Transport for NSW
Sydney Trains

Review of Environmental Factors (REF)

Morisset and Vales Point Resignalling

NSW GOVERNMENT

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Executive Summary

Sydney Trains is proposing to provide a new train signalling system in the Morisset and Vales Point area on the Central Coast and Newcastle Line in New South Wales. The Morisset and Vales Point Resignalling Project (the proposal) will upgrade the existing system which has now exceeded its design life. The new train control system uses the Advanced Train Running Information Control System. This new signalling design requires modification of the Automatic Train Protection equipment which has presently been installed. The proposal will also allow for future digital migration to the European Train Control Systems Level 2.

The proposal involves work at various locations within the rail corridor between Wyee Station and Dora creek station, the majority of activities will occur at Morisset Station. The proposal is located wholly within the Lake Macquarie City Council Local Government Area. Construction for the proposal will require access and temporary occupation of sections of rail reserve on Sydney Trains land, accessible via various corridor access gates along the project alignment.

The key features of the proposal includes six additional signal buildings (MT01, MT05, MT08, MT11, MTRR and MT29) at various points within the rail corridor. The purpose of these signalling buildings is to house signalling and power equipment. Additional works to support the proposal include modification to the track alignment such as a perway siding, modification to the Overhead Wiring, a new combined services route, electrical and communications connection and new site drainage.

The construction phase of the proposal is expected to commence in March 2024 with a duration of 14 months.

The proposal is directly aligned with the vision of the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020), as well as the *NSW Long Term Transport Master Plan*, which are designed to modernise Sydney's rail network. The proposal will modernise key components of the railway system within this strategic transport and economic hub of Morisset. The proposal will increase the safety, capacity, and reliability of the Sydney Trains network, in this location, and provide substantially lower lifecycle operation and maintenance costs once operational. Moreover, the proposal will:

- Provide capacity for eight trains per hour (an increase from the current capacity of around four trains per hour) with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour
- Improve journey times, with the aim that journey times do not exceed the November 2017 or latest timetable
- Improve the overall safety of the train network for passengers and workers.

The completion of these works has a long term benefit to the community through the provision of a more frequent, reliable, and safer train network. The update significantly reduces the maintenance cost and lifecycle costs for the train network. It will also support the changed

network requirements when the Lower Hunter Freight Corridor (rail bypass) comes into being with a dedicated freight rail line between Fassifern and Hexham at a future date.

Clause 2.92(1) within Chapter 2 of *State Environmental Planning Policy (Transport and Infrastructure) 2021* provides development on any land for the purpose of 'rail infrastructure facilities' to be carried out by or on behalf of a public authority are permissible without consent. Sydney Trains is a public authority and the proposed activities of the proposal fall within the definition of rail infrastructure facilities under Clause 2.91 of *State Environmental Planning Policy (Transport and Infrastructure) 2021*. Therefore, the proposal is permissible without development consent and can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*.

This Review of Environmental Factors has been prepared to fulfil Sydney Trains' obligations under Section 5.5 of the *Environmental Planning and Assessment Act 1979* and Clause 171 of the *Environmental Planning and Assessment Regulation 2021*. Under Section 5.5 of the *Environmental Planning and Assessment Act 1979*, Sydney Trains, as a determining authority, is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the construction and operation of the proposal. Clause 171 of the *Environmental Planning and Assessment Regulation 2021* identifies factors to be considered by Sydney Trains in order to assess the likely impacts of the proposal on the natural and built environment.

This Review of Environmental Factors provides the assessment of the environmental impacts of the proposal, in accordance with the requirements of clause 171 of the *Environmental Planning and Assessment Regulation 2021*. It also identifies that a referral to Subsidence Advisory – NSW is required to be undertaken under clause 2.15(2)(f) of the *State Environmental Planning Policy (Transport and Infrastructure) 2021*, and approval has been obtained under section 22 of the *Coal Mine Subsidence Compensation Act 2017* to undertake works within a mine subsidence district.

The key environmental considerations for the proposal that were considered as part of the proposed designs include:

- The minor waterways which intersect with the study area (including Dora Creek, Pourmalong Creek, Cobra Creek, Wyee Creek, Swampy Creek and Mannering Creek) and drain from Morisset Station (Dillwynia Creek and Pourmalong Creek
- Threatened ecological communities as well as individual flora and fauna species in close proximity to the proposal
- Noise and vibration impacts to sensitive receivers
- Built heritage items, archaeological sites and Aboriginal heritage
- Visual impacts and flooding risks.

These matters are extrapolated on further below.

Water Quality and Flooding: This proposal could potentially impact on Wyee Creek intersecting the proposal area as a result of erosion and sedimentation, or from spills such as

fuels, oils and chemicals during construction related to plant operation and maintenance. Mitigation measures are outlined in Section 7, and provided these are implemented no significant impacts to the waterway will result from this proposal.

Biodiversity: The proposal can be undertaken with only minimal impacts on biodiversity. Two of the proposed buildings require vegetation clearing and trimming to allow for an asset protection zone and to mitigate against the risk of bushfires.

Noise and Vibration: An assessment on the noise and vibration as a result of this proposal was carried out by Resonate. It was identified that exceedances of project-specific noise levels will be experienced at nearby residences at Noise Catchment Areas 01, 02 and 03 around the Morisset Station. However, it is predicted that only minimal vibration impacts will be experienced. Various management measures will need to be implemented and adhered when track alignment, buildings, drainage/drainpipes, overhead wiring, pits and ancillary works in order to minimise the impacts. This includes the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains Environment Protection Licence 12208, which will need to be followed during this proposal. However, no variations or modifications are required to be made to the existing Sydney Trains Environment Protection Licence 12208 to facilitate the proposal.

Heritage: An assessment of the heritage matters in relation to the proposal was carried out by CCG and Artefact Heritage. Findings were as follows:

The proposal is located partly in an area of Sensitive Aboriginal Landscape Area (mapping under Clause 7.7 of the *Lake Macquarie Local Environmental Plan 2014*). It is considered that the portions of rail corridor that overlap with the proposal footprint have been subject to extensive past ground disturbance and represent 'disturbed landscapes' and therefore it is not anticipated that this proposal will impact on Aboriginal Heritage.

In terms of historical (non-Aboriginal) archaeological matters, a previous assessment conducted by Aurecon in 2021 indicated that the proposal area had overall limited potential to contain intact or significant archaeological resources, therefore it was unlikely that works would result in adverse impacts to significant archaeological works. Artefact Heritage conducted an updated assessment in 2023, which came to the same conclusion. Approval for excavations under Section 139 of the NSW Heritage Act 1977 is not required.

The proposal area also contains several items of heritage significance. For items listed under Schedule 5 of the *Lake Macquarie Local Environmental Plan 2014* and which are also mapped within the proposal area, a Statement of Heritage Impact (SoHI) report was undertaken by CCG in 2024. This CCG report assessed impacts to these heritage items as being minor or less as a result of the proposal.

The decommissioning of the signalling equipment at Morisset Station will impact the heritage item Morisset Railway Station Group and Residences, listed on the Transport Asset Holding Entity Section 170 Heritage and Conservation Register, to a moderate degree. In particular, this will impact the signal box and equipment. Much of this will be mitigated through the retention

of the signalling levers and interlock system. Furthermore, all of the moveable heritage of the signal room is to remain on site. Mitigation measures are detailed below in Section 7 in order to reduce the impacts associated with this heritage item.

Traffic and Access: The construction works will occur during planned possessions. The possession period required to carry out the proposal will affect the movement of trains through the area, including number, frequency and/or timing, that may impact passengers who are accustomed to the existing movement schedule. There are standard requirements for railway possessions during the year for inspections and maintenance, and the proposal will follow those standard requirements. Sydney Trains will provide standard communications prior to this possessions period to allow rail users time to make alternative travel arrangements if the temporary bus replacement service does not suit their needs. A Traffic Management Plan will be completed to minimise and manage the disruption caused by the proposal.

This proposal is part of the overarching *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020) designed to modernise Sydney's rail network. The proposal will support this planning by enhancing safety, capacity, and reliability of the Sydney network, and provide significantly lower lifecycle operation and maintenance costs.

Acknowledgement of Country

Sydney Trains acknowledges the traditional custodians of the land on which we work and live. We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Glossary (Terms & Definitions)

Term / Acronym	Description
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
APZ	Asset protection zone
ARS	Automatic Route Setting
ASS	Acid Sulfate Soils
ATP	Automatic Train Protection
ATRICS	Advanced Train Running Information Control System
B&CSEPP	*State Environmental Planning Policy (Biodiversity and Conservation) 2021*
BC Act	*Biodiversity Conservation Act 2016*
CEMP	Construction Environmental Management Plan
CBI	Computer-based interlocking
CSR	Combined Services Route
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment, and Water
DPE	Department of Planning and Environment
EEC	Endangered Ecological Community
EMS	Environmental Management System
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2021* (NSW)
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence issued by the NSW Environment Protection Authority
ETCS L2	European Train Control Systems Level 2
FM Act	*Fisheries Management Act 1994*
Future Transport	*Future Transport Strategy 2056* (Transport for NSW, March 2018)
GST	Galvanised steel troughing
HIA	Heritage Impact Assessment
HSE	Health, Safety and Environment
IBRA	Interim Biogeographic Regionalisation for Australia
Lake Macquarie LSPS	*Lake Macquarie Local Strategic Planning Statement*
LGA	Local Government Area
Lake Macquarie LEP 2014	*Lake Macquarie Local Environmental Plan 2014*
Metro CNVS	*Sydney Metro Appendix F Construction Noise and Vibration Standard 2020*

Term / Acronym	Description
MNES	Matters of National Environmental Significance
NCA	Noise Catchment Area
NP&W Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OHW	Overhead Wiring
OOH	Out of Hours
PAR	Photographic Archival Recording
PASS	Potential Acid Sulfate Soils
PCT	Plant Community Type
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997*
REF	Review of Environmental Factors
Regional Plan	*Hunter Regional Plan 2041*
Regional Transport Plan	*Draft Hunter Regional Transport Plan 2041*
R&HSEPP	*State Environmental Planning Policy (Resilience and Hazards) 2021* (NSW)
s170 Register	Heritage and Conservation Register, a register of heritage assets owned or managed by a NSW government organisation, made under Section 170 of the *Heritage Act 1977*
SEPP	State Environmental Planning Policy – a state level Environmental Planning Instrument
SHR	State Heritage Register
SMEC	SMEC Australia Pty Limited
SoHI	Statement of Heritage Impact
T&I SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021* (NSW)
TAHE	Transport Asset Holding Entity
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TfNSW CNET	*TfNSW Construction Noise Estimation Tool*
TfNSW CNVG	*TfNSW Construction Noise and Vibration Guideline (Roads) 2023*
TfNSW CNVS	*TfNSW Construction Noise and Vibration Strategy 2018*
TMP	Traffic Management Plan
Transport Master Plan	*NSW Long Term Transport Master Plan* (Transport for NSW, 2012)
ULX	Under-line crossing
WARR Act 2001	*Waste Avoidance and Resource Recovery Act 2001*
Waste Strategy 2014	*NSW Waste Avoidance and Resource Recovery Strategy 2014 – 2021*
WIRES	NSW Wildlife Information, Rescue and Education Service Inc

Term / Acronym	Description
WM Act	*Water Management Act 2000*
WRCC	Wyong Regional Control Centre

1 Introduction

This Review of Environmental Factors (REF) has been prepared on behalf of Sydney Trains for the proposed new signalling system in the Morisset and Vales Point area on the Main North Line in New South Wales (NSW).

The Morisset and Vales Point Re-Signalling proposal (the proposal) proposes to upgrade existing 36-lever frame mechanical style interlocking controlling system to a new automated train control system using the Advanced Train Running Information Control System (ATRICS). The mechanical interlocking system currently in use at Morisset was commissioned in 1938. The Relay interlocking was installed for the Vales Point area in 1980 and is controlled from a panel within the Morisset Signal Box. The signal equipment is considered to be past its design life and requires upgrading. The Signalling and Control System assets are to be replaced as part of this proposal and the new signalling to be controlled using ATRICS, including Automatic Route Setting (ARS) from Wyong Regional Control Centre (WRCC). The proposal will also allow for future digital migration to the European Train Control Systems Level 2 (ETCS L2).

The proposal involves works at various locations, primarily inside the rail corridor, between Wyee Station and Dora Creek Station, with the main activities occurring around Morisset Station. The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail. Construction for the proposal will require access and temporary occupation of sections of rail reserve and overflow carparking on Sydney Trains land, accessible via various corridor access gates along the proposal alignment.

Key features of the proposal include:

- Temporary works including those to facilitate site access and for ancillary facilities such as stockpile and laydown areas
- Construction of a new signalling building at Morisset Station and an additional five signalling buildings at various points along the rail corridor
- Removal and installation of signalling posts, equipment housings and trackside equipment
- Track renewals at Morisset Station including a perway siding
- Overhead wiring (OHW) changes including construction of new OHW stanchions
- Installation of new train detection and train protection systems throughout the proposal area
- New combined services route (CSR)
- New electrical and communications connections
- New site drainage.

Network upgrades will allow for capacity of running trains to increase to eight trains per hour with the assumption of trains stopping at each station along the route. Also, headway will be designed for future capacity of 10 trains per hour. In addition, the upgrades will improve journey times and provide a safer and more reliable service.

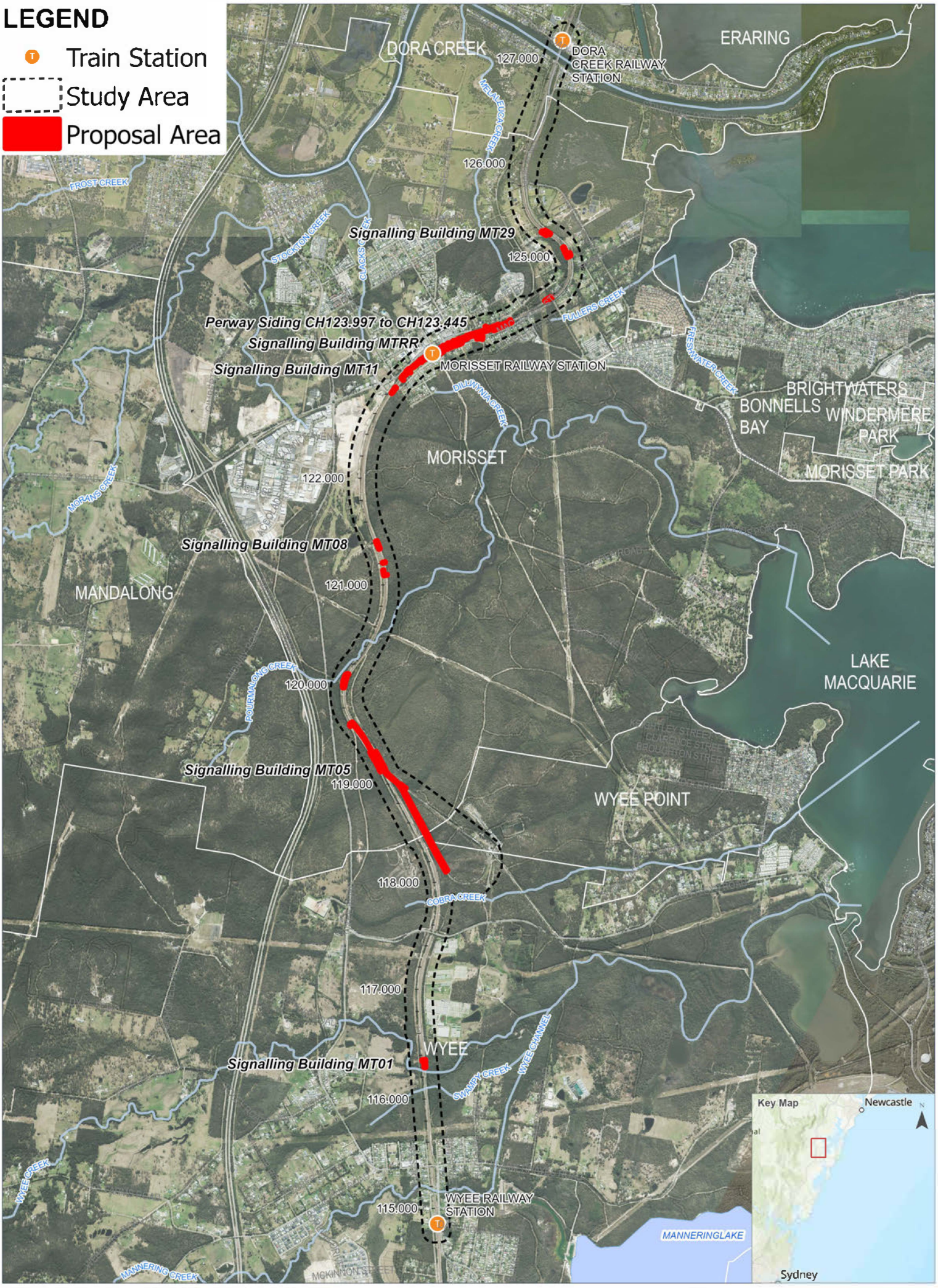
This REF has been prepared by SMEC Australia Pty Ltd (SMEC) on behalf of Sydney Trains in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act).

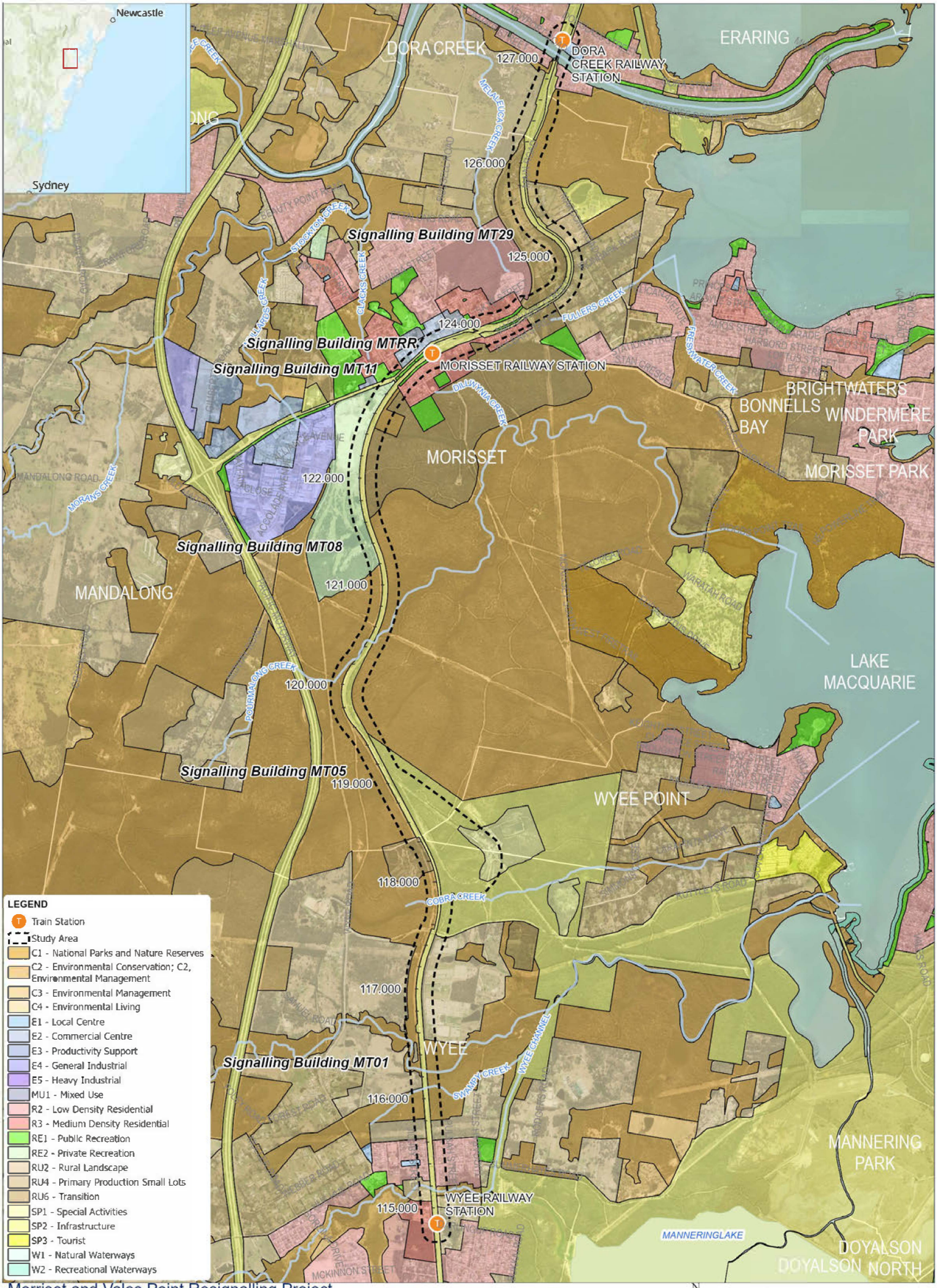
1.1 Proposal location

The proposal is approximately 12km in length, located within the Lake Macquarie Local Government Area (LGA) (Figure 1-1). The Study area adopted for the REF includes the areas between Wyee Station and Dora Creek Station and is contained with the rail corridor on Sydney Trains owned land. The construction has a southern limit of 116.000km north of central station, Sydney between Wyee Station and Vales Point Junction and a northern limit of 126.900km between Morisset and Dora Creek stations. For this REF, a study area (100m buffer from the rail corridor) has been used for the environmental considerations. The surrounding land uses consist of a mix of naturally vegetated areas, rural areas, and built up commercial and residential areas around Morisset Station (see Figure 1-3). In the middle of the proposal towards Lake Macquarie is the Lake Macquarie State Conservation Area (Reservation N0629 gazetted 18/04/1997). The Lake Macquarie State Conservation area is located 1.5km east of the study area boundary.

The works around Morisset Station will be undertaken in proximity to residential properties, predominately on the southern side of the corridor. The proposal is also located within two Mine Subsidence Districts (Mandalong and West Lake districts) as shown in Figure 1-4. Photographs of the proposal site and surrounds are provided in Figure 1-5 to Figure 1-10.

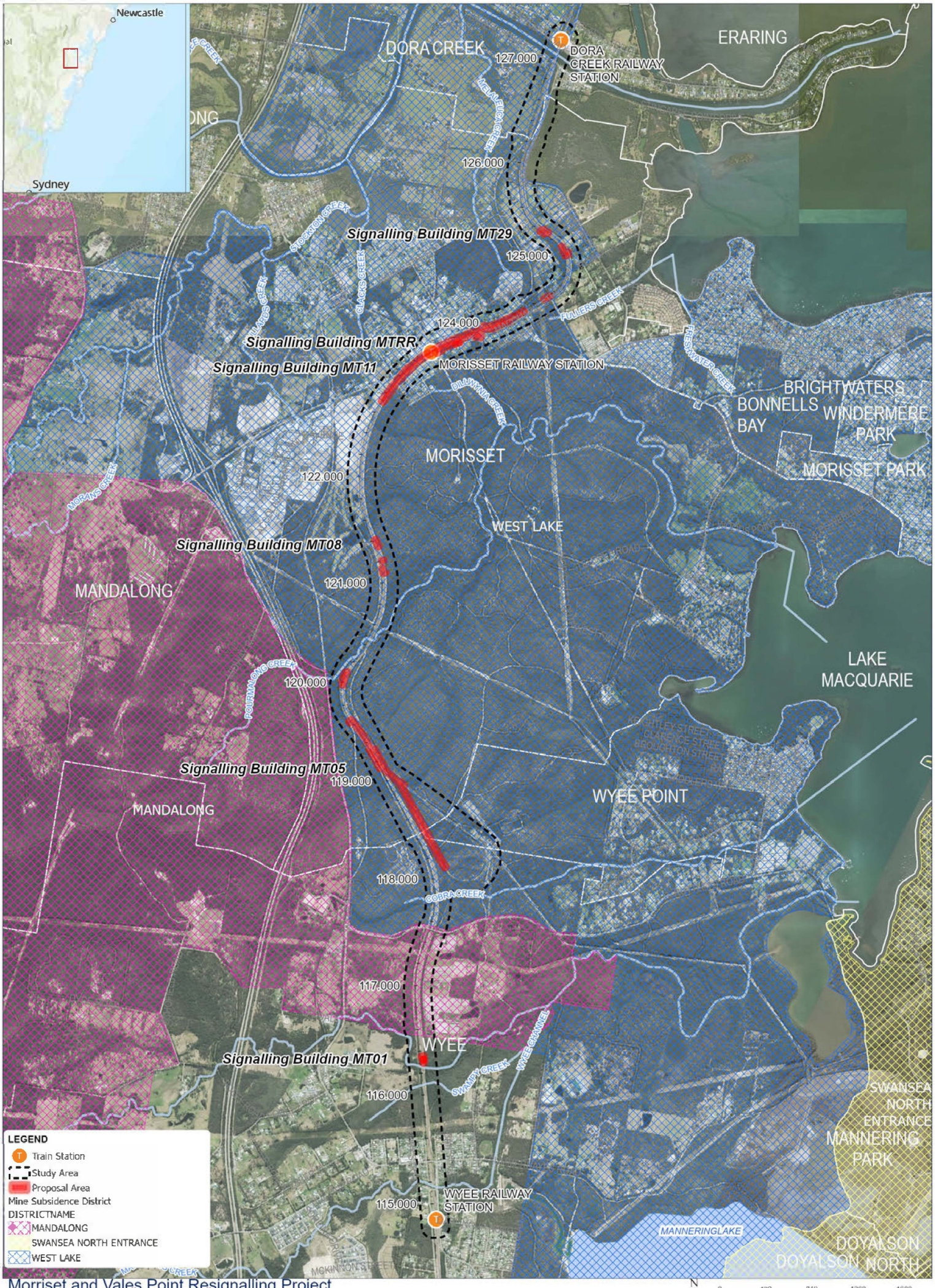
The proposal crosses a series of minor watercourses (Figure 1-1) with Dora Creek, Pourmalong Creek, Cobra Creek, Wyee Creek, Swampy Creek, and Mannering Creek crossing the study area. In general, the proposal is removed from the water courses and are unlikely to impact upon the creeks or their catchments. Further discussion around water and other impacts are discussed in Chapter 5.


LEGEND
Train Station
Study Area
Proposal Area
DORA CREEK
DORA CREEK RAILWAY STATION
ERARING
127.000
126.000
125.000
MELALEUCA CREEK
FROST CREEK
STOCKTON CREEK
CLACKS CREEK
Signalling Building MT29
FULLERS CREEK
Perway Siding CH123.997 to CH123.445
Signalling Building MTRR
Signalling Building MT11
MORISSET RAILWAY STATION
FRESHWATER CREEK
DILLWYNIA CREEK
BRIGHTWATERS
BONNELLS BAY
WINDERMERE PARK
MORISSET PARK
MORISSET
122.000
MORIANS CREEK
Signalling Building MT08
121.000
MANDALONG
LAKE MACQUARIE
POURMALONG CREEK
120.000
Signalling Building MT05
119.000
WYEE POINT
118.000
COBRA CREEK
117.000
WYEE
Signalling Building MT01
WYEE CHANNEL
SWAMPY CREEK
116.000
WYEE CREEK
115.000
WYEE RAILWAY STATION
MANNERINGLAKE
MANNERING CREEK
MCKINNONS
Key Map
Newcastle
Sydney
Morriset and Vales Point Resignalling Project
Proposal Location
N
0
420
840
1260
1680
Metres
Scale: 1:30,000
CRS: GDA 1994 MGA Zone 56



Morriset and Vales Point Resignalling Project

Figure 1-3 Land Zoning



Morriset and Vales Point Resignalling Project

Figure 1-4 Mining Subsidence

1.2 Purpose of the REF

This REF has been prepared by SMEC on behalf of Sydney Trains for the purposes of the proposal. The purpose of the REF is to:

- Describe the proposal
- Document, examine and take into account to the fullest extent possible the likely impacts of the proposal on the environment
- Detail mitigation measures to be implemented
- Determine whether an Environmental Impact Statement or Species Impact Statement is required in relation to the proposal
- Determine whether the proposal can proceed.

For the purposes of these works, Sydney Trains is both the proponent and the determining authority for this REF under Part 5 of the EP&A Act.

The proposal and associated environmental impacts have been described in the context of Clause 171 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), other relevant NSW legislation and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so the REF aims to fulfil the requirements of Section 5.5 of the EP&A Act, for Sydney Trains to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF will be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Infrastructure under Division 5 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act and therefore the requirement for a Species Impact Statement
- The potential for the proposal to significantly impact a Matter of National Environmental Significance (MNES) or Commonwealth land and the need to make a referral to the Australian Government Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 The Proposal

2.1 Need and objectives of the proposal

The existing signalling system at Morisset requires upgrading to a modern computer-based interlocking (CBI) system. The existing mechanical signalling interlocking system currently in use at Morisset was commissioned in 1938 and controls colour light signals for both motor-operated and mechanically operated points. The relay interlocking was installed for the Vales Point area in 1980 and is controlled from a panel within the Morisset signal box. A range of modifications and renewals have been carried in recent years to both interlocking areas since the initial implementations. The signal equipment has exceeded its design life and now needs upgrading.

The main objective of the proposal is to upgrade the existing signalling system to a modern CBI system in the Morisset and Vales Point area, that will include a new ATRICS based train control system to be located in the WRCC and ARS from the WRCC. The proposal requires modification of the Automatic Train Protection (ATP) equipment that is presently being installed, as a result of the new signalling design. The proposed upgrades will allow for future migration to digital systems and integration with ETCS L2.

The replacement of the existing signalling system is primarily comprised of replacing the mechanical interlocking. The existing signalling system consists of redundant equipment, which is not feasible to maintain. A key upgrade to the signalling system is to allow remote control of the Morisset and Vales Point areas from the WRCC. These signalling upgrade works will have an impact to other rail infrastructure including track components, train detection, power supply and communications, which are included in this proposal. Remote monitoring of interlocking point condition monitoring and axle counter condition monitoring will be enabled as part of this proposal.

This proposal is part of the overarching *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020) designed to modernise Sydney's rail network. The proposal will support this planning by enhancing safety, capacity, and reliability of the Sydney Trains network, and provide substantially lower lifecycle operation and maintenance costs.

Other key objectives of the proposal are to:

- Provide capacity for eight trains per hour with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour
- Improve journey times, with the aim that journey times do not exceed the November 2017 or latest timetable
- Improve the overall safety of the train network for passengers and workers.

2.2 Description of proposal

The key environmental considerations for the proposal that were considered as part of the proposed designs are described in Section 5 and include:

- Minor waterways which intersect with the study area (including Dora Creek, Pourmalong Creek, Cobra Creek, Wyee Creek, Swampy Creek and Mannering Creek) and drain from Morisset Station (Dillwynia Creek and Pourmalong Creek), as shown on Figure 1-1
- Native vegetation, threatened ecological system including flora and fauna in close proximity to the proposal
- Built heritage items, archaeological sites and Aboriginal heritage
- Visual impacts
- Flooding risks.

The proposal's scope of works includes signalling work including six new buildings, track work, underground and overhead cabling and other supporting activities as described below.

2.2.1 Track works and Perway Siding

The track work upgrades being proposed include the removal of existing cross overs (2AB and 12AB) and the installation of new cross overs. Crossover MT53A/B will be located south of Morisset Station, and crossover MT56A/B will be located north of Morisset station.

The existing non electrified Up refuge will be removed and replaced with a perway siding at chainage 123.445km at a length of 541.5m. The construction of the perway siding will require earthworks within the railway ballast cess. Noise and vibration assessment was considered necessary to support this construction element, and this is addressed in Chapter 5.

The proposal also includes the installation of a new turnout MT55A which is connected to the perway siding and a new catchpoint MT55B. The catch point is located before OHW portal N123+434 and is based on standard configuration. The catchpoint proposed has been designed to minimise the potential risk of runaway and driver signal over with a 33m long land zone with a ballast mound.

Further detail of the proposal's scope and design is located in Appendix A11.

2.2.2 Signalling and Train Control Systems

The proposal includes six additional signal buildings (MT01, MT05, MT08, MT11, MTRR and MT29) at various points within the rail corridor as shown by Figure 1-2. The purpose of these signalling buildings is to house signalling and power equipment. The list of buildings required and their locations are detailed in Table 2-1 below.

Buildings MT01, MT05, MT08, MT11 and MT28 are designed for BAL-FZ bushfire rating as per the bushfire hazard risk assessment report (Appendix A9). The construction of the MT05

building will require vegetation clearance to the boundary fence and a 30m asset protection zone (APZ) created north to the fence line to adequately reduce the bushfire hazard risk. Building MT29 will require a flame zone for construction by adding a 1m concrete path and maintaining existing vegetation to the boundary fence. Several mature trees (not managed by Sydney Trains) will require trimming to the boundary fence as to not overhang the building.

Building MTRR is within a bushfire zone but does not require significant vegetation removal.

Building MT11 is not located in the flame zone and so is not required to be designed for BAL rating, other than the standard bushfire requirements.

The proposed signalling buildings are to be constructed using bricks and have been designed to the following concepts:

- Simple materials and forms to make an unobtrusive building that does not encourage vandalism
- Respect for heritage context where applicable
- Bushfire risk reduction
- Natural ventilation
- Low maintenance finishes
- Secure and concealed services
- Cost effective.

The proposed buildings MT01, MT08 and MT11 have two attached rooms, a 7000mm x 3500mm signal relay room and a 3000mm x 3500mm power room. MT05 has a 7000mm x 3500mm signal relay room and a larger 4500mm x 3500mm power room. MTRR building has a larger 10000mm x 3500mm signal relay room and 3000mm x 3500mm power room. The finished floor levels varies for each building which is outlined in the Hydraulic Study (Appendix A4 – see Table 8). A low height 6 degree sloped skillion roof was adopted for the design of MT05. However, no gutters are to be installed to reduce the amount of ongoing maintenance for each of the buildings.

Table 2-1: Proposed buildings and locations

Name	Location	Type
MT01	Approximately 116.300km, on the Down Side	Brick Building, Type 1
MT05	Approximately 119.150km, on the Up Side	Brick Building, Type 2
MT08	Approximately 121.380km, on the Up Side	Brick Building, Type 1
MT11	Approximately 123.090km, on the Down Side	Brick Building, Type 1
MTRR	Approximately 123.520km, on the Down Side	Brick Building, Type 3
MT29	Approximately 125.300km, on the Down Side	Brick Building, Type 1

2.2.3 Overhead wiring

As a result of the proposed track work between 119km to 124km, the revised track arrangements has direct and indirect impacts to the OHW in order to support the track and signalling upgrades including new crossovers and stanchions to suit the reconfigured signalling works and track layouts, and decommissioning of redundant existing structures and wiring. New crossovers will require installation of structural support including portal structures, signal gantries, a new mast cantilever structure, wires, and guy anchors. Where crossovers are removed, the crossover wire, associated cantilever arrangements and structures will need to be decommissioned. Only OHW affected by the resignalling works and track layout alterations will be altered.

The OHW scope also includes:

- A new OHW structure to be built at N123+706 due to an inadequate existing structure at 123+696. The existing structure will require removal alongside the removal of the structure at N123+326.
- Removal of OHW infrastructure for cross-over N119+083
- Wire Run N-X0119A, N119+120, N119+166
- Anchor/guy arrangement for N119+083 and N119+217/N119+219
- Removal of OHW mast 123+401 is proposed as this location will form part of the catch point landing zone.

2.2.4 Combined Services Route

A new CSR was recently installed by Sydney Trains in the rail corridor, and will be utilised by this proposal where feasible. The proposal scope includes requirements to upgrade or repair the existing galvanised steel troughing (GST) and construct any additional GST as required to carry new/existing cables to facilitate the proposal.

New and existing trenched cable routes will be used to install cables for signalling, communications, compressed air, and electricity. Cables will run from the proposed new signalling equipment rooms to nearby infrastructure.

Low voltage cable routes will be installed at a minimum depth of approximately 1m. No high voltage cable containment is proposed as part of the detailed design.

Buried in-ground cables and pipes will have a minimum cover of 800mm. Where conduits are within paved areas the depth may be reduced to 300mm from the surface. New GST is proposed where it is not practicable to install buried conduits.

New cables pits are proposed for signalling, communications, low voltage, and compressed air. The existing pits will be reused to allow conduits from the existing CSR network to connect local routes to trackside equipment.

New under-line crossings (ULXs) are proposed where signalling, communications and electrical cables are required to cross the rail corridor. They consist of buried in ground cables in the track formation at a minimum depth of 1.6m for signalling and communications, and a minimum depth of 2m for electrical cables. ULX trenching for the main route is 0.5m (bottom of trench) to 2.5m wide (top of trench), and typically 2m deep (maximum 4m).

ULX08 location has been changed during design development, moving from 121.135 chainage to 121.090 chainage due to the topography limitations (steep batter).

2.2.5 Electrical

The proposal includes commissioning of two new 11kV/415V pad mount transformers as the primary source of supply for building MTRR (at Morisset Station) and MT05 (Vales Point).

These will be installed within Sydney Trains property as close as possible to the signalling buildings. The primary supply for building MTRR will be the Sydney Trains 11kV network, with the pad mount transformers to step down the Sydney Trains 11kV feed to a 415V supply. The supply for the pad mount transformer at MT05 will be required directly from an AusGrid pole located outside of the rail corridor on crown owned land currently managed by Lake Macquarie Council. The required approvals have been submitted to both Lake Macquarie City Council and AusGrid (See Appendix A12). This will require OHW from the Ausgrid pole to a property pole within the rail corridor.

Electrical upgrades will include:

- Power supply upgrades to signalling and OHW, including new low voltage and high voltage cable installation in both existing and new inground conduits and above ground service troughs
- Earthing and bonding as required for all new and modified structures and equipment installed.

2.2.6 Drainage

It is proposed to modify and/or re-use the existing tracks for the proposed new tracks, where practicable for the proposal. New intertrack drainage will be installed next to the new tracks at Morisset, which will connect to existing drainage pits that currently discharge to existing channels. Cess drains are proposed for all new track works. At approximately chainage 123km, a concrete pipe has been designed to run below the proposed train landing zone. This pipe is to be concrete encased to protect it from live and dead loads.

Roof water runoff from buildings is to discharge freely onto existing terrain away from the building structure and captured by the existing drainage system where practicable.

The detailed design completed by SMEC proposes that a separate split discharge of the 6-foot drainage be installed rather than the single drain drainage. This was based on the hydrology and the hydraulic assessment which showed the existing drainage ULXs within the new the new siding track area have adequate capacity to capture the localised stormwater flows.

The length of the proposed 6-foot drainage sections is approximately 300m which follows the same alignment of the single run surface drain within earlier design development. A total of 10 drainage pits are proposed along the drainage alignment. Pit levels and buried pipe will range between 0.8m to 3.453m depths to tie into the existing drainage ULXs.

The ground disturbance depths associated with ULX and pit trenching for the proposed drainage elements identifies the deepest approximate excavations at 4m for ULX trenching a 3m for pits. The width of proposed drainage trenches will be approximately 1m-1.5m, which is consistent with expected ULX and buried route trenching.

2.2.7 Summary of Ground Disturbance Works

Table 2-2 below summaries the ground disturbance depths in order to assess the potential environmental impacts.

Table 2-2: Proposed construction and excavation works

Activity	Approximate Depth (m)	Approximate Footprint (m)
CSR Trenching	Main Route: 1 (minimum) to 2 (maximum) Local Route 1 to 1.2 (typically)	Main Route: Corridor of 1 (minimum) to 2.5 (maximum) Local Route: Corridor of 0.45 to 0.6 (typically)
ULX Trenching	2 (typically) 4 (maximum)	Main Route 0.5 (minimum) (Bottom of trench) 2.5 (maximum) (Top of trench)
Pits Trenching	Buried Route Pits 1.8 (typically) ULX Pit 2.2 (minimum) 3 (maximum)	Buried Route Pits 1.5 by 1.5 ULX Pit 2.2 by 2.2 (typically)
Removal of signal posts	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 (maximum) Piled Footing: 1 to 3 (maximum) Note: piles may not require removal)	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 Piled Footing: 1 to 3 (maximum) note that piles may not require removal
Installation of Signal Posts	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 (maximum) Piled Footing: 1 to 3 (maximum)	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 1.5 by 3 Piled Footing: assume piled foundation will have a pad on top equal to above dimensions (i.e. 1.5 by 3)
Installation of OHW Structures	Piles: 5.5 (maximum) Guy Footings: 2.1 (maximum)	0.9 diameter pile with a 1 by 1 square pile cap (typically). 1.2 diameter pile with a 1.3 by 1.3 square pile cap (maximum). Guy Footing: 1.5 by 2.5 (maximum)

Activity	Approximate Depth (m)	Approximate Footprint (m)
Installation of Signalling Buildings	2 assumed (inclusive of CSR conduits coming under buildings from pits) up to 5m deep piles	Approximately 12.7 by 6.1 (including a 1m wide concrete path that encircles the building) for signalling buildings MT01, MT08, MT11 and MT29. Dimensions for MT05 are 14.2 by 6.1 (larger power room) and for MTRR are 15.7 by 6.1 (larger signal relay room).

2.3 Construction methodology

The following construction methodology is proposed for delivery of the proposal.

2.3.1 Geotechnical Investigations

A geotechnical desktop study has been completed as part of the design phase of the proposal to assess currently available information in the region to inform expected ground conditions and provide interdisciplinary guidance. Additional geotechnical investigations including boreholes and test pits have been carried out during detailed design to assess the ground conditions and footing requirements for the proposed new OHW structures, ULX locations and under-boring works. Investigations have also been undertaken to confirm the existing ballast depth at bridges and proposed crossover locations.

Potholing and service locating will also be carried out during detailed design subject to relevant approvals to locate interfacing or intersecting CSR routes to determine structure foundation locations.

2.3.2 Stage 1 – Site Establishment

Site establishment will be carried out prior to construction, during standard working hours, and will include:

- Establishing environmental controls including erosion and sediment controls, signage, and fencing
- Setup of proposed site compounds (amenities, materials storage etc.)
- Stockpiling of rail infrastructure, materials, ballast, capping, subgrade, stabilised sand and imported fill if required.

Establishment of temporary construction site compounds, turnout assembly areas, material handling and laydown areas will be required to support construction activities. Four suitable areas on the Up-side of the rail corridor have been identified to support the works around Morisset Station (Figure 2-1). The areas shown in Figure 2-1 have been determined by Sydney Trains as suitable locations due to access and availability.

These areas will contain site offices, meeting rooms, toilets, storerooms, meal room, change rooms, first aid facilities, material storage, dangerous goods storage, site security and construction vehicle parking.

