent was provided to the project in 2009. Currently, land access negotiations are being conducted with landholders along the pipeline route. Construction of the Hunter Gas Pipeline will be completed in three stages, with construction slated to commence once detailed designs are finalised. The construction timeframe of the Hunter Gas Pipeline is likely to overlap with the construction timeline for the modification.	Adjacent	- The modification will tie-in with the Hunter Gas Pipeline. - The project may need to share construction routes with the modification.
Tomago Asphalt Facility COLAS Australia	The Tomago Asphalt Facility is an operational asphalt batching facility on Kennington Drive, Tomago. The facility was granted development consent in 2007. A modification to the original development consent was sought to increase the facility's annual production limit from 150,000 tonnes per year to 250,000 tonnes per year. This modification involved no changes to the existing site infrastructure and was approved in February 2025.	3 km north-east	- No direct interface with the modification. - Traffic impacts from increased production capacity.
Tomago Aluminium Smelter Tomago Aluminium/Rio Tinto	The Tomago Aluminium Smelter is an existing aluminium smelter located in Tomago. The site has been in operation since 1983, producing up to 600,000 tonnes of aluminium products per year. A new aluminium dross facility has been constructed to manage waste at the facility, and is slated to commence operations in January 2025.	4 km east	- No direct interface with the modification. - Construction timeframe of the modification may overlap with the project's operations.
Under development			

Project name and proponent	Project description	Distance from modification	Interface with modification
M1 Pacific Motorway Extension TfNSW	The M1 Pacific Motorway Extension project will connect the existing M1 Pacific Motorway at Black Hill and the Pacific Highway at Raymond Terrace. This connection consists of a 15 km-long four-lane motorway, the creation of four new interchanges at Tarro, Black Hill, Tomago and Raymond Terrace, as well as a 2.6 km-long viaduct over the Hunter River, the adjacent floodplain, Main North Railway Line and the New England Highway. The project was originally granted development approval in November 2022 and is currently under construction. Major works are ongoing throughout the project area, with completion expected in 2028. One modification to the original development consent has been approved for the project. The modification involved amendments to the project's environmental conditions.	Intersecting	- The modification area intersects the M1 Pacific Motorway Extension project area. - The project will influence transport routes to the modification area. - Construction timeframe of the modification may overlap with the project. - Competition for accommodation and skilled workers.
Hexham Straight Widening TfNSW	The Hexham Straight Widening project involves the widening of Maitland Road between the Newcastle Inner City Bypass at Sandgate and Hexham Bridge, from two lanes to three lanes in each direction. The project also involves the construction of twin bridges across Ironbark Creek (<i>Toohrnbing</i>) and off-road shared use paths. The project is currently being constructed in parallel to the M1 Pacific Motorway Extension project. To date, three new southbound lanes have already been opened from Sparke Street to Hexham Bridge. Works are continuing on the new northbound bridge over Ironbark Creek, traffic signal and road pavement works. This project is expected to be completed by 2026. There have been five modifications to the original development consent for the project granted in 2021. These modifications involve the correction of minor errors, and changes to the design of the project.	Adjacent	- The project will influence transport routes to the modification area. - Competition for accommodation and skilled workers.
Kooragang Island Resource Recovery Facility Boral Recycling (NSW/ACT) Pty Ltd	The Kooragang Island Resource Recovery Facility is a recycling facility that has been operating since 2003. In 2019, Boral Recycling (NSW/ACT) Pty Ltd received development consent to expand the facility's raw materials and products stockpile size and height, operating hours, as well as increasing the permitted production capacity at the facility from 130,000 tonnes per year to 350,000 tonnes per year. The project is currently under construction, with the expanded facility to commence operations by early 2026 (once all management plans for the facility are approved).	11 km south-east	- The operation of the project may coincide with the modification's construction period. - Traffic impacts from increased production capacity.

Project name and proponent	Project description	Distance from modification	Interface with modification
Resource recovery facility – 509 Tomago Road Recycled Concrete Products Pty Ltd	Expansion of an existing resource recovery facility to include new infrastructure. The resource recovery facility also seeks to increase its processing capacity (30,000 tonnes per year to 99,000 tonnes per year) and operating hours (24 hours a day, seven days a week). The proponent is aiming to commence works to expand the facility within six months of receiving development consent. It is unknown how long the construction phase of the expansion will take.		- Construction timeframe of the facility expansion may overlap with the modification. - Competition for skilled workers.
Black Hill Employment Lands Coal & Allied Industries Ltd	The Black Hill Employment Lands encompass the Black Hill, Tank Paddock and part of the Stockrington sites, located along John Renshaw Drive. These undeveloped sites will be subdivided into 138 smaller industrial lots (<i>englobo</i>). Development consent based on a concept plan was granted for the area in 2013. Since then, this land has been cleared and developed in stages, in accordance with a development approval provided by the CN in 2021. The Staging Plan for the Black Hill Employment Lands (submitted as part of DA2021/01256, City of Newcastle), includes works to upgrade the John Renshaw Drive/M1 Pacific Motorway/Weakleys Drive intersection. The Traffic Modelling and Upgrades Assessment for the Staging Plan (Bitzios Consulting 2022) assumed that these works will be complete 'before 2026'.	10 km west	- Construction activities within the estate may overlap with the modification. - Competition for skilled workers.
Kinross Industrial Estate CABP Group Pty Ltd	The Kinross Industrial Estate encompasses several lots at 343 and 470 Masonite Road, Heatherbrae. These undeveloped lots will be subdivided into 142 smaller industrial lots (<i>englobo</i>) across 16 development stages. Development consent for this subdivision was granted in 2009, with subsequent modifications made to the layout and staging of the development.	6 km east	Construction activities within the estate may overlap with the modification.
Determination			
Newcastle Gas Power Station, Tomago AGL	The Newcastle Gas Power Station is a proposed 250-megawatt gas fired power station that will be connected to AGL's existing Newcastle Gas Storage Facility. The purpose of the power station is to provide 'firming' capacity to the National Electricity Market. Originally, construction was slated to begin in 2021, with operations to commence from 2022. While development consent has been granted for the project in March 2021, AGL has since paused the project. AGL is currently considering other options for the power station site, including the Tomago Battery Energy Storage System (BESS) proposal. It is currently unclear whether AGL plans to proceed with either project. The Newcastle Gas Power Station EIS states that construction is intended to commence in 2021 and will take approximately two	4 km north-east	- Competition for accommodation and skilled workers. - Traffic impacts throughout the construction period

Project name and proponent	Project description	Distance from modification	Interface with modification
	years to complete. For the purposes of this CIA, an overlap with the modification's construction timeframe has been assumed.		
Tomago Battery Energy Storage System AGL	The Tomago BESS is a proposed 2,000 megawatt hours battery energy storage system located on the site of the proposed Newcastle Gas Power Station. Like the Newcastle Gas Power Station, the purpose of the project is to provide 'firming' capacity to the National Electricity Market. It is currently unclear whether AGL plans to proceed with the Tomago BESS or Newcastle Gas Power Station project. The project EIS (AECOM 2023) states that construction is intended to commence in the second quarter of 2026 and will take approximately 36 months to complete. As the Newcastle Power Station has the potential to cause more direct and indirect impacts, the project has not been considered as part of the CIA.	4.5 km east	• Competition for accommodation and skilled workers. • Traffic impacts throughout the construction period.
Richmond Vale Rail Trail City of Newcastle	The Richmond Vale Rail Trail is a proposed 18 km off-road cycle trail that will run from Hexham to Shortland, Minmi and Lenaghan. The rail trail will traverse the disused portions of the former Richmond Vale Railway Line and the former alignment of the CTGM. A portion of the project within the City of Newcastle LGA received development consent in December 2021. Construction is expected to be undertaken in three stages (Shortland to Tarro, Hexham to Pambalong Nature Reserve and Fletcher to Minmi Junction). Construction was slated to begin in 2020; however, land acquisitions required for the projects have only been finalised in December 2025. Construction is expected to take 12 to 18 months—for the purposes of this CIA, an overlap with the modification's construction timeframe has been assumed.	Adjacent	• The project is located parallel to the eastern boundary of the modification area. • Construction timeframe of the modification may overlap with the project. • Competition for accommodation and skilled workers • Traffic impacts throughout the construction period • Potential cumulative environmental impacts to downstream sensitive receivers (e.g. wetlands).
Steel River East Battery Energy Storage System	The Steel River East Battery Energy Storage System (BESS) is a proposed energy storage system with a maximum power output capacity of up to 200 MW/400 MWh (2 hours). The BESS would connect to the existing Mayfield West substation via a 33 kV underground cable.	6 km south-east	• Construction timeframe of the modification may overlap with the project.

Project name and proponent	Project description	Distance from modification	Interface with modification
Ausgrid	Construction is expected to commence in late 2025, and is scheduled to be completed by late 2027.		• Competition for accommodation and skilled workers • Traffic impacts throughout the construction period
Assessment			
Hexham Metal Recycling InfraBuild	The InfraBuild Recycling facility at Hexham is an existing metal recycling facility located at Sparke Street, Hexham. A modification was proposed in 2020 to construct a new non-ferrous yard, truck overflow parking areas and maintenance workshops on the site. This modification is currently under assessment. While the Modification Application does not indicate when construction of the new site infrastructure will begin, it is expected that construction will take 10 weeks to complete. For the purposes of this CIA, an overlap with the modification's construction timeframe has been assumed.	3.5 km south	• Construction timeframe of the modification may overlap with the project. • Competition for skilled workers
Prepare EIS/documentation			
Port of Newcastle Clean Energy Precinct Port of Newcastle	The Port of Newcastle's Clean Energy Precinct is a proposed clean energy production, storage and distribution precinct to be located on a 220-hectare site on Kooragang Island. Currently, the EIS for this project is being prepared, with construction expected to begin in 2027 (subject to the submission of the concept development application EIS in 2026). For the purposes of the CIA, it is assumed that part of the project's construction will overlap with the modification's construction timeframe.	6 km south-east	• Construction timeframe of the modification may overlap with the project. • Competition for accommodation and skilled workers
Berry Park Senior Housing Berry Park Retirement Village Pty Ltd	This SSD proposes to expand the existing Berry Park Village and Gatehouse seniors' housing developments along McFarlanes Road with 913 dwellings for seniors and associated open space and community facilities. A concurrent planning proposal (rezoning) and SSD application has been lodged for this development. It is unknown when construction of this project will commence, or how long construction of this project will take. It is assumed that this development will be staged, consistent with typical housing developments.	9 km north	• Construction activities within the estate may overlap with the modification. • Competition for skilled workers.
Proposed			

Project name and proponent	Project description	Distance from modification	Interface with modification
Lower Hunter Freight Corridor TfNSW	The Lower Hunter Freight Corridor is a proposed freight rail line between Fassifern and Hexham, bypassing the Newcastle urban area. This freight line allows freight movements to be separated from passenger movements, reducing rail network congestion within the Newcastle region. The land for the corridor is currently protected through the Sydney Trains Corridor Protection Zone. This corridor is an important freight rail link – the preservation of the corridor is a key action in the NSW Freight and Ports Strategy and the State Infrastructure Strategy. While the route for the Lower Hunter Freight Corridor has been confirmed, detailed designs have not been developed for the project. The <i>Hunter Strategic Regional Integrated Transport Plan</i> (TfNSW 2025b) outlines a high-level timeline for the project: • Concept and detailed design of the Lower Hunter Freight Corridor is a short-term action, to be completed within five years • Construction of the freight corridor will occur within 5-10 years. There is a low likelihood for the construction phase of the Lower Hunter Freight Corridor will overlap with the Hunter Lateral Project. As such, this project has not been considered as part of the CIA.	Adjacent	N/A
John Renshaw Drive Upgrade Programme TfNSW	The John Renshaw Drive and Weakleys Drive intersections with the M1 Pacific Motorway will be upgraded as part of a joint \$15 million investment between the Australian and NSW governments. Preliminary investigations for the project are ongoing; there are no confirmed timelines for planning approval and construction of the upgrade. There is a low likelihood for the construction phase of the upgrade will overlap with the Hunter Lateral Project. As such, this project has not been considered as part of the CIA.	3.3 km west	N/A

6.13.2 Assessment

A qualitative assessment of the cumulative impacts associated with the Hunter Lateral Pipeline project has been conducted. A total of five potential cumulative impacts has been identified as part of the CIA.