Access to these areas has been negotiated with Sydney Trains and assessed against the existing rail corridor cadastral boundary for impacts on any other stakeholders who may require consultation.

In addition to the temporary construction site compounds, there will be a requirement for establishment of temporary satellite compounds and amenities within the rail corridor. Each of these satellite areas will have a small site office, toilets and a laydown area for material and construction machinery. These areas will be secure with temporary construction fencing and relocated to suit the advancement of works along the rail corridor.

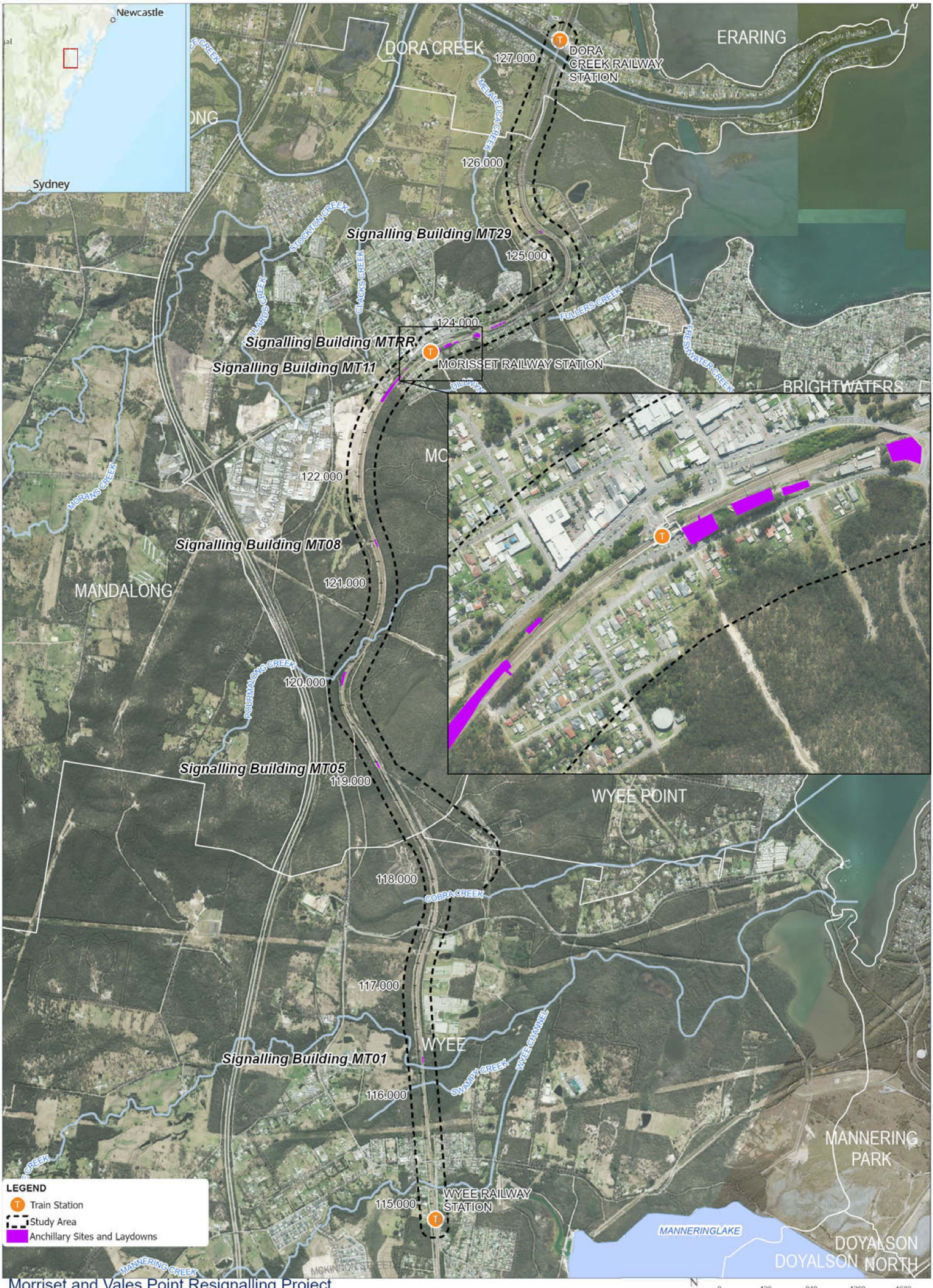


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Figure 2-3 Temporary Site Compound Locations and Stockpile Areas

2.3.3 Stage 2 – Construction: Signal Works

Signal works will be carried out during standard construction hours and possession periods. Minor civil works associated with the signal works (such as new cable routes and installation of signal posts and signal buildings) will be carried out during possession periods where the works cannot be completed during standard construction hours due to safety or operational constraints. Other minor signalling works will be undertaken during standard construction hours. The signal works include:

- Demolition of existing signal foundations
- Clearing of vegetation at sites MT05, MT11 and MT29 to the total of 0.0762 ha
- Removal and installation of signalling equipment
- Installation of signalling equipment room foundations and signal foundations outside the danger zone with excavator
- Enabling/reconfiguration of equipment within signalling equipment room (hand tools and light vehicles)
- Cable installation in existing and new CSR
- Install prefabricated concrete signal bases and signals at designated locations for new cable routes to be installed to enable new signal infrastructure, including:
    - Survey new signal route
    - Excavate trench (about 1m deep) for signal route
    - Lay plastic PVC conduits to house new signal cables
    - Install pre-fabricated concrete pits, connecting the PVC conduits
    - Backfill the trenches with approved materials
    - Under-boring or directional drilling of new undertrack cable routes and installation of conduit
    - Minor drainage works to accommodate signal infrastructure
- Install pad-mounted high voltage electrical equipment including transformers.

The track works and OHW scope will utilise track possessions, typically carried out over a 48-hour period from 2:00 am Saturday to 2:00 am on Monday morning.

2.3.4 Stage 2 – Construction: Track works and out of hours works

Track works will involve removal of redundant rail infrastructure which may include:

- Cutting of existing disused track into smaller portions
- Removal of dis-used track using lifting equipment
- Removal of old sleepers (may require minor excavation with a five-tonne excavator)

- Removal of associated mechanical signalling equipment, and;
- Full reconditioning of track subgrade.

Associated out of hours (OHW) work will require excavation and anchoring of new footings, and installation of the new OHW structures, wire runs and associated components.

Any work within 3m of the nearest active rail track (at any height above or below the rail corridor) is considered to be the work in the rail danger zone. Track works are typically carried out within the danger zone. Some track works may be carried out during standard working hours where safety and operational mechanisms can feasibly be put in place. However, the majority of track works will be carried out during scheduled track possessions which limits impacts to the rail network and protects worker safety and infrastructure integrity.

Track possessions are a pre-planned period during which the rail line is blocked to trains to permit work to be carried out on or near the operating rail line. They are typically carried out over a 48-hour period from 2:00 am Saturday to 2:00 am on Monday morning.

2.3.5 Stage 3 – Testing, commissioning and decommissioning

Prior to entering operational service, testing and commissioning activities will be carried out, including:

- New signalling equipment including signals, points, axle counters, interlocking
- New electrical assets
- New wire runs.

Decommissioning will take place for redundant points, signals, and track circuits throughout the alignment. Redundant relay-signal huts and equipment will be removed by use of an excavator, and concrete breaker for foundations.

2.3.6 Stage 4 – Site Rehabilitation

Site rehabilitation and demobilisation works will include:

- Removal of fencing, site amenities, waste, and environmental controls
- Rehabilitation of disturbed areas.

2.3.7 Plant and Equipment

Plant and equipment likely required to undertake the proposal include:

- Excavators
- Hand and power tools
- Bobcats
- Compactors
- Generators
- Day maker lighting
- Front end loader
- Concrete trucks
- Concrete pumps
- Cranes
- Hi-rail trucks
- Hi-rail elevated work platforms
- Tip trucks
- Steel saws
- Concrete saws
- Jackhammers
- Chainsaws
- Backhoes
- Storage containers
- Non-destructive digging equipment.

2.3.8 Materials and Resources

Initial quantity surveyor assessment of the proposal indicates that the following materials and resources would be required to support the track extension components of the proposal (noting that these are subject to change):

- Addition of the following to the site
    - Clearance markers
    - Long bearers
    - Ballast drag
    - MainlinePerway siding
    - Proposed track for turnover/crossover
    - Proposed track for turnout/crossover on long bearers
    - Points machine
    - Proposed points
    - Tangent points
    - Temporary insultation points
    - Transition points
- Removal of around 362m of existing track
- Slewing of around 1109m of existing track

Various components of the overhead traction would require removal and/or replacement, including:

- Removal of around 316m of out of running wire and around 408m of in running wire

- Modification of around 730m of in running wire and around 323m of out of running wire
- Provision of around 107m of new in running wire and around 175m of out of running wire
- Provision of new OHW structures to varying specifications.

There would also be demolition wastes generated and new materials required to facilitate drainage channel updates and signalling building upgrades.

Initial quantity surveyor assessment of the proposal also indicates that the following quantities of excavated materials are required to support the track extension components of the proposal (noting that these are subject to change):

- Ballast excavations of around 419m^3
- Ballast importation of around 213m^3
- Ballast importation of around 445m^3
- Removal of capping layer of around 282m^3
- Importation of capping layer materials of around 633m^3
- General earthworks cut of around 318m^3
- General earthworks filling of around 104m^3
- Disposal of general earthworks excavations of around 215m^3 offsite.

Initial quantity surveyor assessment of the proposal also indicates that around 338m^3 of fill is required to be brought onsite to meet the excavation and fill balance requires of the total combined earthworks for all signalling buildings.

2.4 Construction Schedule

The proposal is estimated to take approximately 14 months to complete with the onsite construction works to occur via non-possession where safe and practical to do so, and during planned possessions. The proposal is scheduled to commence in March 2024, although early works such as site establishment may occur before this time, subject to securing the relevant approvals.

Standard hours of works are from Monday to Friday between 7:00am and 6:00pm, and Saturday 8:00am to 1:00pm.

This REF seeks approval to undertake construction works as both day and night-time activities.

The planned possession and key construction dates for this project is outlined below in Table 2-3.

Table 2-3 Planned dates for construction activities.

Construction phase	Date(s)	Hours of operation
Pre-work (including site establishment, installation of erosion and sediment control structures, deliveries etc.)	01/02/2024 – 02/03/2024	7am-6pm Mon – Fri and 7am-1pm Sat
Site construction	05/03/24 – 06/03/26	7am-6pm Mon – Fri and 7am-1pm Sat
	FY2324 WE37	Sat 2am – Mon 2am
	FY2324 WE50	Sat 2am – Tues 2am
	FY2425 WE05	Sat 2am – Mon 2am
	FY2425 WE18	Sat 2am – Mon 2am
	FY2425 WE32	Sat 2am – Mon 2am
	FY2425 WE46	Sat 2am – Mon 2am
	FY2526 WE08	Sat 2am – Mon 2am
	FY2526 WE18	Sat 2am – Mon 2am
	FY2526 WE31	Sat 2am – Mon 2am
	FY2526 WE46	Sat 2am – Mon 2am
	FY2627 WE06	Sat 2am – Mon 2am
Demobilisation / completion works	09/03/26 – 18/12/26	7am-6pm Mon – Fri and 7am-1pm Sat

2.5 Alternatives considered

2.5.1 Option 1 – Do nothing

Option 1 involves a 'do nothing' approach resulting in the objectives set out in Section 2.1 not being met.

2.5.2 Option 2 – Like for like replacement

Undertake works to replace the existing signalling equipment with similar equipment to maintain current function.

2.5.3 Option 3 – Update existing signalling system

Option 3 involves the provision of a new train control system using ATRICS.

A comprehensive review was carried out to assess the options against key criteria including technical capacity, economic viability, and level of risk mitigation. Option 3 includes the below benefits:

- A high integrity safety system that controls risks associated with drivers over- speeding or exceeding the limit of their movement authority
- Availability as an 'off the shelf' from multiple suppliers designing to common specifications
- Mature technology with a large and rapidly growing user base
- Flexibility in its application and can be overlaid, with minimal impact, to existing signalling systems and rolling stock
- Provides a major risk mitigation of the rail network's direct risks
- A defined upgrade path to allow future functionality enhancements
- The potential to enable future signalling changes which will deliver significant capacity benefits.

2.6 Justification of preferred option

Options 1 and 2 are not considered feasible alternatives. Option 1 'do nothing' fails to address issues arising from the outdated signalling system. Option 2 'like-for-like replacement' would be maintaining an outdated signalling system that, when compared to modern alternatives, is more costly to install and maintain, less reliable, and restricts capacity. Most importantly, both Option 1 and Option 2 are inconsistent with the NSW government's commitment to improving journey times, safety and improving rail capacity.

Option 3 is the preferred option as it addresses the need for the proposal and meets the objectives, and arguably presents less risk in the longer-term than the 'do nothing' or 'like-for-like replacement' options. Option 3 is consistent with Sydney Trains' system upgrades to ATP throughout its rail infrastructure to ensure the proposal's objectives are met with minimal environmental and community impact.

3 Statutory requirements

3.1 State Environmental Planning Policies

3.1.1 1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) aims to assist in the effective delivery of public infrastructure across the State by improving certainty and regulatory efficiency through a consistent planning assessment and approvals regime for public infrastructure and services and through the clear definition of environmental assessment and approval processes for public infrastructure and services facilities.

Section 2.92(1) of the T&I SEPP provides for development on any land for the purpose of rail infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for rail infrastructure facilities and is to be carried out by Sydney Trains, it can be assessed under Part 5 of the EP&A Act. Development consent from Lake Macquarie City Council is not required.

Chapter 2, Part 2.2 of the T&I SEPP contains provision for public authorities to consult with local councils and other agencies prior to the commencement of development, as described in Section 4.

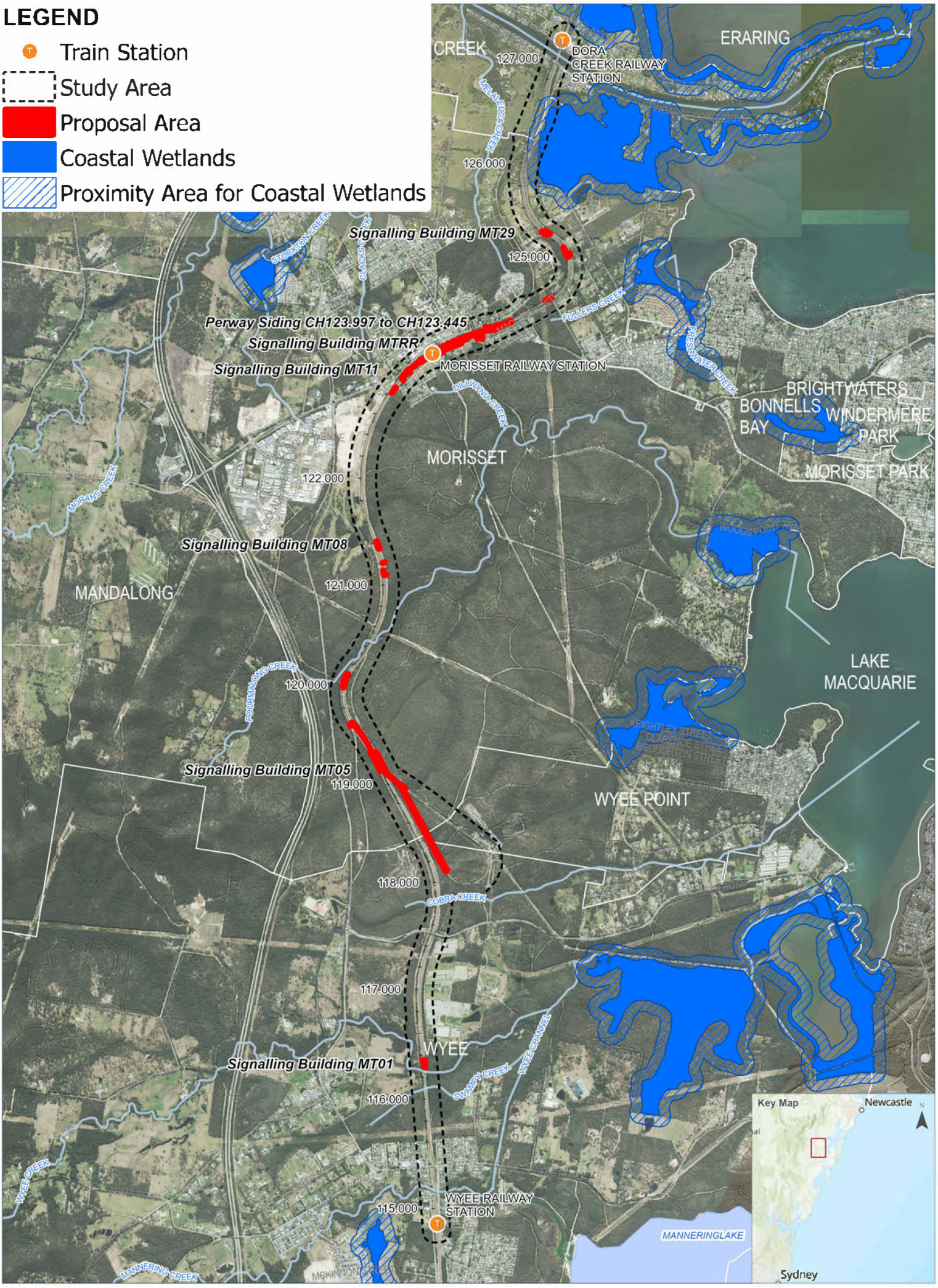
The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NP&W Act) and does not affect land or development regulated by the following State Environmental Planning Policies (SEPPs):

- *SEPP (Resilience and Hazards) 2021*
- *SEPP (Precincts – Eastern Harbour City) 2021*, Chapter 2 State Significant Precincts
- *SEPP (Precincts – Central River City) 2021*, Chapter 2 State Significant Precincts
- *SEPP (Precincts – Western Parkland City) 2021*, Chapter 2 State Significant Precincts
- *SEPP (Precincts – Regional) 2021*, Chapter 2 State Significant Precincts
- *SEPP (Planning Systems) 2021* (Planning Systems SEPP)
- *SEPP (Exempt and Complying Development Codes) 2008.*

Sections 2.10 to 2.15 of the T&I SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by T&I SEPP (where applicable), is discussed in Chapter 4 of this REF.

The proposal location closest to Dora Creek is mapped as being 280m from the Coastal Wetlands Proximity Area mapped under R&H SEPP (refer to Figure 3-1).

Overall, it is considered that the proposal is permissible without consent under Clause 2.92 of the T&I SEPP and may be assessed using this REF under Part 5 of the EP&A Act.



Morriset and Vales Point Resignalling Project

Coastal Wetlands

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3.1.2 3.1.2 Other Environmental Planning Instruments

State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (B&C SEPP) provides for the protection and management of biodiversity. Chapter 3 Koala Habitat Protection 2020 aims to conserve and manage vegetation that can provide habitat for koalas. It applies to specified land zones, including RU1 Primary Production, RU2 Rural Landscape and RU3 Forestry. As the site and lots immediately adjoining it are not zoned as such, these provisions of B&C SEPP do not apply to the proposal.

Chapter 2 provides that permits may be required to clear native vegetation within certain land use zones, including land zoned C2 Environmental Management. The railway corridor in the location of the proposal is immediately surrounded by land zoned C2 Environmental Management. The proposal may require either the trimming or removal of a minimal amount of vegetation within the railway corridor, which is zoned SP2 Infrastructure, rather than C2 Environmental Management. Therefore, no approval is required under Chapter 2 of B&C SEPP.

State Environmental Planning Policy (Resilience and Hazards) 2021

The REF was assessed against the provisions of the *State Environmental Planning Policy (Coastal Management) 2018*, which now forms Chapter 2 (Coastal management) of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (R&H SEPP). Four coastal management areas are defined under the R&H SEPP:

- Coastal wetlands and littoral rainforests area – areas that display the characteristics of coastal wetlands or littoral rainforests previously protected by *State Environmental Planning Policy* (SEPP) 14 and SEPP 26
- Coastal vulnerability area – areas subject to coastal hazards such as coastal erosion and tidal inundation
- Coastal environment area – areas with natural coastal features such as beaches, rock platforms, coastal lakes and lagoons, and undeveloped headlands. Marine and estuarine waters are also included
- Coastal use area – land next to coastal waters, estuaries and coastal lakes and lagoons, and where urban coastal development may be found.

The Detailed Design changes will not affect land or development regulated by the R&H SEPP.

3.2 Local Environmental Plans

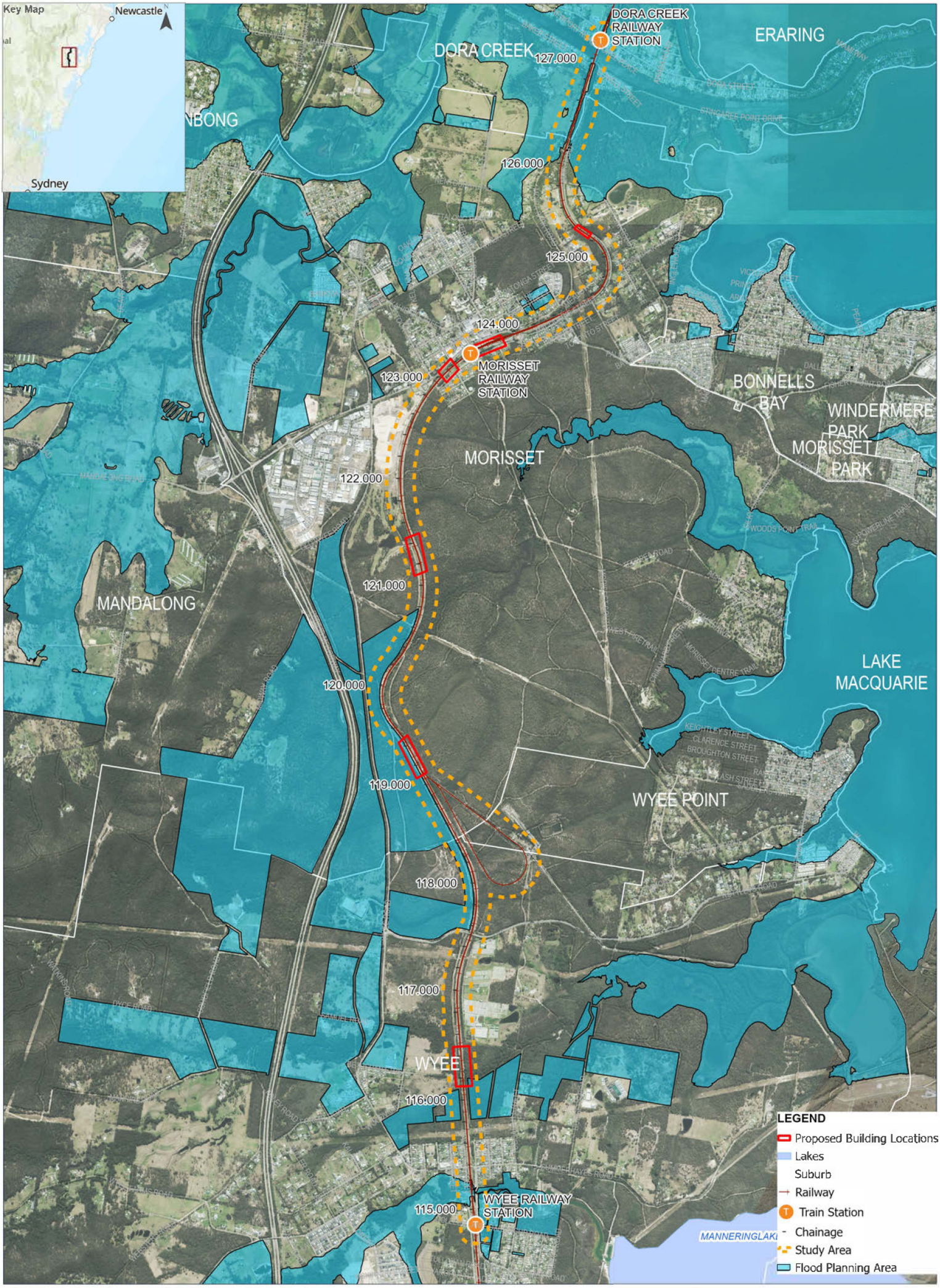
The proposal is located within the Lake Macquarie LGA, which is subject to the *Lake Macquarie Local Environmental Plan 2014* (Lake Macquarie LEP 2014). The provisions of T&I SEPP override the development consent requirements of any LEP, therefore the proposal can be undertaken without development consent. Further details of this can be found in the Draft REF.

As demonstrated in Figure 3-2 below, the proposal adjoins areas which are mapped as being floodprone under the Lake Macquarie LEP 2014. Subclauses 5.21(2) and (3) of the Lake

Macquarie LEP 2014 set out requirements that a consent authority should take into considering when granting consent for development within the flood planning area. The proposal does not require consent from council, and so these Lake Macquarie LEP 2014 considerations do not strictly apply. Nevertheless, Table 3-1 sets out how they have been considered in the design of this proposal.

Table 3-1: Lake Macquarie LEP 2014, Clause 5.21(2)&(3)

Subclause	Application to the proposal
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—	
(a) is compatible with the flood function and behaviour on the land, and	This continued land use does not comprise any sensitive land uses which cannot be evacuated in the event of a flooding event.
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	The proposal will not affect flooding behaviour in the locality.
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	The site locations do not comprise of any sensitive land uses which cannot be evacuated in the event of a flooding event and does not require any additional measures to manage hypothetical risks to life in the event of a flood, other than existing operational management of the CCN Line by Sydney Trains during extreme weather events.
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	The proposal will include appropriate mitigation measures to avoid unnecessary erosion, siltation, or destruction of riparian vegetation, and therefore impacts to the stability of the surround land.
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—	
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	Drainage flows would remain the same.
(b) the intended design and scale of buildings resulting from the development,	The proposed buildings MT01, MT08 and MT11 have two attached rooms, a 7000mm x 3500mm signal relay room and a 3000mm x 3500mm power room. MT05 has a 7000mm x 3500mm signal relay room and a larger 4500mm x 3500mm power room. MTRR building has a larger 10000mm x 3500mm signal relay room and 3000mm x 3500mm power room. The finished floor levels varies for each building which is outlined in the Hydraulic Study (Appendix A4 – see table 8).
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	The site locations do not comprise of any sensitive land uses which cannot be evacuated in the event of a flooding event and does not require any additional measures to manage hypothetical risks to life in the event of a flood, other than existing operational management of the CCN Line by Sydney Trains during extreme weather events.
(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	The proposal will not result in any new built form elements being added to this mapped Flood Planning Area.



Morriset and Vales Point Resignalling Project

Figure 3.2: Flood Planning

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3.3 NSW State legislation

3.3.1 *Environmental Planning and Assessment Act 1979*

In NSW, the EP&A Act and the EP&A Regulation regulate the majority of planning and environmental impact assessment processes. Under Section 5.5 of the EP&A Act, Sydney Trains is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of its activities. This REF was prepared to fulfil Sydney Trains' obligation under Section 5.5. The proposal is considered to be consistent with the provisions of the EP&A Act and the EP&A Regulation.

Clause 171 of the EP&A Regulation identifies factors to be considered by Sydney Trains in order to assess the likely impacts of the proposal on the natural and built environment in producing the REF. The Clause 171 factors are considered in Section 6.

3.3.2 *Heritage Act 1977*

The *Heritage Act 1977* provides for the protection and conservation of non-Aboriginal cultural heritage items such as buildings, works, relics and other places of historic, cultural, social, archaeological, architectural, natural, and aesthetic significance. Sydney Trains must seek approval under Section 60 of the *Heritage Act 1977* if it is likely to impact an item of heritage significance listed on the NSW State Heritage Register (SHR). There are no sites within the proposal area listed on the SHR.

There are several non-Aboriginal heritage sites along the proposal's alignment which are protected under the TAHE s170 Register or the Lake Macquarie LEP 2014, including Morisset Railway Station Group and Residences, Dora Creek Underbridge, and the alignment of the Great Northern Railway itself. These matters are considered in a Heritage Impact Assessment (HIA) contained in Appendix A7.

A Statement of Heritage Impact (SoHI) was further completed by CCG (Appendix A8) which concluded a moderate impact would occur to the heritage item 'Morisset Railway Station Group and Residences.' However, several mitigation measures will be implemented to reduce the impact which are detailed in the SoHI and addressed in Section 5.8.

As no items of State Heritage significance are likely to be affected, nor will there be any likely significant impact to items listed on a Local Environmental Plan, under the *State Agency Management Principles*,[38] heritage approval for works to these items will be made internally by Sydney Trains.

3.3.3 *Contaminated Land Management Act 1997*

The *Contaminated Land Management Act 1997* establishes a process for investigating and remediating land where contamination presents a significant risk of harm to human health or the environment. It applies to contamination which occurred before or after its commencement.

Sydney Trains must consider contamination caused by past activities (including rail activities) and potential contamination from spills and leaks in developing and managing land.

Currents within the surrounding Dora, Pourmalong, Cobra, Wyee, Swampy and Mannering Creeks constantly disperse and transport creek bed sediments, and it is unlikely that there will be a concentrated build-up of any significant contamination as a result of railway operations.

The proposal is not expected to exacerbate any contamination risk at the proposal area provided the mitigation measures outlined in Section 5.3 are implemented.

A search undertaken on 28 September 2023 of the EPA contaminated land record of notices website did not identify any recorded contaminated sites within the proposal footprint.

3.3.4 *National Parks and Wildlife Act 1974*

Under the NP&W Act, all Aboriginal cultural heritage (including objects and places) are protected, irrespective of their level of significance or matters of land tenure. The NP&W Act establishes strict liability offences for harming or desecrating Aboriginal objects and Aboriginal places (this type of offence may apply even if a person is unaware that they are harming an Aboriginal object). All persons are therefore responsible for taking reasonable precautions and exercising due diligence to ensure that their actions will not harm Aboriginal objects. A person who exercises this due diligence has a defence against prosecution if they later unknowingly harm an object.

The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) provides guidance on how to identify activities that may harm an Aboriginal object or place, and to determine whether they should apply for consent to harm an Aboriginal object or place in the form of an Aboriginal Heritage Impact Permit (AHIP) under Section 90A of the NP&W Act. The *National Parks and Wildlife Regulation 2019* removes the need to follow the due diligence process if the proponent is carrying out an activity which is specifically defined as a 'low impact activity.'

The proposal will not take place on land which is adjacent to a National Park, Nature Reserve or other area reserved under the NP&W Act. As such, no consultation is required to be undertaken with Department of Planning and Environment (DPE). However, the entire Main North Line within the Lake Macquarie LGA is subject to a mapped overlay for Sensitive Aboriginal Landscape Area under Clause 7.7 of the Lake Macquarie LEP 2014. Whilst this is not a matter which is governed by the NP&W Act, it nevertheless indicates a sensitive landscape as defined under the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010).

As such, it must be queried whether there are any:

- Relevant confirmed site records or other associated landscape feature information on AHIMS? and/or
- Any other sources of information of which a person is already aware? And

- Landscape features that are likely to indicate presence of Aboriginal objects?

At minimum, the proposal triggers an assessment to be undertaken following the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010).

An Aboriginal Cultural Heritage Due Diligence was completed by Extent (2020) which was updated by Artefact (2023) see appendix A6. The outcomes of this assessment are detailed within Section 5.7. Overall, the portions of rail corridor that overlap with the proposed works footprint have been subject to extensive past ground disturbance (Extent 2020: 13) and represent 'disturbed landscapes.' As a result, the detailed design is unlikely to result in adverse impact to sensitive Aboriginal landscapes or Aboriginal sites.

The entire Main North Line corridor within the Lake Macquarie LGA is subject to a heritage protection for Sensitive Aboriginal Landscape Area (mapping under Clause 7.7 of the Lake Macquarie LEP 2014).

An Aboriginal Cultural Heritage Due Diligence (Appendix A6) was prepared by Extent Heritage (2020) for the proposal to determine the Aboriginal archaeological potential of the site. This initial study has been reviewed and updated by Artefact (2023) (Appendix A6).

Given that the impacts to this heritage item are considered to be negligible/inconsequential, Sydney Trains has determined that consultation with Lake Macquarie City Council is also not triggered under Clause 2.11 of T&I SEPP with respect to this mapped overlay for Sensitive Aboriginal Landscape Area under Clause 7.7 of the Lake Macquarie LEP 2014.

3.3.5 *Biodiversity Conservation Act 2016*

The BC Act was introduced to consolidate various pieces of legislation relating to threatened species and the environment. The BC Act seeks to:

- Conserve biological diversity at bioregional and State scales
- Maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations
- Assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process
- Establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity.

Sydney Trains must identify the location of any threatened species or threatened ecological communities (TECs) or areas of outstanding biodiversity value when undertaking construction and maintenance activities in or near areas in which the above mentioned are known to occur or may occur.

The Biodiversity Assessment contained in Appendix A5 and summarised in Section 5.6 confirmed that the proposal will not significantly impact on any threatened species, native vegetation or other biodiversity values. The Biodiversity Assessment did identify the presence

of notifiable weeds within the study area, and measures will be undertaken during construction to manage these.

3.3.6 *Biosecurity Act 2015*

The *Biosecurity Act 2015* provides a framework to manage biosecurity risks from animal and plant pests and diseases, weeds, and contaminants.

Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans developed for each region in NSW. Appendix 1 of each Regional Strategic Weed Management Plan identifies the priority weeds for control at a regional scale. However, landowners and managers must take appropriate actions to reduce the impact of problem weed species regardless of whether they are listed in Appendix 1 of the Regional Strategic Weed Management Plan or not as the general biosecurity duty applies to these species.

Section 5.5 has identified the DPI Priority Weeds for the Hunter Region which have been found at the site and which require control under the *Biosecurity Act 2015.*

3.3.7 *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environmental protection and pollution control legislation in NSW. All work potentially resulting in pollution must comply with the POEO Act.

The POEO Act is administered by the NSW Environment Protection Authority (EPA) and provides for the issue of Environment Protection Licences (EPLs) where works or activities are to be carried out which may pose a risk to the environment. Sydney Trains operates under EPL 12208. This EPL authorises the carrying out of 'rolling stock operations' and 'railway infrastructure operations' on the NSW metropolitan rail network as defined by the Sydney Trains network diagram.

It is considered that the proposal can proceed in compliance with the following key provisions of EPL 12208:

- Part 5.3 – Water Pollution
- Part 5.4 – Air Pollution
- Part 5.5 - Noise Pollution
- Part 5.6 – Land Pollution and Waste.

3.3.8 *Transport Administration Act 1988*

The *Transport Administration Act 1988* provides a framework for the governance and delivery of transport services, promotes integration of the transportation system, and enables effective planning and delivery of transport infrastructure and services.

Pursuant to Section 98 of the *Transport Administration Act 1988* and Clause 4 of Schedule 6A of the *Transport Administration Act 1988*, Sydney Trains, by authority of its Chief Executive or his or her authorised delegate specifies that all persons who are:

- Sydney Trains personnel who work within the Sydney Trains Maintenance Directorate,
- Contractors engaged by Sydney Trains personnel within the Major Works Division of the Sydney Trains Maintenance Directorate, or
- Are authorised to exercise the powers of entry onto land, buildings, or facilities pursuant to Section 98 and Clause 3 of Schedule 6A to the *Transport Administration Act 1988*.

This power can allow Sydney Trains to enter onto, pass and repass across and carry out works on land it does not own for the purpose of exercising its functions.

3.3.9 *Water Management Act 2000*

The main object of the *Water Management Act 2000* (WM Act) is to manage NSW water in a sustainable and manner for the benefit of both present and future generations. The WM Act is administered by Department of Primary Industries – Water and establishes an approvals regime for activities which impact waterfront land.

The WM Act is administered by the Department of Primary Industries (Water) (DPI Water) and establishes an approvals regime for activities which impact waterfront land (being land 40m from the highest bank of a river, the shore of a lake, or the mean high-water mark of an estuary). Section 91E of the WM Act provides that an approval is required to undertake a controlled activity in on or under waterfront land. A controlled activity is defined as including the carrying out of a work as defined in the EP&A Act, which includes the making of alterations to or the enlargement or extension by physical activity (work).

However, clause 41 of the Water Management (General) Regulation 2018 provides that a public authority is exempt from section 91(E)1 of the WM Act for all controlled activities that it carries out in, on or under waterfront land.

The construction footprint of building site MT01 is 40 meters from Wyee Creek. This area proposed is already cleared of vegetation including land that has been cleared for vehicle access.

As a public authority, Sydney Trains does not need to obtain a controlled activity approval under section 91E(1) for any controlled activity that is carried out in, on or under waterfront land. It is however a requirement to undertake these activities in accordance with the relevant guideline issued by DPI Water. Section 5.3 outlines the mitigation measures that will be carried out in line with the relevant Guideline issued by Department of Primary Industries – Water.

3.3.10 *Waste Avoidance and Resource Recovery Act 2001*

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act 2001) sets out the priorities and mechanisms by which waste reduction is to be achieved in NSW.

The Act requires the development of a waste strategy for NSW, which is contained in the current *NSW Waste Avoidance and Resource Recovery Strategy 2014 – 2021* (Waste Strategy, 2014). The Waste Strategy 2014 provides guidance for key industry, local government and State agencies and groups to assist in the minimisation of environmental harm from waste disposal and the conservation and efficient use of resources. The provisions of the Waste Strategy 2014 have been considered in Section 5.9 of this REF.

3.3.11 *Coal Mine Subsidence Compensation Act 2017*

The *Coal Mine Subsidence Compensation Act 2017* makes provisions for the payment of compensation for damage caused by subsidence in connection with the extraction of coal; and for related purposes. Part 3 of the *Coal Mine Subsidence Compensation Act 2017* provides that development within a mine subsidence district requires an approval under Section 22 of that Act.

The proposal was granted approval from the Subsidence Advisory on 31 August 2023 for works within the proposal footprint, subject to the conditions set out in the determination under Schedule 1, see Appendix A3.

3.4 Commonwealth legislation

3.4.1 *Environment Protection and Biodiversity Conservation Act 1999*

MNES are protected under the EPBC Act and Sydney Trains must not take an action that has, will have or is likely to have a significant impact on any MNES without approval from the Commonwealth Minister for the Environment. An action is a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things.

MNES are considered further in Section 6. The assessment of the project's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES. Accordingly, the project has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water

3.4.2 *Native Title Act 1993*

The *Native Title Act 1993* provides a framework for the determination of Native Title claims within Australia, and for negotiations and decision making regarding the use and management of Native Title lands and waters. Exclusive rights to land are only available on certain unallocated or vacant Crown lands.

A Native Title Registrar is responsible for maintaining three Registers under the Act: the National Native Title Register, the Register of Native Title Claims, and the Register of

Indigenous Land Use Agreements. Exclusive rights to land are only available on certain unallocated or vacant Crown lands.

A search of the National Native Title Tribunal Register on 28 September 2023 confirmed that there were no approved determinations of Native Title, Native Title Claims, or Indigenous Land Use Agreements existing in the Lake Macquarie LGA.

It is pertinent to remember that the railway corridor in this location is immediately adjacent to Crown Lands. Therefore, the potential for a future Native Title claim to affect future access to this site via the mapped Crown Lands to the north-east should be contemplated.

3.5 Ecologically sustainable development

Ecologically sustainable development entails using, conserving, and enhancing the community's environmental resources in a manner that sustains and improves ecological processes, and hence the quality of life, for present and future generations.

Part 3B, Division 2 of the *Transport Administration Act 1988* states that an objective of Sydney Trains is that where its activities affect the environment, it must conduct its operations in compliance with the principles of ecologically sustainable development contained in Section 6(2) of the *Protection of the Environment Administration Act 1991.*

Section 6(2) of the *Protection of the Environment Administration Act 1991* requires compliance with the following four principles of ecologically sustainable development, where an activity affects the environment:

- **The precautionary principle:** for example, 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
- **Inter-generational equity:** the present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations
- **Conservation of biological diversity and ecological integrity:** should be a fundamental consideration of the decision to undertake the activity
- **Improved valuation, pricing, and incentive mechanisms:** for example, the users of goods and services should pay prices that include the use of natural resources and assets and the ultimate disposal of any waste generated by the provision of that good or service, and that environmental goals, having been established, should be pursued in the most cost-effective way.

Sydney Trains is committed to ensuring that its projects are consistent with the principles of ecologically sustainable development. The principles of ecologically sustainable development have therefore been an integral consideration in the proposal. Table 3-2 outlines the how the principles of ecologically sustainable development have been applied to the proposal.

Table 3-2: The principles of ecologically sustainable development applied to proposal

Principle	Application to the proposal
Precautionary principle	This REF assessment has concluded that the proposal does not pose a risk of serious or irreversible environmental damage occurring. Any adverse impacts associated with the proposal will be minor. Measures to reduce adverse impacts as far as practicable have also been identified within this REF.
Intergenerational equity	This proposal will contribute to part of the overarching *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020) designed to modernise Sydney's rail network. In particular, the proposal will contribute towards the efficiency, connectivity, capacity, and safety of existing freight rail access on the Main North Line which will benefit future generations whilst generating only a minimal environmental impact.
Conservation of biological diversity and ecological integrity	This Biodiversity Assessment has concluded that no significant impacts will be generated as part of this proposal to either threatened flora or fauna or other biodiversity values.
Improved valuation and pricing of environmental resources	Sydney Trains recognises the value of environmental resources and aims to minimise the impacts of its activities by ensuring that appropriate mitigation measures are implemented for all aspects of the proposal.

3.6 Licences, approvals, and permits

3.6.1 Environmental Protection Licence

Sydney Trains operates under EPL 12208. This EPL authorises the carrying out of 'rolling stock operations' and 'railway infrastructure operations' on the NSW metropolitan rail network as defined by the Sydney Trains network diagram. This EPL 12208 contains an objective to control and progressively reduce noise and air quality impacts. The works being undertaken as part of the proposal fall within this definition of 'rail infrastructure operations' and therefore do not trigger a variation to EPL 12208. As discussed in Section 3.3, no new EPL or current EPL variations are required to support the proposal.

The proposal is not likely to impact protected aquatic habitats or species and does not involve any activities requiring a permit from NSW Department of Primary Industries such as dredging and reclamation, harming marine vegetation or using explosives or other dangerous substances.

No controlled discharge to waterways is currently proposed for the proposal.