Traffic impacts

There is a potential for cumulative traffic impacts as a portion of the Hunter Lateral Project's construction vehicle routes overlap with traffic routes for other major projects within the region:

- Most projects identified in Table 6.50 will traverse a portion of **Maitland Road, New England Highway and/or the Pacific Highway** at Hexham for their construction or operational traffic routes.
- The M1 Pacific Highway Extension and Richmond Vale Rail Trail projects will use **the Aurizon Access Road and Woodberry Road** for construction traffic.
- The Berry Park Senior Housing development may use **Woodberry Road** for construction traffic, although an EIS for this project has not been prepared.

The Hunter Lateral, Richmond Vale Rail Trail, Berry Park Senior Housing and M1 Pacific Motorway Extension projects may use Woodberry Road and/or the Aurizon Access Road for construction access. Woodberry Road forms a part of several school bus routes operated by CDC NSW. As such, additional engagement and coordination as part of a Construction Traffic Management Plan (CTMP) is necessary to reduce safety risks to school bus passengers associated with increased heavy and light vehicle traffic. The Aurizon Access Road is a narrow local road which is not suitable for simultaneous two-way passing traffic. Coordination between major projects will be necessary to minimise the likelihood of heavy vehicles departing and arriving the access road simultaneously.

It is expected that the additional construction and operational traffic arising from major projects within the region will not affect the performance of Maitland Road and the Pacific Highway. However, the capacity of Maitland Road and the Pacific Highway may be reduced because of temporary traffic changes required for the M1 Pacific Motorway Extension and Hexham Straight Widening. This may result in traffic queues and delays at major intersections along both roads. This reduction in capacity will only be temporary; temporary traffic controls will be removed once both projects are complete. It is expected that the upgrades to Maitland Road and the Pacific Highway will increase the efficiency and capacity of the regional road network to cater for the major projects identified in Table 6.50.

The Hunter Lateral project will have a negligible impact on the local and regional road network when it is operational.

Noise and vibration impacts

Cumulative noise impacts can be caused by a combination of increased traffic, construction and/or operational activities, and are most likely to occur with the simultaneous development of neighbouring or intersecting major projects. The M1 Pacific Motorway Extension, Richmond Vale Rail Trail, Hexham Straight Widening and Hunter Gas projects have been considered for cumulative noise and vibration impacts.

The following should be noted when assessing cumulative noise and vibration impacts involving the Hunter Lateral Project:

- When a NSR is affected by noise and vibration from multiple projects and land uses at the same time, it is likely that noise and vibration levels from one project or land use would dominate over other noise and vibration impacts. As such, the resulting noise and vibration level experienced by an NSR would only increase marginally due to surrounding major projects or land uses.
- The Hunter Lateral NVIA has modelled noise and vibration impacts for the entire project, as if the project is being developed in one stage. In reality, civil engineering and installation works for the Hunter Lateral will be undertaken progressively, in stages.
- Most construction activities for the Hunter Lateral will occur at different times and locations. However, there may be instances where construction activities for multiple major projects may occur at the same time, close to each other.

The Construction NVIA has accounted for noise impacts from the Hexham Straight Widening and M1 Pacific Motorway Extension projects. The noise impacts from both projects on NSRs have been captured as part of baseline noise measurements for the Construction NVIA. These baseline noise measurements form the basis for the construction noise and vibration management limits used to assess noise impacts from the Hunter Lateral Project. As noted in Section 6.4, the noise impacts of the Hunter Lateral Project are generally compliant with the noise management limits for each NSR, with exceedances expected for seven NSRs (depending on the construction stage). Mitigation measures for noise impacts have been prescribed in Section 6.4.3.

The Richmond Vale Rail Trail and Hunter Gas Pipeline projects have not commenced; this CIA has assumed that the construction timeline for both projects will overlap with the development of the Hunter Lateral project. As the construction noise impacts of the Hunter Lateral project will be localised, there is a possibility of minor noise and vibration impacts if construction works for these projects occur at the same time, or in close proximity. Section 6.4.3 describes mitigation measures to avoid or reduce cumulative noise and vibration impacts.

The Hunter Lateral Pipeline project will have a minor vibration impact to NSRs throughout construction and operation. The project is also expected to have negligible noise impacts when it is operational. Hence, the project will have negligible long-term noise and vibration impacts on NSRs.

Surface water and groundwater impacts

The SWGA conducted a high-level assessment of cumulative surface water and groundwater impacts associated with the Hunter Lateral Pipeline project. The cumulative impact to surface water and groundwater will be minor as major projects near the Hunter Lateral Pipeline are nearing completion. The SWGA has also proposed several mitigation measures to reduce the Hunter Lateral Pipeline's direct impacts on acid sulphate soils, surface water and groundwater. These mitigation measures are outlined in Section 6.6.3.

Aboriginal cultural heritage

Cumulative impacts to Aboriginal cultural heritage may arise from impacts to cultural heritage sites and intangible cultural values of the modification area.

As noted in Section 6.2, Site 38-4-1810 is located within the modification area, along the Tarro Levee and access track. If Site 38-4-1810 is still considered a valid cultural heritage site on AHIMS, the ACHAR recommends the artefact be salvaged and temporarily stored prior to construction works.

This mitigation measure will minimise cumulative impacts to tangible cultural heritage associated with the use of the access track.

The ACHAR noted that there may be intangible cultural heritage values associated with the broader region and the Hunter River (*Coquun*). It is not expected that the Hunter Lateral Pipeline's construction phase will cause additional landscape and visual impacts beyond the impacts arising from the M1 Pacific Motorway Extension Project. Once complete, the Hunter Lateral Pipeline will cause negligible landscape and visual impacts.

Socio-economic impacts

Major projects and land uses within a region can introduce positive cumulative impacts, such as new employment and skills development opportunities for the local workforce. The possibility of these positive impacts has been assessed below:

- **Local employment and procurement** – there will be opportunities for residents and businesses within the Greater Newcastle region to support the construction of the project. Supporting local employment and procurement also helps grow the local infrastructure sector for future major projects.
- **'Spillover' economic benefits** – the Hunter Lateral Pipeline project will also support the growth of other supporting industries. This creates further indirect employment and procurement opportunities within the region.

However, the simultaneous development of multiple major projects may also introduce negative cumulative impacts. The development of multiple major projects may place pressures on workforce, social infrastructure and accommodation availability within a region. The possibility of these impacts has been assessed below:

- **Construction workforce pressures** – as outlined in Section 3.2.4, a total of 50 construction personnel will be required during the peak construction period, a relatively modest figure when compared to other major projects proposed within the Greater Newcastle region (see Table 6.51). At the same time, the SIA has demonstrated that there is sufficient availability of people with the skills required to support the project. While the Hunter Lateral Pipeline will not overburden local construction workforce availability, proposed large-scale major projects such as may impact construction workforce availability.
- **Accommodation pressures** – Jemena proposes to source the majority of the construction workforce required for the Hunter Lateral Pipeline project from the Newcastle area. There will be a small number of construction personnel from outside the Newcastle area that will require accommodation within commuting distance of the modification area. The Hunter Lateral Pipeline project is not expected to cause significant direct and indirect impacts to local accommodation availability.
- **Social infrastructure pressures (sporting, recreation and healthcare)** – as most of the Hunter Lateral Pipeline's construction workforce will be sourced locally, minimal impacts to the availability of social infrastructure are expected. The project will not cause an influx of project personnel into the region.
- **Social integration** – social integration issues associated with the influx of construction workers into the Newcastle area is not expected. Most of the Hunter Lateral Pipeline's construction workforce will be sourced locally. Construction personnel recruited by Jemena

and its subcontractors will also be expected to behave appropriately and conform to professional standards.

Mitigation measures to avoid or minimise all negative socio-economic impacts resulting from the Hunter Lateral Pipeline project are outlined in Section 6.12.3.

Table 6.51 Construction workforce requirements for major projects

Project	Peak construction workforce	Local employment commitments	Construction duration
Hunter Lateral Pipeline	50	Majority of workforce to be sourced from the Hunter region.	Seven months in 2026 or 2027
Under development			
M1 Pacific Motorway Extension Project (TfNSW 2021b)	1,050 per year	Workforce to be sourced from the Hunter and Greater Sydney regions.	Five years (2023-2028)
Hexham Straight Widening (Jacobs and TfNSW 2021)	500	Workforce to be sourced from the Hunter region, where possible.	30 months (completion by 2026)
Tomago Resource Recovery Facility – 509 Tomago Road	No information available; assumed to be 5-10 based on Hexham Metal Recycling.	No information available; assumed to be sourced from the Hunter region.	No information available; assumed to be 10 weeks based on Hexham Metal Recycling (no confirmed construction timeline)
Black Hill Employment Lands	No information available; project will be developed progressively.	No information available; assumed to be sourced from the Hunter region.	No information available; project will be developed progressively based on demand.
Kinross Industrial Estate	No information available; project will be developed progressively.	No information available; assumed to be sourced from the Hunter region.	No information available; project will be developed progressively based on demand.
Determination			
Newcastle Gas Power Station (AGL and Aurecon 2019)	300	Majority of workforce to be sourced from the project's surrounding areas.	24 months (no confirmed construction timeline)
Richmond Vale Rail Trail (GHD 2019)	85	Workforce to be sourced from the Hunter region.	12-18 months (no confirmed construction timeline)
Steel River East BESS (AECOM 2025)	100 for construction works, five for commissioning activities	No firm commitments on local employment and procurement; EIS indicates measures to prioritise local hiring and procurement where practical.	18 months (Q3 2025 to Q1 2027)
Assessment			

Project	Peak construction workforce	Local employment commitments	Construction duration
Hexham Metal Recycling (Ethos Urban 2020)	5-10	No information available; assumed to be sourced from the Hunter region.	10 weeks (no confirmed construction timeline)
Prepare EIS			
Port of Newcastle Clean Energy Precinct (WSP 2023)	5,261, across all construction stages	Workforce to be sourced from the Hunter region.	1-2 years (construction to commence in 2027, subject to concept development application submission)
Berry Park Seniors Housing	Project will be developed progressively.	No information available; assumed to be sourced from the Hunter region.	No information available; project will be developed progressively based on demand.

6.13.3 Mitigation measures

Table 6.52 Cumulative impact management measures

Reference	Mitigation measure	Timing
CI1	A protocol will be developed to coordinate construction activities with surrounding major projects and land uses.	Throughout construction
CI2	Early notifications of construction activities and heavy vehicle movements will be provided to the surrounding major projects and land uses.	Throughout construction

7 Justification and conclusion

As discussed in Chapter 2, the modification will serve as a crucial piece of ‘midstream’ gas infrastructure that will allow gas from Narrabri, northern NSW and the Wallumbilla Gas Supply Hub, Queensland to be supplied to the domestic gas market. This will support the reliability of the domestic gas network as end users will be able to access increased gas supply. The modification will also add competition to the domestic gas market as it increases the number of gas sources available.