3.6.2 Subsidence Advisory Approval

Part 3 of the *Coal Mine Subsidence Compensation Act 2017* provides that development within a mine subsidence district requires an approval under Section 22 of that Act. Section 24 of the *Coal Mine Subsidence Compensation Act 2017* provides that some developments do not require such approval as they are considered exempt. A review of the current published exempt list published by the Subsidence Advisory - NSW does not class the current proposal as being exempt.

The proposal was referred to Subsidence Advisory - NSW under Clause 2.15(2)(f) of T&I SEPP (refer to Section 4.1). Approval was granted by the Subsidence Advisory for the proposal in August 2023, for a period of five years, subject to the conditions set out in Schedule 1 of the determination, (refer to Table 3-3).

Table 3-3: Subsidence Advisory - Schedule 1 Conditions of Approval

General	
Plans, Standards and Guidelines	
1.	These conditions of approval under Section 22 of the *Coal Mine Subsidence Compensation Act 2017* (the Act) only apply to the development described in the plans and associated documentation relating to TBA23-02370. Any amendments or subsequent modifications to the development renders this approval invalid
2.	This approval expires five years after the date the approval was granted if building, engineering, or construction work relating to the application has not physically commenced on the land.
Post Construction	
3.	Certification of Works Upon completion of construction, submit certification from a qualified builder or certifier that confirms construction is in accordance with the plans approved by Subsidence Advisory.

3.7 Summary of statutory requirements

Overall, it is considered that the proposal is permitted without consent under Clause 2.92 of T&I SEPP, and may therefore be assessed using this REF under Part 5 of the (EP&A Act). The proposal does not trigger consideration of State Significant Development, State Significant Infrastructure, or Regionally Significant Development provisions.

Table 3-4 summarises the statutory requirements for the proposal.

Table 3-4: The statutory requirements relevant to the proposal

Aspect	Legislation	Section/Clause	Approval authority	Comment
Planning Pathway	EP&A Act	Part 5	Sydney Trains	The proposal is permissible without consent under Clause 2.92 of T&I SEPP being for rail infrastructure facilities.
	T&I SEPP	Chapter 2, Part 2.3, Division 15, Clause 2.92	Sydney Trains	
Licensing	EPL 12208	Sections 47 and 48	NSW EPA	The proposal will be undertaken subject to the standard environmental controls set out within EPL 12208 for the licensed activity of Railway Infrastructure Operations. Due to predicted noise exceedances for surrounding residences during track alignment works, buildings, drainage/drain pipes, OHW, pits, and ancillary works in Noise Catchment Areas (NCAs) 01, 02 and 03 (refer to Table 5-14 in Section 5.6.2 below), the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains EPL 12208 will need to be implemented during this proposal. However, no variations or modifications are required

Aspect	Legislation	Section/Clause	Approval authority	Comment
				to be made to the existing Sydney Trains EPL 12208 to facilitate the proposal.
Other approvals	*Heritage Act 1977*	Section 170	Sydney Trains	Internal endorsement for the proposal by a Sydney Trains Heritage Specialist.
	NP&W Act	Section 90	National Parks	The proposal is not expected to harm any Aboriginal object or declared Aboriginal place protected under the NP&W Act. There is accordingly no need to consult with Lake Macquarie City Council regarding the proposal and its relationship with this heritage listing under Clause 2.11 of T&I SEPP.

4 Consultation

4.1 Transport and Infrastructure SEPP Consultation

T&I SEPP contains provisions for public authorities such as Sydney Trains to consult with local councils and other public authorities prior to the commencement of certain types of development. Sydney Trains must take consideration of any responses received within 21 days after notification. A summary of the T&I SEPP consultation requirements is detailed in Table 4-1.

Table 4-1: Summary of Transport and Infrastructure SEPP consultation

Is consultation with council or other agencies required under Clauses 13-16 of the T&I SEPP?	
Are the works likely to have a substantial impact on the stormwater management services which are provided by council? Agency – Lake Macquarie City Council	No
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area? Agency – Lake Macquarie City Council	No
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system? Agency – Lake Macquarie City Council	No
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water? Agency – Lake Macquarie City Council	No
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? Agency – Lake Macquarie City Council	No
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? Agency – Lake Macquarie City Council	No
Are the works located on flood liable land? If so, will the works change flooding patterns to a more than minor extent? Agency – Lake Macquarie City Council	No
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential? Agency – Lake Macquarie City Council	Part A Yes, Part B No
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*? Agency – Office of Environment and Heritage	No
Are the works adjacent to a declared aquatic reserve under the *Marine Estate Management Act 2014* Agency – Office of Environment and Heritage	No
Are the works adjacent to a declared marine park under the *Marine Parks Act 1997*? Agency – Marine Parks Authority	No

Is consultation with council or other agencies required under Clauses 13-16 of the T&I SEPP?	
Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*? Agency – Sydney Harbour Foreshore Authority	No
Do the works involve the development of a fixed or floating structure in or over navigable waters? Agency – NSW Maritime	No
Are the works located on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961* Agency – Subsidence Advisory - NSW	Yes The proposal will be undertaken within a mapped mine subsidence districts of West Lake and Mandalong. The proposal was granted approval from the Subsidence Advisory on 31 August 2023 for works within the proposal footprint.
Are the works for the purpose of residential development, as educational establishment, a health services facility, a correctional facility or group home in an area that is bush fire prone land? Agency – Rural Fire Services	No

5 Environmental impact assessment

5.1 Assessment of applicable environmental factors

A scoping exercise has been completed for the proposal. The scoping exercise has considered the potential environmental impacts of the proposal to identify those environmental factors requiring environmental impact assessment within this REF. The environmental factors relevant to the proposal are summarised in Table 5-1.

Table 5-1: Applicable Environmental Factors

Environmental Factors	Comments	Detailed discussion in REF? If Yes, Where?
Landforms, geology, and soils	The proposal could have minor localised impacts from excavation activities which could lead to erosion and sedimentation. Provided control measures are implemented no significant impacts will occur.	Yes ☒ Section 5.2 No ☐
Water quality and hydrology	The proposal area is intersected by six creek lines. The proposal could have an impact on localised water quality as a result of erosion and sedimentation. Provided control measures are implemented no significant impacts will occur.	Yes ☒ Section 5.3 No ☐
Air quality	There is potential to cause minor, short-term, and localised impacts from dust generation during construction activities.	Yes ☒ Section 5.3 No ☐
Biodiversity	The Biodiversity Assessment completed for this proposal has concluded that vegetation clearing and trimming is not to a scale which is likely to have significant impact to native vegetation or biodiversity values	Yes ☒ Section 5.5 No ☐
Noise and vibration	This proposal will generate some noise that will impact residential receivers a number of control measures have been identified to mitigate these impacts.	Yes ☒ Section 5.6 No ☐
		Yes ☒ Sections 5.7 and 5.8

Environmental Factors	Comments	Detailed discussion in REF? If Yes, Where?
Aboriginal and Non Aboriginal heritage	The entire Main North Line corridor within the Lake Macquarie LGA is subject to a heritage protection for Sensitive Aboriginal Landscape Area (mapping under Clause 7.7 of the Lake Macquarie LEP 2014). An Aboriginal Cultural Heritage Due Diligence Addendum (Appendix A6) was prepared by Artefact (2023) to support a previous Due Diligence Assessment conducted by Extent (2020) for the proposal, to determine if works would result in adverse impact to sensitive Aboriginal landscapes or Aboriginal sites. There are several non-Aboriginal heritage sites along the proposals alignment which are protected under the TAHE s170 Register or the Lake Macquarie LEP 2014, including Morisset Railway Station Group and Residences, Dora Creek Underbridge, and the alignment of the Great Northern Railway itself. These matters are considered in a HIA contained in Appendix A7 and the SoHI contained in Appendix A8.	No ☐
Waste management	The proposal will generate minor amounts of wastes which require onsite management and appropriate removal offsite.	Yes ☒ Section 5.3 No ☐
Contaminated land and hazardous materials	The railway corridor is generally subject to contamination through historical use.	Yes ☒ Section 5.10 No ☐
Visual aesthetics and urban design	The proposal has potential to have a minor impact on visual aesthetics as a result of the place of new signalling buildings. These building are located within the rail corridor in areas predominately semi-rural residential with nearby stretches of public recreation areas and dense bushland	Yes ☒ Section 5.11 No ☐
Socio-economic effects	The proposal will be undertaken during planned rail possessions which will impact rail users within the region. The long term benefits of the proposal is that it allows for a high capacity and safer and reliable train network.	Yes ☒ Section 5.12 No ☐
Traffic and access	The proposal will increase traffic on local roads during construction activities. The access locations for the proposal will be carried out via existing Sydney Trains access gates.	Yes ☒ Section 5.13 No ☐
Demand on resources		Yes ☒ Section 5.14

Environmental Factors	Comments	Detailed discussion in REF? If Yes, Where?
	This proposal would not increase demand on resources in short supply or a scare in nature.	No ☐
Cumulative environmental effects	This proposal is not expected to impact on regional climate change. The continued use of the railway line is compatible with the flood function and behaviour of the land. There are several State Significant Projects and Local Council approved development applications within the surrounding area which are likely to overlap with this proposal. This may contribute to some cumulative traffic impacts and short-term noise impacts. However, the spread of the local Das identified is considered to be adequately spread around the local suburbs so that they are unlikely to contribute to significant cumulative impacts.	Yes ☒ Section 5.15 Yes ☒ No ☐
Local strategic planning statements, regional strategic plans, or district strategic plans	This proposal aligns with the objectives in the *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020).	Yes ☒ Section 5.16 No ☐
Other relevant environmental factors	Nil	Yes ☐ Section 5.17 No ☒

5.2 Landforms, geology, and soils

5.2.1 Existing environment

The proposal is located in the Wyong subregion of the Sydney Basin bioregion. Interim Biogeographic Regionalisation for Australia (IBRA) classifies Australia's landscapes into large geographically distinct bioregions based on common climate, geology, landform, native vegetation, and species information. Sub-regions delineate significant geomorphic patterns within a bioregion, and are based on finer differences in geology, vegetation, and biophysical attributes. The characteristic landforms, geology, and soils of the Wyong subregion are described in Table 5-2 below (NSW National Parks and Wildlife Service, 2003).

Table 5-2: Characteristic landforms, geology, and soils of the Wyong subregion

Attribute	Wyong IBRA subregion description
Characteristic landforms	Coastal fall of the Sydney Basin, rolling hills and sandstone plateau outliers. Beach, dune, and lagoons of coastal barriers interspersed with coastal cliffs and rock platforms.
Geology	Triassic Narrabeen sandstones, Quaternary estuarine fills, and coastal barrier complexes.
Typical soils	Texture contrast soils on lithic sandstones and shales. Loamy sands alluvium along creeks clean quartz sands on beaches and frontal dunes, podsols in older hind dunes. Organic sands and muds in lagoons and swamps.

The topology of the proposal area can be described as having gradual slopes in a south and south-eastern direction from approximately 40m Australian Height Datum (AHD) near the proposed building MT05 to 20m AHD near the southern end of the alignment. The topography across the rest of the alignment slopes down towards Dora Creek located at the northern end of the alignment, with surface elevations ranging from approximately 40m AHD to 0m AHD. The construction areas appear to be generally flat. Table 5-3 summarises the elevation at each construction area.

Table 5-3: Topography at each construction area

Construction Area	Direction	Surface Elevation
Near proposed building MT01	Slopes down in a southern direction	14m AHD to 8m AHD
Near proposed building MT05	Slopes down in a south-eastern direction	40m AHD to 30m AHD
Near proposed building MT08	Slopes down in a northern direction	30m AHD to 20m AHD
Near proposed building MT11	Slopes down in a northern direction	38m AHD to 30m AHD
Near proposed building MTRR	Slopes down in a northern direction	40m AHD to 30m AHD
Near proposed building MT29	Slopes down in a northern direction	16m AHD to 20m AHD

The Australian Soil Classification soil type as shown in Figure 5-1 identifies the proposal sites as traversing through three soil landscapes that all typical of the Central Coast lowlands, which are described in Table 5-4. The geology of the proposal area is shown in Figure 5-2 and is further discussed in Table 5-4 below.

Table 5-4: Soil landscapes

Soil Landscape	Topography	Soils	Geology
Doyalson	Generally undulating rises with local relief to 30m and slope gradients <10%. Broad crests and ridges and long gently inclined slopes are the major landform elements. Drainage lines are broad. Rock outcrop is usually absent.	Moderately deep (50–150cm) Yellow Earths, Yellow Podzolic Soils and Soloths occur on sandstones and conglomerates Moderately deep (50–150cm) Yellow Podzolic Soils, Soloths and some Red Podzolic Soils occur on fine-grained siltstones and claystone Moderately deep to deep (100–150cm) Yellow Leached Earths, Grey Earths, Soloths and Gleyed Podzolic Soils occur along drainage lines.	Narrabeen Group— Clifton Subgroup— Munmorah Conglomerate Formation: conglomerate, pebbly sandstone, grey green and grey siltstone and claystone.
Gorokan	Undulating low hills and rises with local relief <30m and slope gradients <15%. Broad crests and ridges with long gently inclined slopes and broad drainage lines. Rock outcrop is absent.	Moderately deep (50–150cm) Soloths, Yellow Podzolic Soils on ridges and crests; Soloths, Yellow Podzolic Soils and Grey- brown Podzolic Soils on slopes with Gleyed Podzolic Soils along drainage lines.	Narrabeen Group— Clifton Subgroup— Tuggerah Formation: light coloured lithic sandstone, pebbly in part, red brown and grey green claystone and siltstone with rare conglomerate.
Wyong	Generally broad (2km), poorly drained, deltaic	Deep (>200cm) Yellow Podzolic Soils, Brown Podzolic Soils, Soloths with some Humus Podzols around lake edges.	Quaternary sediments— sand, silt, gravel, and clay.

Soil Landscape	Topography	Soils	Geology
	floodplains and alluvial flats. Slope gradients <3% and local relief <10m. Levees, meander scrolls, oxbows and swamps are common. Low lying, slightly elevated terraces are occasionally present.		

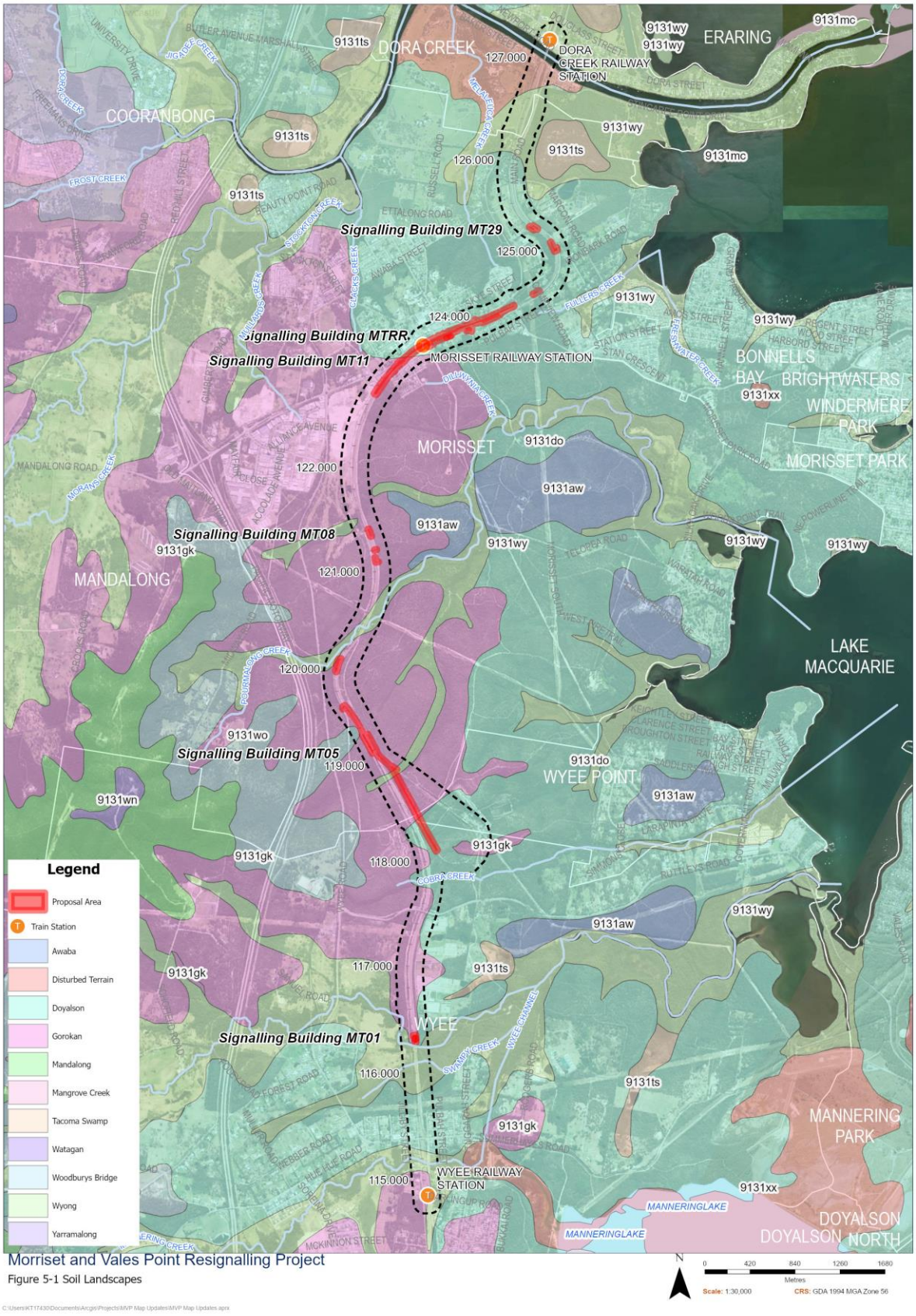


Figure 5-1: Soil landscapes

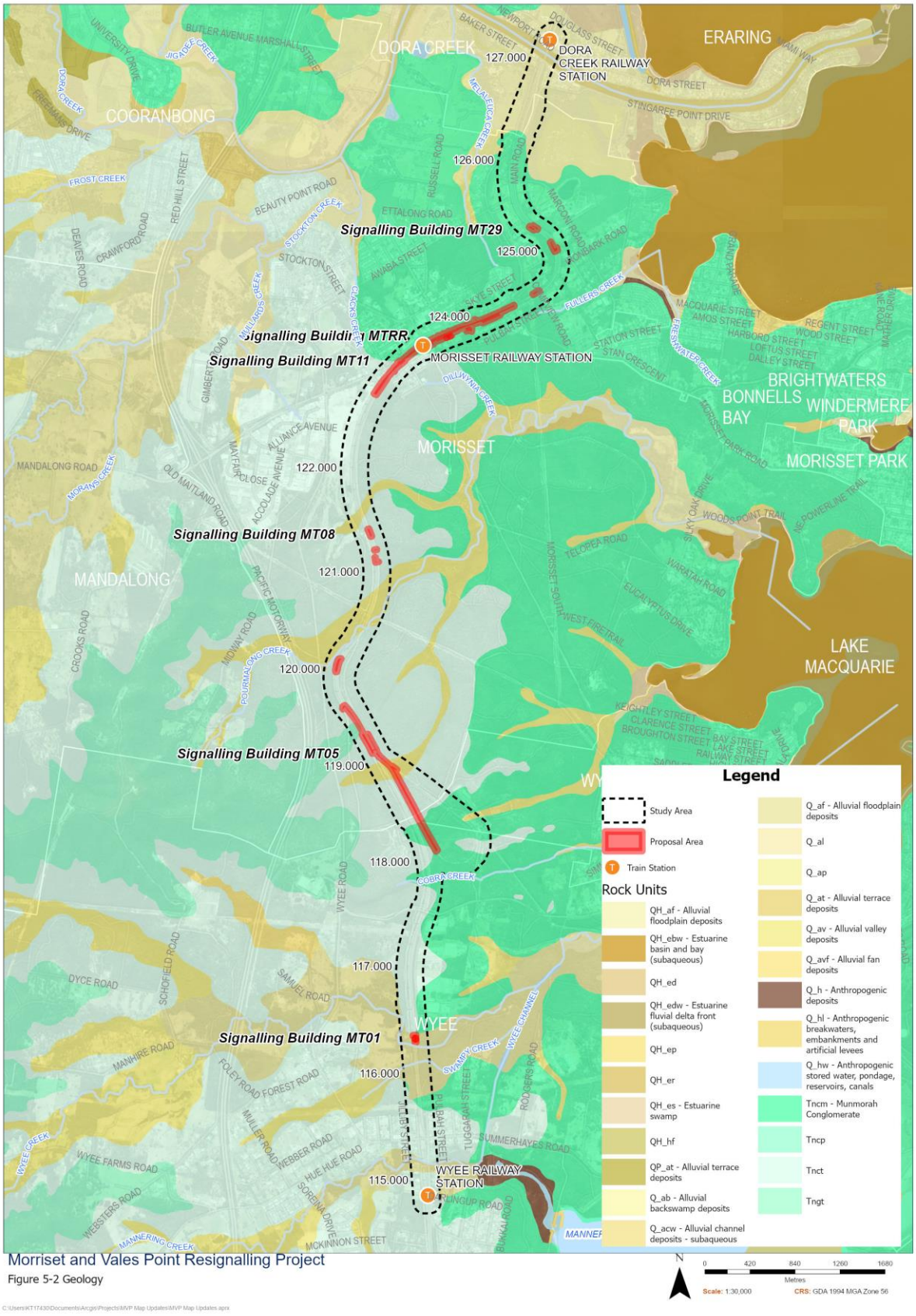


Figure 5-2: Geology

Potential Acid Sulfate Soils (PASS) are soils rich in iron sulfides (pyrite) when these soils area exposed to oxygen and oxidation occurs, they become Acid Sulfate Soils (ASS) which are highly acidic. Estuarine floodplains and coastal low land areas have an associated risk for PASS. The ASS risk mapping is shown in Figure 5-3 and the results of this are contained in Table 5-5 below). If these soils are brought into contact with oxygen, oxidisation occurs, and they become ASS which are highly acidic. There is a risk of encountering PASS along the margins of estuarine floodplains and coastal lowlands.

The Lake Macquarie LEP 2014 has mapped five classes of ASS risk. These classes relate to the depth at which ASS are likely to be encountered. The proposal footprint intersects ASS, between Dora Creek and Morisset Stations and between Vale Point and Wyee, as indicated in Table 5-5 and Figure 5-3. The ASS risk mapping (Naylor, et al., 1998) indicates that a high probability of ASS occurrence at depths of one to 2m in the floodplains of Dora Creek and a low probability of ASS occurrence at depths below 4m near Wyee.

Table 5-5: Acid Sulftate Soil locations for the proposal buildings

Activity	Acid Sulfate Classification	Acid Sulfate Classification Definition
Proposed Signalling Building MT29	Class 5	ASS are not typically found in Class 5 areas. Areas classified as Class 5 are located within 500m on adjacent class 1,2,3 or 4 land.
Proposed Signalling Building MTRR	No mapped PASS	Not applicable
Proposed Signalling Building MT11	No mapped PASS	Not applicable
Proposed Signalling Building MT08	No mapped PASS	Not applicable
Proposed Signalling Building MT05	No mapped PASS	Not applicable
Proposed Signalling Building MT01	Class 4 and Class 5	Class 4: ASS in a class 4 area are likely to be found beyond 2m below the natural ground surface. Class 5: ASS are not typically found in Class 5 areas. Areas classified as Class 5 are located within 500m on adjacent class 1,2,3 or 4 land.

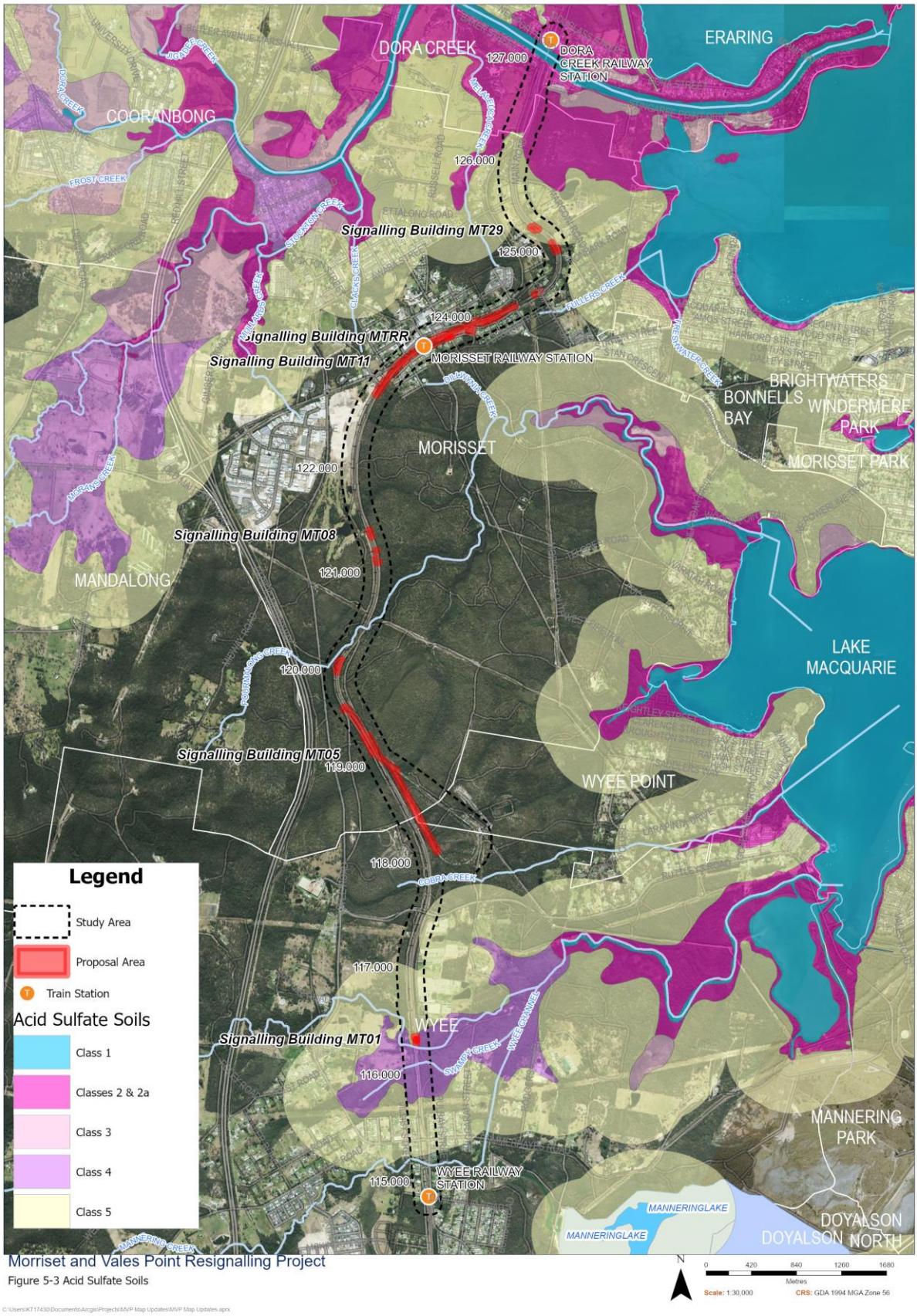
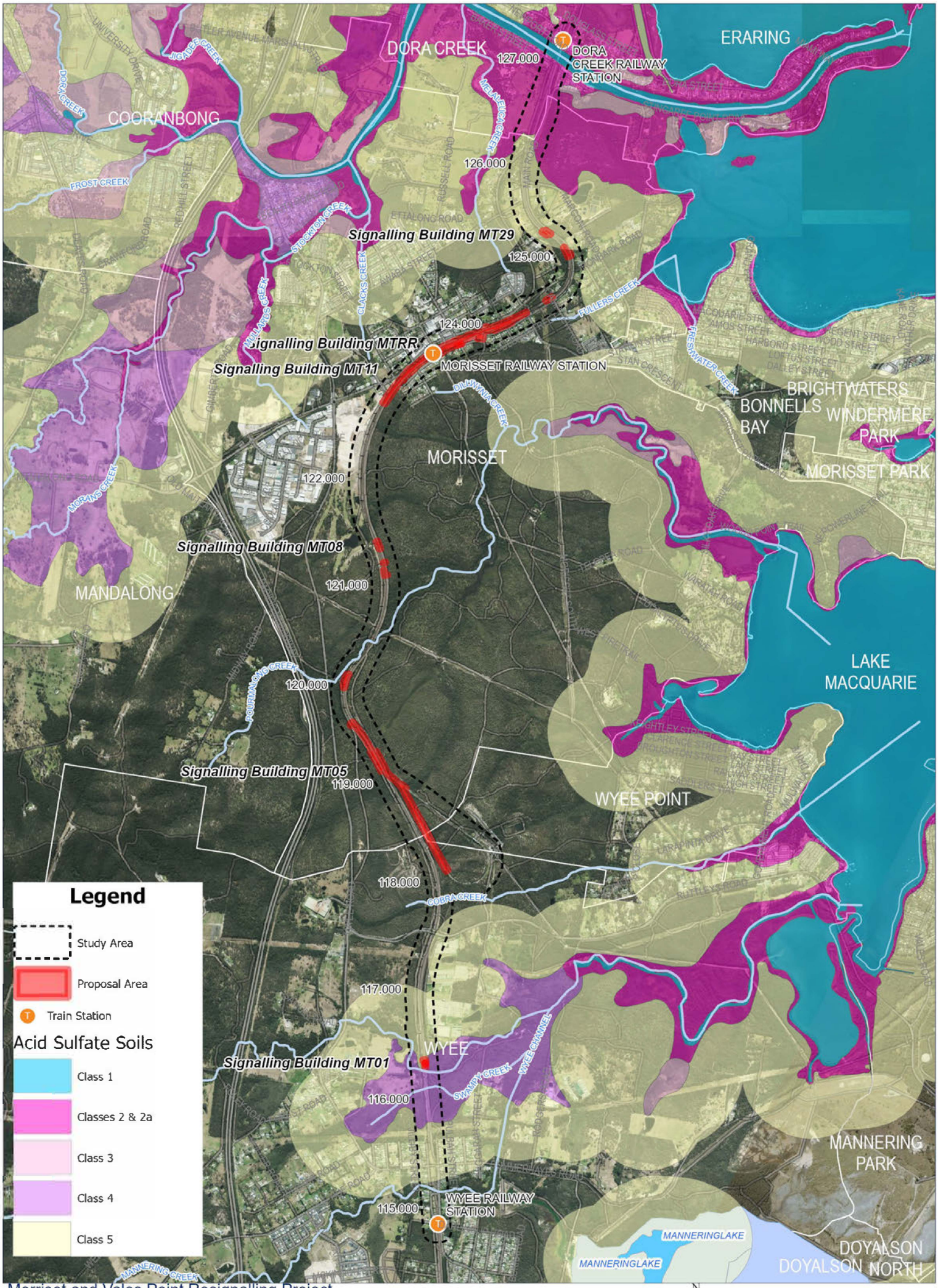


Figure 5-3: Acid Sulfate Soils



Morriset and Vales Point Resignalling Project

Figure 5-3 Acid Sulfate Soils

5.2.2 Potential impacts

The proposal has the potential to impact negatively on the surrounding environment due to excavation works required for foundation, infrastructure removal, and for service connections to the proposed Resignalling buildings. The summary of ground disturbance works, Table 2-2, shows that minor excavation works will be completed up to 4m (typically 2) for ULX trenching, six meters for OHW piles and less than 2m for CSR trenching. Replacement of the signalling post may require excavation of around 3m.

The proposal aims to take advantage of existing elements like conduits, steel troughs etc for the signalling cabling. Where these elements do not exist or cannot be used then trenching will need to occur at a depth of 0.5m to 2.5m. Ground disturbance to allow for the construction of the new buildings and walkways with some additional ground disturbance required at MT05 to allow for an APZ to mitigate bushfire risk.

Excavated soil and rock from any cable trenching will be temporarily stockpiled on site and backfilled upon completion, provided it is not contaminated or weed infested.

Where trenching is difficult to undertake in rocky terrain, rock breaking may be required.

These activities have the potential to result in erosion and therefore appropriate measures will need to be in place. Any erosion that was to occur has the potential to destabilise landforms and deposit sediments into drainage systems and waterways. These sediments and particular fine particles if they were to enter waterways may impact on the water quality and aquatic life.

Given the proposal's characteristics and the size of the area of actual works, it is anticipated that erosion risks can be adequately managed through the implementation of standard measures as outlined in Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004) (the Blue Book).

There is minimal risk of encountering ASS given the majority of work does not occur within an ASS mapped area. The depths of excavation required are not such whereby ASS will be uncovered. However, should the works associated with this proposal uncover potentially contaminated materials or ASS they will be required to be handled, managed, and disposed of appropriately to prevent any land or water pollution.

5.2.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise potential impacts to landforms, geology, and soils. These control measures are divided into two categories with the first aimed at reducing the risk of erosion and the second to mitigate against ASS.

Erosion and Sediment controls:

- Disturbed surfaces must be stabilised as soon as possible
- An Erosion and Sedimentation Control Plan must be prepared by suitably qualified persons as per Environmental Management System (EMS)-14-PR-0012 Erosion and

Sediment Control and is to be fully implemented and managed through all stages of the proposal

- Erosion and sediment control measures are to be implemented and maintained to:
    - Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets
    - Reduce water velocity and capture sediment on site
    - Minimise the amount of material transported from site to surrounding pavement surfaces
    - Divert clean water around the site (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines Vol 1 (the Blue Book)) to be read in conjunction with the relevant DECC Managing Urban Stormwater – Soils and Construction volume
- Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request
- Erosion and sediment control measures are not to be removed until the proposal is complete in those areas
- Allow for the application of a geotextile or other cover / weighting of denuded areas to protect the soil from erosion and destabilisation if required (subject to requirements to remove versus only trimming of soil)
- Removal of any vegetation would keep the trunk base and root system intact (e.g., remove trunk to near ground level only) to continue holding soils
- Stockpile management will consider:
    - All stockpiles would be located in designated areas as defined in Figure 2-1 and away from high water flow areas
    - Limiting stockpile sites to a height of one meter
    - Covering stockpile sites to reduce both the risk of erosion and generation of dust

ASS control measures:

- Confirm the presence of ASS through soil sampling which is to be undertaken accordance with the *NSW Acid Sulfate Soil Manual* (Stone, Ahern, & Blunden, 1998) at sites where there is a risk of encountering ASS as per Table 5-5
- If ASS are detected by soil sampling, then an ASS management plan must be developed (as part of the Construction Environmental Management Plan - CEMP). The ASS management plan would include material handling and disposal, and be prepared and approved by relevant stakeholders prior to the commencement of construction in the

areas where potential ASS exists. Alternative routes for trenching works must also be considered

- Management of ASS to be undertaken in accordance to Acid Sulfate Soils Assessment Guidelines (Ahern, Stone, & Blunden, 1998).

5.3 Water quality and hydrology

5.3.1 Existing environment

The proposal area is intersected by six creek lines between Wyee Station and Dora Creek Station. Dora Creek is the largest of the creeks and runs through the northern portion of the footprint. The southern portion of the Proposal is intersected by Pourmalong Creek, Cobra Creek, Wyee Creek, Swampy Creek and Mannering Creek as shown in Figure 5-4.

These creeks flow in a west to east direction where they discharge into Lake Macquarie. Lake Macquarie is located approximately 2km east of Morisset Station.

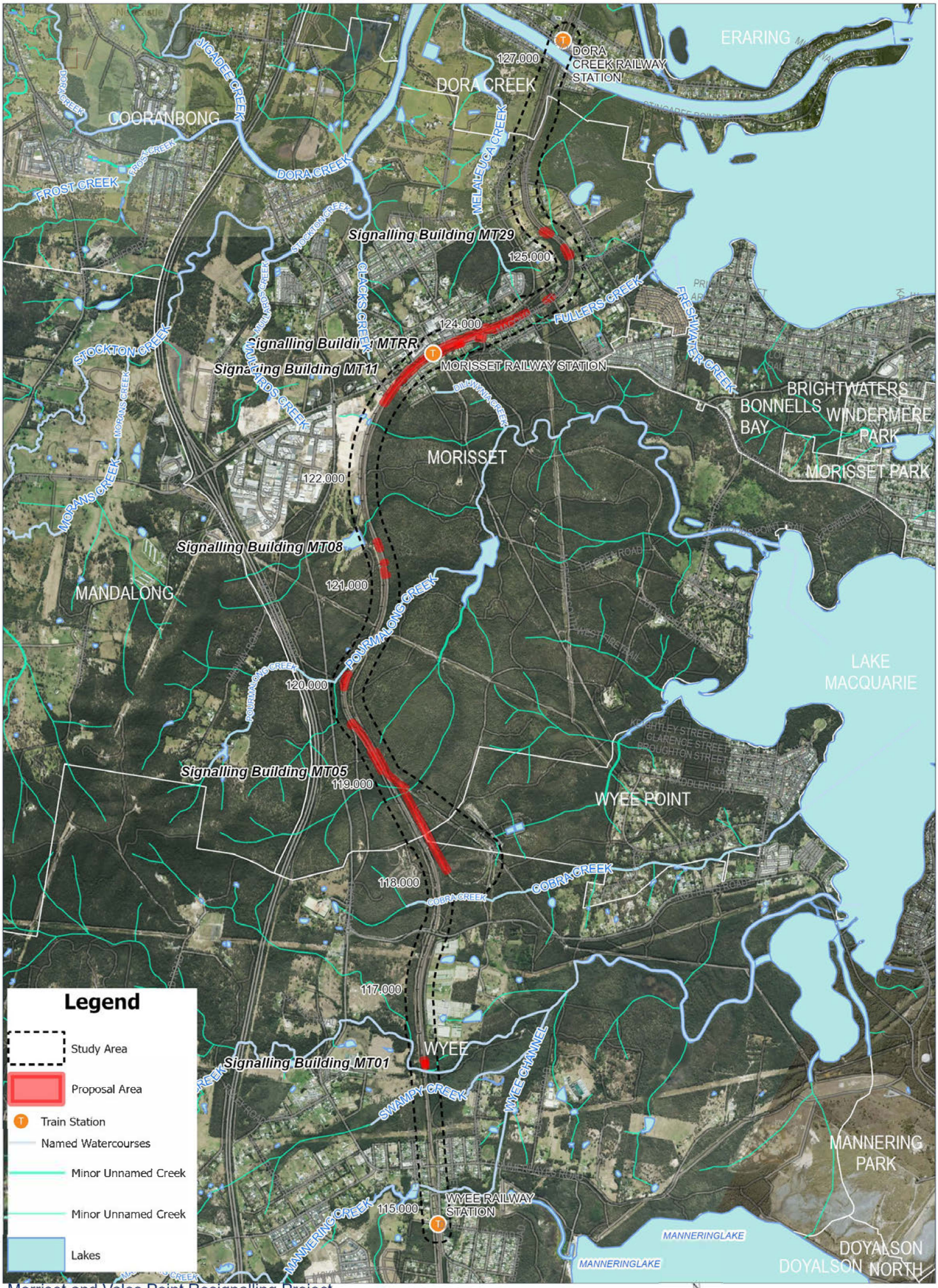
Along the rail corridor two bridges have been constructed over the ephemeral tributaries of Pourmalong Creek which cross the rail line between the Morisset Station and the Vales Point Balloon Loop. The Dora Creek Bridge is located at the northern end of the proposal area. Throughout the rail corridor multiple artificial drains and outlet sources have been added. These are shown in more detail in the hydraulic study (refer to Appendix A4).

The existing drainage system within the rail corridor consists of an informal arrangement of pit and pipe and outfall points to stormwater. Overland flows from adjoining properties generally pass beneath the ballasted areas via culverts and buried pipes. Track drainage and runoff generally discharges into bushland and nearby creeks, and into existing culverts in urban areas. Existing shelters above signal cabinets and buildings are located at a number of signal locations. Rainwater runoff from these shelters discharges to the ground and does not present a risk to local water quality.

A hydrology assessment was completed by SMEC (2023) to provide advice on the flood levels along the rail corridor which was then used to assist with the design phase of this proposal. As per the hydraulic study the proposal is located outside of any flood risk zones. Further information around flooding within this locality is provided within Section 3.2 above.

The DPI has mapped Key Fish Habitats (KFH) along the Pourmalong Creek and Wyee Creek. KFH are aquatic habitats that are important to maintain sustainable recreational and commercial fishing industries, maintain fish populations and ensure survival and recovery of threatened aquatic species. These KFH are discussed in the biodiversity Section 5.5 in more detail.

The Groundwater Dependant Ecosystems (GDE) mapping shows that there is a high to moderate potential (See Figure 5-5). These areas are scattered along the edges of the proposal area and rail corridor. The areas associated with a high potential for GDE's tend to occur along drainage lines and depressions in the landscape.



Morriset and Vales Point Resignalling Project

Figure 5-4 Hydrology

Key Map

Newcastle

Sydney

DORA CREEK RAILWAY STATION

ERARING

127.000

DORA CREEK

126.000

125.000

124.000

123.000

MORISSET RAILWAY STATION

MORISSET

BONNELLS BAY

BRIGHTWATERS

WINDERMERE PARK

MORISSET PARK

122.000

121.000

MANDALONG

120.000

LAKE MACQUARIE

119.000

WYEE POINT

118.000

117.000

WYEE

116.000

115.000

WYEE RAILWAY STATION

LEGEND

Train Station

Terrestrial

gwdep_ds

High potential GDE - from national assessment

High potential GDE - from regional studies

Low potential GDE - from regional studies

Moderate potential GDE - from national assessment

Moderate potential GDE - from regional studies

Proposal Area

Study Area

Morriset and Vales Point Resignalling Project

Terrestrial Groundwater Dependent Ecosystems

N

0 450 900 1350 1800

Metres

Scale: 1:31,000

CRS: GDA 1994 MGA Zone 56

C:\Users\KT17430\Documents\Arcgis\Projects\MVP Map Updates\MVP Map Updates.aprx

5.3.2 Potential impacts

This proposal could potentially impact on the waterway intersecting the proposal area as a result of erosion and sedimentation or from spills such as fuels, oils and chemicals during construction related to plant operation and maintenance. Other water quality risks that could potentially impact on water quality include paint and paint wastes, concrete wastes from washing process, building wastes and coarse litter and the use of pesticides and herbicides.

As shown by Figure 5-4 the key areas in proximity to creeks include:

- Morisset Station (chainage ~ 123.5 to 123.9km), in proximity to drainage channels Dillwynia Creek and Pourmalong Creek south of the station
- Signalling building MT08 (chainage ~ 121.4km), approximately 100m east of the lake on the former Morisset Country Club
- CSR works near junction of the Vales Point Balloon Loop (chainage ~ 118.8 to 118.9km), intersecting minor creek lines
- Stockpile site (chainage ~ 120.0km) which is 42m west of Pourmalong Creek south of the station. The creek along this section is surrounded by dense vegetation.
- Signalling building MT01 and drainage works (chainage ~ 116.3 to 116.35km), intersecting Wyee Creek. The end extent of the CSR is approximately 38m from Wyee Creek.

Given the proximity of construction to waterways it is vital that the control measures outlined below are followed and adhered to. Without appropriate safeguards, contaminants may reach nearby drains and discharge into local waterways. These contaminants may have the potential to harm KFH and affect the quality of water downstream. KFH are considered to be sensitive to changes in pollutants and particularly increases in sediment loads.

This proposal introduces some additional areas of non-permeable surfaces such as the roofs of the new buildings and access footpaths. The hydrology assessment completed by SMEC (2023) concluded that the alternations to the surface drainage patterns are minor in nature and that this will flow into existing drainage networks. Given there is no change to ground water level it is unlikely this proposal will have any impact on GDE's. The mitigation measures outlined in sections 5.2.3 and 5.3.3 would prevent potential contamination from entering groundwater which could potentially impact of GDE's.

In order to manage the potential water quality impacts at signalling building MT01 it is recommended that a control measure be implemented to monitor water quality of Wyee creek.

The new proposed buildings are unlikely to be impacted by any flooding as these have been designed to be away from any areas where cess drains or locations where flooding could occur from major creeks.

5.3.3 Control measures

The following management measures are to be implemented to avoid, reduce and minimise potential water impacts:

- Erosion and sediment control outlined in Section 5.2.3 Control Measures
- Contamination controls outlined in Section 5.10.3 control measures
- Implement relevant DPI water guidelines and control measures such as the those outlined in the Guidelines for instream works on waterfront land (DPIE, 2022) and all other supporting guidelines
- There is to be no release of water into water ways or drainage lines that is dirty
- Water quality control measures are to be used to prevent any materials (eg sediment) entering drain inlets or waterways
- All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains
- Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment
- Plant and equipment to be regularly inspected for oil leaks
- Spill kits appropriate to products used on site must be readily available
- Wash down of concrete mixers, concreting equipment and trucks must take place in an appropriate area away from drainage lines and stormwater drains
- Wash down areas must be appropriately constructed, and the collected material disposed of off-site
- Sydney Trains will notify the EPA of any pollution incidents that cause or may cause material harm to the environment that occur onsite.

The following mitigation measures will apply to works being completed close to Wyee Creek for the construction of signalling building MT01:

- Details of water quality inspections and monitoring of Wyee Creek will be presented in the Water Quality Monitoring Program section of the CEMP. All water compliance sampling, analysis, modelling and assessment will be as prescribed in the NSW EPA Approved methods for the sampling and analysis of water pollutants in NSW. The Program shall include a process for reporting and responding to exceedances of water quality criteria and/or targets for the proposal. Other standard approaches to water management are covered in the EMS-14-OR-1014 Water.
- Visual monitoring of Wyee Creek to assess water quality (i.e., turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls.

- The Project Manager would receive regular routine water quality monitoring reports relevant to the frequency of sampling and analysis which will be outlined in the CEMP. A water sample will be collected prior to construction to establish baseline conditions of Wyee Creek. In the case of high results or identified potential pollution the report would include a brief interpretation of the potential source of the pollution and the contributory causes.

5.4 Air quality

5.4.1 Existing environment

The nearest air monitoring station along the railway corridor between Wyee and Dora Creek is at Morisset (70 Fishery Point Road, Mirrabooka). The site is a mixture of residential and industry and was commissioned in 2020.

The *Newcastle Local Air Quality Monitoring Network four-year review 2014 to 2021* (DPE, 2023a) states the at the air quality in central coast region ranked among the stations with the lowest annual PM2.5 levels. The PM2.5 levels are an important indicator of air quality as the particulates 2.5 micrometers or less. These particles are so small they can get deep into the lungs and into the bloodstream. There is sufficient evidence that exposure to PM2.5 over long periods (years) can cause adverse health effects.

Whilst the Morisset air quality monitoring station is technically within the Lower Hunter air quality monitoring network region, the majority of studies and reporting for the Lower Hunter air quality region are focused on the impacts of industrial activities taking place closer to the city of Newcastle. The seasonal reporting on air quality monitoring for the Lower Hunter Region is focused mainly on the six monitoring stations at Beresfield, Carrington, Mayfield, Newcastle, Stockton and Wallsend, and does not mention Morisset (e.g., refer to the *Air quality in Newcastle: Spring 2022* (DPE, 2023).

The National Pollutant Inventory (NPI) was searched in January 2024 and found that 12 organisations are located within a 6km radius of the REF study area. These organisations are listed in table Table 5-6 and are likely to have an impact on localised air quality. A review of the emissions reports show that these organisations are emitters of Carbon Monoxide, Oxides of Nitrogen and Ammonia. Earing power station and Sunset Power International (Trading as Delta Electricity) 2021/2022 report showed emissions of particulate Matter of 10.0 um and 2.25um as well as Sulfur Dioxide.

Table 5-6 NPI search results of activities within a 6km radius of the proposed works

Facility Name	Primary Activity	Distance to Proposal
Sanitarium The Health Food Company - Cooranbong	Cereal health foods processing, manufacturing and packaging products.	3.51km
Bushells Ridge Asphalt Plant	Hot mix asphalt manufacturing	3.37km
Mannering Colliery	Coal works and mining for coal	4.82km

Facility Name	Primary Activity	Distance to Proposal
MOMS and MCS (Munmorah Offtake and Metering Station and Compressor Station)	Gas Metering Compression	2.3km
Chain Valley Colliery	Coal works. Mining for coal.	5.77km
Mannering Colliery	Coal works and mining for coal	4.87km
Vales Point Power Station	Electricity generator	5.2km
Yates Australia Wyee	Manufacture of manure and mineral blend fertilisers and potting mix.	800m
Dora Creek Wastewater Treatment Works	Wastewater treatment by continuous extended aeration	300m
Mandalong Mine	Underground coal mining and coal handling	1.5km
Montoro Lutum Roofing	Manufacture of clay roof tiles products	2.98km
Eraring Power Station	Coal fired electricity generation	2.87km

5.4.2 Potential impacts

The proposal is not of the scale, intensity or duration of other activities that have been shown to significantly affect air quality in this region.

There is the potential for the proposal to have a temporary impact on air quality in the immediate area and downwind, associated with vehicle movements to facilitate site access, as well as excavation, the decommissioning of structures, and the placement of new buildings, walkways, stockpiling of materials and minor emissions from plant and machinery during construction. However, given the small area of the buildings and scale of works, this will largely be localised and can be reduced with standard mitigation measures such as dust suppression methods and covering waste.

The proposal is not anticipated to change the current operational capacity, capability, or other factors that will impact local air quality. Accordingly, the proposal will not have an ongoing impact on air quality.

5.4.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise air quality impacts:

- The techniques adopted for stripping out and/or demolition must minimise the release of dust into the environment

- At the conclusion of the demolition works, the sites must be examined visually for any evidence of paint chips or debris resulting from the demolition activities. All debris must be removed
- Emission of dust from unsealed roads and other exposed surfaces such as unprotected earth or soil stockpiles must be controlled by use of surface sealants and/or water spray carts or other appropriate cover material
- Disturbed areas must be rehabilitated upon completion of demolition works by provision of protective ground cover such as mulches, vegetation, organic binders, or dust retardants
- Stockpiles must be appropriately maintained and contained which could include covering or regular watering to minimise dust. Long term stockpiles must be covered
- Traffic movements on any disturbed areas must be limited. Keep vehicles on existing access roads
- Work must be minimised during high wind periods
- Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
- Trucks or train carriages transporting spoil and other waste materials from the site must be covered
- Plant and equipment must be operated in a proper and efficient manner and switched off when not in use
- Plant and equipment must be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition
- Plant and equipment must be regularly inspected to ascertain that fitted emission controls are operating efficiently.

5.5 Biodiversity

The likelihood of occurrence for threatened fauna and flora species, populations and ecological communities was determined for a 5km radius around the study area. The ecological records were obtained from DPE Atlas of NSW Wildlife database (BioNet) and the Commonwealth Department of Climate Change, Energy, the Environment, and Water (DCCEEW) Protected Matters Search Tool (PMST). These records and an assessment of the habitat within the study area were used to determine how likely a threatened species or ecological community was of occurring in the study area (see Figure 1-1).

5.5.1 Existing environment

A comprehensive Biodiversity Assessment was completed between Wyee Station and Dora Creek station as a desktop study and field survey by SMEC on the 20 September 2023.

The likelihood of occurrence for threatened fauna and flora species, populations and ecological communities was determined for a 5km radius around the study area. The ecological records were obtained from the following sources:

- DPE Atlas of NSW Wildlife database (BioNet)
- NSW Seed Mapping Portal (DPE, 2023c)
- DCCEEW's PMST database
- The NSW Bionet Vegetation Database (DPE, 2023b) to check known vegetation associations with threatened species and TECs
- NSW DPI Fisheries Spatial Data Portal
- Coastal management areas identified by the R&H SEPP 2022.

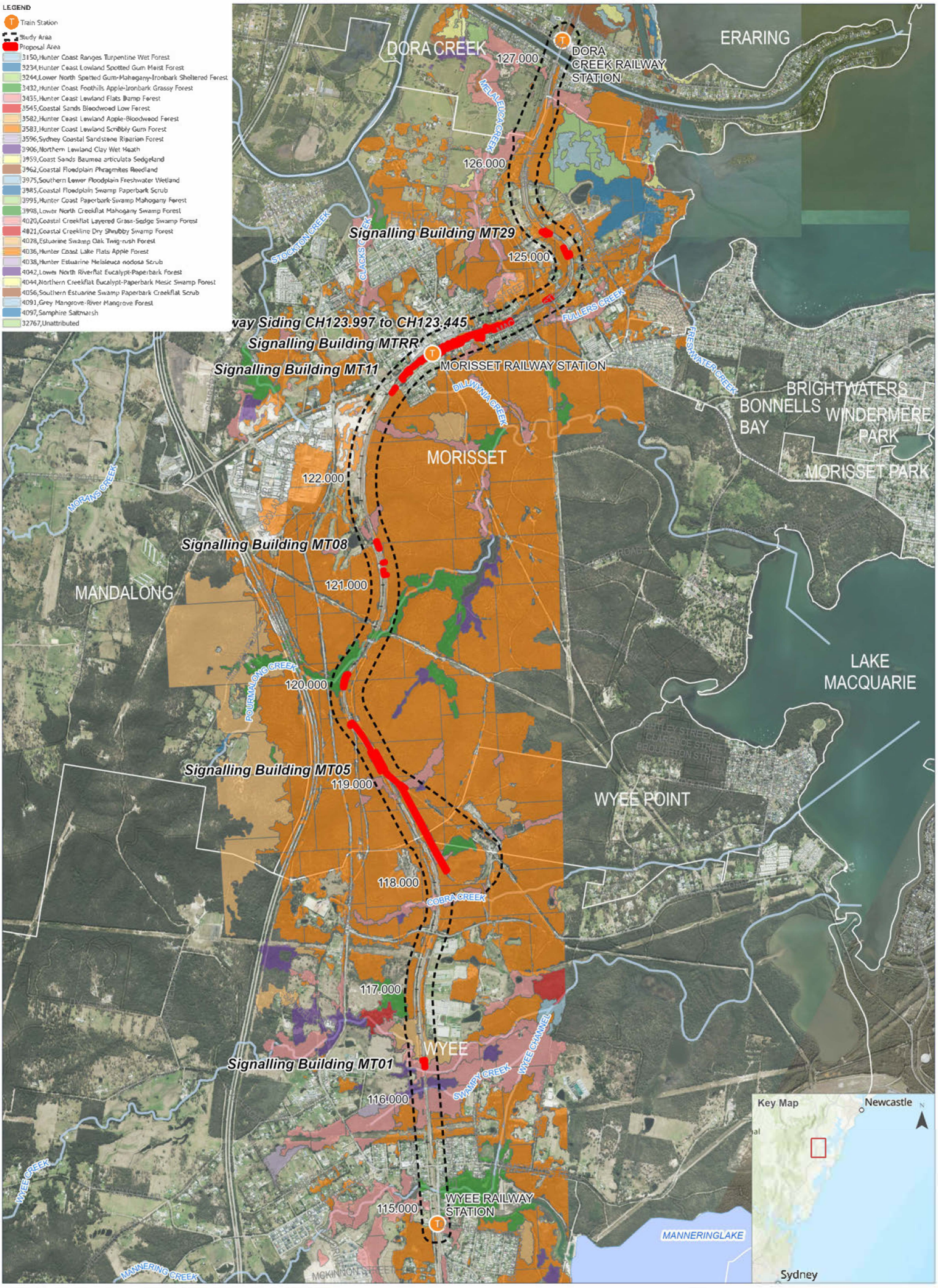
These records and an assessment of the habitat within the study area were used to determine how likely a threatened species or ecological community was of occurring in the survey area.

The field survey was completed at the signalling building locations MT05, MT11 and MT29, the perway siding extension and observation of the riparian area around Pourmalong Creek under bridge. Table 5-7 below sets out the Plant Community Types (PCTs) within 100m of the study area.

Table 5-7: PCTs within 100m of the study area

PCT ID	PCT Name	TEC Associations
4020	Coastal Creekflat Layered Grass-Sedge Swamp Forest	Swamp Sclerophyll Endangered Ecological Community (EEC)
3998	Lower North Creekflat Mahogany Swamp Forest	Swamp Sclerophyll EEC
3435	Hunter Coast Lowland Flats Damp Forest	No
3582	Hunter Coast Lowland Apple-Bloodwood Forest	No*
3906	Northern Lowland Clay Wet Heath	Swamp Sclerophyll EEC
4036	Hunter Coast Lake Flats Apple Forest	No*
3995	Hunter Coast Paperbark-Swamp Mahogany Forest	Swamp Sclerophyll EEC
4056	Southern Estuarine Swamp Paperbark Creekflat Scrub	Swamp Oak EEC

* PCT 3582 and 4036 are associated with TECs geographically restricted outside of the site's bioregion or locality


LEGEND
Train Station
Study Area
Proposal Area
3150,Hunter Coast Ranges Turpentine Wet Forest
3234,Hunter Coast Lowland Spotted Gum Moist Forest
3244,Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest
3432,Hunter Coast Foothills Apple-Ironbark Grassy Forest
3435,Hunter Coast Lowland Flats Swamp Forest
3545,Coastal Sands Bloodwood Low Forest
3582,Hunter Coast Lowland Apple-Bloodwood Forest
3583,Hunter Coast Lowland Scribbly Gum Forest
3596,Sydney Coastal Sandstone Riparian Forest
3906,Northern Lowland Clay Wet Heath
3959,Coast Sands Baumea articulata Sedgeland
3962,Coastal Floodplain Phragmites Reedland
3975,Southern Lower Floodplain Freshwater Wetland
3985,Coastal Floodplain Swamp Paperbark Scrub
3995,Hunter Coast Paperbark-Swamp Mahogany Forest
3998,Lower North Creekflat Mahogany Swamp Forest
4020,Coastal Creekflat Layered Grass-Sedge Swamp Forest
4021,Coastal Creekline Dry Shrubby Swamp Forest
4028,Estuarine Swamp Oak Twig-rush Forest
4036,Hunter Coast Lake Flats Apple Forest
4038,Hunter Estuarine Melaleuca nodosa Scrub
4042,Lower North Riverflat Eucalypt-Paperbark Forest
4044,Northern Creekflat Eucalypt-Paperbark Mesic Swamp Forest
4056,Southern Estuarine Swamp Paperbark Creekflat Scrub
4091,Grey Mangrove-River Mangrove Forest
4097,Samphire Saltmarsh
32767,Unattributed
DORA CREEK
DORA CREEK RAILWAY STATION
ERARING
127.000
126.000
125.000
Signalling Building MT29
vay Siding CH123.997 to CH123.445
Signalling Building MTRR
Signalling Building MT11
MORISSET RAILWAY STATION
MORISSET
BRIGHTWATERS
BONNELLS BAY
WINDERMERE PARK
MORISSET PARK
122.000
Signalling Building MT08
MANDALONG
121.000
LAKE MACQUARIE
120.000
Signalling Building MT05
119.000
WYEE POINT
118.000
117.000
WYEE
Signalling Building MT01
116.000
WYEE RAILWAY STATION
115.000
MANNERINGLAKE
Key Map
Newcastle
Sydney
Morriset and Vales Point Resignalling Project
Plant Community Types within 1km of Study Area
N
0
420
840
1260
1680
Metres
Scale: 1:30,000
CRS: GDA 1994 MGA Zone 56

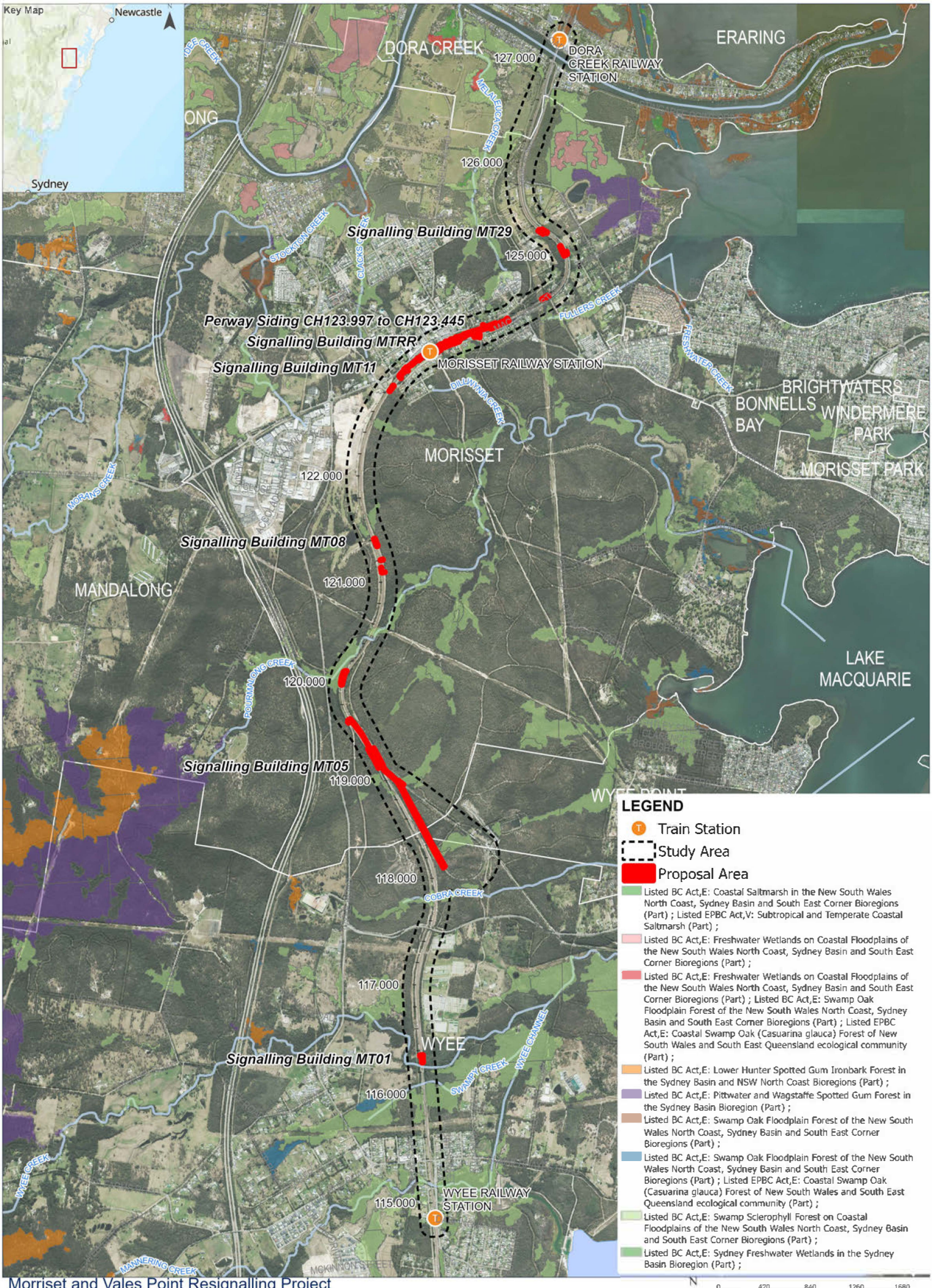
Threatened Ecological Communities

Potential TECs were identified using the current Statewide Vegetation Type Mapping and referencing the known PCT to TEC associations with the locality available from the Bionet Vegetation Classification database as of 29 September 2023. The likely locations of TECs are shown in Figure 5-7.

Two potential TECs were identified within a 100m buffer of the study area and are given in Table 5-8.

Table 5-8: TECs within 100m of the study area

TEC	BC Act	EPBC Act
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Endangered
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Endangered



Morriset and Vales Point Resignalling Project

Threatened Ecological Communities

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Threatened flora habitat

Within the study area the BioNet reports shows 4 plant species as having a moderate likelihood of occurring. These species are detailed in Table 5.9. The Biodiversity report concluded that most of the Morisset Station area had been cleared and replaced with landscaping of combined native and exotic flora.

Table 5-9 Flora Species with a moderate likelihood of occurring in the study area

Scientific Name	Common Name	NSW Status	Comm. Status	Records	PMST
Angophora inopina	Charmhaven Apple	V	V	513	X
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	45	X
Rutidosis heterogama	Heath Wrinklewor	V	V	302	X
Tetratheca juncea	Black-eyed Susan	V	V	724	X

Threatened fauna habitat

Surrounding the proposal area, a total eight threatened fauna species and populations were identified through the BioNet sighting records and the PMST. Because of the site's proximity to the coast and Lake Macquarie, an array of marine animals had records such as sharks and cetaceans, which have not been included in this total. Results of the NSW Fisheries Spatial Data search does not identify any threatened freshwater fish species in the study area and associated waterways. An additional 24 non-threatened migratory birds listed under the EPBC act were also identified through the PMST.

Table 5-10: Species with a moderate to high likelihood of occurring in the study area

Scientific Name	Common Name	NSW Status	Comm. Status	Records	PMST
Birds					
Burhinus grallarius	Bush Stone-curlew	E		2	
Glossopsitta pusilla	Little Lorikeet	V		60	
Hirundapus caudacutus	White-throated Needletail	P	V	34	
Lathamus discolor	Swift Parrot	E	CE	31	
Lophoictinia isura	Square-tailed Kite	V		2	
Ninox connivens	Barking Owl	V		2	
Ninox strenua	Powerful Owl	V		17	
Tyto novaehollandiae	Masked Owl	V		5	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		4	
Frogs					
Litoria brevipalmata	Green-thighed Frog	V		2	
Mammals					

Scientific Name	Common Name	NSW Status	Comm. Status	Records	PMST
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	6	X
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		7	
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V		49	
Miniopterus australis	Little Bent-winged Bat	V		63	
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		25	
Myotis macropus	Southern Myotis	V		26	
Petaurus norfolcensis	Squirrel Glider	V		141	
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	56	X
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		5	
Scoteanax rueppellii	Greater Broad-nosed Bat	V		24	

Weeds and Exotic Species

The landscaped or mown areas of the rail corridor are generally vegetated by exotic species such as common grasses that respond well to disturbance and mowing. A number of weed species as outlined in Table 5-11 below were identified which are covered by the *Biosecurity Act 2015* whereby "*All pest plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.*"

Table 5-11: Presence of weed species identified

Common name and species	Measures for the Hunter Region (LLS) under the *Biosecurity Act 2015*
Crofton weed (*Ageratina adenophora*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry, or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Blackberry (*Rubus fruticosus*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry, or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Bridal creeper (*Asparagus asparagoides*)	Regional Recommended Measure An exclusion zone is established for all land in the region, except the core infestation which includes: Dungog LGA, Lake Macquarie LGA, Cessnock LGA, and MidCoast LGA. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry, or release the plant into the environment. Land managers

Common name and species	Measures for the Hunter Region (LLS) under the *Biosecurity Act 2015*
	should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Pampas grass (*Cortaderia species*)	Regional Recommended Measure An exclusion zone is established for all land in the region, except the core infestation which includes parts of: Lake Macquarie LGA. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry, or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
African lovegrass (*Eragrostis curvula*)	Regional Recommended Measure Land managers should mitigate the risk of new weeds being introduced to land used for grazing livestock. Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried, or released into the environment.
Coolatai grass (*Hyparrhenia hirta*)	Regional Recommended Measure (for Regional Priority - Asset Protection) Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry, or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Lantana (*Lantana camara*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

Native vegetation

During the field survey it was noted that the rail corridor is generally cleared of native vegetation. Any fragments of native vegetation were defined as regrowth and located adjacent to the rail corridor. While the desktop study showed some threatened flora species in the local area the survey found no evidence of these species and therefore it is not likelihood of these species being present within the rail corridor is low. The rail corridor is fenced which acts as a buffer to any native vegetation beyond the fence line.

Habitat trees

There are very few large or mature trees within the rail corridor and the narrow fragment of native vegetation along the fence line at MT05 was found to contain no fallen logs, tree hollows and limited leaf litter. No hollow bearing trees were observed in or near the proposal site. No tall trees or stags with stick nest were observed that could have been nesting sites for large raptors such as Osprey or Little eagles. This is consistent with the database searched conducted which showed a low likelihood of these species being present.

Aquatic habitat

An inspection of the DPI KFH mapping showed both Pourmalong creek and Wyee creek as KFH. However, DPI does not identify any threatened fish species within the watercourses surrounding this proposal.

During the field survey in September the riparian zone of the Pourmalong Creek was inspected. A layer of ballast lines most of the creek bed as shown by Figure 5-8. The water present was shallow, turbid, and contained plague minnows (*Gambusia holbrooki*), which suggest the main creek line is not good breeding habitat for frogs. This area of the creek is used as a vehicle crossing for Sydney Trains maintenance activities via as causeway made of gravel and ballast. A similar causeway exists where Wyee Creek intersects with the railway corridor.

Figure 5-8: Pourmalong Creek and the Rail Bridge Crossing

5.5.2 Potential impacts

Direct impacts

This proposal is unlikely to result in significant adverse impacts to native vegetation and other biodiversity values. The proposal area is largely cleared of native vegetation and the vegetation that remains is largely subjected to regular slashing and/or clearing as a result of track maintenance and access. Where possible, this proposal will use existing conduits and the new building locations are close to ballasted rail track area.

The proposal will result in a maximum clearance of 0.0762ha of vegetation associated with PCT 3583. This PCT does not represent a BC Act or EPBC Act-listed TEC and is well represented outside of the proposal area. The locations that require vegetation clearing are:

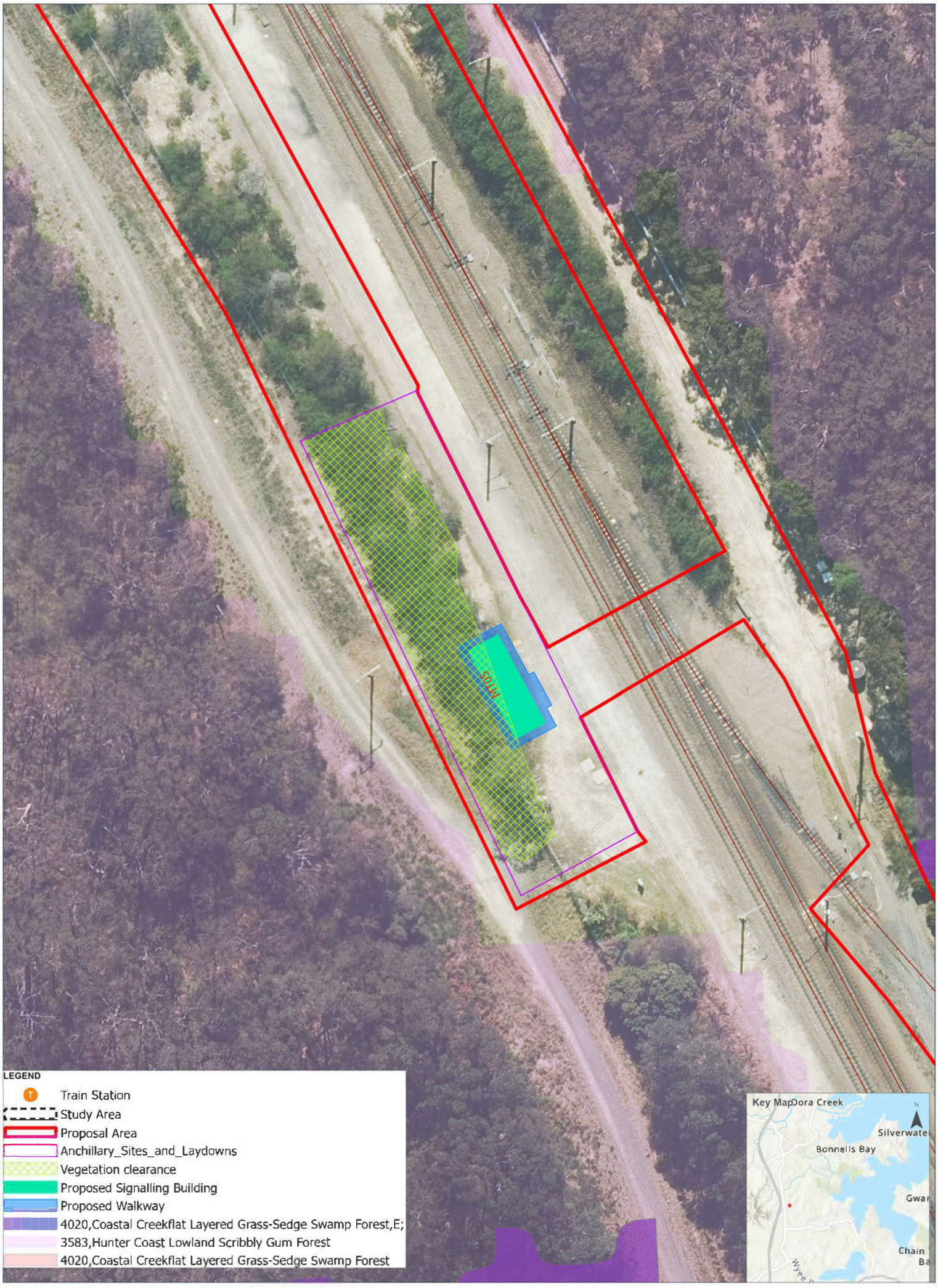
- MT05 - Clearing 0.055 hectares (550m^2) of regrowth Hunter Coast Lowland Scribbly Gum Forest (PCT 3583) within the corridor fence. This includes the removal of two trees
- MT29 - Clearing 0.0212ha (212m^2) of regrowth (PCT 3583) within the corridor fence including pruning overhanging branches.

The vegetation clearing is largely required to provide an APZ and mitigate against the potential bushfire risk to the buildings. Further details are provided in Appendix A9. Given the minor area of vegetation to be removed, and the control measures in Section 5.5.3, it is considered unlikely that the proposal will significantly impact any conservation significant fauna or flora species.

The trees to be removed at site MT05 include a mature Scribby Gum and juvenile Black she-oak (see Figure 5-9: Tree and Vegetation to be removed along the boundary fence .

This narrow fragment of vegetation is to be removed to the fence line. On the other side of the fence the vegetation has already been removed to create an easement for electrical infrastructure. The vegetation which has been proposed to be cleared is mapped as being associated with PCT 3583 which is Hunter Coast Lowland Scribbly Gum Forest. This community is not associated with any TEC's and no threatened flora species where identified.

Figure 5-9: Tree and Vegetation to be removed along the boundary fence at MT05



Morriset and Vales Point Resignalling Project

MT29 Vegetation Clearance

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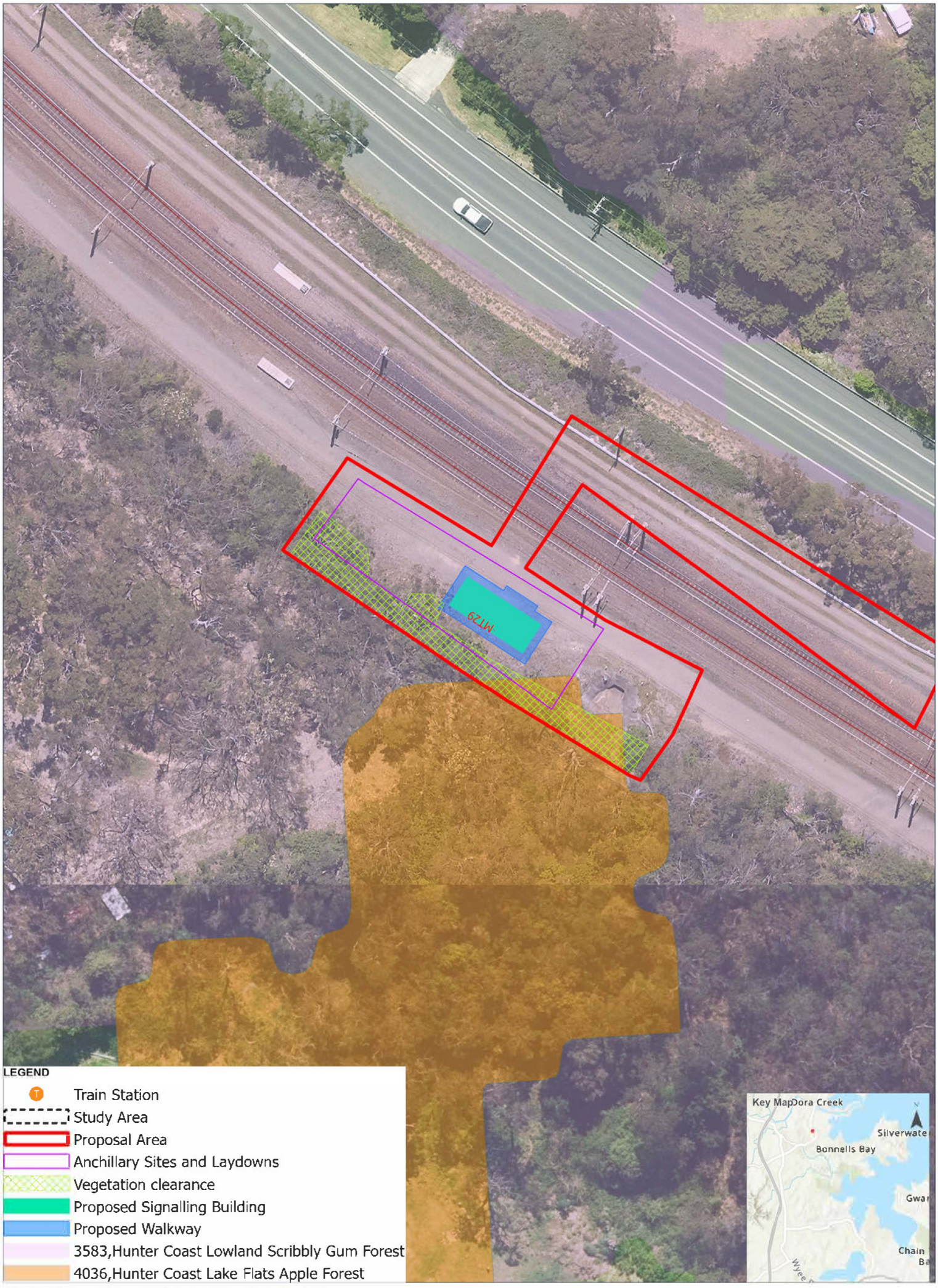
The proposed site of MT29 includes some removal of regrowth vegetation and trimming of vegetation as shown in Figure 5-11. These tree limbs are required to be trimmed to the boundary fence in order to provide a sufficient asset protection zone to the building being proposed. The vegetation for clearing includes a black she oak (*Allocasuarina littoralis*), cheese tree (*Glochidion ferdinandii*), and prickly leaf paperbark (*Melaleuca nodosa*). This vegetation is considered to be low condition native vegetation. The tree pruning required is estimated to be 10-15% of the canopy and is not expected to impact on the health of the trees.

Figure 5-11 Overhanging tree limbs over boundary fence at Signalling Building MT29



Morriset and Vales Point Resignalling Project

MT29 Vegetation Clearance

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The proposed building site MT11 as shown in Figure 5-13. This area forms part of the managed land within the railway corridor and is subject to frequent mowing. The plant species found in this area were largely exotic grasses along with some weed species such as honeysuckle (Lonicera japonica), Coolatai Grass (*Hyparrhenia hirta*) and Camphor laurel (*Cinnamomum camphora*).

Figure 5-13 Proposed building location for MT11

There is some potential for some impact to native vegetation to occur as a result of trimming of native vegetation to allow for the access of plant and equipment for the proposal. Any trimming activities are likely to be minor given the rail corridor is already largely cleared and the plant and equipment will be utilising access tracks already in use along the tracks.

There is no clearing of vegetation required along the riparian zone of Pourmalong Creek. In this area all cabling works for the proposal will be carried out within existing conduits reducing the potential negative impacts within the surrounding waterways.

Fauna is unlikely to be impacted by the proposal, although there is a low risk that animals could potentially be injured by a vehicle or equipment or fall into an open trench and become trapped or injured.

Indirect impacts

The most likely indirect impact of this proposal is the introduction, establishment and spread of weeds.

Weed establishment and spread generally results from soil disturbance and excavation as well as use of equipment that may carry weed propagules. This could include species listed as noxious under the *Biosecurity Act 2015*.

Vehicle, plant, and construction equipment will temporarily increase noise pollution within the proposal area. This can cause disruption to normal fauna activity and lead to stress, avoidance, or departure of species from an area during construction. The extent of such impacts will be dependent upon the volume and frequency of the source and received levels, other sources of anthropogenic noise, and the noise dispersal characteristics of the local environment, and the habituation or sensitisation of fauna to the noise. It is considered unlikely that noise emissions associated with the proposal in the context of an operational trainline will present a significant impact upon local fauna.

While sedimentation of waterways can impact on aquatic species it is unlikely to be significant with the implementation of the proposed mitigation measures outlined in Section 5.5.3.

Lighting has the potential to affect fauna behaviour. However, as the proposal will predominantly be undertaken during the day, this is unlikely to have a significant impact.

Impacts – conclusion

While some vegetation clearing and trimming is required as a result of this proposal, it is not of a scale which is likely to have significant impacts to native vegetation or biodiversity values. The total clearing is 0.0762 of PCT 3583 mapped vegetation. This PCT is considered to be well represented outside of the proposal area and do not represent any BC Act or EPBC Act-listed TECs. No threatened ecological communities were found within the proposal area.

During the field survey it was noted this vegetation or the surrounding areas of the railway corridor did not contain evidence of bats, frogs, or other evidence of habitats such as tree hollows. It was noted during the survey that the managed vegetation within the rail corridor may provide occasional foraging resources or passage through the landscape for smaller or mobile animals, however corridor exclusion fencing restricts connectivity for larger terrestrial animals to culverts and rail overbridges.

There is a low risk of damage to other stands of existing vegetation due to stockpiling of materials or vehicle movements. Appropriate control measures identified in Section 5.5.3, such as fencing, would be installed to ensure the risk of damage to existing vegetation is minimised.

The proposal is to avoid impacts within riparian corridors by maintaining suitable setback from larger streams including Wyee, Swampy and Pourmalong Creeks. Some minor tributaries of Pourmalong Creek cross under the Proposal Area through culverts running underneath the corridor. Proposed work near the tracks and above these culverts is not considered to be

involving riparian habitat. No areas within the Proposal Area contain important habitat for threatened amphibians or other fauna reliant on riparian vegetation.

5.5.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise both the direct and indirect impacts on biodiversity as a result of this proposal:

- Construction staff will be made aware of the biodiversity constraints.
- Any disturbed areas of the site must be revegetated using locally indigenous species in accordance with EMS-06-GD-0074 Revegetation Guide and EMS-06- TP-0066 Revegetation Technical Specification Template. The exception will be APZ areas which will retain only a short ground layer.
- All vegetation trimming and removal work will be carried out in accordance with AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of Trees on Development Sites. No hollow bearing trees are to be removed or trimmed without approval. Trees nominated for retention will be marked on all plans. A Level 3 Arborist supervises work involving tree trimming.
- Work must be planned to minimise disturbance to vegetation and soil in accordance with EMS-14-PR-0012 Erosion and Sediment Control.
- Tree or native vegetation removal works must be the offset in accordance with EMS06-WI-0177 Biodiversity Offset Calculator.
- Debris from tree pruning and removal is to be removed off site and legally disposed.
- Controls must be implemented to minimise the spread of weeds.
- There is to be no disturbance or damage to threatened species or critical habitat.

Threatened and protected species and ecological communities:

- No work to be carried out in the areas mapped as TECs (refer to Figure 5-7). These areas are to be marked on construction site maps and demarcated on site as no-go areas
- If threatened and/or protected flora or fauna species are identified, work in the vicinity of the subject flora or fauna will stop immediately. A spotter/catcher or ecologist will be engaged to survey the area, in conjunction with Sydney Trains' Environmental Officer, and advise on species management
- Construction works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Sydney Trains has provided written approval to do so

- A site survey and an environmental impact management plan by an ecologist must be created if any threatened species are recorded during the works
- Should the design be modified to alter the area or extent of vegetation removal, further ecological impact assessment must be undertaken.

Fauna (general):

- The site-specific CEMP must include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES), or Council for domestic species
- Trenches/excavations will be covered at the end of each day, and inspected before they are backfilled, to ensure that no fauna species are harmed.

Native vegetation (general):

- The extent of approved clearing and/or trimming must be marked out and minimised where possible
- Construction areas will be kept to a minimum and be clearly demarcated to prevent accidental damage to native vegetation
- Stockpiles, plant, equipment, and materials storage are to be located on existing cleared lands away from the drip zone of trees or other native vegetation, with appropriate sediment erosion controls implemented
- Vehicle turning circles and parking areas shall be clearly marked and will occur in areas free of native vegetation
- Where space within existing conduits is not available, GST is to be preferred over underground conduits to connect new assets
- Where trenching or excavation is required for installing new underground conduits or crossings, the route or location will be modified or altered to avoid any damage to trees or tree roots, where possible.
- Revegetate disturbed areas using locally native, appropriate species, in an approved vegetation plan.
- The offset calculator would be applied as determined by the biodiversity report. The full details of this are highlighted in Appendix A5. This totals $11,430 to be paid into the Sydney Trains Biodiversity offset fund.