As such, the modification complements the findings and actions identified in the GSOO and the *Future of Gas Statement* (NSW) (Department of Regional NSW 2021) by developing gas-related infrastructure to meet the increased demand for gas. Increased accessibility to gas will also unlock economic opportunities for the broader Hunter region, including the development of gas grid-forming generation projects.

7.1 Scale and nature of impacts

The modification’s location and nature both raise specific environmental and planning considerations as outlined in state, regional and local planning policies. These include the protection of freight corridors, agricultural land, natural areas and waterways, as well as ensuring the resilience of infrastructure against climate change impacts. The modification’s impacts on these considerations have been assessed in the previous chapter; Chapter 6.

A summary of key environmental and land use planning impacts arising from the modification is provided below. Where potential impacts have been identified, the Modification Report and associated technical studies have provided measures to avoid, reduce and/or offset these impacts. A consolidated list of mitigation measures has been provided in **Appendix B**.

7.1.1 Environmental

Table 7.1 provides a summary of impacts and mitigation measures for potential environmental impacts arising from the modification. In addition to these impacts, the following environmental considerations discussed in Section 2.2 have been considered in this Modification Report:

- **Protecting natural areas** – the modification will avoid impacts to the riparian areas of intersecting waterways (including Francis Greenways Creek) by using the HDD pipeline installation method; the modification area will avoid the Hunter River (*Coquun*) riparian area. The riparian areas of both waterways constitute regionally significant biodiversity corridors.
- **Protecting waterways** – per the SWGA, management and monitoring measures will be implemented to ensure stormwater run-off, contaminants and sediment from the modification’s construction do not adversely affect surface water and groundwater quality. An ASSMP will also be in place to ensure exposed acid sulfate soils are managed to prevent acid leaching into surface water and groundwater.

The modification’s consistency with the ESD principles (as outlined in Section 193 of the EP&A Regulation) has also been assessed as part of this Modification Report. As demonstrated in Table 7.2, the modification will be consistent with the ESD principles.

Table 7.1 Summary of environmental impacts

Environmental impacts	Summary of impacts	Summary of mitigation measures
Surface water and groundwater	- Construction activities may mobilise sediment or introduce contaminants (such as oils, as well as fuels from spills and leaks) into surface water and groundwater. Flooding will compound this impact to water quality. - Exposed acid sulfate soils may leach into surface water and ground water. - Construction dewatering activities may temporarily lower the water table within the modification area.	Minimisation - Develop an ESCP with sediment and erosion control measures, as well as measures to manage stormwater flows. - Develop an ASSMP to minimise impacts from acid sulfate soils from dewatering activities. Monitoring - Implementing a surface water and groundwater monitoring regime, based on the performance benchmark prescribed in the SWGA.
Flora and fauna	- No specific threatened flora species were found within the modification area. - Clearing 9.08 ha of native vegetation within the modification area. This includes potential habitat for two endangered species listed under the BC Act.	Avoidance - Use HDD to install pipeline segments in environmentally sensitive areas, such as waterways. - Refining the modification area to avoid environmentally sensitive watercourses. - Incorporate measures in the CEMP to ensure works, equipment or vehicles are not located outside the modification area. Minimisation - Refining the modification area to reduce clearing of native vegetation. - Prepare a BMP to manage vegetation clearing activities, as well as protect surrounding florae and faunae. Offsetting - Retire biodiversity and species credits through the NSW Biodiversity Offsets Scheme, in accordance with the BDAR.
Air quality	Construction dust may impact surrounding sensitive receivers.	Minimisation - Include air quality management measures in the CEMP. This includes measures to notify sensitive receivers about dust impacts, stage vegetation clearing and ensure proper maintenance of equipment. Monitoring - Daily site inspections and monitoring of local meteorological forecasts. - Log dust complaints in a complaints register.
Greenhouse gas	The modification does not meet the large emitters threshold per the <i>NSW Guide for Large Emitters</i> (NSW EPA 2025).	Minimisation - Implement fuel efficiency measures, including sourcing materials from local areas. - Source low-carbon materials where practical. Monitoring - Implement a formal leak detection program when the pipeline is operational.

Table 7.2 Ecologically Sustainable Development principles

ESD principle	Response
The precautionary principle	The precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. The Modification Report and associated technical reports have assessed the potential for the modification to cause SAIL to the environment. As discussed in Section 2.4, refinements to the modification area and construction methodology have been made based on the specialist technical assessment of the modification area. The BDAR does not consider that the modification will cause SAIL to threatened flora, fauna and TECs. This is provided the recommendations outlined in the BDAR is implemented. As such, these measures will result in a modification that will have a minor overall impact on the environment. Additionally, a conservative (worst-case) approach to assessing environmental impacts have been adopted for this Modification Report. Based on the findings of these assessments, management and monitoring measures have been proposed for each environmental and land use planning consideration. These measures avoid, reduce or offset the modification's potential impacts to the environment arising from all direct and cumulative impacts. It is considered that the modification's assessment is consistent with the precautionary principle.
Intergenerational equity	Intergenerational equity has been considered as part of the Hunter Gas Pipeline. This includes: • Avoiding and minimising impacts to Aboriginal cultural heritage within the modification area, guided by the ACHAR's findings and consultation with RAPs. • Avoiding impacts to historic heritage located near the modification area. • Avoiding, minimising and offsetting impacts to biodiversity (discussed in <i>Conservation of biological diversity and ecological integrity</i>). • Where practical, reducing greenhouse gas emissions from the modification's construction and operation, guided by the recommendations of the GHG Assessment. The modification will also support the growth of 'downstream' industries throughout the Newcastle area such as gas firing energy generation. It is considered that the modification is consistent with the principle of intergenerational equity.
Conservation of biological diversity and ecological integrity	Actions have been taken as part of this modification to avoid or minimise impacts to biodiversity where possible. This includes: • Assessing the existing environmental context of the modification area, and the modification's impacts to the environment through the BDAR. • Guided by the BDAR's findings, locating the pipeline, supporting infrastructure and work areas away from environmentally sensitive areas. • Using the HDD installation method to avoid impacts to waterways and waterfront land. • Ensuring temporary and permanent erosion and sediment controls are provided as part of the modification, minimising the impact to waterways intersecting the modification area. • Guided by the BDAR's findings, offsetting any residual impacts to threatened flora, fauna and their habitats through the NSW BOS. • Guided by the BDAR, incorporating management measures to ensure the modification's construction does not impact surrounding native flora, fauna and TECs. As such, it is demonstrated that the conservation of biological diversity and ecological integrity has been a primary consideration in the design, construction and operation of the Hunter Lateral Pipeline.