Weed control measures are to be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during construction. This will include the management and disposal of weeds in accordance with the *Biosecurity Act 2015*. Such measures will include:

- Any vegetation removal will be assessed by an ecologist to ensure that any identified noxious weeds are removed appropriately

- Weeds shall be treated and disposed of appropriately and not mixed with other vegetation to be mulched for reuse
- Piles of cleared vegetation would be mulched as soon as practicable after clearing and mulch reused at the signal location where possible
- Soil and vegetation that could contain weed material is to be removed from machinery prior to any movements off site
- Should any priority weeds be encountered, appropriate management and disposal of these weeds must be carried out.

Prevention and management measures for plant pathogens, including Phytophthora cinnamomic and the fungus responsible for chytridiomycosis would be incorporated into the CEMP or and focus on the following key protocols:

- Vehicles, machinery, equipment entering the site would be inspected to be free of obvious soil contamination or implement appropriate hygiene protocols including wash down and/or disinfection measures
- Ensure that contaminated soil or plant material is not brought onto the site.

5.6 Noise and vibration

5.6.1 Existing environment

The activities as outlined by this proposal are contained within the rail corridor on land controlled by Sydney Trains. This proposal area is surrounded by a mixture of rural, residential, environmental conservation, recreational, agricultural, commercial, and industrial areas. The residential receivers located in close proximity to the study area defined by the REF occur at Dora Creek, Wyee and Morisset Station. The sensitive receivers located at Dora Creek will not be impacted as the works stop before Dora Creek. There are no sensitive receivers identified at Vales Point Balloon Loop. The existing acoustic environment surrounding Morisset Station is defined as a combination of rail noise, road noise and industrial or commercial sources.

Receivers surrounding the proposal were divided into four noise catchment areas (NCAs). The four NCAs are presented in Figure 5-14 and Figure 5-15. Table 5-12 below provides a description of the existing acoustic environments at these four NCAs.

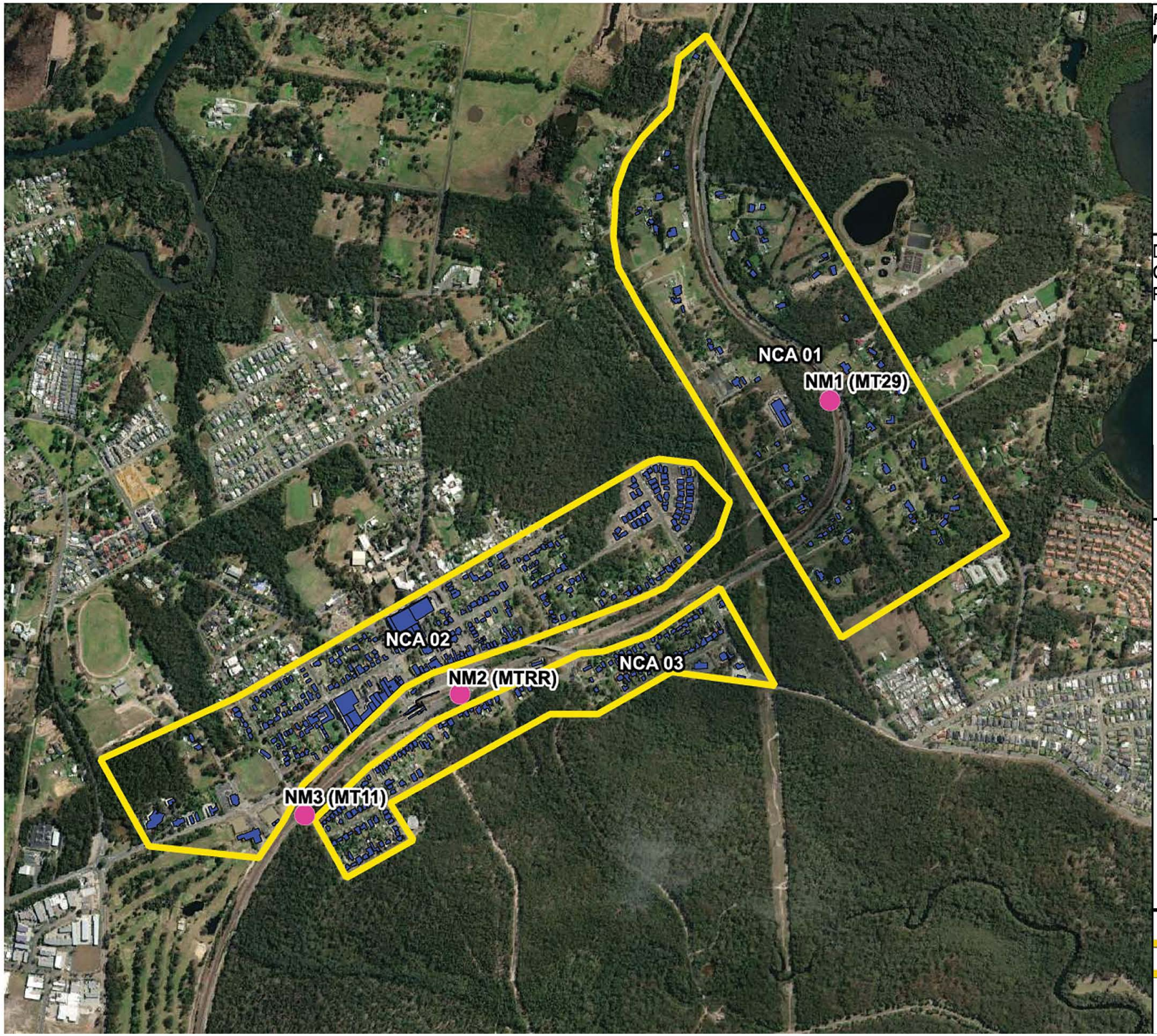

Figure 5-14: Nearest receivers and noise monitoring locations in Morisset

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- Nearest Morisset receivers
- Noise logger locations
- NCA

Resonate

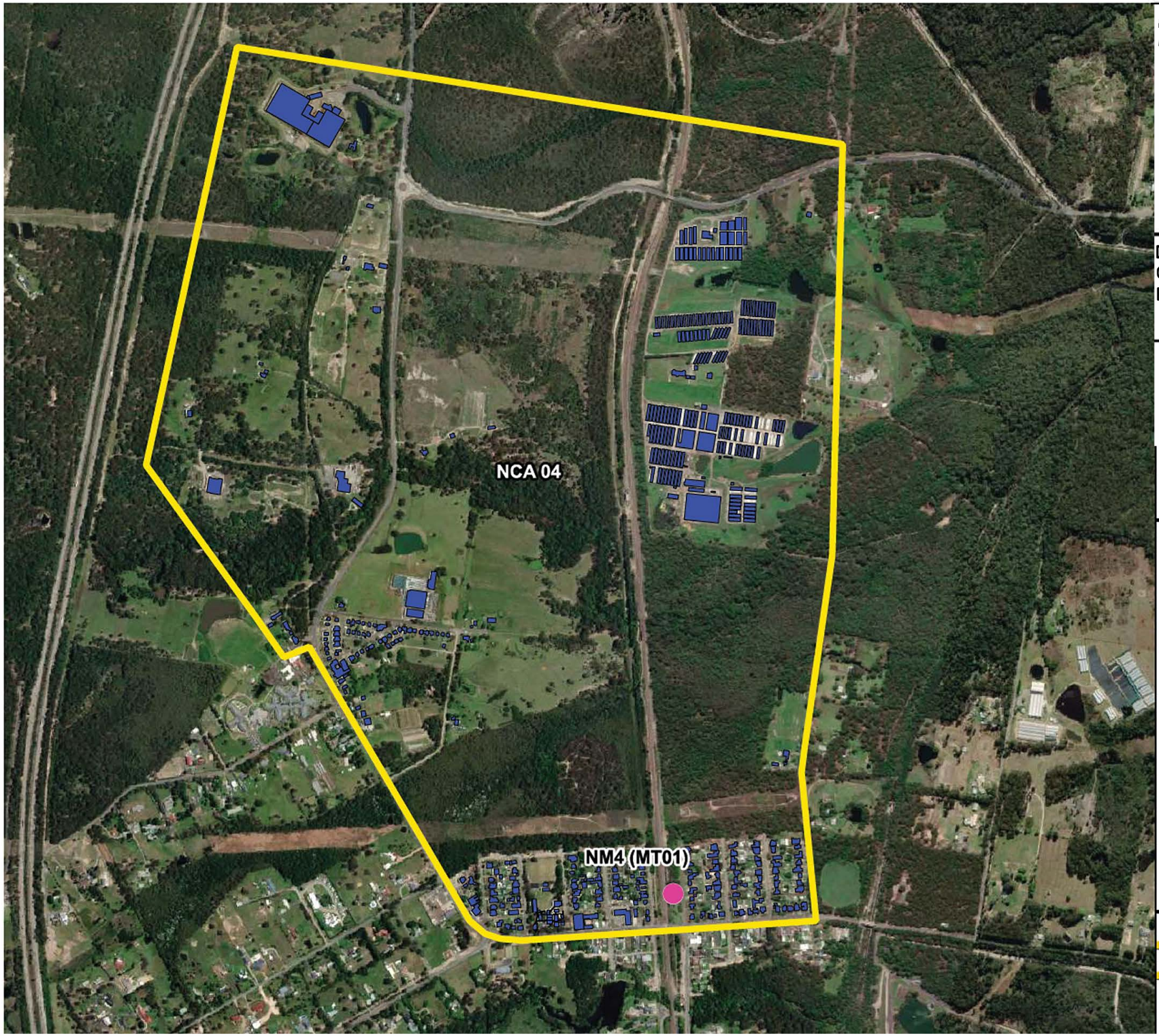

Figure 5-15: Nearest receivers and noise monitoring locations in Wyee

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- Nearest Wyee receivers
- Noise logger locations
- NCA

Resonate

Table 5-12: Summary of existing acoustic environment

Proposed Building Location	Noise receiver ID	Summary
MT01	NM4	This location is at Wyee in the southern end of the proposal and has mainly residential homes and some agricultural industries with the main existing noise coming from the passenger trains bypassing.
MTRR	NM2	This location is north of Morisset Station and contains a mix of residential and commercial receivers. The noise environment is influenced by road traffic on the main road and the train passbys.
MT11	NM3	This location is south of Morisset Station and contains residential receivers. This area is set back from the main road further than NM3 and the noise environment is mainly influenced by the trains passing by.
MT29	NM1	This area is characterised as a mix of residential and commercial receivers and has noise influenced by passenger trains on the Main Northern Line and the road traffic on the main road

The proposed signalling building MT08 is located between Morisset Station and the Balloon Vales loop and is characterised by a large environmental conservation area to the east and a private recreational area to the east. The proposed signalling building MT05 is similar with a large area of environmental conservation to the west and infrastructure large to the east which part from the cleared track alignment is surrounded by dense trees. Given the proximity of sensitive receivers to these locations noise monitoring was not carried out at these locations. These areas can be seen in Figure 1-2 proposal overview and Figure 1-3 land zoning.

5.6.2 Potential impacts

In order to fully assess the potential impacts of this proposal, long term unattended noise monitoring was undertaken by Resonate between the dates of 27th September 2023 to 10th October 2023 at four locations (NM1, NM2, NM3 and NM4 as shown in Figure 5-14 and Figure 5-15. These locations include the proposed building MT01 (study location NM4), MT11 (study location NM3), MTRR (NM2), MT29 (study location NM1). These locations were selected due to the proximity to residential and commercial receivers. Operator attended noise measurements were conducted on 10 October 2023, prior to the retrieval of the noise loggers, in order to verify logger data and observe background noise levels. The measurements were conducted between 8:00 am and 10:30 am at the logger locations. The operator attended noise measurement results at the logger locations showed good correlation to the unattended noise monitoring results.

Based on the observations during the attended measurements, it was determined that:

- Noise logging at NM1 is representative of the background noise levels in NCA01
- Noise logging at NM2 is representative of the background noise levels in NCA02
- Noise logging at NM3 is representative of the background noise levels in NCA03
- Noise logging at NM4 is representative of the background noise levels in NCA04.

The construction noise criteria for Sydney Trains resignalling works are specified in Conditions O13.1, O13.2 and O13.3 of NSW EPA issued EPL 12208. The three EPL conditions have been extracted and presented below:

Standard railway maintenance hours

O13.1 Maintenance activities must be undertaken:

a) between the hours of 7:00am and 6:00pm Monday to Friday

b) between the hours of 8:00am and 1:00pm Saturday; and

c) not on Sunday or public holidays, unless an exception in condition O13.2 or condition O13.3 applies.

Exception to standard railway maintenance hours

O13.2 The licensee may undertake maintenance activities outside of the hours specific in Condition O13.1:

a) to provide safe and reliable train services or a safe working environment; or

b) for emergency works; or

c) for the delivery of oversized plant or structures that require special arrangements or authorisation to be lawfully transported along public roads.

Exception to standard railway maintenance hours for low noise impact generating works

O13.3

(a) The licensee may undertake maintenance activities outside of the hours specified in Condition O13.1, if the activities do not exceed:

i. 5dBA (LAeq, 15min) above the relevant rating background levels at day, evening and night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation, and

ii. 15dBA (LA1, 1min or LAmax) above the relevant rating background level at night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation.

b) The results of any acoustic investigation undertaken in relation to Conditions O13.3(a)(i) and O13.3(a)(ii) must be provided by the licensee when requested by an authorised officer of the EPA.

c) An acoustic investigation referred to in Conditions O13.3(a)(i) and O13.3(a)(ii) is not required if there are no noise sensitive receivers impacted by the activities.

Based on Condition O13.3 and measured background noise levels, the project-specific OOH construction noise limits have been presented in Table 5-13.

Table 5-13: Project-specific construction noise limits at surrounding receiver

NCA	OOH daytime noise limit dB(A) $L_{eq,15min}$	OOH evening noise limit dB(A) $L_{eq,15min}$	OOH night-time noise limit dB(A)	
			$L_{eq,15min}$	$L_{1,1min}$ or L_{max}
NCA01	49	43	36	46
NCA02	49	46	39	49
NCA03	47	46	39	49
NCA04	43	42	38	48

Noise modelling software (SoundPLAN v9.0, ISO 9613 prediction algorithm) was used to predict the $L_{Aeq(15\text{-minute})}$ and L_{Amax} noise levels at nearby noise sensitive receivers. The calculations include the source noise levels of the anticipated equipment, the location of selection of nearby sensitive receivers, the number of plant items likely to be operating at any given time and the distance between the equipment and the receivers. The typical noise levels used for the purposes of this assessment have been based on the following references:

- *TfNSW Construction Noise and Vibration Strategy* (TfNSW CNVS) (2018)
- *TfNSW Construction Noise and Vibration Guideline (Roads)* (TfNSW CNVG) (2023)
- *TfNSW Construction Noise Estimation Tool* (TfNSW CNET)
- *Sydney Metro Appendix F Construction Noise and Vibration Standard* (Metro CNVS) (2020)
- *Equipment manufacturer datasheet* such as Volvo, Hydrema and Geismar.

In practice, the noise levels will vary due to the fact that plant will move around the worksites and will not all be operating concurrently. As such, noise levels are likely to be lower than the worst-case noise levels presented for notable periods of time during the works.

A summary of the construction activities and the relevant equipment sound power levels used for the construction noise assessment is provided in Table 7 of Appendix A10.It is understood that these construction activities will need to be carried out during standard daytime construction hours and OOH i.e weekend possessions to provide safe and reliable train services, and a safe working environment.

The locations of the construction activities are presented in Figure 5-16 and Figure 5-17, and were incorporated in the noise model for the noise predictions.

Construction vibration criteria were developed for the proposal from the following sources:

- *Cosmetic and structural damage to buildings: German Standard DIN 4150-34*
- *NSW EPA's Human comfort: Assessing Vibration – a technical guideline.*

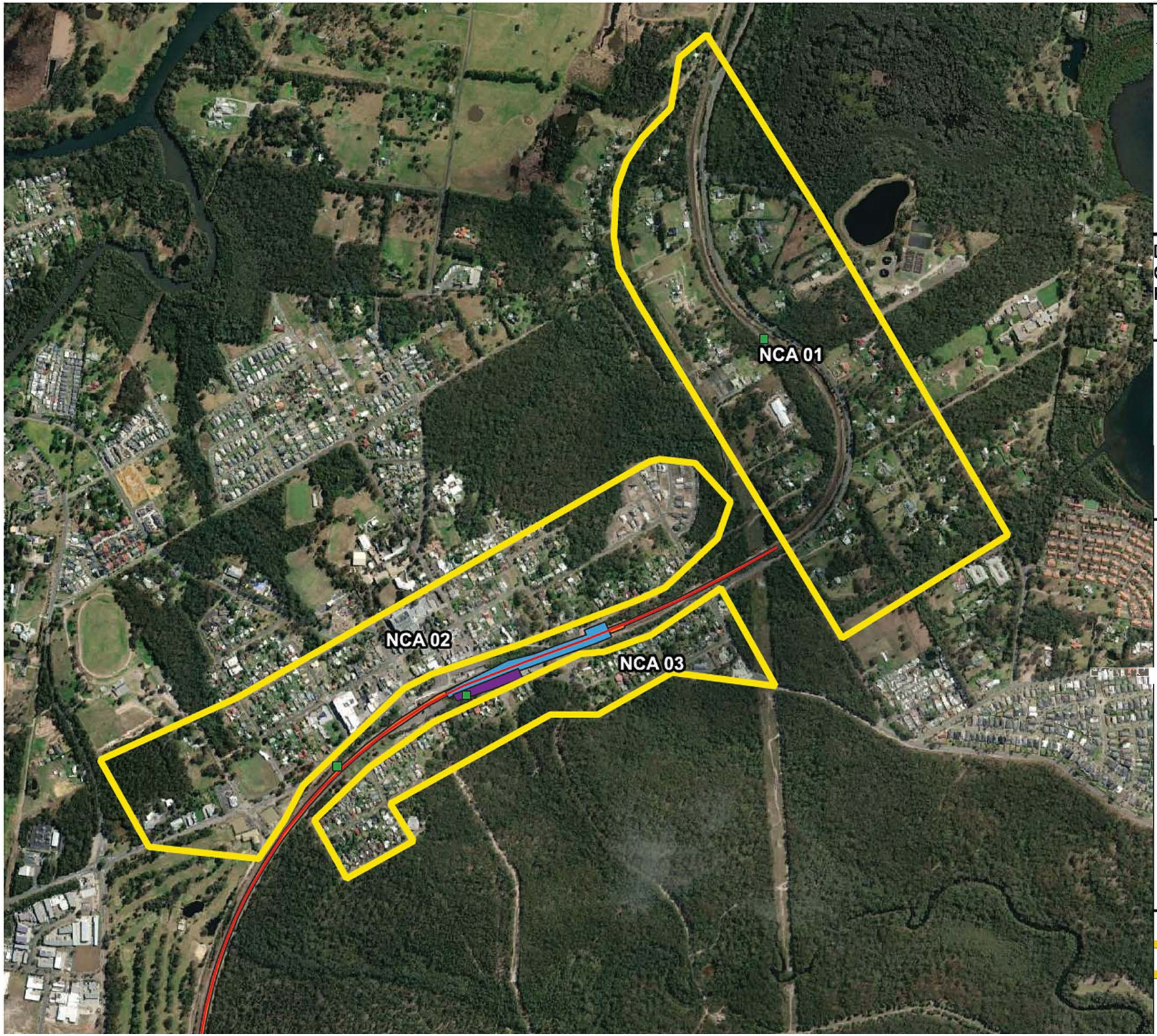

Figure 5-16: Resignalling works locations in Morisset

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- NCA
- Buildings works
- Drainage drain pipe works
- Overhead wiring works
- Pits
- Track alignment works

Resonate

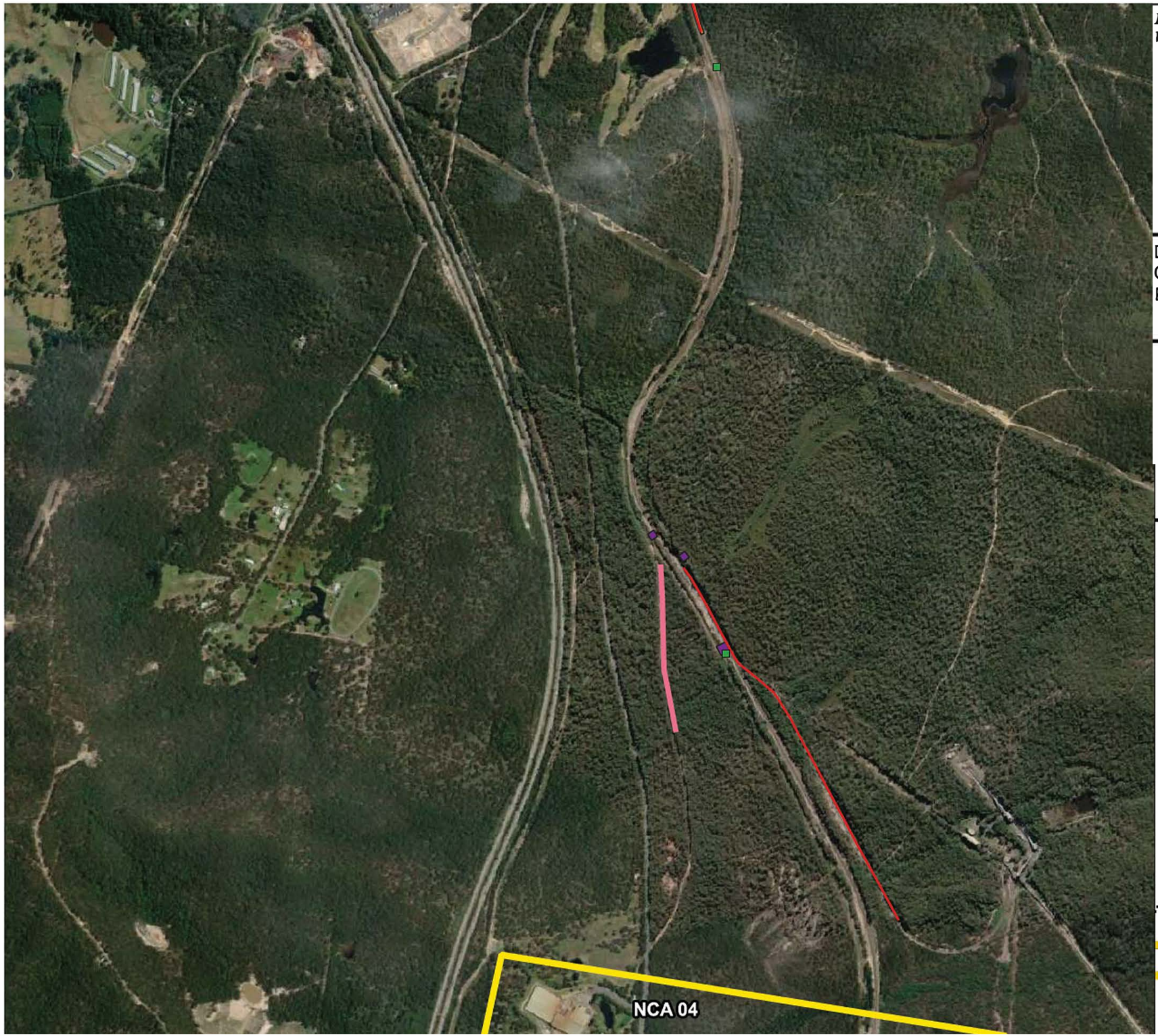

Figure 5-17: Resignalling works locations in Wyee

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- NCA
- Buildings works
- LV cable works
- Overhead wiring works
- Pits

Resonate

In accordance with Conditions O13.1 to O13.3 of EPL 12208 (refer to Section 5.6.1 above), construction noise assessment is only required for the following:

- Resignalling works conducted outside of the standard hours, i.e. possession weekends day, evening, and night periods
- Impacts to noise sensitive receivers, which as per the NSW EPA's Rail Infrastructure Noise Guideline includes residential land uses, schools, educational institutions, childcare centre, places of worship and hospitals.

The detailed predicted L_{eq} and L_{max} noise levels of the resignalling works are presented in Appendices D and E of Appendix A10 respectively. Discussions of the predicted noise levels of each resignalling works within each NCA are presented in Table 5-14 below.

Table 5-14: Assessment of predicted noise levels

NCA	Proposal element and impacts
NCA01	**Track Alignment** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 66 dB(A) and 62 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 25, 41 and 48 noise sensitive receivers respectively within NCA01. This activity is also predicted to exceed the L_{max} noise criteria at up to 23 noise sensitive receivers within NCA01. **Buildings** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 68 dB(A) and 62 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 15, 23 and 46 noise sensitive receivers respectively within NCA01. This activity is also predicted to exceed the L_{max} noise criteria at up to 10 noise sensitive receivers within NCA01 **Drainage/Drain Pipes** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 48 dB(A) and 42 dB(A) respectively. This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 16 and 47 noise sensitive receivers respectively within NCA01. This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01. **LV Cables** There are no predicted L_{eq} and L_{max} impacts within NCA01 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA01. **Overhead Wiring** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 64 dB(A) and 58 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 22, 40 and 47 noise sensitive receivers respectively within NCA01. This activity is also predicted to exceed the L_{max} noise criteria at up to 17 noise sensitive receivers within NCA01. **Pits** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 46 dB(A) and 40 dB(A) respectively. This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 3 and 40 noise sensitive receivers respectively within NCA01. This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01. **Ancillary** Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 48 dB(A) and 42 dB(A) respectively.

NCA	Proposal element and impacts
	This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 18 and 47 noise sensitive receivers respectively within NCA01. This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01. **Stockpiles** There are no predicted L_{eq} and L_{max} impacts within NCA01 for this activity. This activity is predicted to comply with the daytime, evening and night-time Leq noise criteria and the Lmax noise criteria within NCA01.
NCA02	**Track Alignment** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 71 dB(A) and 67 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 187, 203 and 205 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 161 noise sensitive receivers within NCA02. **Buildings** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 73 dB(A) and 67 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 48, 65 and 188 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 17 noise sensitive receivers within NCA02. **Drainage/Drain Pipes** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 72 dB(A) and 66 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 94, 123 and 192 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 48 noise sensitive receivers within NCA02. **LV Cables** There are no predicted L_{eq} and L_{max} impacts within NCA02 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA02 **Overhead Wiring** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 69 dB(A) and 63 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 181, 195 and 205 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 93 noise sensitive receivers within NCA02. **Pits** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 58 dB(A) and 52 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 22, 47 and 155 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 3 noise sensitive receivers within NCA02. **Ancillary** Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 67 dB(A) and 61 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 105, 143 and 202 noise sensitive receivers respectively within NCA02. This activity is also predicted to exceed the L_{max} noise criteria at up to 45 noise sensitive receivers within NCA02. **Stockpiles** There are no significant predicted L_{eq} and L_{max} impacts within NCA02 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA02.

NCA	Proposal element and impacts
NCA03	**Track Alignment** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 74 dB(A) and 70 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 137, noise sensitive receivers for all periods within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 135 noise sensitive receivers within NCA03. **Buildings** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 79 dB(A) and 73 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 88, 90 and 122 noise sensitive receivers respectively within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 61 noise sensitive receivers within NCA03. **Drainage/Drain Pipes** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 73 dB(A) and 67 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 98, 105 and 134 noise sensitive receivers respectively within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 47 noise sensitive receivers within NCA03. **LV Cables** There are no predicted L_{eq} and L_{max} impacts within NCA03 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA03. **Overhead Wiring** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 71 dB(A) and 65 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 136, 137 and 137 noise sensitive receivers respectively within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 127 noise sensitive receivers within NCA03. **Pits** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 82 dB(A) and 76 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 68, 74 and 116 noise sensitive receivers respectively within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 31 noise sensitive receivers within NCA03. **Ancillary** Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 79 dB(A) and 73 dB(A) respectively. This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 128, 130 and 135 noise sensitive receivers respectively within NCA03. This activity is also predicted to exceed the L_{max} noise criteria at up to 84 noise sensitive receivers within NCA03. **Stockpiles** There are no significant predicted L_{eq} and L_{max} impacts within NCA03 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA03.
NCA04	**Track Alignment** There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04. **Buildings** Highest predicted L_{eq} and L_{max} noise levels within NCA04 are 50 dB(A) and 44 dB(A) respectively.

NCA	Proposal element and impacts
	This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 112, 160 and 230 noise sensitive receivers respectively within NCA04. This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA04. **Drainage/Drain Pipes** There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04. **LV Cables** There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04. **Overhead Wiring** There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04. **Pits** There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04. **Ancillary** There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time Leq noise criteria and the Lmax noise criteria within NCA04 **Stockpiles** There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity. This activity is predicted to comply with the daytime, evening and night-time Leq noise criteria and the Lmax noise criteria within NCA04.

Exceedance of the construction noise criteria have been predicted at a number of nearby noise sensitive receivers located within NCA01, NCA02 and NCA03. The criteria exceedances may be considered noticeable to highly intrusive depending on the relative location of sensitive receivers to the works and whether the works are occurring during daytime, evening, or night-time period of the OOH possession weekend. Analysis of the predicted noise levels found that the exceedances at noise sensitive receivers within NCA01, NCA02 and NCA03 are due to track alignment, buildings, drainage/drain pipes, OHW, pits, and ancillary works. Based on this understanding, the management measures detailed in Conditions O13.4 and O13.5 in the EPL will need to be implemented. The management measures will need to be implemented and adhered when track alignment, buildings, drainage/drain pipes, OHW, pits and ancillary works are being carried out in NCAs 01, 02 and 03. In addition to the EPL noise management measures, standard best practice noise management measures developed from Sydney Trains' CMNVM have also been recommended for the Proposal. These standard measures are presented in Section 5.6.3 of this REF.

Safe working distances for typical vibration intensive construction equipment are provided in the Sydney Trains' *EMS10-PR-0048 Construction and Maintenance Noise and Vibration Management* (CMNVM) and are shown in Table 5-15. The safe working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Assessing Vibration: a technical guideline). They are calculated from empirical data which suggests that where work is further from receivers than the quoted safe distances then impacts are not considered likely. The safe working distances apply to addressing the risk of cosmetic (minor – easily reparable) damage of typical buildings under typical geotechnical conditions. Where vibration intensive works are required to be undertaken within the specified safe working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied. In relation to human comfort, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions will be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed. Table 5-15 presents the recommended safe working distances for vibration intensive plant.

Table 5-15: Recommended safe working distances for vibration intensive plant

Plant item	Rating/description	Minimum Working Distance – Cosmetic Damage (BS7385)	Minimum Working Distance – Human Response (OH&E Guideline)
Vibratory roller	<50kN (typically 1-2 tonnes)	5m	15m-20m
	<100kN (typically 2-4 tonnes)	6m	20m
	<200kN (typically 4-6 tonnes)	12m	40m
	<300kN (typically 7-13 tonnes)	15m	100m
	>300kN (typically 13-18 tonnes)	20m	100m
	>300kN (>18 tonnes)	25m	100m
Small hydraulic hammer	(300kg – 5 to 12t excavator)	2m	7m
Medium hydraulic hammer	(900kg – 12 to 18t excavator)	7m	23m
Large hydraulic hammer	(1600kg – 18 to 34t excavator)	22m	73m
Vibratory pile driver	Sheet piles	2m-20m	20m
Pile boring	≤800m	2m (nominal)	4m
Jackhammer	Handheld	1m (nominal)	2m

The currently anticipated schedule of plant to be used for the resignalling works does not include any vibration intensive plant. That said, if a vibration intensive plant listed in Table 5-15 is subsequently be used, the safe working distances should be adhered to.

The list of equipment required was assessed as part of this study and it was concluded that through the proposal the equipment required will not cause vibrations that will impact on either the comfort of those within close proximity to the works, and also that structural damage to buildings is unlikely.

5.6.3 Control measures

Based on the predicted exceedances during track alignment, buildings, drainage/drain pipes, OHW, pits, and ancillary works in NCAs 01, 02 and 03 (refer to Table 5-14 in Section 5.6.2 above), the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains EPL 12208 will need to be implemented. The management measures will need to be implemented and adhered when track alignment, buildings, drainage/drain pipes, OHW, pits, and ancillary works are being carried out in NCAs 01, 02 and 03.

The management measures specified in Conditions O13.4 and O13.5 of the EPL have been extracted and presented below.

> *O13.4 Where maintenance activities are undertaken, including outside of the hours specified in Condition O13.1, noise impacts must be managed in accordance with the recommendations in the Interim Construction Noise Guideline (DECCW, 2009), as updated from time to time. The licensee is required to:*
>
> *a) identify noise sensitive receivers that may be affected;*
>
> *b) identify hours of work for the proposed activities;*
>
> *c) identify noise impacts at noise sensitive receivers;*
>
> *d) select and apply reasonable and feasible work practices to minimise noise impacts; and*
>
> *e) notify the identified noise sensitive receivers at least 5 days prior to the commencement of maintenance activities undertaken outside of the hours specified in Condition O13.1, except where the licensee first becomes aware of the need to undertake those maintenance activities less than 5 days prior to the proposed commencement date, in which case the notification must be provided as soon as practicable after becoming aware of the need to undertake the maintenance activities.*
>
> *O13.5 When requested by an authorised officer of the EPA, the licensee must provide the following information regarding any proposed maintenance activities on the Sydney Trains Network:*
>
> *a) dates and times of the proposed maintenance activity;*
>
> *b) location of the proposed maintenance activity;*

c) type(s) of work to be performed in conducting the proposed maintenance activity;

d) plant and equipment to be used; and

e) contact name and telephone number of a person who will be on site during the activity and who is authorised by the licensee to take action, including the cessation of the activity or any part of it, if so directed by the EPA. A contact person must be contactable 24 hours a day via the supplied telephone number(s) during the whole of the period that the activity takes place outside the hours specified in Condition O13.1.

In order to reduce the construction noise during the track alignment, buildings and drainage works of this proposal a number of other, general control measures will need to be introduce. These are:

General management measures:

- Implement community consultation or notification measures including:
    - Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number
    - Contact telephone number for community
- All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:
    - All project-specific and relevant standard noise and vibration mitigation measures
    - Relevant licence and approval conditions
    - Permissible hours of work
    - Any limitations on high noise generating activities
    - Location of nearest sensitive receivers
    - Construction employee parking areas
    - Designated loading/unloading areas and procedures
    - Site opening/closing times (including deliveries)
    - Environmental incident procedures
- Behavioural practices will be implemented, including:
    - No swearing or unnecessary shouting or loud stereos/radios on site

  - No dropping of materials from height, throwing of metal items and slamming of doors

- The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies

Source controls:

- Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods
- Use quieter and less vibration emitting construction methods where feasible and reasonable
- For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained
- The noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the levels presented in Table 7 of Appendix A10
- The noise levels of plant and equipment items are to be considered in rental decisions and, in any case, cannot be used on site unless compliant with the levels presented in Table 7 of Appendix A10
- The offset distance between noisy plant and adjacent sensitive receivers is to be maximised
- Plant used intermittently to be throttled down or shut down
- Noise-emitting plant to be directed away from sensitive receivers
- Only have necessary equipment on site
- Locate compounds away from sensitive receivers and discourage access from local roads
- Plan traffic flows, parking, and loading/unloading areas to minimise reversing movements within the site
- Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible
- Very noisy activities would be scheduled for normal working hours. If the work cannot be undertaken during the day, it would be completed before 11.00 pm where possible
- Where practicable, work would be scheduled to avoid major student examination periods when students are studying for examinations, whether at an institution or

within a residence, such as before or during Higher School Certificate and at the end of higher education semesters

- For reduced equipment power, use only the necessary size and power
- Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any OOH work
- Consider the use of ambient sensitive alarms that adjust output to the ambient noise level
- Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers
- Select site access points and roads as far as possible from sensitive receivers
- Dedicated loading/unloading areas to be shielded if close to sensitive receivers
- Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible
- Avoid or minimise these OOH movements where possible
- Limit the use of engine compression brakes at night and in residential areas
- Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'Inservice test procedure' and standard

Path controls:

- Stationary noise sources would be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding
- Use of structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.

5.7 Aboriginal heritage

5.7.1 Existing environment

An Aboriginal Cultural Heritage Due Diligence Addendum (Appendix A6) was prepared by Artefact (2023) for the proposal to assess whether the proposal would result in adverse impact to sensitive Aboriginal landscapes or Aboriginal sites. This Aboriginal Cultural Heritage Due Diligence Addendum took into consideration the previous Due Diligence Assessment completed by Extent (2020). This assessment included:

- Review of the contextual information (landscapes, historical land use, history of traditional owners and trends in the regional spatial distribution of Aboriginal sites)

- Review of previous archaeological assessments in proximity of the proposal
- Search of the Aboriginal Heritage Information Management System (AHIMS) database on 2 November 2023. The search included the surrounding area for regional archaeological context and inform predictive statements regarding the archaeological potential
- A site inspection of the study area on 16 November 2020 completed by Extent to gain an overall impression of the intactness of the study area and identify whether Aboriginal objects occur, or are likely to occur, beneath the ground surface. The inspection of the study area was limited to the locations of the proposal, between the Vales Point Balloon Loop and Morisset Station.

The Lake Macquarie Aboriginal Heritage Management Strategy (2011) defines Lake Macquarie City Council's intent to work toward cultural reconciliation and sustainable management of Council's Aboriginal cultural resources in the City's landscape. The strategy aims to achieve the sustainable management of Aboriginal cultural heritage values and sets out the mechanisms by which Council will achieve specific outcomes in collaboration with the local Aboriginal community.

One Aboriginal site, Mannering Creek AS1 (AHIMS ID 45-3-4337) is located 40m west of the tracks (refer Figure 5-18). AHIMS ID 45-3-4337 is a low density, subsurface artefact scatter, comprised of two stone artefacts, identified through a test excavation program within a context of low archaeological integrity. The site is located on private property and is separated from the tracks by two fences. Additionally, this site is located approximately 1km south of the MT01 proposed building. MT01 The site will not be impacted by the proposal.

5.7.2 Potential impacts

Although the proposal is partly within the Lake Macquarie Sensitive Aboriginal Cultural Landscape and other sensitive landform types, the portions of rail corridor that overlap with the proposal footprint have been subject to extensive past ground disturbance (Extent 2020: 13) and represent 'disturbed landscapes' and therefore it is not anticipated that this proposal will impact on Aboriginal Heritage.

The AHIMS site (AHIMS ID 45-3-4337) which is located within the study area is a significant distance from where construction activities will occur. As the detailed design footprint is no larger than the concept design footprint which was assessed in the previous due diligence report by Extent (2020), the location of AHIMS ID 45-3-4337 will not be impacted by the proposal.

5.7.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise impacts to Aboriginal heritage:

- Should an unexpected historic relic or Aboriginal object be identified during construction, work in the immediate vicinity of the find is to stop and the area must be fenced off with suitable markers (star pickets, flagging or barrier mesh). The Sydney Trains Project Manager and Environment Division are to be notified and the procedures outlined in the Sydney Trains Unexpected Archaeological Finds Procedure (EMS-09-PR-0164) must be followed
- Engage an archaeologist to determine the significance of the find, and if required, determine the notification, consultation, and approval requirements. Works must not recommence until Sydney Trains has provided written approval to do so
- Aboriginal objects must not be harmed without an AHIP.

5.8 Non-Aboriginal heritage

5.8.1 Existing environment

Built Environment

For this proposal, a HIA was completed by Artefact. Additionally, a SoHI has been completed by CCG (2023). These studies completed a review of the heritage listed items within the study area with the database searches being completed 17th October 2023, including:

- The SHR
- TAHE Section 170 Heritage and Conservation Registers (sites managed by Sydney Trains)
- Local Heritage items including those included in Schedule 5 of the Lake Macquarie LEP 2014.

- Lake Macquarie Local Environment Plan (LEP) 2014
- Lake Macquarie Development Control Plan (DCP) 2014 and other supporting registers

The heritage items identified are listed in Table 5-13 and the mapped locations of these items shown in Figure 5-19.

Table 5-16: Heritage-listed items within the heritage study area

Bridge Name	Bridge 2, Bridge 3, and Bridge 4	Significance	Within proposal area
Morisset Railway Station Group and Residences	TAHE Heritage and Conservation Register #4801056	Local	Yes – 0m
Garden Suburb to Wyee, Railway Line	TAHE Heritage and Conservation Register #4805752	Local	Yes- 0m
Tree – Morisset's Campsite	Lake Macquarie LEP 2014 Item # 120	Local	Yes – 8m
Great Northern Railway	Lake Macquarie LEP 2014 Item # 189	Local	Yes – 0m
Morisset Community Hall	Lake Macquarie LEP 2014 Item # 231	Local	No – 80m
The Mullard Chambers Building	Lake Macquarie LEP 2014 Item # 230	Local	No – 70m

The Morisset Railway Station Group and Residences has been highlighted as having heritage significance, and is listed on the TAHE Heritage and Conservation Register (s170).

Morisset Railway Station is a culturally significant railway station on the Central Coast. It is part of a complex of related heritage items within and adjacent to the proposal area (Figure 5-19). Morisset Railway Station has heritage significance at a local level. Opened in 1897 [sic] Morisset station had a direct impact on the development of the local area, with the central commercial area of Morisset growing around the station. The current station building, built in 1938, physically represents the growth of Morisset in the 1930s, associated with the opening of Morisset Hospital and in particular the increasing demand on rail transport created by the Hospital. The current form of the station group reflects changing technological and social requirements of the station since the late 19th century. The Station has aesthetic significance as a good example of a 1930s railway station building with a highly intact incorporated signal box, with simple detailing typical of the interwar period. The two residences, particularly the Station Master's Residence, are good representative examples of the standard design Type J1 and J2 railway residences that were constructed for several decades from the 1880s.

A Eucalyptus sp. tree on the southern boundary of the station ('Morisset's tree') has local heritage significance as a rare remnant tree that may predate European settlement of the area, and which is historically associated with James Thomas Morisset, early military Commandant of the Newcastle penal settlement.

The entire Main North Line as it is mapped within the Lake Macquarie LGA (Figure 5-19) is listed under the Lake Macquarie LEP 2014 (I89) and the *Lake Macquarie Local Environmental Plan 2004* (RT-03) as being the Great Northern Railway. This duplicated railway line forms part

of the rail link between Sydney and Newcastle, running north to south through the Central Coast. The railway is a 19th century colonial infrastructure achievement which has local significance. It is also listed on the TAHE s170 register as 'Garden Suburb to Wyee, Railway Line.'

The Statement of Significance for this heritage item is as follows:

> *SIGNIFICANCE – 1993: At State level, the Main Northern Line changed the relationship of Sydney and the North, by speeding up communications and transport. It changed profoundly the relationship of Newcastle with its hinterland and the north, and the standing of Newcastle as a great commercial centre. It confirmed the importance of Newcastle as a great coaling port, comparable with Cardiff in Wales. Locally, the railway brought changes to the pattern of development of Lake Macquarie.*
>
> *It was the route by which Lake Macquarie coal was carried to its markets. It linked the towns and villages of western Lake Macquarie with Newcastle and was a way for holidaymakers to reach the Lake. It opened the Lake to residential development and, since electrification, has become a commuting link to both Newcastle and Sydney for residents of Lake Macquarie* (HNSW, 2023).

The Historical Notes available on the State Heritage Inventory (HNSW, 2023) are also as follows:

> *HISTORICAL NOTES – 1993: The first section of the railway from Newcastle to Maitland and other parts of northern NSW was opened in 1857.*
>
> *For the next 30 years, all communications between Sydney & the north were carried out via ship or slow & difficult inland routes.*
>
> *The linking section of railway was started in 1884, the section through Lake Macquarie opened 1887, Hawkesbury Bridge opened 1889.*

At State level, the Main Northern Line changed the relationship of Sydney and the North, by speeding up communications and transport. It changed profoundly the relationship of Newcastle with its hinterland and the north, and the standing of Newcastle as a great commercial centre. It confirmed the importance of Newcastle as a great coaling port, comparable with Cardiff in Wales.

Locally, the railway brought changes to the pattern of development of Lake Macquarie. It was the route by which Lake Macquarie coal was carried to its markets. It linked the towns and villages of western Lake Macquarie with Newcastle, and was a way for holidaymakers to reach the Lake. It opened the Lake to residential development and, since electrification, has become a commuting link to both Newcastle and Sydney for residents of Lake Macquarie.

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Morriset and Vales Point Resignalling Project

Heritage Items

Figure 5-19: Heritage items

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Historical Archaeology

The HIA identified that with the proposal area closest to the Morisset Station there was low to moderate potential for historical remains such as former platform surfaces, railway infrastructure elements such as rail tracks and sleepers, services, roads and footpaths, culverts and remanent landscaping.

The station itself has been redeveloped in the both the 1960's when platform 1 was rebuilt and again in the 1980's when platform 2 and duplication and electrification of the tracks was added. These past redevelopment works would have caused broad-scale clearance, demolition activities and disturbance in this area.

The remainder of the study area has a low to NIL potential of containing historical items given the development of these areas such as the Wyee Coal Conveyors Loop was undistributed bushland until construction of the loop in the 1970's. The potential of uncovering items of historical significance is discussed below in section 5.8.2.

5.8.2 Potential impacts

For the purposes of this Proposal three zones have been created in order to ascertain the potential impacts on non aboriginal heritage for both the built environment and historical archaeology. These zones are described below and are further detailed by Figure 5-20.

- Zone 1: Morisset Station and Former Yards
- Zone 2: Vales Point Balloon Loop
- Zone 3: Remainder of the study area.

Built Environment

Zone 1

Within Zone 1 the design was developed in order to avoid impact to nearby heritage items in particular the Stationmaster's and Gatekeeper's Residences on Dora Street and The Morisset Campsite Tree, which is in the car park.

The proposal includes changes surrounding these heritage items through trackwork, involving the removal and replacement of crossovers, as well as the creation of new drains, cess pits, and other drainage these areas such as track ballast, overhead wiring, contemporary signals, and the like. Changes to works involving these non-significant elements will therefore not represent any change, or impact, to significant fabric.

The decommissioning of the signalling equipment will impact the signal box and its movable heritage. This will result in an adverse, but unavoidable, impact on heritage. Much of this will be mitigated through the retention of the signalling levers and interlocking system, and all the moveable heritage of the signal room are to remain on site. These mitigation measures are outlined in detail below. A number of control measures have been detailed below in Section 5.8.3 to reduce the impact associated with the signaling box.

The moderately adverse impact of decommissioning the signal box will be mitigated by the retention of all relevant movable heritage on the site, as well as by the recording of these items

in a schedule, the result of a Movable Heritage Audit undertaken according to NSW Heritage's Movable Heritage Principles.

The replacement of guard indicators has been assessed by the SoHI report as not affecting the platform fabric of significance as these items are to be installed outside the location of the original platform. Platform 1 is a contemporary platform which contributes little to the significance of the place. The indicator on Platform 2 is attached to the awning of the Platform 2 building which, though located in the c.1910 platform area, is physically part of the c.1938 works, and is likely a device and lens installed at a later (20th century) date.

Zone 2

This zone contains the Wyee Coal Conveyors railway loop (Lake Macquarie LEP 2014) and the Garden Suburb to Wyee Railway line (TAHE Heritage and Conservation Register).

The Wyee Coal Conveyors Railway Loop was constructed in the 1980's overcome problems with supply from Vales Point's captive coal mines (Chain Valley, Newvale, Wyee State).

The entire length of the Garden Suburb to Wyee Railway alignment will not be adversely impacted however it has the same curtilage as the Great Northern Railway Alignment and impacts associated with the works located in the study area have been assessed against the LEP Great Northern Railway Alignment listing. These works remain unlikely to detract from the cultural significance of the GNR or the railway alignment.

Zone 3

This zone covers the remainder of the proposal study area and includes the Great Northern Railway which is discussed in detail above. This section of the proposal area includes very minor works to the to the rail tracks and will not alter the alignment.

Historical Archaeology

Zone 1

This zone contains a number of buildings with historical significance and has been assessed as having a low to moderate potential for uncovering items of archaeological potential

The original station buildings and platform completed in c.1910 predate the current structure which saw duplication of the line and electrification in c.1980's. This current structure required board scale clearance, demolition and disturbances. However, it is noted that given this zone includes the Morisset platform and station that there is some potential for historical remains such as former platform surfaces, railway infrastructure elements such as rail tracks and sleepers, services, roads and footpaths, culverts and remanent landscaping. These are all consider 'works' under the Act and not 'relics' under the Heritage Act and would therefore not be cover by the archaeological 'relics' provisions of the Act.

Overall, is it unlikely that any potential archaeological resources would reach the threshold for local or state significance. However, mitigation measures have been included in this REF to ensure any archaeological remains which where to be uncovered are protected and assessed appropriately.

Zone 2

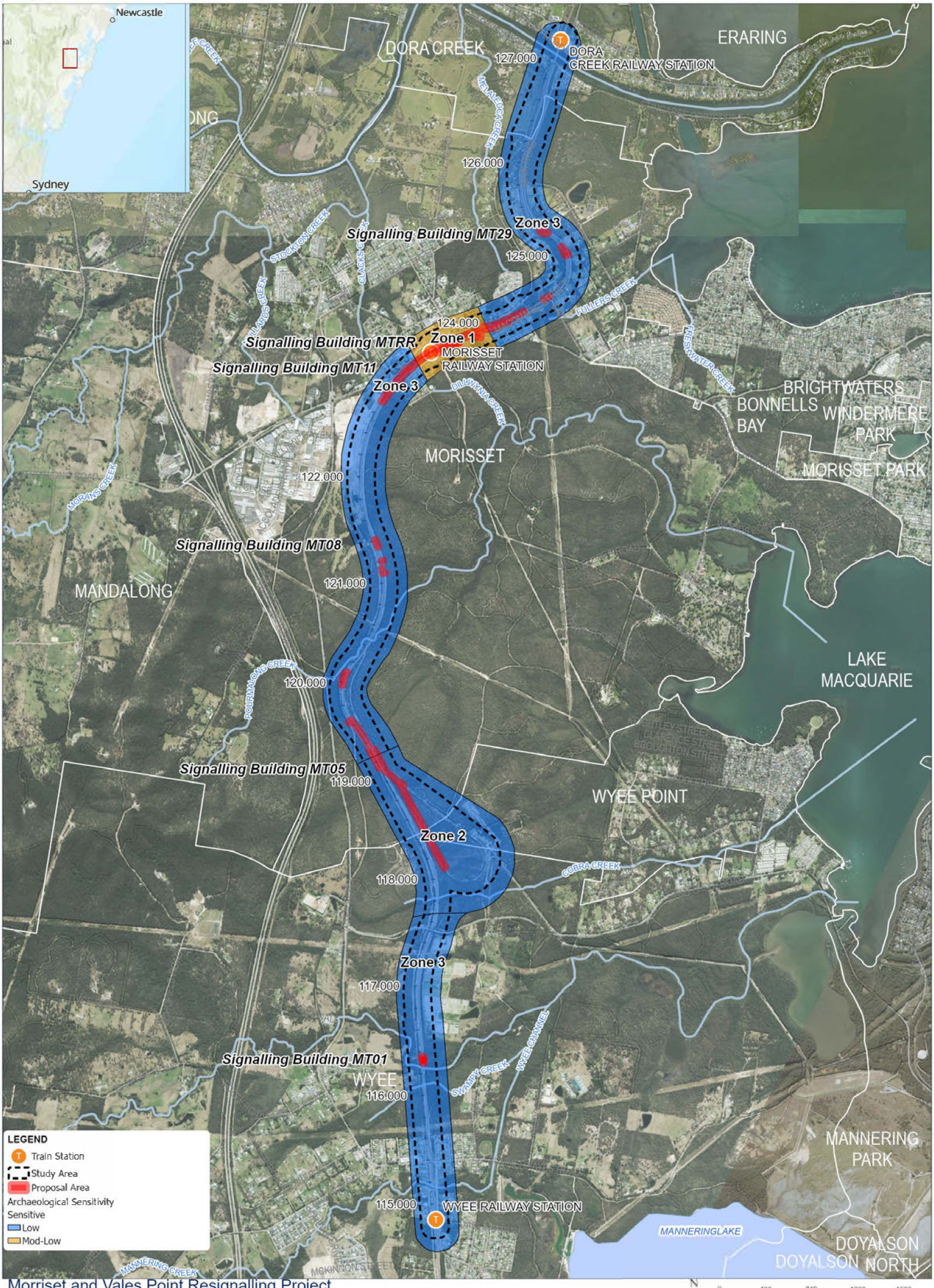
Within Zone 2 there is a low to nil likelihood that these works will impact on significant historical archaeology. No known significant historical archaeology has been identified in the Balloon Loop which was undisturbed bushland until its construction in 1970. The Vales Point Balloon loop existed to deliver coal to the former Vales Point power station, has part manual control from a signal box at Morisset Railway Station. The proposal is unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics.' Rail infrastructure remnants such as track, sidings, sleepers and landscape features will be considered 'works' as opposed to 'relics' and will not meet the threshold for local significance and/or research value.

The majority of these works are located within the ballasted track to the west and outside Zone 2.

Due to this zone have limited archaeological potential, the removal of GST and other minor excavation works are unlikely to result in impacts to significant archaeological resources.

Zone 3

These sections are considered to have a low to nil likelihood that these works will impact on significant historical archaeology. The proposal is unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics.' Artefacts or deposits associated with Phases 1 and 2 may hold value at a local-level. However, they may not be intact or substantial enough to meet the threshold for significance.



Morriset and Vales Point Resignalling Project

Historical and Industrial Archaeological Sensitivity

N

0 420 840 1260 1680

Metres

Scale: 1:30,000

CRS: GDA 1994 MGA Zone 56

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5.8.3 Control measures

The following management measure is to be implemented to avoid, reduce, and minimise impacts to non-Aboriginal heritage:

Built Environment

- Conservation of significant elements, especially the lever frame, interlock, relays, and moveable heritage, in-situ,
- Photographic and video archival recording of the signal box room
- Recording of the existing state of the signalling levers and interlock, and all the moveable heritage of the signal room before works, in the form of a Photographic Archival Recording. The moveable heritage items includes but it is not limited to the following:
    - A signaller's staff,
    - Signal lever equipment, including blocks, labels, canvas covers, keys and the like (but not including the levers themselves, the interlock mechanism, and rods, which are not 'moveable' heritage in the relevant sense of the term),
    - Blocking equipment for points,
    - Electric control panels, with keys, blockers, and other associated items,
    - Padlocks,
    - A telephone,
    - A safe,
    - A photograph of former Stationmasters,
    - A wooden luggage and goods trolley, and
    - Wooden tumbling indicator boards.
- Completion of the Decommissioning Heritage Assets Checklist
- Interpretation is to be implemented, as detailed in an Interpretation Strategy and Interpretation Plan, which may involve plaques, signage on the signal box windows, reuse of levers and rod material in installations, and the production of a video documentary about the working practices of the signal box
- The signal box would be decommissioned in accordance with Sydney Trains EMS-09-PR-0231 Decommissioning Heritage Assets including the completion of the Decommissioning Heritage Assets Checklist
- The relay room would be closed and made secure as part of its decommissioning. An audit of the relay room, once the room is decommissioned, is to be completed by an

appropriate specialist to establish the significance of any of the electrical items and their potential for reuse

- Updating of existing heritage Inventories
- Photographic recording of timber sleepers in the Refuge to be removed
- A Heritage Asset Maintenance Plan for Morisset Railway Station would be prepared to guide the maintenance and ongoing repair of the place. This would be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned.
- Tree protection zone to be established before construction starts to ensure the Morisset Campsite Tree will not be impacted, in accordance with the Australian Standard Protection
- Site inductions are to include information to workers about the location and sensitivity of the three nearby heritage items as described in Section 5.8.1. It is to be communicated to all onsite workers that no physical works is permitted within the area mapped as containing the Morisset Railway Station archaeological sites

Historical Archaeology

- If a heritage item is uncovered, stop further disturbance, demarcate the site and contact the project manager. TfNSW rail heritage team and environmental professional will be notified of any unexpected non-Aboriginal heritage or archaeology finds encountered during delivery of the works. The Sydney Trains Environmental management System Unexpected Archaeological Finds will be followed.
- Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW Heritage Act.
- These stop-work and Unexpected Finds procedures to be included in a Construction Environmental Management Plan (CEMP).

5.9 Waste management

5.9.1 Existing environment

The general operations of the railway by Sydney Trains does not generate any significant waste. If any maintenance activities are to occur within the rail corridor any waste produced as part of this activity will be disposed of in accordance with the processes and procedures outlined by Sydney trains environmental management system. Sydney Trains has a requirement to manage waste as stated by WARR Act 2001. This act states that for all activities the waste hierarchy (Avoid, Reuse, Recycle, Energy Recovery and Disposal) would be followed.

The ancillary and stockpile sites have been assessed and determined by Sydney Trains as being adequate to store the staged quantities of wastes and excavated materials which would be

generated during the proposal's construction works. Where practicable and feasible, some wastes can be reused onsite, such as in the case of excavated materials. There is expected to be a waste import balance that needs to be brought onto the site, as the majority of excavated materials at the site would be sequentially backfilled into the disturbance footprint.

The nearest waste management facility is the Awaba Waste Management Facility. This facility is able to process building and demolition waste including bricks, concrete, timber, and glass. The facility is located approximately 16 kilometres north of Morisset Station.

5.9.2 Potential impacts

This proposal has the potential to produce waste associated with:

- Demolition waste including concrete, steel, bricks, wiring and redundant fencing
- Excavation materials which are not suitable for re-use on site or for site rehabilitation
- Any excess construction material and any packaging or covering materials
- Green waste from vegetation clearing and tree trimming
- Waste generated from plant and machinery maintenance
- Spent materials used as environmental management measures, such as spent erosion and sediment control materials
- Site personal activities and needs (e.g. Food and paper wastes).

5.9.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise waste impacts:

- Resource management options for the proposal must be considered against a hierarchy of the following order embodied in the WARR Act 2001:
    - Avoid unnecessary resource consumption
    - Recover resources (including reuse, reprocessing, recycling, and energy recovery)
    - Dispose (as a last resort)
- Separate wastes, place all wastes in appropriate containers and dispose of them as they are generated
- Prevent the mixing of similar new and waste materials. All wastes must be classified in accordance with the *Waste Classification Guidelines* (DECC, 2009) prior to disposal and transported to a licensed waste disposal facility
- Keep records of all waste classification, transport, disposal, reuse, and recycling activities

- Excavated material must be temporarily stored in a bunded area or with appropriate environmental controls in place to prevent run-off of contaminants entering the stormwater system
- Should volumes of excavated material exceed the capacity for stockpiling prior to off-site disposal, excavation works must cease until existing stockpiled material has been disposed of offsite or an additional appropriate stockpiling area is identified elsewhere on the site
- Any spoil or waste material tracked onto paved areas such as roads and car parks must be immediately swept up. No water is to be used to wash any such material tracked onto roads into stormwater drains
- An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the proposal site will be kept clean and free of litter, including cigarette butts, at all times
- All waste must be removed from the site on completion of the proposal
- Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal
- Stockpiles are to be removed as soon as possible, and within a week of completion of proposed works
- Ensure proper, immediate disposal of slurry offsite. Alternatively, construct a correctly sized, impermeable slurry holding facility and properly dispose of all dewatered wastes.

Refer also to the management measures identified in Section 5.5.3 in relation to weed management, for those weeds that may comprise any vegetation waste.

5.10 Contaminated land and hazardous material

5.10.1 Existing environment

A search of the proposal area against the EPA contaminated land record of notice was conducted on the 10th October 2023.

A search of the NSW EPA Protection of the Environment Operations (POEO) registers carried out through the NSW EPA website on 15 November 2023. The following licensed activities were recorded within 500m of the Site:

- Surrendered licenced cement or lime handling (EPL1502) activities was recorded immediately west of the study area near Wyee Station at Wyee Transfer Station, Gorokan Road, Wyee, NSW, 2259

- De-licensed hazardous, industrial or Group A waste generation or storage (EPL11190) activities were recorded immediately south of the study area near Morisset Sation, at Morisset Hospital, off Macquarie Street, Morisset, NSW, 2264
- Surrendered licenced sewage treatment processing by small plants (EPL2541) activities were recorded approximately 500m east of the study area at Dora Creek Wastewater Treatment Works, Marconi Road, Dora Creek, NSW, 2264.

A review of the Department of Reginal New South Wales Naturally Occurring Asbestos dataset (accessed through SEED Map (geo.seed.nsw.gov.au) on 15 November 2023), the Site is not mapped as being in an area known to have naturally occurring asbestos.

5.10.2 Potential impacts

The proposal has the potential to cause contamination associated with the storage and use of any chemicals, fuels, lubricants, oils, etc. in the machinery and materials required for the construction works. Such contamination may affect the soil and/or the waterway.

The proposal has the potential to disturb any contaminants associated with the industrial or agricultural land uses of upstream lands over which surface waters flow into the creek and that may be within the creek bed sediments. However, these are pre-existing contaminants within the system.

No ongoing contamination related impacts are anticipated associated with the proposal.

5.10.3 Control measures

The following management measures are to be implemented to avoid, reduce, and minimise impacts as a result of contaminated land and hazardous materials:

Encountering hazardous and contaminated materials:

- As part of the site induction, construction personnel will receive training in the identification, management and handling of contaminated and hazardous materials should they be encountered during the works
- During excavation activities, site workers will look for signs of potential contamination such as the presence of waste and / or other imported materials, odours, soil colouring, floating layers in groundwater and surface water etc.
- The CEMP will include an unexpected finds protocol to address potential incidental subsurface impacts or potential source finds during earthworks and excavation. Under the unexpected finds protocol:
    - Work will stop immediately and the site area will be fenced off and the project manager contacted
    - The site area will be then investigated and work will only commence once approval from the Health, Safety and Environment (HSE) Manger is obtained

- All items to be decommissioned and removed will have site testing to NSW site work guidelines prior to demolition
- Any removal of asbestos will be undertaken by an experienced, appropriately licensed removal contractor in accordance with the *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia, 2022). An Occupational Hygienist will be on site during removal works
- Hazardous materials must be transported, stored, and used in accordance with the corresponding Safety Data Sheets.

Contaminated material removal:

- All excavated material must be analysed prior to transportation and disposal in accordance with NSW *Waste Classification Guidelines* (DECC, 2009)
- All hazardous materials removed will be removed and cleaned up as per the NSW Waste Classification Guidelines
- Contaminated soil will be segregated and contaminated soils are to be treated on site. If soil is not able to be treated onsite it must be removed off site for disposal at an appropriately licenced facility.

Storage, refuelling and plant maintenance:

- All fuels and other hazardous substances must be stored at designated construction compounds in containers within a bunded enclosure with sufficient capacity to hold 120% of the stored material
- Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50m from drainage lines or waterways. The use of adequate spill prevention and containment measures (e.g. drip trays) must be used when refuelling equipment on site
- Ensure SDS is onsite for all stored chemicals
- The amount of hazardous material stored and used on site must be kept to the minimum practicable
- Appropriate spill response material to be kept on site
- Spills or leaks to be reported to the senior officer on site and clean up measures commenced immediately
- Spills to be reported in accordance with legislative and licensing requirements
- If a spill occurs, the material to be contained to the smallest area possible
- All spills that cause or may cause material harm to the environment to be reported to the NSW EPA

Construction personnel to be trained in spill containment and response procedures in accordance with the those set out by Sydney Trains. Notify Pollution Incidents to the Safety Incident and Injury Hotline 1800 772 779.

Wastewater and Discharge

- Wash down of concrete mixers, concreting equipment and trucks must take place in an appropriate area away from drainage lines and stormwater drains
- Wash down areas must be appropriately constructed and the collected material disposed of off-site
- Surface water run-off (requiring treatment) will be collected for treatment prior to discharge.

5.11 Visual aesthetics and urban design

5.11.1 Existing environment

The visual impact assessment for the proposal was completed by desktop analysis. This analysis relied on previous reports, background studies, drawings, and aerial imagery. The proposal corridor has an existing landscape and visual environment characterised by a significant expanse of bushland which mainly occurs between the townships of Morisset and Wyee. Other areas of bushland occur sporadically along the corridor and established native trees are often situated along the railway corridor fence line. These typically have the effect of filtering views of the rail corridor from surrounding locations. Other land uses comprise rural, residential, rural residential, commercial, and industrial land use types. There is also a golf course located on the southern side of Dora Street.

With the exception of the railway stations and associated infrastructure, the railway line is generally an inconspicuous element within a rural landscape that has many other examples of human made modifications since European settlement. Such examples include roads, overhead transmission lines, lighting fixtures, commercial, industrial, and agricultural buildings, towns, and settlements.

5.11.2 Potential impacts

For this proposal, all visible changes will be limited to those occurring within the rail corridor. Given that overhead gantries, rail signals and other infrastructure are elements that are typical and expected visual components, the visual impact of any changes to the location of these elements will be negligible. The typical rail passenger is unlikely to notice such minor changes. This will extend to observers outside the railway corridor. Given the extent of existing vegetation surrounding the proposal, this will further reduce the effect of any visual changes from adjacent areas.

The most prominent visual change associated with the proposal will be the relocation of Signalling Building MT05. This building will be relocated approximately 100m north. Given that this building is located within a densely vegetated area, without nearby residences or roads, the

only likely witnesses to this change will be rail passengers. For reasons as stated above, the visual impact of the relocation of the signalling building will also be negligible.

The visual impact of the proposal during construction will include the presence of temporary work buildings, site compounds, fencing, plant, equipment, and vehicles. However, these impacts will be temporary and reversible once construction is complete. Minimal vegetation trimming and removal will also be required. However, it will not be in any areas which could reduce the privacy for adjacent property owners.

The proposed construction works and support areas including vehicle movements will be contained in the area immediately adjacent to the bridges within the railway corridor. Construction works to be carried out at night will have a visual impact due to required lighting of the work area. This lighting will also highlight the construction vehicles and activities, as visible from surrounding residences and the surrounding road network. However, this may also provide a point of interest for drivers, breaking the journey. Given the distance to residences, light intrusion is not anticipated to be a major impact. There do not appear to be any nearby livestock which might be disturbed by such lighting.

5.11.3 Control measures

Control measures to reduce visual impact may consist of the following:

- Designing above ground structures to achieve the best fit with the existing contours, vegetation, and earthworks
- Considering the form and finish of structures, including minimising the size of buildings and structures,
- Screening planting and encouraging natural regeneration
- Landscaping and rehabilitation work on disturbed areas are undertaken as soon as possible
- Using locally endemic vegetation species in rehabilitation that are known to be well adapted to the area and soils
- Minimising vegetation clearing at sensitive sites
- Minimising temporary hoarding of construction and waste materials
- Locating storage facilities away from residential areas
- Minimising temporary signage and removing regularly when no longer required
- Removing waste materials from the site regularly
- Restricting lighting of compounds and worksites to low impact lighting
- Locate portable lighting towers so that they are not directed at residential properties
- Storing materials and machinery neatly during the works, and where possible behind solid hoardings

- Maintaining access roads to site compounds and works areas as free of dust and mud as far as reasonably practicable
- Removing all construction and waste materials to a suitably licensed facility as soon as possible upon completion of construction.
- Locate portable lighting towers so that they are not directed at residential properties.
- Ensure parked vehicles headlights do not shine into residences.

5.12 Socio-economic effects

5.12.1 Existing environment

The proposal is located with the Lake Macquarie LGA. This proposal occurs between the train stations of Dora Creek, Morisset and Wyee which is defined as having a mixture of rural, residential, agricultural, industrial, and commercial areas.

Australian Bureau of Statistics (ABS) data from 2016 shows that 3,213 people were living in Morisset at that time, with 47.5% being male, the median age being 56, and 1,566 private dwellings being located within the area (ABS, 2016).

The most common occupations in Morisset included Professionals 16.3%, Technicians and Trades Workers 15.4%, Labourers 13.7%, Community and Personal Service Workers 13.3%, Clerical and Administrative Workers 11.4%, Sales Workers 10.3%, Managers 10.0% and Machinery Operators and Drivers 7.5% (ABS, 2016).

In Morisset, on the day of the Census, the most common methods of travel to work for employed people included Car, as driver 67.3%, Car, as passenger 5.0%, Worked at home 4.4%, Walked only 3.3% and Train 3.1%. On the day, 4.9% of employed people used public transport (train, bus, ferry, tram/light rail) as at least one of their methods of travel to work and 73.0% used car (either as driver or as passenger) (ABS, 2016).

The CNN line is regularly used by passengers and plays an important role within the surrounding local community. The railway plays a vital role for economic activities to enable commuters to travel to and from other major economic areas.

5.12.2 Potential impacts

The proposal will not alter the current use of the railway or the Morisset station and no impacts are expected to neighbouring properties.

This proposal has a long-term positive impact on the local communities as this proposal will allow for a high capacity, safer and reliable train service. In particular, the proposal will increase the capacity of the system to support an increase from around four trains per hour to around eight trains per hour and reduced journey times.

Short term positive impacts on local business in the area may result from the supply of some construction materials, transport, food, services, living supplies and accommodation. This may result in some increased traffic and social interactions.

Short term impacts will be experienced by the community as a result of the construction activities altering the train schedule. A number of control measures have been detailed below to mitigate the impacts as much as possible.

5.12.3 Control measures

The following controls would be implemented to avoid, reduce, or minimise impacts to the community

- As part of the communications strategy, to notify the local council and provide local notification for the community ahead of the proposal's commencement.
- Clear signage to address the track possession period and implications for train schedules, with associated communication of implications as required within Sydney Trains and TfNSW in respect of passenger services
- Access to the Morisset Station, the station carpark and the drop off areas such as the kiss and ride drop off loop would be maintained and left unobstructed during works
- Fencing of the works to maintain public safety during construction and operation.

5.13 Traffic and access

5.13.1 Existing environment

Access locations for the proposal will utilise existing Sydney Trains access gates as shown by Figure 5-21. These gates are already used by Sydney Trains personal for inspection and maintenance activities. The access gates are generally positioned in areas that allow for safe access to the surrounding roads.

The existing road corridor is safe for vehicle use and no development of access roads or tracks is required.

The traffic volumes for the areas surrounding the proposal will vary according to the time of day and expected to be busiest during the morning and evening peak periods. It is expected that the traffic volumes will be more significant in around the Morisset Station due to this area having both residential and industrial sites within close proximity. The other sites within the proposal are in rural areas or surrounded by dense vegetation.

5.13.2 Potential impacts

The proposal is likely to increase the traffic on local roads in order to reach the access gates as shown on Figure 5-21. In particular, the following roads will be used to provide access to the proposed buildings locations:

- MT29 via Macquarie St
- MTRR and MT11 via gates located at the edge of the Morisset Station carpark
- MT08 via a gate from Wyee Road

- MT05 and the Vales Balloon Loop via gates from Ruttleys Road
- MT01 can be access either from access gates on Ruttleys Road which is to the north or by either Wallarah St or Bungaree St to the south.

In particular during the construction of this proposal, equipment, plant, materials and waste removal deliveries will need to occur. The plant and materials will be stored with the ancillary sites which are all within the rail corridor. Some offsite parking maybe required for workers vehicles. The majority of vehicle movements will occur beginning and end of the track possessions and work shifts. The control measures outline below will aid in reducing impact of traffic and the offsite parking requirements will be minor.

As the proposed works all take place within the rail corridor there are no changes required to any local roads that will alter their access and nor are there any expected changes to driveways.

Any impacts to the pedestrian access at the station over passes will need to be address in a Traffic Management Plan (TMP) and implemented in order to minimise any impacts local pedestrian traffic.

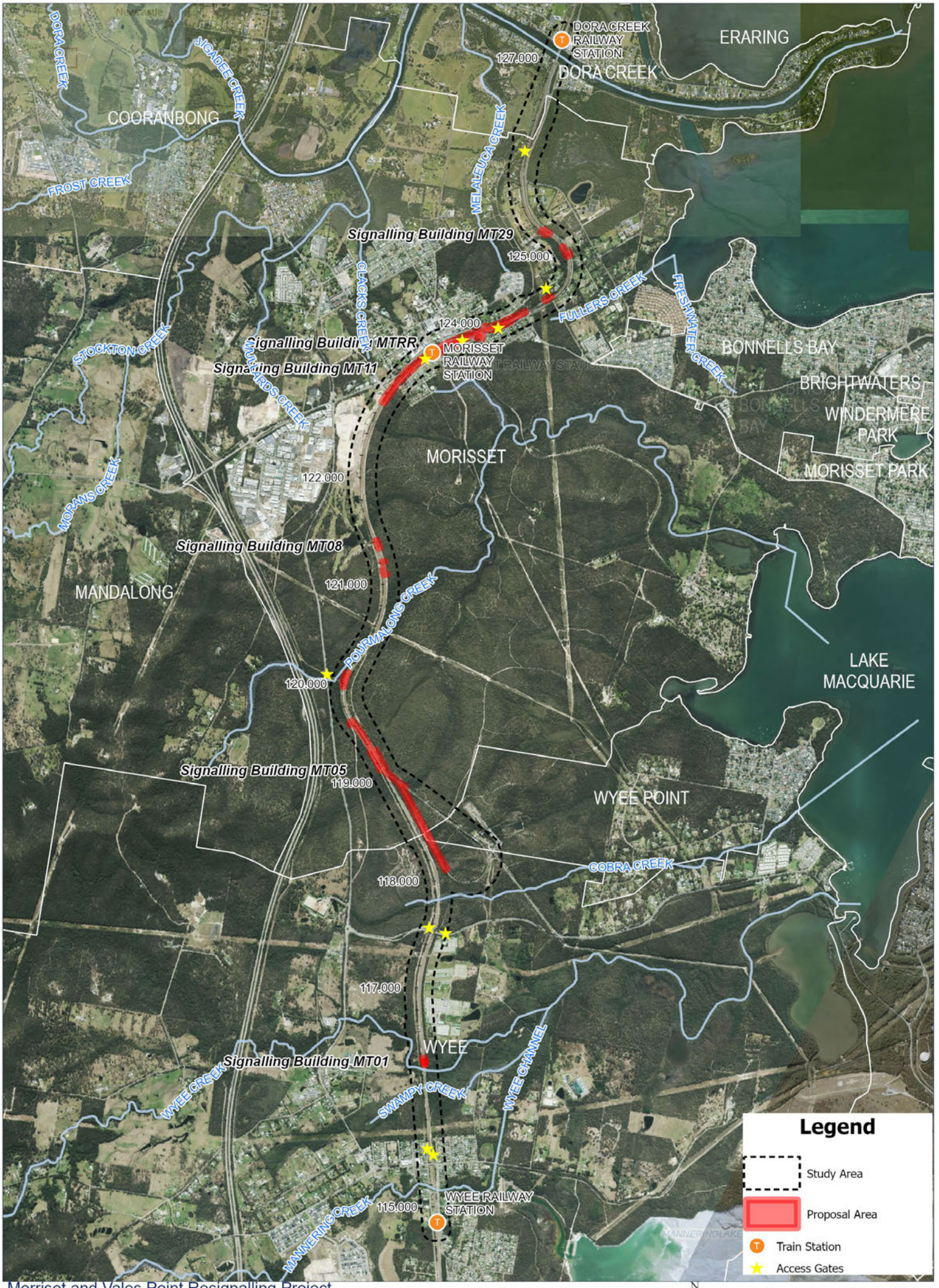


Figure 5-21 Access gates for Sydney Trains corridor

5.13.3 Control measures

The following control measures will be implemented to mitigate traffic and access impacts:

- Construction vehicles required for work near the Morisset station will be required to park at the designated ancillary sites as shown by Figure 2-1
- TMP for the proposal must be prepared in consultation with the relevant traffic authority to minimise and manage the disruption to local vehicular and pedestrian traffic. The TMP will ensure compliance with Australian Standard AS 1742.3–2009 Manual of uniform traffic control devices – Part 3: Traffic control devices for works on roads
- A traffic speed limit shall be enforced at all signal locations
- Deliveries of both plant and construction materials to take place outside of peak periods where practical
- Scheduled road movements must be minimised where possible
- Where access is required through land not owned by TfNSW, consultation will be undertaken with landowners and consent to access the land will be obtained where required
- A road dilapidation survey will be completed before demobilisation
- Any pavement or road surfaces damaged during construction will be restored when work is finished.
- Where possible, current traffic movements and property accesses are to be maintained during the works. Any disturbance is to be minimised to prevent unnecessary traffic delays.

5.14 Demand on resources

This proposal will not significantly increase the demand on any current or likely scare resources. The resources required to complete this proposal such as water, electricity and construction materials are not significant when compared to other large scale construction projects.

The construction materials required for this proposal are all standard and readily available. The volume of materials required would not place a high or significant demand on supply chains. Where possible construction materials will be able to be purchased from local contractors.

5.15 Cumulative environmental impacts

5.15.1 Existing environment

State projects

A search undertaken on 22 December 2023 of the NSW Planning Portal for State level projects within the locality provided the following results:

- No identified State Significant Development sites as listed in Planning Systems SEPP
- No identified State Significant Infrastructure or Critical State Significant Infrastructure on specific land or specified projects as listed in Planning Systems SEPP
- Chain Valley Colliery Consolidation Project (SSD-17017460) which is located around 13.5km south-east of Morisset Station. Delta Coal is seeking to maximise the use of the Delta Coal assets to supply coal to the Vales Point Power Station. The Chain Valley Colliery Consolidation Project would provide for the consolidation of the existing operations and associated development consent and project approval under a single development consent. The Project would also allow for secondary extraction in the approved Mannering Colliery mining areas located under Lake Macquarie to maintain consistency with the existing Chain Valley Colliery consent and provide an extension of the life of mine for an additional two years from 2027 to 2029. This extension would align the life of mining operations at MC and CVC with the planned operational period of the Vales Point Power Station. An Environmental Impact Statement, Response to Submissions, and Additional Information Report have all been provided to DPE, and the Project awaits its final approval from DPE
- The Trinity Point Mixed Use Development (SSD-27028161) was approved on 29 September 2023. This approved a concept development for a new mixed-use tourism and residential development at Trinity Point Drive in Morisset Park, around 6km east of Morisset Station
- Newstan Mine Extension Project (SSD-10333), which is located around 36km south of Wyee. Centennial Newstan is seeking approval for the re-commencement of mining within its West Borehole seam. The Newstan Extension Project proposes to extract up to 25.9 million tonnes over a 15 year period at a maximum production rate of four million tonnes per annum using continuous miner methods. The project site encompasses three distinct areas (Newstan Colliery, the proposed Extension of Mining Area, and Awaba Entry Site), which collectively form the project application area
- Eraring Battery Energy Storage System (SSD-15950052), which is around 8km to the south-east of Morisset Station. This project was approved on 10 May 2022 and was last modified on 22 August 2023. It has been approved for development of a standalone 700 MW battery storage system with ancillary infrastructure

- Awaba Battery Energy Storage System (SSD-29702120), which was approved on 22 December 2023 and will be located at 12 Toronto Street, Toronto (Lot 8, DP 821188 – around 25km north-east of Morisset Station). Firm Power plans to develop a 50 megawatt, 100 megawatt hour Battery Energy Storage System.

Local projects

There are several current or recently approved Planning Proposals affecting the Lake Macquarie LGA that are within the locality of the proposal as follows:

- PP-2022-3016, which received gateway approval on 5 September 2023 for land at 1377 Hue Hue Road, Wyee, around 10km south of Morisset Station. This planning proposal will rezone the majority of the existing RU2 Rural Landscape zoned land to R2 Low Density Residential and a very small section in the southern part of the RU2 Rural Landscape zoned land to C2 Environmental Conservation to add a buffer for two habitat trees located on the existing boundary of the two zones, as shown in figures two and three. The planning proposal also seeks to rezone a small part of Digary Road from C2 Environmental Conservation to R2 Low Density Residential
- PP-2022-3152, which was approved on 10 May 2023 for land at Watagan Park Town Centre, which is around 7km to the north-west of Morisset Station. This planning proposal will enable a diversity of housing types and densities
- PP-2022-1990, which is currently being finalised for land at Trinity Point Drive, Morisset Park, around 6km east of Morisset Station. This planning proposal will enable a larger scale of mixed use tourism, residential and commercial development and permit a helipad at Trinity Point in Morisset Park. It is also proposed to rezone Council owned foreshore land from SP3 Tourist to RE1 Public Recreation and make minor amendments to reflect a cadastral misalignment between Trinity Point Drive roundabout and Lots 101 and 102 DP 1256630
- PP-2021-4822, which was approved on 21 June 2022 at 482 Bushells Rudge Road, Wyee, around 9km to the south of Morisset Station. This planning proposal will rezone SP2 Infrastructure zoned land to R2 Low Density Residential. This would facilitate the removal of an unused and now redundant wastewater treatment facility, and the development of new housing on the site adjacent to recent residential development
- PP-2021-4683, which was approved on 4 May 2022 at 18 Gosford Road, Wyee, around 11km south of Morisset Station. This planning proposal will rezone 3.14ha of land from RU2 Rural Landscapes to R2 Low Density Residential to enable future residential development.

A search was also undertaken of the Lake Macquarie City Council DA Tracker on 22 December 2023. This search found numerous local DAs which have been determined or which are currently under assessment, within the surrounding suburbs during 2022 and 2023. This search found numerous DAs which primarily comprised:

- Residential subdivisions
- Residential demolitions, upgrades, and ancillary features such as sheds, retaining, decks and swimming pools
- Commercial change of use (existing building fit out).

Climate change

The *Hunter Region Climate Change Snapshot* (NSW HNSWand AdaptNSW, 2014) identifies that for the near future (2039):

- Rainfall is expected to increase in autumn but decrease in winter and summer
- Increase in average, minimum, and maximum temperatures
- Increase in the number of hot days mainly in summer
- A decrease in the number of cold nights
- Increase in average fire forest danger index in summer, spring, and winter.

5.15.2 Potential impacts

State projects

There is potential for any of the State Significant Development projects listed in Section 5.15.1 above to coincide with TfNSW's proposal. There is therefore potential for:

- some cumulative traffic impacts
- short-term cumulative noise impacts
- short-term pressures on the local workforce.

Local projects

There are a significant number of local DAs which have been approved in 2022-2023 within the adjoining suburbs for a variety of small-medium scale residential, commercial, and waste facility land uses.

The works associated with the proposal may coincide with slight increases to light and heavy vehicles utilising the local road network to service the plethora of local DAs which are currently afoot for this locality.

Overall, the extent of recent and nearby local DAs identified in Section 5.15.1 are considered to be adequately spread out across the surrounding locality so that they are unlikely to contribute to significant cumulative impacts for the proposal.

Climate change

The proposal will ensure the continued operation of the railway line through maintenance and upgrades.

The proposal itself is not intended to or directly result in an increase in the utilisation of the line but will support any increase in services required operationally

The proposal is relatively moderate in scale. The proposal will require standard railway bridge construction materials and methods, and related supporting activities.

Accordingly the proposal will have a negligible impact on or contribution to climate change.

The continued use of these the railway line in these locations along the Main North Line is considered to be compatible with the flood function and behaviour of the land. This continued land use does not comprise any sensitive land uses which cannot be evacuated in the event of a flooding event. The proposal will not result in any new built form elements being added to this mapped Flood Planning Area.

5.15.3 Management measures

The following management measures are to be implemented to avoid, reduce and minimise cumulative impacts:

- Immediately prior to commencement of the proposal, review the status and progress of the State Significant Developments listed in Section 5.15.1, for any concurrent activities, to scope the potential impacts of those concurrent activities. Regard would be given to heavy vehicles travelling on Mandalong Road, Main Road, Wyee Road, and other key arterial road connections. Consult with these other proponents if deemed necessary to manage and mitigate those impacts if there is a predicted overlap in activities. These matters would also be referenced in the proposal's TMP.

5.16 Local strategic planning statements, regional strategic plans or district strategic plans

The proposal is located in an area addressed by the strategic planning documents of the *Hunter regional Plan 2041* (Regional Plan) and the Lake Macquarie Local strategic Planning Statement (LSPS).

5.16.1 Hunter Regional Plan 2041

The Regional Plan is a 20-year land use plan prepared under the EP&A Act, setting the strategic land use framework for continued economic growth and diversification for the region. It will shape how DPE will collaborate with local councils, Local Aboriginal Land Councils, state agencies, and stakeholders in regionally significant growth areas.

The Regional Plan was prepared concurrently with TfNSW's *Draft Hunter Regional Transport Plan 2041* (Regional Transport Plan), a multimodal and integrated vision for transport planning in the region. It also aligns with the *Greater Hunter Regional Water Strategy* and the *Lower Hunter Water Security Plan*, long-term roadmaps to a resilient and sustainable water future, along with the State Infrastructure Strategy 2022-2042 (NSW Gov). Together, these strategic plans set a coordinated 20-year vision to manage growth and change for the Hunter in the context of social, economic, and environmental matters.