ESD principle	Response
Improved valuation, pricing and incentive mechanisms	The modification has accounted for the cost of compliance with all relevant environmental legislation. Examples include costs associated with specialist environmental assessments, as well as mitigation and monitoring measures throughout the construction and operation of the modification. Jemena will also be offsetting residual impacts to threatened species and TECs by retiring biodiversity and species credits in accordance with the NSW Biodiversity Offsets Scheme. It is considered that the modification's assessment, mitigation and monitoring measures are consistent with the principle's intent to provide improved valuation and pricing mechanisms for development in NSW.

7.1.2 Social

Table 7.3 provides a summary of impacts and mitigation measures for potential social impacts arising from the modification. In addition to these impacts, the following social considerations discussed in Section 2.2 have been considered in this Modification Report:

- **Ensuring infrastructure is resilient against natural hazards** – per the SWGA, the modification will not increase the flood risk of surrounding areas. As the modification area is vulnerable to flooding, the SWGA has proposed mitigation and monitoring measures to avoid or reduce impacts to property and human life associated with flooding.

Table 7.3 Summary of social impacts

Consideration	Summary of impacts	Summary of mitigation measures
Aboriginal cultural heritage	• Site 38-4-1810 will be impacted by construction activities, if the site is still present within the modification area. • Potential impacts to intangible cultural heritage values within and surrounding the modification area. • Potential for undiscovered cultural heritage sites within the modification area.	Avoidance • If Site 38-4-1810 remains valid on AHIMS, attempt a salvage and temporary storage of the site. Minimisation • Amend the CHMP for SSI-46360740 to include provisions for Site 38-4-1810. • Include a procedure for unexpected Aboriginal cultural heritage finds in the CEMP.
Historic heritage	• Little to no impact to surrounding historic heritage sites are expected during the modification's construction and operation.	Avoidance • Demarcate work zones, and ensure project vehicles do not locate outside of these work zones. Minimisation • Include a procedure for unexpected historic heritage finds in the CEMP.
Hazards	• The modification does not pose a significant risk to the community in the event of a pipeline rupture. Several sensitive receivers adjacent to the modification may be affected by a pipeline rupture event. • The modification area is susceptible to flooding. The modification area will not be safe to traverse by foot or vehicles during a flood.	Avoidance • Conduct major construction works for the modification during the dry season. • Designing the modification to have sufficient depth of cover. • Elevating critical pipeline components above the 1 in 100-year ARI + 20% rainfall increase flood level. A 50 m freeboard will also be included.

Consideration	Summary of impacts	Summary of mitigation measures
		- Ensure the pipeline is maintained in accordance with a pipeline management system. Minimisation - Develop an ERP and FEMP to manage all pipeline- and flooding-related emergency events. - Conduct an SMS to identify and mitigate identified safety threats to the pipeline. - Monitor flood warnings from the BOM.
Social impacts	- The modification will have positive impacts on local employment, training and procurement opportunities. - The modification will also have a positive impact on NSW's energy security. - However, the modification may cause some negative impacts on traffic, accommodation availability and amenity.	Minimisation - Develop an LPP to encourage local employment and procurement, especially from women, Aboriginal-owned businesses and people with disabilities. - Implement a local buy/spend incentivisation policy for the construction workforce. - Update the SMP to provide a tailored communication and engagement plan for the modification's construction.
Noise and vibration	- While construction noise levels will generally be in accordance with the project noise limit, there is a risk of discernible elevated noise at seven NSRs. - Modification vibration impacts will be negligible.	Minimisation - Develop a Construction NVP in accordance with the recommendations outlined in the Construction NVIA. Monitoring - Conduct additional noise and vibration measurements during the modification's commissioning phase. - Develop a complaints handling process to track noise- and vibration-related complaints.

7.1.3 Economic

Table 7.4 provides a summary of impacts and mitigation measures for potential economic impacts arising from the modification. In addition to these impacts, the following economic considerations discussed in Section 2.2 have been considered in this Modification Report:

- **Protecting productive agricultural land** – the modification is located on land that has a moderate to low agricultural capability to sustain intensive agricultural land uses. The modification is not located on land identified as BSAL. The modification will not cause the fragmentation of existing agricultural land. While the modification is a non-agricultural land use, the modification area will continue to be used as grazing land once the modification is operational.
- **Protecting operating and future freight corridors** – the modification's construction and operations will not jeopardise the safe and efficient operations of the New England Highway and the future M1 Pacific Motorway Extension. The modification will minimise disruptions to the Main Northern Line by using trenchless pipeline installation methods. The modification will also minimise impacts to land that has been set aside for the Lower Hunter Freight Corridor;

the modification will be installed underground to allow the freight corridor to be developed in the future.

Table 7.4 Summary of economic impacts

Consideration	Summary of impacts	Summary of mitigation measures
Traffic and transport	- Construction routes and access arrangements for the modification are generally suitable for heavy and light vehicles. However, some local road intersections are too narrow to allow simultaneous two-way heavy vehicle movements. - The traffic generated by the modification will have a negligible impact on the efficiency of the existing road network.	Avoidance - HDD usage to avoid impacts to existing and future transport corridors. Minimisation - Develop a construction TMP which includes traffic management measures to manage heavy, light and OSOM vehicle movements on narrow local roads. - Engage with the M1 Pacific Motorway Extension project team, bus and rail operators to ensure construction traffic does not impact to road safety, infrastructure or the operation of transport infrastructure.
Land	- The modification area is currently used for grazing. The modification area mainly comprises land considered to have a moderate to low agricultural capability. - The modification may expose acid sulfate soils, which can cause negative environmental impacts. - The modification is not expected to worsen the agricultural capability of the land. - There are localised areas of land contamination within the southern portion of the modification area. There is no widespread land contamination within the modification area.	Avoidance - Avoid any areas previously identified as contaminated land where practical. Minimisation - Conduct soil testing of previously identified contaminated areas. - Incorporate measures to manage acid sulfate soils, contaminated soils and groundwater into the CEMP. - Manage waste from the modification's construction in accordance with the PoEO Act and relevant EPA guidelines. - Implement an ESCP, in accordance with the mitigation measures outlined in the SWGA. - Manage of noxious weeds and pests in accordance with the <i>Biosecurity Act 2015</i> (NSW).

7.2 The public interest

A targeted stakeholder engagement program with near neighbours and government regulators has been undertaken for the modification. Engagement was also undertaken with RAPs, local businesses and residents to support the preparation of the SIA and ACHAR. As outlined in Section 5.5, considerations raised during engagement included:

- Interfaces with third-party infrastructure, including transport and flood mitigation infrastructure
- Potential conflicts with agricultural land uses and rural residences.
- Flooding and drainage impacts.
- The management of Aboriginal cultural heritage.

Community and stakeholder feedback has been considered as part of this Modification Report. This has been supported by avoidance and mitigation measures. Where practical, feedback has also been incorporated into the modification's design and construction methodology.

7.3 Monitoring and compliance

A consolidated table of mitigation measures outlined in this Modification Report are provided in **Appendix B**.

Subject to the approval of this modification, the mitigation measures recommended in this Modification Report will be implemented through a project-specific environmental management framework and pipeline management system developed by Jemena. Environmental management plans will be developed to guide specific aspects of the project's construction and operation. These include a:

- Construction Environmental Management Plan, supported by a/an:
 - Erosion and Sediment Control Management Plan (including measures to manage stormwater flows)
 - Soil and Water Management Plan (including an Acid Sulfate Soil Management Plan)
 - Waste Management Strategy
 - Cultural Heritage Management Plan
 - Biodiversity Management Plan (including a Weed and Disease Control Plan)
 - Traffic Management Plan
 - Emergency Response Plan (including a Flood Emergency Response Plan and spill management procedure)
 - Noise and Vibration Management Plan
 - Community and Stakeholder Engagement Plan
 - Property Management Plans for specific land parcels.
- Operational Environmental Management Plan, supported by a/an:
 - Emergency Management Plan
 - Safety Pipeline Management Plan.

These environmental management plans will include monitoring measures to assess the modification's continued compliance with regulatory requirements.

7.4 Conclusion

This Modification Report has assessed the Hunter Lateral Pipeline's impacts on the modification area and surroundings, from a social, environmental and economic perspective. The Modification Report also evaluated the modification's consistency with statutory requirements, as well as strategic objectives and actions. All direct, indirect and cumulative impacts resulting from the modification's construction and operations were assessed in accordance with relevant guidelines.

The Modification Report has demonstrated that the modification is justified on **environmental** grounds for the following reasons:

- **The potential and severity of environmental impacts relating to the modification are well-understood.** These impacts have been assessed through specialist technical reports, as summarised in Chapter 6 and appended to this Modification Report. In accordance with the

precautionary principle, a conservative (worst-case) approach to assessing environmental impacts has been adopted in this Modification Report.

- **Mitigation measures to avoid or minimise environmental impacts as far as possible have been adopted in this Modification Report.** These mitigation measures will be incorporated into the management plans outlined in Section 7.3, supported by monitoring measures to ensure these mitigation measures are implemented. If impacts to threatened flora and fauna cannot be avoided, these impacts will be offset.
- **A precautionary approach to avoiding and minimising environmental impacts was adopted for the modification.** Jemena has made changes to the modification area and adopted HDD installation technologies for environmentally sensitive areas; these changes were based on an initial review of the modification area's environmental constraints.

The Modification Report has also demonstrated that the modification is justified from a **land use planning** perspective for the following reasons:

- **Mitigation measures have been provided to address the common land use planning considerations** outlined in state, regional and local planning policies. Even though environmental planning instruments do not apply to SSIs per Section 5.22(1) of the EP&A Act, the Modification Report has also sought to evaluate the modification's consistency with the mandatory considerations outlined in these environmental planning instruments.
- **The modification is considered permissible with consent** per Section 2.75(1) of the Transport and Infrastructure SEPP. The Modification Report has considered the modification's consistency with the principles of ESD and the objects of the EP&A Act.
- **The modification is consistent with the objectives of the zones it traverses.** The modification will neither fragment nor introduce land use conflicts with productive agricultural land. At the same time, the modification will not cause long-term impacts to the Hunter River floodplains and the nearby Hexham Wetlands.

The modification will provide a **net economic and social benefit** for the region, after accounting for the modification's environmental and land use planning impacts. This is because:

- Mitigations to **avoid or minimise potential amenity, traffic and Aboriginal cultural heritage impacts** have been provided.
- In addition to providing energy security for the domestic gas market, the modification will provide **direct and indirect opportunities for local training, employment and procurement during construction and operation.**
- **Feedback received during community and stakeholder engagement** has been used to inform the design and development of the modification.