Relevant to the proposal, the Regional Plan recognises the following local strategic planning considerations under 'Strategy 4.9:'

- Protect, maintain, and improve the existing and approved freight transport networks
- Balance the need to minimise negative impacts of freight movements on urban amenity with the need to support efficient freight movements and deliveries
- Limit incompatible uses in areas expected to have intense freight activity
- Limit incompatible freight uses in and near residential areas.

The Regional Plan describes the need for the Hunter Region to maintain its globally integrated logistics system, acknowledging that:

- An efficient freight network supports the function of many economy sectors across the Hunter
- Sustainable freight movements reduce road congestion, pollution, and conflict with other land users
- Newcastle Airport and the Port of Newcastle enhance the Hunter's global reach
- The Lower Hunter Freight Corridor (rail bypass) will provide a dedicated freight rail line between Fassifern and Hexham, bypassing 10 train stations within Greater Newcastle. This will improve amenity for residents around these train stations and enable future transit-oriented development opportunities.

The objectives for the region, to which the proposal supports or is aligned with, are outlined in Table 5-17.

Table 5-17: Alignment of proposal to the objectives of the Hunter Regional Plan

Objective	Proposal support or alignment
Objective 1: Diversity the Hunter's mining, energy and industrial capacity	The proposal contributes to Sydney Trains' continued investment in rail freight access, as per the Objectives of the Regional Plan (NSW Government, September 2018). It also aligns with the future mapping and strategy to support the Lower Hunter Freight Corridor. Indeed, the proposal will modernise key components of the railway system within this strategic transport and economic hub of Morisset. The proposal will increase the safety, capacity, and reliability of the Sydney Trains network, in this location, and provide substantially lower lifecycle operation and maintenance costs once operational. Moreover, the proposal will: • Provide capacity for eight trains per hour with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour • Improve journey times, with the aim that journey times do not exceed the November 2017 or latest timetable • Improve the overall safety of the train network for passengers and workers. This would support the future of freight bypassing the City of Newcastle, allowing the Hunter to continue to support the movement of freight whilst reducing

Objective	Proposal support or alignment
	network congestion by preventing the need for some freight to traverse through the Newcastle LGA.
Objective 2: Support the right of Aboriginal residents to economic self-determination	The Proposal will not generate any significant impacts to Aboriginal heritage, nor to any matters pertaining to Indigenous self-determination within the State of NSW.
Objective 3: Create 15-minute neighbourhoods to support mixed, multi-modal, inclusive, and vibrating communities	The Lake Macquarie LSPS (refer to Section 5.16.3 below), implements the objectives of the Regional Plan at a more granular level. The proposal does not detract from the Lake Macquarie LSPS's vision to explore opportunities for various form of social and economic development within the Morisset and Wyee localities as part of the overall South West Growth Corridor.
Objective 4: An inter-connected and globally-focused Hunter without car dependent communities	The proposal improves the safety, efficiency and lifespan of the Main North Line within the Morisset and Wyee areas. By aligning with the future Lower Hunter Freight Corridor, it also represents an investment in future capacity building for the Main North Line to reduce some freight rail congestion for passenger rail users.
Objective 5: Plan for 'nimble' neighbourhoods, diverse housing, and sequenced development	The Lake Macquarie LSPS (refer to Section 5.16.3 below), implements the objectives of the Regional Plan at a more granular level. The proposal does not detract from the Lake Macquarie LSPS's vision to explore opportunities for various form of social and economic development within the Morisset and Wyee localities as part of the overall South West Growth Corridor.
Objective 6: Conservate heritage, landscapes, environmentally sensitive areas, waterways and drinking water catchments	The proposal will largely occur within the existing railway corridor. The proposal will be of a relatively short duration and within a limited and defined area. It will mainly affect previously disturbed land. Some new disturbance will occur in small discrete sites. This REF has assessed the impact on biodiversity. Management measures, identified in this REF, will be implemented to avoid, minimise, and mitigate biodiversity impacts.
Objective 7: Reach net zero and increase resilience and sustainable infrastructure	The proposal will increase the safe lifespan and efficient operation of the existing Main North Line infrastructure without creating an additional, permanent infrastructure footprint.
Objective 8: Plan for businesses and services at the heart of healthy, prosperous, and innovative communities	The proposal is aligned with the more granular land use strategy for Morisset and Wyee as part of the South West Growth Corridor in the Lake Macquarie LSPS (refer to Section 5.13.3 below). The proposal will support the Lake Macquarie LSPS's vision to increase economic and social development within this South West Growth Corridor.
Objective 9: Sustain and balance productive rural landscapes	The proposal will have a negligible, temporary impact on the surrounding semi-rural and bushland environment during its construction stage. Once operational, the proposal will have a nil impact on these surrounding environments.

5.16.2 Draft Hunter Regional Transport 2041

The Regional Transport Plan supports the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020). It provides a blueprint for how TfNSW will proactively respond to the transport needs of the region, and address the key trends that will necessitate a transport related response into the future.

Key goals of the Regional Transport Plan which are relevant to the proposal include:

- Improved multimodal connectivity between the Hunter, Central Coast and Greater Sydney
- Improved freight connectivity to accommodate more efficient vehicle combinations, embrace technology driven solutions, and address first mile/ last mile limitations.

The Regional Transport Plan recognises how the Hunter Region has the largest freight volumes in NSW. The rail network currently facilitates the transportation of most freight across the region, with 79.3% of coal being transported by rail.

Federal Government funding for upgrades to the Newcastle Airport runway and other facilities will accommodate longer range domestic and international passenger services as well as significantly increased large freight capabilities.

Current forecasts suggest the regional freight task will increase approximately one per cent per annum over the next 20 years with an estimated 165 million tonnes by 2041. This growth will need to be accommodated and moved safely and efficiently on road, rail, and air networks.

The Regional Transport Plan recognises the need to improve protections for key freight corridors. This includes the existing Main North Line, as well as the future Lower Hunter Freight Corridor, which will provide for a dedicated freight rail bypass of the Newcastle passenger rail system. The Lower Hunter Freight Corridor will free up space for more passenger services and allow freight to flow seamlessly to, through and beyond the region. The proposal is directly aligned with this vision, as it will modernise key components of the railway system within this strategic transport and economic hub of Morisset. The proposal will increase the safety, capacity, and reliability of the Sydney Trains network, in this location, and provide substantially lower lifecycle operation and maintenance costs once operational. Moreover, the proposal will:

- Provide capacity for eight trains per hour with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour
- Improve journey times, with the aim that journey times do not exceed 2017 or latest timetable
- Improve the overall safety of the train network for passengers and workers.

5.16.3 Lake Macquarie Local Strategic Planning Statement

The *Lake Macquarie Local Strategic Planning Statement* (Lake Macquarie LSPS) sets out the social economic and environmental considerations and visions, and the related land uses and planning approach, to 2050. Relevant to the proposal, the Lake Macquarie LSPS recognises the importance of:

- The Main North Line in this location as it will support the future linkages to the Lower Hunter Freight Rail Bypass as the LGA becomes intertwined with other regions along the East Coast of Australia

- Capitalising on existing infrastructure for freight while safeguarding centres, residential and other sensitive areas from heavy vehicle intrusion
- Protecting major freight corridors.

The Lake Macquarie LSPS recognises Morisset as an important Regional Hub for the Hunter, and also as a strategic economic centre within the South West Growth Area. Morisset and Wyee are both recognised as having significant potential to support urban development. In terms of Morisset more specifically, the Lake Macquarie LSPS recognises the following potential:

- Significant new urban release areas south of Morisset rail station, at North Cooranbong and at Wyee have a mix of housing types and community services and infrastructure to support local community needs
- Trinity Point is developed into a significant tourism asset, supporting a growing visitor economy including conference facilities, restaurants and a marina
- Once operations cease, Eraring Power Station is remediated and repurposed to another economic use, such as renewable energy generation
- Wangi Power Station is adaptively re-used to take advantage of its infrastructure and location
- The area has important environmental assets that have been maintained and enhanced, such as biodiversity corridors to the Central Coast and along the western side of the LGA
- The rural production areas are protected for agricultural use such as the Martinsville and Mandalong valleys
- A diverse range of businesses, medical, personal services, creative enterprises, government, and community services, all take advantage of the clustering of activity
- More intensive multi-storey commercial, mixed use and residential development are in the centre and close to the train station
- The Morisset Square, a bustling local hub provides community uses, cafes and commercial uses. Yambo and Dora Streets are high amenity and pedestrian movement is prioritised
- There is an interchange point for transport, local buses and park and ride to the heavy rail system to Glendale, Newcastle, Central Coast and Sydney
- A focus for an improved local pedestrian and cyclist transport network, including direct links to cycleways to the Morisset Peninsula and Cooranbong
- The nearby industrial area is expanded to capitalise on its access to the M1 Motorway
- Development opportunities, including the potential expansion of commercial and residential development to the south of the Morisset train station, are realised

- A traffic bypass for Dora Street is investigated to improve the amenity of the centre, taking into consideration the implications for the development of land to the south of the Morisset Train Station
- The heritage significance of the State-listed Morisset Hospital site is maintained, enhanced and interpreted through adaptive reuse and development.

In terms of Wyee more specifically, the Lake Macquarie LSPS recognises the following potential:

- The service role of the local centre is reinforced with an increase in services to cater for the growing population
- Additional residential areas are developed with a range of housing types, particularly near the local centre and railway station while maintaining local ecological corridors
- High-amenity cycle and pedestrian linkages run between new residential, recreation, and commercial areas and the train station
- Mannering Creek and its riparian corridors are rehabilitated and conserved
- Quality recreational areas are provided to cater for the growing community.

The Lake Macquarie LSPS also recommends that opportunities are investigated to implement the following:

- Work with Transport for NSW to determine the location and barriers to delivering a Morisset Centre Bypass to improve amenity in Morisset, reduce congestion along Dora Street, and prepare for future growth
- Advocate, and seek funding, for the Morisset Regional Centre Revitalisation Project to improve the amenity and liveability of Morisset through the delivery of a new facilities including a library, community centre and town square
- Commence a review of the Morisset strategic economic centre's landuse and transport planning framework
- Prepare and report the Morisset Transport Management Plan to Council for exhibition to establish a vision and prioritise key transport infrastructure needs and public domain improvements, better manage parking resources, and create a more liveable centre.

The proposal is directly aligned with this vision for the future of Morisset and Wyee within the South West Growth Corridor under the Lake Macquarie LSPS. As the proposal will increase the efficiency, reliability, and the number of trains that can travel via Morisset each hour, it will support the social and economic growth of the South West Growth Corridor without using additional, productive lands within the vicinity of the rail corridor which might be used for other land uses in the future.

5.16.4 NSW Future Transport Strategy 2056

The *Future Transport Strategy 2056* (Transport for NSW, March 2018) (Future Transport) is an update of the *NSW Long Term Transport Master Plan* (Transport for NSW, 2012) (Transport Master Plan). Future Transport sets the 40 year vision, directions, and outcomes framework for customer mobility in NSW, which will guide transport investment over the longer term.

Future Transport is delivered through the Services and Infrastructure Plans and supporting plans including:

- Greater Sydney Services and Infrastructure Plan
- Regional NSW Services and Infrastructure Plan
- NSW Draft Freight and Ports Plan
- Road Safety Plan 2021
- Draft Tourism and Transport Plan.

An aim of the strategy is to improve safety and performance where customers are provided with efficient, safe, and secure travel. The proposal is directly aligned with the vision of Future Transport, as well as the Transport Master Plan, which are designed to modernise Sydney's rail network. The proposal will modernise key components of the railway system within this strategic transport and economic hub of Morisset. The proposal will increase the safety, capacity, and reliability of the Sydney Trains network, in this location, and provide substantially lower lifecycle operation and maintenance costs once operational.

The proposal also aligns with the sustainability outcomes of the strategy by extending the lifecycle of this key piece of public transport infrastructure linking Sydney and Newcastle.

5.17 Other relevant environmental factors

There are no additional, relevant environmental factors which have not already been considered throughout this REF.

6 Consideration of State and Commonwealth environmental factors

6.1 Clause 171 Factors

Clause 171 of the EP&A Regulation provides a list of factors that should be considered in determining the likely impacts of many varied activities on the natural and built environment. They are framed so that all potential effects on the environment are considered. Table 6-1 sets out these factors, along with commentary with respect to how the proposal responds to these matters.

Table 6-1: Clause 171 Factors

Clause 171 Factors		Impact
(a)	Any Environmental Impact on a Community?	Minor Short Term negative impacts will occur to the nearby community as a result of temporary noise, lighting, and traffic impacts. These impacts would be mitigated through the implementation of the measures outlined in Section 7. Long Term positive impacts will result from this proposal as it contributes to enhancing the capacity, safety, and reliability of the Main Line train network. It significantly lowers the cost of lifecycle operations and maintenance costs.
(b)	Any transformation of a locality?	Short term negative impacts during the construction phase of the proposal due to the presence of plant and equipment, ancillary sites, and noise from temporary works. In the long term the additional infrastructure of the signalling buildings, OHW and poles will include minor alterations of the visual landscape within the rail corridor. These impacts would be mitigated through the implementation of the measures outlined in Section 7.
(c)	Any environmental impact on the ecosystems of the locality?	Short term minor negative impact due to vegetation removal and trimming. The vegetation communities impacted by the works are well represented outside of the proposal area and do not represent any BC Act or EPBC Act-listed TECs. Given the minor area of vegetation to be removed, and the control measures in Section 5.5.3, it is considered unlikely that the proposal will significantly impact any conservation significant species or TECs. There may be short-term minor impacts on fauna in the area due to construction noise and vibration. These impacts would be mitigated through the implementation of the measures outlined in Section 7.
(d)	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Short term minor negative impact. During the construction phase, there may be minor adverse impacts on amenity (noise, air quality, traffic, visual aesthetics). These impacts will be managed and minimised through implementation of the mitigation measures outlined in Section 7.

Clause 171 Factors		Impact
		In the long term, the addition of new infrastructure (signal buildings, OHW, signal poles) will alter the visual landscape. However, alterations in close proximity to Morisset Station have been designed sympathetically with the main station building. The new infrastructure is consistent with current land use as a rail facility, and does not present a significant impact on the landscape character of the locality.
(e)	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Long term moderate negative impact. The decommissioning of the c.1938 interlocking and relay system in the Morisset Signal Box, is a key heritage impact of this proposal and results in a long-term moderate impact on the technical and historical values of the Signal Box. The proposal includes alteration of elements of the Morisset Railway Station group which is listed on the TAHE 170 Register. The control measures outlined by the SoHI Appendix A8 will be implemented in order to minimise these impacts. The findings of the HIA in Appendix A7 found there was low potential for archaeological finds. These impacts would be mitigated through the implementation of the measures outlined in Section 7.
(f)	Any impact on the habitat of protected fauna (within the meaning of the *Biodiversity Conservation Act 2016*)?	No impact is expected as per the findings of the Biodiversity assessment Appendix A5 and addressed in Section 5.5. Mitigation measures would be implemented to avoid impacts to protected biodiversity as identified in Section 5.5.
(g)	Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	No impact is expected as per the findings of the Biodiversity assessment Appendix A5 and addressed in Section 5.5. Mitigation measures would be implemented to avoid impacts to protected biodiversity as identified in Section 5.5.
(h)	Any long term effects on the environment?	Long Term Minor Positive Impacts as the proposal will contribute to enhancing the safety, capacity, and reliability of the Sydney network, and provide significantly lower lifecycle operation and maintenance costs.
(i)	Any degradation of the quality of the environment?	No impact is expected due to the implementation of the control measures listed in Section 7.1.
(j)	Any risk to the safety of the environment?	There is a negligible short-term risk to the safety of the environment by the construction activities generally and the use of plant and equipment that has an inherent risk of spills and accidents. These risks would be mitigated through the implementation of the measures such as the use of appropriately stocked spill kits as outlined in Section 7.
(k)	Any reduction in the range of beneficial uses of the environment?	Short-term minor impacts during construction phase infrastructure works will result in interruptions to train services. Cumulative impacts will be minimised by coordinating works with scheduled trackwork activities. The proposal is not anticipated to reduce the range of

Clause 171 Factors		Impact
		beneficial uses of the environment. These impacts would be mitigated through the implementation of the measures such as community notification of proposed works during rail possessions outlined in Section 7.
(l)	Any pollution of the environment?	The proposal is unlikely to cause any pollution of the environment. During construction there is a risk of noise, water, and air pollution. However, these risks will be mitigated through implementation of the proposed control measures outlined in Section 7.1.
(m)	Any environmental problems associated with the disposal of waste?	Negligible impacts as the proposal is unlikely to cause any environmental problems associated with the disposal of waste. The proposal is unlikely to generate excessive quantities of waste. All waste will be managed and disposed of in line with Sydney Trains existing procedures and any relevant EPA guidelines. A site-specific Waste Management Plan will be prepared as part of the CEMP. Mitigation measures will be implemented to ensure waste is reduced, reused, or recycled where practicable. If contaminated soil is encountered during construction works, an appropriate remediation plan and/or waste disposal method will be prepared and implemented. These impacts would be mitigated through the implementation of the measures outlined in Section 7.
(n)	Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	No impact is expected. The materials use in the proposal are common and readily available and will be sourced from local contractors where possible
(o)	Any cumulative environmental effect with other existing or likely future activities?	The distance between the core proposal work sites is such that cumulative noise, air quality and traffic impacts are not expected. Cumulative effects of the proposal with other projects (existing or proposed) are described in Section 5.15. Where feasible, cumulative construction impacts of the proposal with scheduled trackwork activities will be minimised by coordinating works. Any effects will be minimal and temporary in nature during the construction period only. In the long-term, the proposal will contribute to enhancing the safety, capacity, and reliability of the Sydney network, and provide significantly lower lifecycle operation and maintenance costs.
(p)	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Nil
(q)	Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	The proposal is consistent with the *NSW Long Term Transport Master Plan* and the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020) (refer to Section 5.16.4).
(r)	Any other relevant environmental factors	No

6.2 Matters of National Environmental Significance Factors

Under the environmental assessment provisions of the EPBC Act, the following MNES and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of Climate Change, Energy, the Environment and Water . Table 6-2 addresses the MNES for the proposal.

Table 6-2: Matters of National Environmental Significance

Matters of National Environmental Significance	Impact
Any environmental impact on a World Heritage property?	No – there is no World Heritage property within 5km of this proposal.
Any environmental impact on National heritage places?	No – the national heritage items noted in close proximity to proposal fall outside of the areas where construction activities are taking place. No direct or indirect impacts are proposed.
Any environmental impact on RAMSAR wetlands?	No – the proposal is located at least 260m from any identified Ramsar site.
Any environmental impact on Commonwealth listed threatened species or ecological communities?	No – A Biodiversity Assessment has been completed and has concluded that no significant impacts will be generated for MNES as a result of this proposal as outlined in Sections 5.5 and detailed within Appendix A5.
Any environmental impact on Commonwealth listed migratory species?	No – The Biodiversity Assessment did not conclude any impact on Commonwealth listed migratory species.
Does any part of the project involve nuclear action?	No – this proposal does not involve a nuclear action.
Any environmental impact on a Commonwealth marine area?	No – this proposal does not impact on any Commonwealth Marine Areas.
Any impact on Commonwealth land?	No – this proposal does not impact on Commonwealth land.

There are no MNES that will be affected as a result of the proposal. No Commonwealth land will be affected, either directly or indirectly, as a result of the proposal.

7 Environmental management measures

7.1 Summary of control measures

The following control measures have either been identified through the assessment undertaken through this REF or are standard best practice environmental management controls. They will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These control measures will minimise any potential adverse environmental impacts arising from the proposal. The controls measures are summarised in Table 7-1.

Table 7-1: Summary of Site-Specific Control Measures

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
Landforms, Geology and Soils	☒ Soil Erosion / Stability ☒ Site Rehabilitation ☒ Acid Sulfate Soils	The following management measures are to be implemented to avoid, reduce, and minimise potential impacts to landforms, geology, and soils. These control measures are divided into two categories with the first aimed at reducing the risk of erosion and the second to mitigate against ASS. Erosion and Sediment controls: • Disturbed surfaces must be stabilised as soon as possible • An Erosion and Sedimentation Control Plan must be prepared by suitably qualified persons as per EMS-14-PR-0012 Erosion and Sediment Control and is to be fully implemented and managed through all stages of the proposal • Erosion and sediment control measures are to be implemented and maintained to: o Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets o Reduce water velocity and capture sediment on site o Minimise the amount of material transported from site to surrounding pavement surfaces o Divert clean water around the site (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines Vol 1 (the Blue Book)) to be read in conjunction with the relevant DECC Managing Urban Stormwater – Soils and Construction volume

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request • Erosion and sediment control measures are not to be removed until the proposal is complete in those areas • Allow for the application of a geotextile or other cover / weighting of denuded areas to protect the soil from erosion and destabilisation if required (subject to requirements to remove versus only trimming of soil) • Removal of any vegetation would keep the trunk base and root system intact (e.g., remove trunk to near ground level only) to continue holding soils • Stockpile management will consider: o All stockpiles would be located in designated areas as defined in Figure 2-1 and away from high water flow areas o Limiting stockpile sites to a height of one meter o Covering stockpile sites to reduce both the risk of erosion and generation of dust ASS control measures: • Confirm the presence of ASS through soil sampling which is to be undertaken accordance with the NSW Acid Sulfate Soil Manual (Stone, Ahern, & Blunden, 1998) at sites where there is a risk of encountering ASS as per Table 5-5 • If ASS are detected by soil sampling, then an ASS management plan must be developed (as part of the CEMP). The ASS management plan would include material handling and disposal, and be prepared and approved by relevant stakeholders prior to the commencement of construction in the areas where potential ASS exists. Alternative routes for trenching works must also be considered • Management of ASS to be undertaken in accordance to ASS Assessment Guidelines (Ahern, Stone, & Blunden, 1998).
Water Quality and Hydrology	☒ Pollution ☒ Sedimentation ☒ Oil Spills	Erosion and Sediment controls: • Disturbed surfaces must be stabilised as soon as possible

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*

		• An Erosion and Sedimentation Control Plan must be prepared by suitably qualified persons as per EMS-14-PR-0012 Erosion and Sediment Control and is to be fully implemented and managed through all stages of the proposal
		  o Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets
		  o Reduce water velocity and capture sediment on site
		  o Minimise the amount of material transported from site to surrounding pavement surfaces
		  o Divert clean water around the site (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines Vol 1 (the Blue Book)) to be read in conjunction with the relevant DECC Managing Urban Stormwater – Soils and Construction volume
		• Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request
		• Erosion and sediment control measures are not to be removed until the proposal is complete in those areas
		• Allow for the application of a geotextile or other cover / weighting of denuded areas to protect the soil from erosion and destabilisation if required (subject to requirements to remove versus only trimming of soil)
		• Removal of any vegetation would keep the trunk base and root system intact (e.g., remove trunk to near ground level only) to continue holding soils
		Stockpile management will consider:
		• All stockpiles would be located in designated areas as defined in Figure 2-1 and away from high water flow areas
		• Limiting stockpile sites to a height of one meter
		• Covering stockpile sites to reduce both the risk of erosion and generation of dust
		• Contamination controls measures to be implemented as outlined in contaminated land and hazardous materials section below.
		• Implement relevant DPI water guidelines and control measures such as the those outlined in the Guidelines for instream works on waterfront land (DPIE, 2022) and all other supporting guidelines
		• There is to be no release of water into water ways or drainage lines that is dirty

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Water quality control measures are to be used to prevent any materials (eg sediment) entering drain inlets or waterways • All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains • Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment • Plant and equipment to be regularly inspected for oil leaks • Spill kits appropriate to products used on site must be readily available • Wash down of concrete mixers, concreting equipment and trucks must take place in an appropriate area away from drainage lines and stormwater drains • Wash down areas must be appropriately constructed, and the collected material disposed of off-site • Sydney Trains will notify the EPA of any pollution incidents that cause or may cause material harm to the environment that occur onsite. The following mitigation measures will apply to works being completed close to Wyee Creek for the construction of signalling building MT01: • Details of water quality inspections and monitoring of Wyee Creek will be presented in the Water Quality Monitoring Program section of the CEMP. All water compliance sampling, analysis, modelling and assessment will be as prescribed in the NSW EPA Approved methods for the sampling and analysis of water pollutants in NSW. The Program shall include a process for reporting and responding to exceedances of water quality criteria and/or targets for the proposal. Other standard approaches to water management are covered in the EMS-14-OR-1014 Water. • Visual monitoring of Wyee Creek to assess water quality (i.e., turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient erosion and sediment controls. • The Project Manager would receive regular routine water quality monitoring reports relevant to the frequency of sampling and analysis which will be outlined in the CEMP. A water sample will be collected prior to construction to establish baseline conditions of Wyee Creek. In the case of high results or identified potential pollution the report would include a brief interpretation of the potential source of the pollution and the contributory causes.

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
Air Quality	☒ Dust ☐ Odour & Fumes ☐ Greenhouse Gases	The following management measures are to be implemented to avoid, reduce, and minimise air quality impacts: • The techniques adopted for stripping out and/or demolition must minimise the release of dust into the environment • At the conclusion of the demolition works, the sites must be examined visually for any evidence of paint chips or debris resulting from the demolition activities. All debris must be removed • Emission of dust from unsealed roads and other exposed surfaces such as unprotected earth or soil stockpiles must be controlled by use of surface sealants and/or water spray carts or other appropriate cover material • Disturbed areas must be rehabilitated upon completion of demolition works by provision of protective ground cover such as mulches, vegetation, organic binders, or dust retardants • Stockpiles must be appropriately maintained and contained which could include covering or regular watering to minimise dust. Long term stockpiles must be covered • Traffic movements on any disturbed areas must be limited. Keep vehicles on existing access roads • Work must be minimised during high wind periods • Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust. • Trucks or train carriages transporting spoil and other waste materials from the site must be covered • Plant and equipment must be operated in a proper and efficient manner and switched off when not in use • Plant and equipment must be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition • Plant and equipment must be regularly inspected to ascertain that fitted emission controls are operating efficiently
Biodiversity	☒ Trimming and removal of trees ☒ Noxious weeds ☒ Native vegetation	The following management measures are to be implemented to avoid, reduce, and minimise both the direct and indirect impacts on biodiversity as a result of this proposal: • Construction staff will be made aware of the biodiversity constraints.

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
	☒ Habitat ☒ Threatened species Sensitive areas	• Any disturbed areas of the site must be revegetated using locally indigenous species in accordance with EMS-06-GD-0074 Revegetation Guide and EMS-06- TP-0066 Revegetation Technical Specification Template. The exception will be APZ areas which will retain only a short ground layer. • All vegetation trimming and removal work will be carried out in accordance with AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of Trees on Development Sites. No hollow bearing trees are to be removed or trimmed without approval. Trees nominated for retention will be marked on all plans. A Level 3 Arborist supervises work involving tree trimming. • Work must be planned to minimise disturbance to vegetation and soil in accordance with EMS-14-PR-0012 Erosion and Sediment Control. • Tree or native vegetation removal works must be the offset in accordance with EMS06-WI-0177 Biodiversity Offset Calculator. • Debris from tree pruning and removal is to be removed off site and legally disposed. • Controls must be implemented to minimise the spread of weeds. • There is to be no disturbance or damage to threatened species or critical habitat. Threatened and protected species and ecological communities: • No work to be carried out in the areas mapped as TECs (refer to Figure 5-7). These areas are to be marked on construction site maps and demarcated on site as no-go areas • If threatened and/or protected flora or fauna species are identified, work in the vicinity of the subject flora or fauna will stop immediately. A spotter/catcher or ecologist will be engaged to survey the area, in conjunction with Sydney Trains' Environmental Officer, and advise on species management • Construction works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Sydney Trains has provided written approval to do so • A site survey and an environmental impact management plan by an ecologist must be created if any threatened species are recorded during the works • Should the design be modified to alter the area or extent of vegetation removal, further ecological impact assessment must be undertaken.

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		Fauna (general): • The site-specific CEMP must include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES), or Council for domestic species • Trenches/excavations will be covered at the end of each day, and inspected before they are backfilled, to ensure that no fauna species are harmed. Native vegetation (general): • The extent of approved clearing and/or trimming must be marked out and minimised where possible • Construction areas will be kept to a minimum and be clearly demarcated to prevent accidental damage to native vegetation • Stockpiles, plant, equipment, and materials storage are to be located on existing cleared lands away from the drip zone of trees or other native vegetation, with appropriate sediment erosion controls implemented • Vehicle turning circles and parking areas shall be clearly marked and will occur in areas free of native vegetation • Where space within existing conduits is not available, GST is to be preferred over underground conduits to connect new assets • Where trenching or excavation is required for installing new underground conduits or crossings, the route or location will be modified or altered to avoid any damage to trees or tree roots, where possible. • Revegetate disturbed areas using locally native, appropriate species, in an approved vegetation plan. • The offset calculator would be applied as determined by the biodiversity report. The full details of this are highlighted in Appendix A5. This totals $11,430 to be paid into the Sydney Trains Biodiversity offset fund. Weed control measures are to be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during construction. This will include the management and disposal of weeds in accordance with the Biosecurity Act 2015. Such measures will include: • Any vegetation removal will be assessed by an ecologist to ensure that any identified noxious weeds are removed appropriately • Weeds shall be treated and disposed of appropriately and not mixed with other vegetation to be mulched for reuse

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Piles of cleared vegetation would be mulched as soon as practicable after clearing and mulch reused at the signal location where possible • Soil and vegetation that could contain weed material is to be removed from machinery prior to any movements off site • Should any priority weeds be encountered, appropriate management and disposal of these weeds must be carried out. Prevention and management measures for plant pathogens, including Phytophthora cinnamomic and the fungus responsible for chytridiomycosis would be incorporated into the CEMP or and focus on the following key protocols: • Vehicles, machinery, equipment entering the site would be inspected to be free of obvious soil contamination or implement appropriate hygiene protocols including wash down and/or disinfection measures • Ensure that contaminated soil or plant material is not brought onto the site.
Noise and Vibration	☒ Noise ☒ Vibration ☒ Adjoining landowners	Based on the predicted exceedances during track alignment, buildings, drainage/drain pipes, OHW, pits, and ancillary works in NCAs 01, 02 and 03 (refer to Table 5-14 in Section 5.6.2 above), the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains EPL 12208 will need to be implemented. The management measures will need to be implemented and adhered when track alignment, buildings, drainage/drain pipes, OHW, pits, and ancillary works are being carried out in NCAs 01, 02 and 03. The management measures specified in Conditions O13.4 and O13.5 of the EPL have been extracted and presented below. *O13.4 Where maintenance activities are undertaken, including outside of the hours specified in Condition O13.1, noise impacts must be managed in accordance with the recommendations in the Interim Construction Noise Guideline (DECCW, 2009), as updated from time to time. The licensee is required to:* *a) identify noise sensitive receivers that may be affected;* *b) identify hours of work for the proposed activities;* *c) identify noise impacts at noise sensitive receivers;* *d) select and apply reasonable and feasible work practices to minimise noise impacts; and* *e) notify the identified noise sensitive receivers at least 5 days prior to the commencement of maintenance activities undertaken outside of the hours specified in Condition O13.1, except where the licensee first*

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		becomes aware of the need to undertake those maintenance activities less than 5 days prior to the proposed commencement date, in which case the notification must be provided as soon as practicable after becoming aware of the need to undertake the maintenance activities. *O13.5 When requested by an authorised officer of the EPA, the licensee must provide the following information regarding any proposed maintenance activities on the Sydney Trains Network:* *a) dates and times of the proposed maintenance activity;* *b) location of the proposed maintenance activity;* *c) type(s) of work to be performed in conducting the proposed maintenance activity;* *d) plant and equipment to be used; and* *e) contact name and telephone number of a person who will be on site during the activity and who is authorised by the licensee to take action, including the cessation of the activity or any part of it, if so directed by the EPA. A contact person must be contactable 24 hours a day via the supplied telephone number(s) during the whole of the period that the activity takes place outside the hours specified in Condition O13.1.* In order to reduce the construction noise during the track alignment, buildings and drainage works of this proposal a number of other, general control measures will need to be introduce. These are: General management measures: • Implement community consultation or notification measures including: o Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number o Website (If required) o Contact telephone number for community o Email distribution list (if required) • All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include:

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		○ All project-specific and relevant standard noise and vibration mitigation measures ○ Relevant licence and approval conditions ○ Permissible hours of work ○ Any limitations on high noise generating activities ○ Location of nearest sensitive receivers ○ Construction employee parking areas ○ Designated loading/unloading areas and procedures ○ Site opening/closing times (including deliveries) ○ Environmental incident procedures • Behavioural practices will be implemented, including: ○ No swearing or unnecessary shouting or loud stereos/radios on site ○ No dropping of materials from height, throwing of metal items and slamming of doors • The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies • If vibration intensive plant are to be used near or at sensitive structures/buildings, undertake dilapidation surveys on all structures/buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage. Source controls: • Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods • Use quieter and less vibration emitting construction methods where feasible and reasonable • For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• The noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the levels presented in Table 7 of Appendix A10 • The noise levels of plant and equipment items are to be considered in rental decisions and, in any case, cannot be used on site unless compliant with the levels presented in Table 7 of Appendix A10 • The offset distance between noisy plant and adjacent sensitive receivers is to be maximised • Plant used intermittently to be throttled down or shut down • Noise-emitting plant to be directed away from sensitive receivers • Only have necessary equipment on site • Locate compounds away from sensitive receivers and discourage access from local roads • Plan traffic flows, parking, and loading/unloading areas to minimise reversing movements within the site • Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible • Very noisy activities would be scheduled for normal working hours. If the work cannot be undertaken during the day, it would be completed before 11.00 pm where possible • Where practicable, work would be scheduled to avoid major student examination periods when students are studying for examinations, whether at an institution or within a residence, such as before or during Higher School Certificate and at the end of higher education semesters • For reduced equipment power, use only the necessary size and power • Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any OOH work • Consider the use of ambient sensitive alarms that adjust output to the ambient noise level • Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers • Select site access points and roads as far as possible from sensitive receivers

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Dedicated loading/unloading areas to be shielded if close to sensitive receivers • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible • Avoid or minimise these OOH movements where possible • Limit the use of engine compression brakes at night and in residential areas • Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'Inservice test procedure' and standard Path controls: • Stationary noise sources would be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding • Use of structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.
Aboriginal and Non-Aboriginal heritage	☒ Aboriginal Heritage ☒ Non-Aboriginal Heritage ☐ Conservation area ☐ Archaeological potential	The following management measures are to be implemented to avoid, reduce, and minimise impacts to Aboriginal heritage: • Should an unexpected historic relic or Aboriginal object be identified during construction, work in the immediate vicinity of the find is to stop and the area must be fenced off with suitable markers (star pickets, flagging or barrier mesh). The Sydney Trains Project Manager and Environment Division are to be notified and the procedures outlined in the Sydney Trains Unexpected Archaeological Finds Procedure (EMS-09-PR-0164) must be followed • Engage an archaeologist to determine the significance of the find, and if required, determine the notification, consultation, and approval requirements. Works must not recommence until Sydney Trains has provided written approval to do so • Aboriginal objects must not be harmed without an AHIP. The following management measure is to be implemented to avoid, reduce, and minimise impacts to non-Aboriginal heritage: Built Environment

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Conservation of significant elements, especially the lever frame, interlock, relays, and moveable heritage, in-situ, • Photographic and video archival recording of the signal box room • Recording of the existing state of the signalling levers and interlock, and all the moveable heritage of the signal room before works, in the form of a Photographic Archival Recording. The moveable heritage items includes but it is not limited to the following: o A signaller's staff, o Signal lever equipment, including blocks, labels, canvas covers, keys and the like (but not including the levers themselves, the interlock mechanism, and rods, which are not 'moveable' heritage in the relevant sense of the term), o Blocking equipment for points, o Electric control panels, with keys, blockers, and other associated items, o Padlocks, o A telephone, o A safe, o A photograph of former Stationmasters, o A wooden luggage and goods trolley, and o Wooden tumbling indicator boards. • Completion of the Decommissioning Heritage Assets Checklist • Interpretation is to be implemented, as detailed in an Interpretation Strategy and Interpretation Plan, which may involve plaques, signage on the signal box windows, reuse of levers and rod material in installations, and the production of a video documentary about the working practices of the signal box • The signal box would be decommissioned in accordance with Sydney Trains EMS-09-PR-0231 Decommissioning Heritage Assets including the completion of the Decommissioning Heritage Assets Checklist

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• The relay room would be closed and made secure as part of its decommissioning. An audit of the relay room, once the room is decommissioned, is to be completed by an appropriate specialist to establish the significance of any of the electrical items and their potential for reuse • Updating of existing heritage Inventories • Photographic recording of timber sleepers in the Refuge to be removed A Heritage Asset Maintenance Plan for Morisset Railway Station would be prepared to guide the maintenance and ongoing repair of the place. This would be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned. • Tree protection zone to be established before construction starts to ensure the Morisset Campsite Tree will not be impacted, in accordance with the Australian Standard Protection • Site inductions are to include information to workers about the location and sensitivity of the three nearby heritage items as described in Section 5.8.1. It is to be communicated to all onsite workers that no physical works is permitted within the area mapped as containing the Morisset Railway Station archaeological sites Historical Archaeology • If a heritage item is uncovered, stop further disturbance, demarcate the site and contact the project manager. TfNSW rail heritage team and environmental professional will be notified of any unexpected non-Aboriginal heritage or archaeology finds encountered during delivery of the works. The Sydney Trains Environmental management System Unexpected Archaeological Finds will be followed. • Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW Heritage Act. These stop-work and Unexpected Finds procedures to be included in a Construction Environmental Management Plan (CEMP).
Waste Management	☒ Spoil ☒ Litter ☒ Chemicals	The following management measures are to be implemented to avoid, reduce, and minimise waste impacts: • Resource management options for the proposal must be considered against a hierarchy of the following order embodied in the WARR Act 2001:

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
	☒ Hazardous, Liquid or Special Waste ☒ Solid waste	○ Avoid unnecessary resource consumption ○ Recover resources (including reuse, reprocessing, recycling, and energy recovery) ○ Dispose (as a last resort) • Separate wastes, place all wastes in appropriate containers and dispose of them as they are generated • Prevent the mixing of similar new and waste materials. All wastes must be classified in accordance with the Waste Classification Guidelines (DECC, 2009) prior to disposal and transported to a licensed waste disposal facility • Keep records of all waste classification, transport, disposal, reuse, and recycling activities • Excavated material must be temporarily stored in a bunded area or with appropriate environmental controls in place to prevent run-off of contaminants entering the stormwater system • Should volumes of excavated material exceed the capacity for stockpiling prior to off-site disposal, excavation works must cease until existing stockpiled material has been disposed of offsite or an additional appropriate stockpiling area is identified elsewhere on the site • Any spoil or waste material tracked onto paved areas such as roads and car parks must be immediately swept up. No water is to be used to wash any such material tracked onto roads into stormwater drains • An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the proposal site will be kept clean and free of litter, including cigarette butts, at all times • All waste must be removed from the site on completion of the proposal • Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal. Refer also to the management measures identified in Section 5.5.3 in relation to weed management, for those weeds that may comprise any vegetation waste.
Contaminated Land and Hazardous Materials	☒ Soil Contamination ☒ Hazardous spills	The following management measures are to be implemented to avoid, reduce, and minimise impacts as a result of contaminated land and hazardous materials: Encountering hazardous and contaminated materials:

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*

		• As part of the site induction, construction personnel will receive training in the identification, management and handling of contaminated and hazardous materials should they be encountered during the works
		• During excavation activities, site workers will look for signs of potential contamination such as the presence of waste and / or other imported materials, odours, soil colouring, floating layers in groundwater and surface water etc.
		• The CEMP would include an unexpected finds protocol to address potential incidental subsurface impacts or potential source finds during earthworks and excavation. Under the unexpected finds protocol:
		  o Work will stop immediately and the site area will be fenced off
		  o The site area will be then investigated and work will only commence once approval from the HSE Manger is obtained
		• All items to be decommissioned and removed will understand site testing to NSW site work guidelines prior to demolition
		• Any removal of asbestos will be undertaken by an experienced, appropriately licensed removal contractor in accordance with the How to Safely Remove Asbestos Code of Practice (Safe Work Australia, 2022). An Occupational Hygienist will be on site during removal works
		• Hazardous materials must be transported, stored, and used in accordance with the corresponding Safety Data Sheets.
		Contaminated material removal:
		• All excavated material must be analysed prior to transportation and disposal in accordance with NSW Waste Classification Guidelines (DECC, 2009)
		• All hazardous materials removed will be removed and cleaned up as per the NSW Waste Classification Guidelines
		• Contaminated soil will be segregated and contaminated soils are to be treated on site. If soil is not able to be treated onsite it must be removed off site for disposal at an appropriately licenced facility.
		Storage, refuelling and plant maintenance:
		• All fuels and other hazardous substances must be stored at designated construction compounds in containers within a bunded enclosure with sufficient capacity to hold 120% of the stored material

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50m from drainage lines or waterways. The use of adequate spill prevention and containment measures (e.g. drip trays) must be used when refuelling equipment on site • The amount of hazardous material stored and used on site must be kept to the minimum practicable • Construction personnel to be trained in spill containment and response procedures • Appropriate spill response material to be kept on site • Spills or leaks to be reported to the senior officer on site and clean up measures commenced immediately • Spills to be reported in accordance with legislative and licensing requirements • If a spill occurs, the material to be contained to the smallest area possible • All spills that cause or may cause material harm to the environment to be reported to the NSW EPA • Construction personnel to be trained in spill containment and response procedures in accordance with the those set out by Sydney Trains • The amount of hazardous material stored and used on site must be kept to the minimum practicable. Wastewater and Discharge: • Wash down of concrete mixers, concreting equipment and trucks must take place in an appropriate area away from drainage lines and stormwater drains • Wash down areas must be appropriately constructed (EPA, 2019), and the collected material disposed of off-site • Surface water run-off (requiring treatment) will be collected for treatment prior to discharge.
Visual Aesthetics and Urban Design	☒ Visual ☐ Views and vistas ☐ Overshadowing ☒ Light spill	Control measures to reduce visual impact may consist of the following: • Designing above ground structures to achieve the best fit with the existing contours, vegetation, and earthworks • Considering the form and finish of structures, including minimising the size of buildings and structures, using darker colours for the structures and less reflective materials • Screening planting and encouraging natural regeneration

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• Landscaping and rehabilitation work on disturbed areas are undertaken as soon as possible • Using locally endemic vegetation species in rehabilitation that are known to be well adapted to the area and soils • Minimising vegetation clearing at sensitive sites • Minimising temporary hoarding of construction and waste materials • Locating storage facilities away from residential areas • Minimising temporary signage and removing regularly when no longer required • Removing waste materials from the site regularly • Restricting lighting of compounds and worksites to low impact lighting • Storing materials and machinery neatly during the works, and where possible behind solid hoardings • Maintaining access roads to site compounds and works areas as free of dust and mud as far as reasonably practicable • Removing all construction and waste materials to a suitable location upon completion of construction.
Socio-Economic Effects	☒ Land Use ☐ Property Effects ☐ Economic Effects ☒ Other community impacts	The following controls would be implemented to avoid, reduce, or minimise impacts to the community • As part of the communications strategy, to notify the local council and provide local notification for the community ahead of the proposal's commencement. • Clear signage to address the track possession period and implications for train schedules, with associated communication of implications as required within Sydney Trains and TfNSW in respect of passenger services • Access to the Morisset Station, the station carpark and the drop off areas such as the kiss and ride drop off loop would be maintained and left unobstructed during works • Fencing of the works to maintain public safety during construction and operation.
Traffic and access	☒ Traffic and access ☒ Transport	The following control measures will be implemented to mitigate traffic and access impacts: • Construction vehicles required for work near the Morisset station will be required to park at the designated ancillary sites as shown by Figure 2 1

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
		• A TMP for the proposal must be prepared in consultation with the relevant traffic authority to minimise and manage the disruption to local vehicular and pedestrian traffic. The TMP will ensure compliance with Australian Standard AS 1742.3–2009 Manual of uniform traffic control devices – Part 3: Traffic control devices for works on roads • A traffic speed limit shall be enforced at all signal locations • Deliveries of both plant and construction materials to take place outside of peak periods where practical • Scheduled road movements must be minimised where possible • Where access is required through land not owned by TfNSW, consultation will be undertaken with landowners and consent to access the land will be obtained where required • A dilapidation survey will be completed before demobilisation • Any pavement or road surfaces damaged during construction will be restored when work is finished.
Community consultation	☒ Notification of works ☒ Complaints	Notification is to be given to affected community members prior to the works taking place. The notification is to include: • Details of the proposal • The duration of works and working hours • Any changed traffic or access arrangements • How to lodge a complaint or obtain more information • Contact name and details. Notification would be a minimum of seven calendar days prior to the start of works. • Refer all complaints to the Sydney Trains & NSW TrainLink Environmental Feedback Line on 1300 500 or https://transportnsw.info/contact-us.
Other relevant environmental aspects		• Immediately prior to commencement of the proposal, review the status and progress of the State Significant Developments listed in Section 5.15.1, for any concurrent activities, to scope the potential impacts of those concurrent activities. Regard would be given to heavy vehicles travelling on Mandalong Road, Main Road, Wyee Road, and other key arterial road connections. Consult with these other proponents if deemed necessary to manage and mitigate those impacts if there is a predicted overlap in activities. These matters would also be referenced in the proposal's TMP.