Hence, the residual impact from the modification is unlikely to cause SAIL to the modification area and broader region's environmental, social and economic assets. Therefore, **the modification is consistent with the principles of ESD, and the objectives of the EP&A Act.**

8 Next steps

This Modification Report and associated specialist technical reports will be submitted to the DPHI for assessment. The Modification Report and associated specialist technical reports will also be published on the Major Projects website.

The DPHI will then decide if a public exhibition is necessary for this modification —here, the DPHI considers whether there is any material environmental impact beyond the impacts of the existing Killingworth to Kooragang Island Pipeline.

Figure 8.1 illustrates the SSI infrastructure approvals modification process.

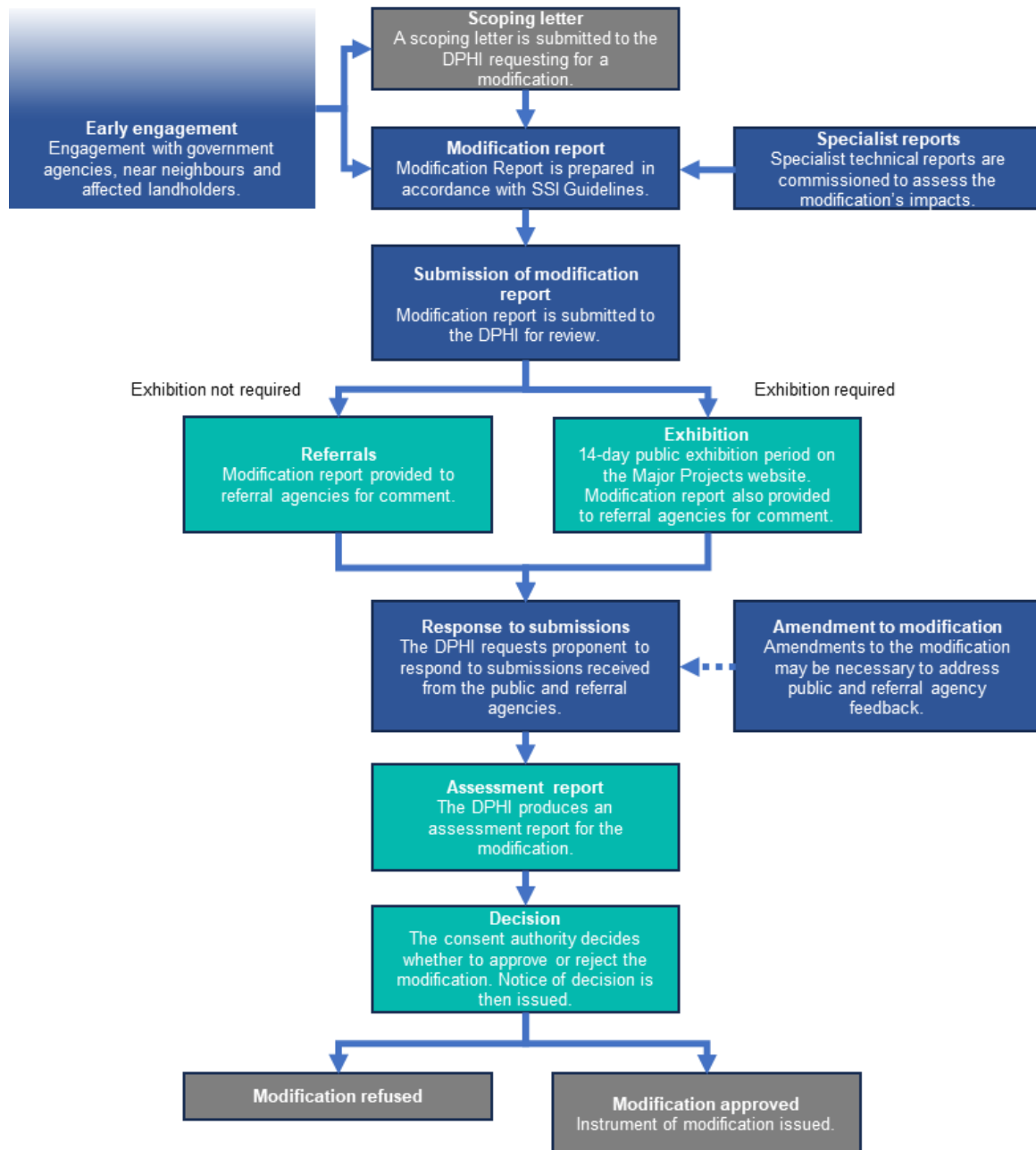


Figure 8.1 SSI modification process

8.1 Public exhibition

Jemena invites the community, government agencies and local councils to make informed submissions in relation to this modification. Formal submissions can be made to the DPHI through the Major Projects website. A Major Projects account is required to make a formal submission.

If the DPHI determines that a public exhibition of the modification is required, the modification will be exhibited for at least 14 days. The minimum exhibition period for modifications is prescribed in Schedule 1 of the EP&A Act. When the modification is to be publicly exhibited, a notice of exhibition will be published on the Major Projects website. Relevant referral agencies (including local councils) will also be invited to provide feedback on the modification.

8.2 Response to submissions

All submissions received by the DPHI will be published on the Major Projects website. All submissions received during the exhibition period will also be considered by the approval authority as part of the assessment process.

The DPHI will request Jemena to respond to the submissions raised by the community and referral agencies. Jemena will analyse every submission that has been received and provide a response through a Response to Submissions Report. This report will be submitted to the DPHI and published on the Major Projects website. The Response to Submissions Report will:

- provide a summary of all matters raised in the formal submissions
- outline Jemena's response to matters raised in the formal submissions
- describe actions taken or changes made to the modification to address these matters.

Jemena may also undertake additional stakeholder engagement during the detailed design, construction, operation and decommissioning of the Project. Additional engagement (if required) will be guided by Jemena's SMP for the modification.

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