Aspect	Potential Impact *Tick relevant aspects*	Control measures *Typical measures included below*
Incident management	☒ Incidents	• Immediately notify incidents to the Incident and Injury Hotline 1800 772 779 or enter incident directly into SHEM.

7.2 Implementation Process

The environmental management measures contained in this REF (as outlined in Section 7.1) will be implemented to ensure that the environment is adequately protected and that adverse impacts are avoided or otherwise substantially ameliorated.

The construction contractor will be required to prepare a specific CEMP incorporating the mitigation measures specified in this REF. A copy of this REF and the CEMP is to be retained on the work site and produced upon request. The CEMP is to be reviewed by a Sydney Trains Environmental Professional, where required and endorsed by the Project Manager prior to works commencing on site. The CEMP is to include the following:

- Identification of the environmental issues and risks of the proposal
- Details of environmental controls to be implemented including location and timing
- Details of statutory requirements including those of any approvals and licences (see Table 7-2)
- Assignment of responsibility for implementation and monitoring of environmental controls
- Reporting, incident notification and emergency procedures
- Contact details for all site personnel and agency contacts
- Corrective action requirements and their verification.

The details of permits, licences, and approvals, including but not limited to those identified in Section 3.7 can be summarised in Table 7-2 where relevant. Details of the other permits and approvals must also be provided in the CEMP.

Table 7-2: Summary of permits and other approvals

Permit required	Legislation	Section/Clause	Approval authority	Comment
Other approvals	*Mine Subsidence Compensation Act 1961*	Clause 2.15(2)(f)	Subsidence Advisory – NSW	The proposal was granted approval from the Subsidence Advisory on 31 August 2023 for works within the proposal footprint, subject to the conditions set out in the determination under Schedule 1, see Appendix A3.
Sydney Trains Heritage Internal Signoff	NSW *Heritage Act 1977*	Section 139	Sydney Trains	As no items of State Heritage significance are likely to be affected, nor will there be any likely significant impact to items listed on a Local Environmental Plan, under the State Agency Management Principles, heritage approval for works to these items will be made internally by Sydney Trains.
EPL 12208 – noise management	POEO Act	Sections 47 and 48	NSW EPA	Due to predicted noise exceedances for surrounding residences during track alignment works, buildings,

Permit required	Legislation	Section/Clause	Approval authority	Comment
Conditions enlivened				drainage/drain pipes, OHW, pits, and ancillary works in NCAs 01, 02 and 03 (refer to Table 5-14 in Section 5.6.2 above), the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains EPL 12208 will need to be implemented during this proposal. However, no variations or modifications are required to be made to the existing Sydney Trains EPL 12208 to facilitate the proposal.
Other Approvals	Rail Safety National Law (NSW) 2021	Section 106	Sydney Trains and Sunset Power International	There is currently an interface agreement between Sydney Trains and Sunset Power International for the access to the Vales Point Balloon Loop to carry out maintenance activities, see Appendix A13 for full details of this agreement.
Other Approvals	Energy Supply Act 1995	Division 4	AusGrid	An application has been made to AusGrid on behalf of Sydney trains to remove one pole top substation and establish one new pole top substation.
Other Approvals	Transport and Infrastructure 2021	Clause 2.10	Lake Macquarie City Council	A formal notification was sent to Lake Macquarie City Council on the 24th October 2023. This notification is attached to this REF see appendix A12.

8 Finalisation

8.1 Justification and conclusion

The scope of this proposal is to provide a new train signalling system in the Morisset and Vales Point are on the central coast and Newcastle Line in NSW. The Morisset and Vales Point Resignalling Project (the proposal) will upgrade the existing system which has now exceeded its design life. The new proposed train control system uses the ATRICS. The key elements of what is being is proposed is the addition of six signalling buildings (MT01, MT05, MT08, MT11, MTRR and MT29) at various points within the rail corridor. The purpose of these signalling buildings is to house signalling and power equipment. Additional works to support the proposal include modification to the track alignment including a perway siding, modification to the OHW, a new CSR, electrical and communications connection and new site drainage.

The proposal is directly aligned with the vision of the *Future Transport Strategy 2056 for NSW* (NSW Government, 2020), as well as the *NSW Long Term Transport Master Plan*, which are designed to modernise Sydney's rail network. The proposal will modernise key components of the railway system within this strategic transport and economic hub of Morisset. The proposal will increase the safety, capacity, and reliability of the Sydney Trains network, in this location, and provide substantially lower lifecycle operation and maintenance costs once operational. Moreover, the proposal will:

- Provide capacity for eight trains per hour (an increase from the current capacity of around four trains per hour) with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour
- Improve journey times, with the aim that journey times do not exceed the November 2017 or latest timetable
- Improve the overall safety of the train network for passengers and workers

The completion of these works has a long term benefit to the community through the provision of a more frequent, reliable, and safer train network. The update significantly reduces the maintenance cost and lifecycle costs for the train network. It will also support the changed network requirements when the Lower Hunter Freight Corridor (rail bypass) comes into being with a dedicated freight rail line between Fassifern and Hexham at a future date.

This REF has examined and taken into account all matters which affecting or likely to affect the environment pursuant to Section 5.5 of the EP&A Act. This has included consideration of soils, water quality, biodiversity values including any TECs or species, noise and vibration impact, Aboriginal and non-Aboriginal heritage impacts, contaminated land and hazardous materials, and traffic and access.

The REF has highlighted that the decommissioning of the signalling equipment at Morisset Station will impact the TAHE Section 170 Heritage and Conservation item, Morisset Railway Station Group and Residences. In particular, this will impact signal box and equipment. Much of this will be mitigated through the retention of the signalling levers and interlock system, and all

the moveable heritage of the signal room is to remain on site. These mitigation measures significantly reduce the impact to an acceptable level. As a result, under Section 57(2) of the *Heritage Act 1977*, TfNSW has delegated authority to use the RailCorp Agency Specific Exemptions to approve minor works or maintenance activities within railway sites on the TAHE S170 Register.

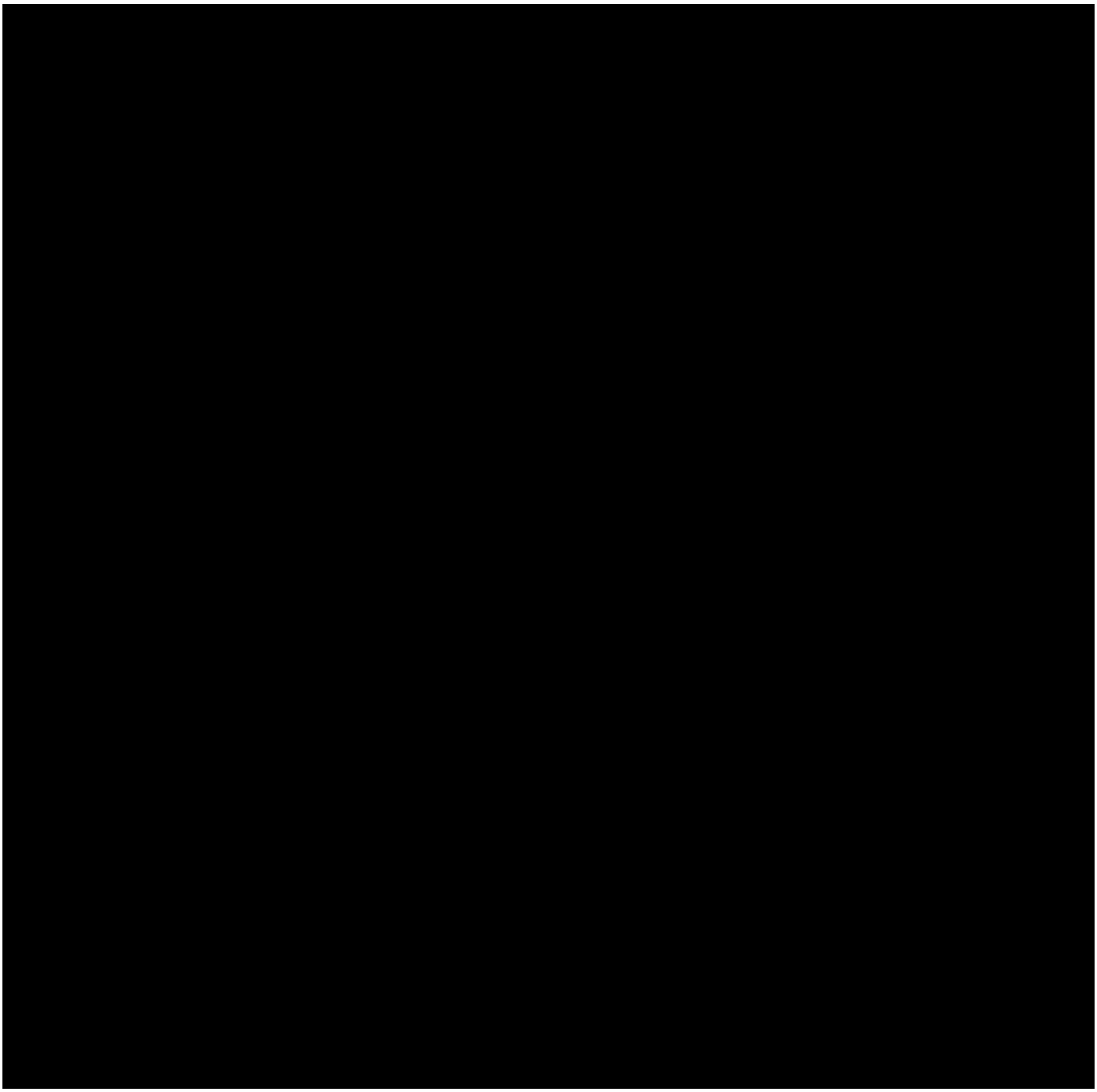
The other key impacts associated this proposal include:

- Exceedances of project-specific noise levels will be experienced at nearby residences at NCAs 01, 02 and 03 (refer to Table 5-14 in Section 5.6.2 above) around the Morisset Station. Various management measures will be implemented and adhered during track alignment, buildings, drainage/drain pipes, OHW, pits and ancillary works in order to minimise these impacts. Due to these predicted noise exceedances for surrounding residences the management measures detailed in Conditions O13.4 and O13.5 in the Sydney Trains EPL 12208 will be implemented during this proposal. However, no variations or modifications are required to be made to the existing Sydney Trains EPL 12208 to facilitate the proposal
- Any potential impacts to waterways are isolated to the Wyee Creek where some construction activities occur at less than 40m from the water way. Mitigation measures will be implemented to reduce the likelihood of erosion, sedimentation, or spills from entering the creek
- Some vegetation clearing and trimming of trees is to occur in order to provide an APZ and reduce the likelihood of infrastructure being damaged by bushfires. This clearing is not expected to reduce the biodiversity values of the area
- It is expected that there will be some increases in traffic however the proposal is being undertaken within the rail corridor and will utilise the existing Sydney Trains access gates.

This REF has considered and assessed these impacts in accordance with the relevant legislation. The environmental impacts of the proposal are minor in nature and localised. Mitigation and control measures have been specified in this REF which will further assist in managing these potential environmental issues. There are no long-term or on-going impacts from this proposal that are not mitigated against or have sufficient control measures in place.

Overall, the benefits derived from proceeding with the proposal are considered to outweigh the potential impacts and the proposal is therefore considered to be justified.

8.2 REF determination



The works covered by this document have been determined to proceed under Division 5.1 of the *Environmental Planning & Assessment Act 1979* and Part 8 of the *Environmental Planning & Assessment Regulation 2021* subject to the implementation of all mitigation measures and actions identified in this document.

Position of Determiner: Deputy Executive Director (Major Works Division, Sydney Trains)

Date of Determination: 05/03/2024

This version of the document has been redacted to remove personal information

For more information regarding these works please visit the below link which also provides appropriate community feedback channels:

https://www.transport.nsw.gov.au/projects/community-engagement/sydney-trains-community/morisset-and-vales-point-resignalling

9 References

ABS, 2016. Morisset: 2016 Census All Persons Quickstats. Available at: 2016 Morisset, Census All persons QuickStats | Australian Bureau of Statistics (abs.gov.au).

Ahern, C. R., Stone, Y., & Blunden, B. (1998). *Acid Sulfate Soils Assessment Guidelines.,* Wollongbar, NSW: Acid Sulfate Soils Management Advisory Committee.

Artefact (2023) *Morisset and Vales Point Resignalling - Aboriginal Cultural Heritage Addendum due diligence report for Detailed Design phase. Report prepared for SMEC.* Sydney: Artefact Heritage.

Atefact (2023) *Morisset to Vales Point (MVP) Resignalling Proposal: Non-Aboriginal (historical) archaeological inputs for Detailed Design phase. Report prepared for SMEC.* Sydney: Artefact Heritage.

CCG (2023) *Statement of Heritage Impact - Morisset Rail Resignalling Project. Report prepared for Sydney Trains.* Sydney: CCG Architects.

DEC (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*.

DECC (2009). *Waste Classification Guidelines*.

DECCW (2010). *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*.

DPIE (2022) *Controlled activities – Guidelines for instream works on waterfront land*

DPE (2023a). *Air quality in Newcastle: Spring 2022*.

DPE (2023b) NSW BioNet Atlas species sightings. Available at https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet [Accessed 22 Oct 2023]. NSW Department of Planning and the Environment, Parramatta, NSW

DPE (2023c) NSW State Vegetation Type Map – Edition C1.1.M1. Available at: https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map [Accessed 22 Oct 2023].

Extent Heritage. (2020). *Aboriginal Cultural Heritage Due Diligence – Morisset Rail Resignalling Project*. *Report prepared for Aurecon*. Sydney: Extent Heritage Pty Ltd.

Landcom/Department of Housing. *'Managing Urban Stormwater, Soils and Construction Guidelines' Vol 1* (the Blue Book).

Naylor, S. D., Chapman, G. A., Atkinson, G. M., Tulau, M. J., Flewin, T. C., Milford, H. B., & Morand, D. T. (1998). Guidelines for the Use of Acid Sulfate Soil Risk Maps. Sydney: Department of Land and Water Conservation. Retrieved from https://datasets.seed.nsw.gov.au/dataset/acid-sulfate-soils-risk0196c

NSW Government, 2012. *NSW Long Term Transport Master Plan.*

NSW Government (2020). *Future Transport Strategy 2056 for NSW*.

HNSW(2023). *State Heritage Inventory.* Available at: https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=1910139.

Resonate (2023) *Morisset and Vales Point Resignalling Project – Construction Noise and Vibration Assessment.*

Report prepared for SMEC. Sydney. Resonate Consultants.

Safe Work Australia. (2022). *How to safely remove asbestos: Code of Practice .* Retrieved from Safe Work Australia:https://www.safework.nsw.gov.au/data/assets/pdf_file/0015/50082/How-to-safely-remove-asbestos-COP.pdf.

SMEC (2023) *Biodiversity Assessment - Morisset Rail Resignalling Project. Report prepared for Sydney Trains.* Sydney: SMEC Australia Pty Ltd.

SMEC (2023) *Technical Memorandum – Hydraulic Study – Morisset Track. Report prepared for SMEC.* Sydney: SMEC Australia Pty Ltd.

TfNSW (2018). *Transport for NSW (TfNSW) Construction Noise and Vibration Strategy.*

TfNSW (2023). *TfNSW Construction Noise and Vibration Guideline (Roads).*

A1. EPBC Protected Matters Search

A2. AHIMS Search Results

A3. Mine Subsidence Determination

Subsidence Advisory

FN23-05884
Our Ref: TBA23-02370
31 August 2023

[redacted]

Address: RAIL CORRIDOR WYEE ROAD MORISSET
District: WEST LAKE
Proposal: MORISSET & VALES POINT RE-SIGNALLING PROJECT

Dear Chris Apps,

Notice of Determination

I refer to your development application for the above property.

Your application has been assessed and approval is granted for the proposed development under section 22 of the *Coal Mine Subsidence Compensation Act 2017*.

Determination Date: 31 August 2023
Approval to Lapse on: 31 August 2028

Approval has been granted, subject to the conditions set out in the attached determination under Schedule 1. The plans stamped with conditional approval are attached.

This determination only applies to the development described in the plans and associated documentation relating to this application and provided to Subsidence Advisory NSW.

If the proposed development is amended, Subsidence Advisory must be notified to determine if any variations to the determination are required.

To satisfy the conditions of approval please submit documentation confirming the conditions under Schedule 1 have been met via email to subsidencedevelopment@customerservice.nsw.gov.au, quoting reference number TBA23-02370.

Should you have any questions regarding the determination, please contact me on (02) 4908 4300 or at subsidencedevelopment@customerservice.nsw.gov.au.

Kind Regards,

[redacted]

SCHEDULE 1

CONDITIONS OF APPROVAL

Application No:	TBA23-02370
Applicant:	[redacted]
Site Address:	RAIL CORRIDOR WYEE ROAD MORISSET
Mine Subsidence District:	WEST LAKE
Proposal:	MORISSET & VALES POINT RE-SIGNALLING PROJECT
Date:	31/08/2023

Schedule 1 – s.22

GENERAL	
Plans, Standards and Guidelines	
1.	These conditions of approval under s.22 of the *Coal Mine Subsidence Compensation Act 2017* (the Act) only apply to the development described in the plans and associated documentation relating to **TBA23-02370**. Any amendments or subsequent modifications to the development renders this approval invalid.
2.	This approval expires 5 years after the date the approval was granted if building, engineering or construction work relating to the application has not physically commenced on the land.
POST CONSTRUCTION	
3.	**Certification of Works** Upon completion of construction, submit certification from a qualified builder or certifier that confirms construction is in accordance with the plans approved by Subsidence Advisory.

A4. Hydraulic Study – Morisset Track

Member of the Surbana Jurong Group

Technical Memorandum

Memo No.	30013326-HD-001-MEM	**Date of Issue**	14 December 2023
Subject	Hydraulic Study – Morisset Track	**Discipline**	Civil- Water Resources
Project Title	Morisset and Vales Point Resignalling	**Project No.**	30013326
Document No.	30013326-HD-001-MEM	**Revision**	3
Author	[redacted]		
Reviewed by	[redacted]	**Approved by**	[redacted]
Prepared for	Sydney Trains	**Attention to**	[redacted]
Attachments	Appendix A – Flood Depth and Flood Velocity Maps Appendix B – Flood Hazard Maps Appendix C – Flood Assessment of CSR Pits		

Glossary

Term	Definition
Annual Exceedance Probability (AEP)	The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year
Intensity-Frequency-Data (IFD)	Design rainfall intensities (mm/h) or design rainfall depths (mm) corresponding to selected Annual Exceedance Probabilities (AEPs), based on the statistical analysis of historical rainfall
Light Detection and Ranging (LiDAR)	A remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth
Regional Flood Frequency Estimation (RFFE)	A technique based on data from 853 gauged catchments to provide flood estimates for sites around Australia
Temporal Pattern	A burst of rainfall that occurs at different points in time for a given region, catchment area and storm duration
TUFLOW	A suite of advanced 1D/2D computer simulation software for flooding and drainage

1. Introduction

This study provides a hydraulic assessment along the railway track from Wyee Dam to Dora Creek, including the Morisset Station. The track alignment passes over Mannering Creek, Wyee Creek and Pourmalong Creek, runs adjacent to Melaleuca Creek as well as some drainage crossings from the Morisset township. Morisset Station is located 45 km south of Newcastle.

The study provides design information on flood levels for various utilities structure proposed along the track as identified in Figure 1 and four electrical transformers at different locations along the track. The hydraulic analysis and assessments are for the “existing development condition". Any changes to the catchment land use, especially land developments, shall utilise water quantity management such that peak flows and hydrological regimes are maintained.

1.1 Purpose

The purpose of this report is to provide advice on flood levels in the existing conditions along the track alignment. This will be used to inform the design for the various utility structures proposed along the rail corridor to ensure they achieve flood immunity in the 1% Annual Exceedance Probability (AEP) storm event with climate change (18.5%).

1.2 Scope of Works

The following details the scope of works to be undertaken for this assessment:

- Develop hydrologic model based on Rain on Grid method, where rainfall is applied over the entire grid area to assess design flows for hydraulic assessment.
- Develop 2d hydraulic model in TUFLOW for flood study along track for design storms for various storm events 20%, 5%, 2%, 1% and 1% AEP storm event with Climate Change (18.5%) as per ARR 2019.
- Provide flood results and recommendations at all utility structures of interest.
- Provide flood depth / water surface level contours, flood velocity and flood hazard maps for all utility structures of interest and flood depths / water surface level contours for the Combined Services Route (CSR) pits.

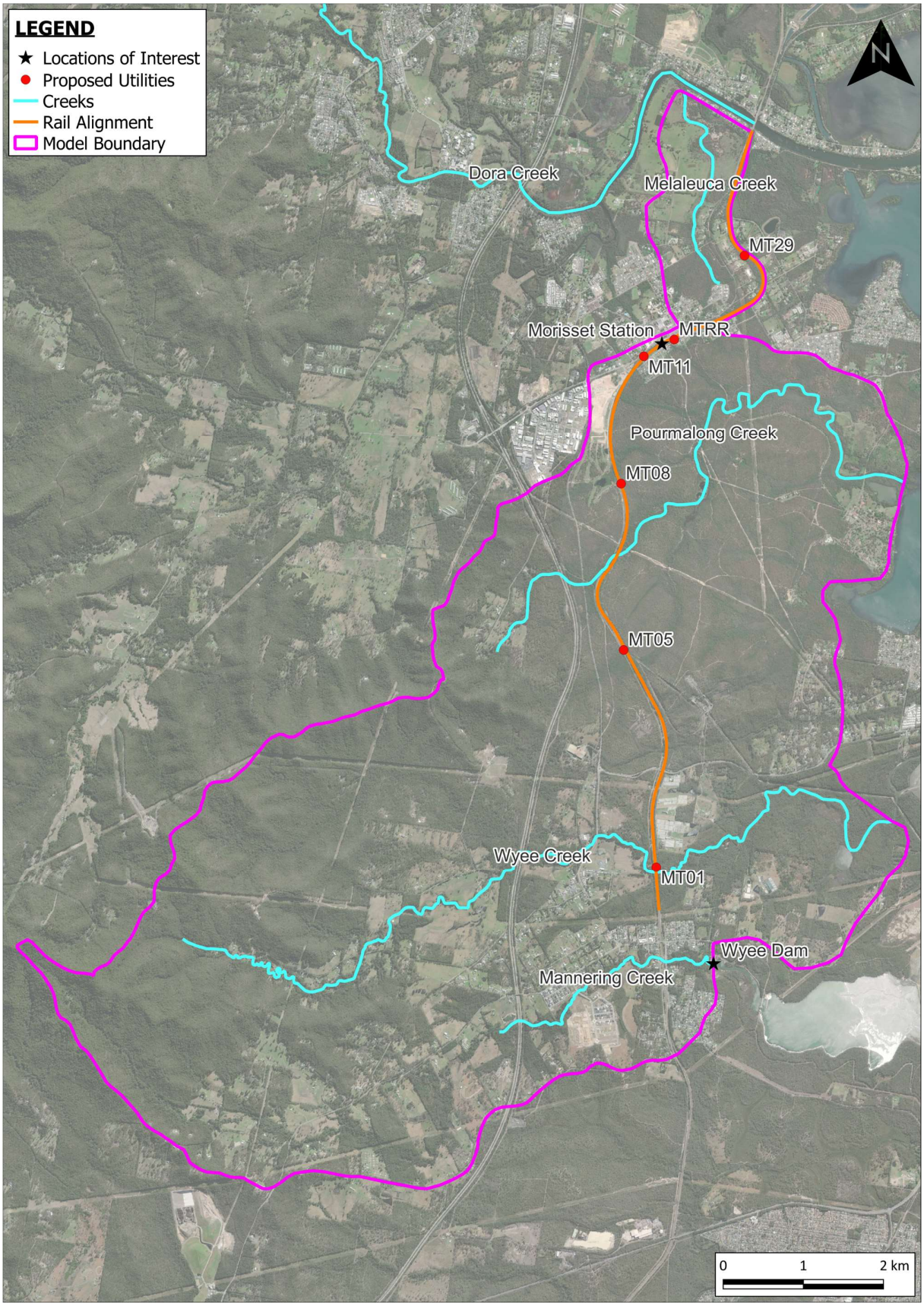


Figure 1: Morisset and Vales Point- Track alignment and utilities structures

2. Topography

The hydrological model requires either a Digital Elevation Model (DEM) or a Digital Terrain Model (DTM) as an input. LiDAR data (DEM data) with 1m grid resolution was obtained from Elevation Foundation Spatial Data (ELVIS) website (https://elevation.fsdf.org.au/) and was used in the hydraulic model. A summary of the topography used is detailed in Table 1 below. Some additional survey information and tracks are incorporated in developing terrain.

Table 1: Details of topographic datasets

Dataset	Resolution	Stated Accuracy	
		Horizontal	Vertical
Lake Macquarie 2014	1 m	+/- 0.8 m	+/- 0.3 m
Gosford 2014	1 m	+/- 0.8 m	+/- 0.3 m
Gosford 2020	1 m	+/- 0.8 m	+/- 0.3 m

3. Catchment Analysis

The contributing catchments and sub catchments were delineated using publicly available LiDAR survey data and aerial imagery as illustrated in in **Error! Reference source not found.**. The overall catchment is approximately 64.65 km2. The general slopes of the creeks are reasonably flat.

The rail alignment (orange) under this study traverse over three separate creeks, Mannering Creek, Wyee Creek and Pourmalong Creek respectively and adjacent to Melaleuca Creek. The creeks and the contributing catchments are also identified in **Error! Reference source not found.**. In addition, the rail track passes over a number of minor crossings over smaller tributaries.

As such, four catchments (pink) were delineated for each creek (blue) to make up the total catchment area (yellow). The catchment is relatively steep in the upper catchment area with sloping terrain from West to East.

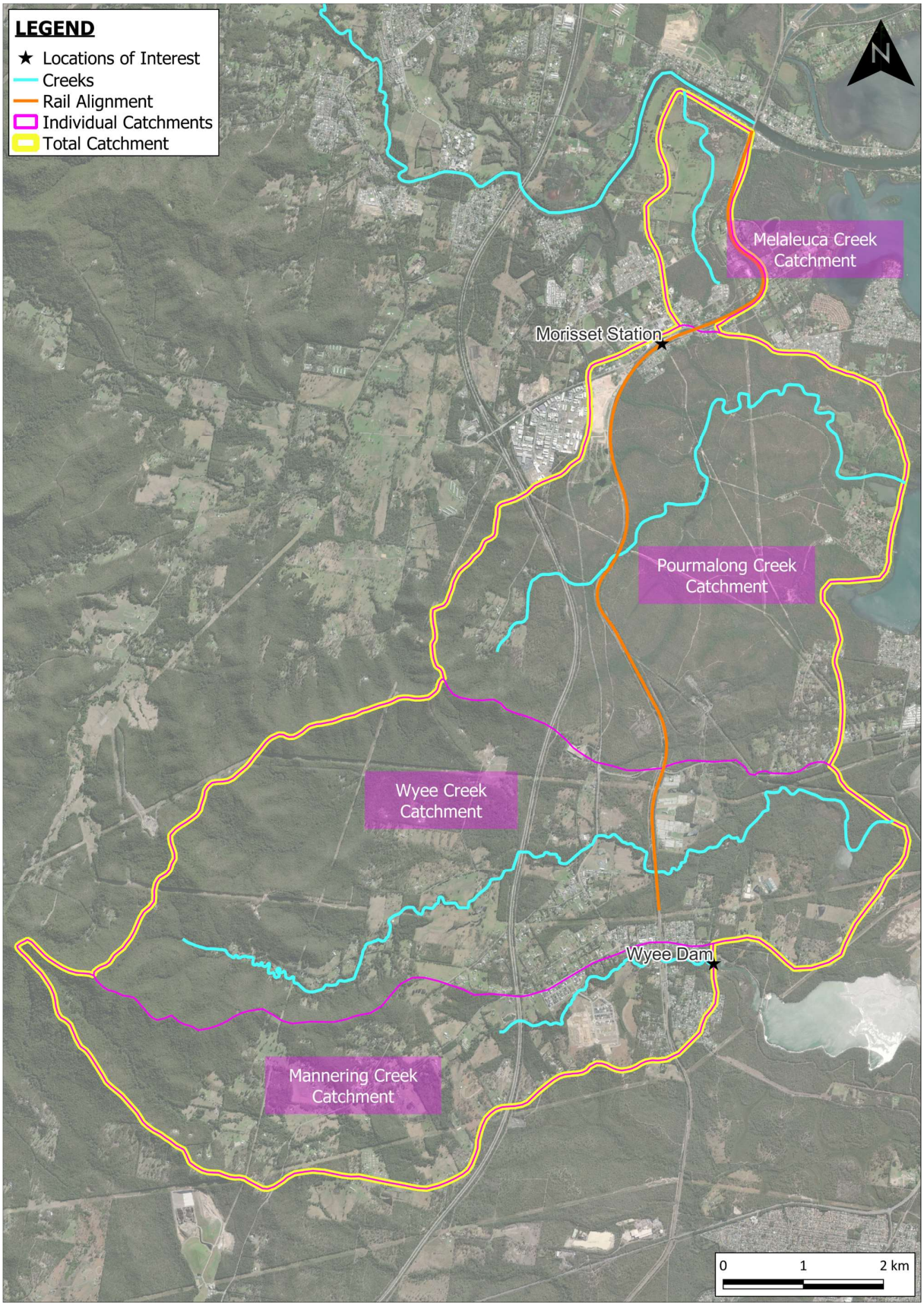


Figure 2: Morisset and Vales Point Catchments

4. Land Use Analysis

The land uses were extracted from the Aerial extent and planning zones. The land use mainly consists of forest, agricultural lands and minor dwellings. These land use and their distribution were extracted from the Open Map Sources using GIS software (QGIS). The existing land use for the delineated catchment surrounding the rail alignment is shown in Figure 3 where pasture is the default land use.

Different land use categories were assigned typical manning's roughness (n) values, provided in Table 2, to represent the loss of energy in open channels. Manning's Roughness (n) typically ranges from 0.01 in smooth concrete channels with no obstructions to upwards of 0.10 in streams with large amounts of large woody debris and vegetation that impedes flow.

Table 2: Adopted Manning's roughness values

Land Use Type	Manning's Roughness [n]
Roads	0.017
Rail	0.050
Pasture	0.040
Dense Bushland	0.120
Urban Residential	0.150
Rural Residential	0.080
Creek	0.035

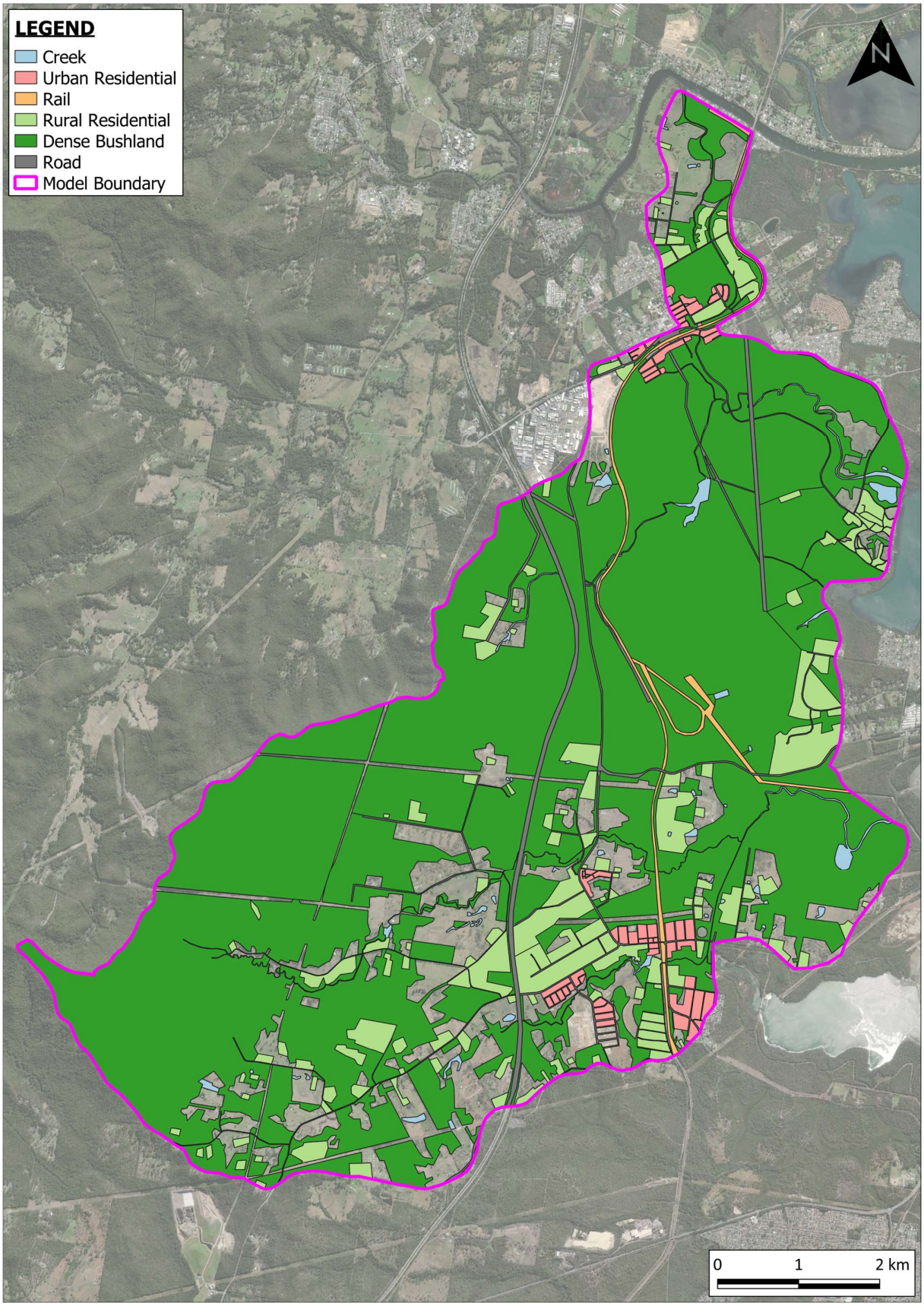


Figure 3: Land Use Types

5. Hydrology

The design rainfalls were extracted from the BoM data hub for the project location. The direct rain on grid approach was considered for hydrological analysis for various storm events. No lumped catchment was used for the flow generation. The design flows determined using ensembled method in accordance with the ARR 2019 method with climatic change (18.5%) for resiliency in the design.

5.1 Direct Rainfall Approach – TUFLOW Rain on Grid

The direct rainfall approach or rain-on-grid method can be used to reflect realistic rainfall behaviour, whereby rain is effectively evenly distributed onto each grid cell within the model. The methodology followed is consistent with the Australian Rainfall and Runoff (ARR 2019) methodology (Babister, et al., 2019), considering the NSW specific advice provided on losses and pre-burst (https://data.arr-software.org/nsw_specific). The following parameters were extracted from the Bureau of Meteorology (BoM) Data Hub

Table 3: Direct Rainfall Input Parameters

Parameter	Description
Rainfall Depths	Rainfall depths for various storm durations for the 20%, 5%, 2%, 1% and 1% with Climate Change (18.5%) events have been extracted from the BoM Intensity-Frequency-Data (IFD), on the BoM 2019 Design Rainfall Data System (http://www.bom.gov.au/water/designRainfalls/revised-ifd/). Note that there is no spatial rainfall variation in the model for any of the modelled flood events.
Temporal Patterns	Design temporal rainfall patterns from ARR 2019 have been adopted.
Rainfall Losses	Storm losses based on the ARR 2019 Data Hub with: Initial loss is based primarily on Probability Neutral Burst initial loss. Continuing loss is based on the NSW advice.

The continuing loss used in the model was 3 mm/hr, as per ARR Data Hub information for the site location. The modelled initial loss varied depending on the event and duration according to the "Probability Neutral Burst Initial Loss" table in the ARR Data Hub. The initial losses are summarised in Table 4.

Table 4:Initial Loss values for modelled events

Duration [mins]	Initial Loss [mm]			
	1% AEP	2% AEP	5% AEP	20% AEP
10	2.8	2.8	2.5	2.3
15	4.2	4.2	3.8	3.5
20	5.6	5.6	5.1	4.6
25	7	7	6.4	5.8
30	8.3	8.3	7.7	6.9
45	12.5	12.5	11.5	10.4
60	16.7	16.7	15.3	13.8
90	13.3	16.6	17.7	16.7
120	14.1	17	17.4	16.3
180	11.4	15.8	17.6	18.7
270	9.7	14.8	15.9	17.9
360	7.9	13.7	14.1	17.2
540	8.7	16.6	17.6	20.3
720	9.4	19.6	21.1	23.4

Duration [mins]	Initial Loss [mm]			
	1% AEP	2% AEP	5% AEP	20% AEP
1080	9.5	22.1	22.9	25.9
1440	11.5	25.8	25.8	28.3

5.2 RFFE Flows

There was no stream data for flow verification. In its absence the Regional Flood Frequency Estimation (RFFE) was applied to qualitatively assess the modelled flows against flows from the nearby river gauges/stations. The RFFE flows only provides a general indication on flow comparison as there are a number of variabilities – e.g. geospatial location of river basin, river basin shape and sizes, variability in rainfalls, catchment properties, land use, catchment slopes, storages within catchments, soil conditions, etc.

The results from the RFFE analysis and the Rain on Grid model for the 1% AEP is provided in Table 5. The results indicate the design flows align closely with the flows predicted from RFFE. The flow through Wyee Creek at the rail crossing is approximately half of the predicted RFFE flow, however it falls above the Lower Confidence Limit (5%).

Table 5: Flow Verification at Rail Crossing locations for the 1% AEP

Location	Rain on Grid, Q [m^3/s]	RFFE, Q [m^3/s]	RFFE Lower Confidence Limit (5%), Q [m^3/s]	RFFE Upper Confidence Limit (95%), Q [m^3/s]
Mannering Creek	109.28	101.62	27.25	332.90
Wyee Creek	108.13	204.07	55.26	680.23
Pourmalong Creek	78.11	79.40	20.55	279.99

It is important to note that flood estimates from the RFFE model with flood characteristics distinctly different from typical gauged catchments in the region may be associated with larger error margins but also significant bias. Large flood storage areas in catchments with extensive floodplains or swamps have the effect of attenuating flood peaks, thus RFFE would overestimate peak flows and could be regarded as upper bound flood estimates (ARR, 2019).

6. Hydraulic Model

A 2D model was developed for the hydraulic modelling approach and has been implemented for the site using TUFLOW software (Build: 2020-10-AF single precision) – HPC with Sub-Grid Sampling (SGS). The model incorporates 1D elements for existing culverts (ESTRY 1D) underneath the rail track.

6.1 TUFLOW Schematisation

The model set up of the area is shown in Figure 4, which consists of the model area, which is the same as the overall catchment (rain on grid approach was used for the flow analysis). The model also shows the rail alignment and culverts. Locations of various buildings and transformer are also shown in Figure 4.

6.2 Digital Elevation Model (DEM)

The DEM defines the topography of the catchment and sub catchments. This data was used for defining model boundaries and catchment boundaries.

A 5 m grid cell size with a SGS size of 1 m was adopted within the model for hydraulic analysis for flood assessment for this study.

6.3 1D Networks

All culverts underneath the rail track are modelled explicitly as 1D elements (ESTRY 1D) in the hydraulic model and have been sized from site survey. Culverts both upstream and downstream of the rail corridor have been added at key locations under the Pacific Motorway, Wyee Road and other road sections to adequately convey water from upstream. The sizes of these culverts are unknown, and therefore have been approximated for this analysis.

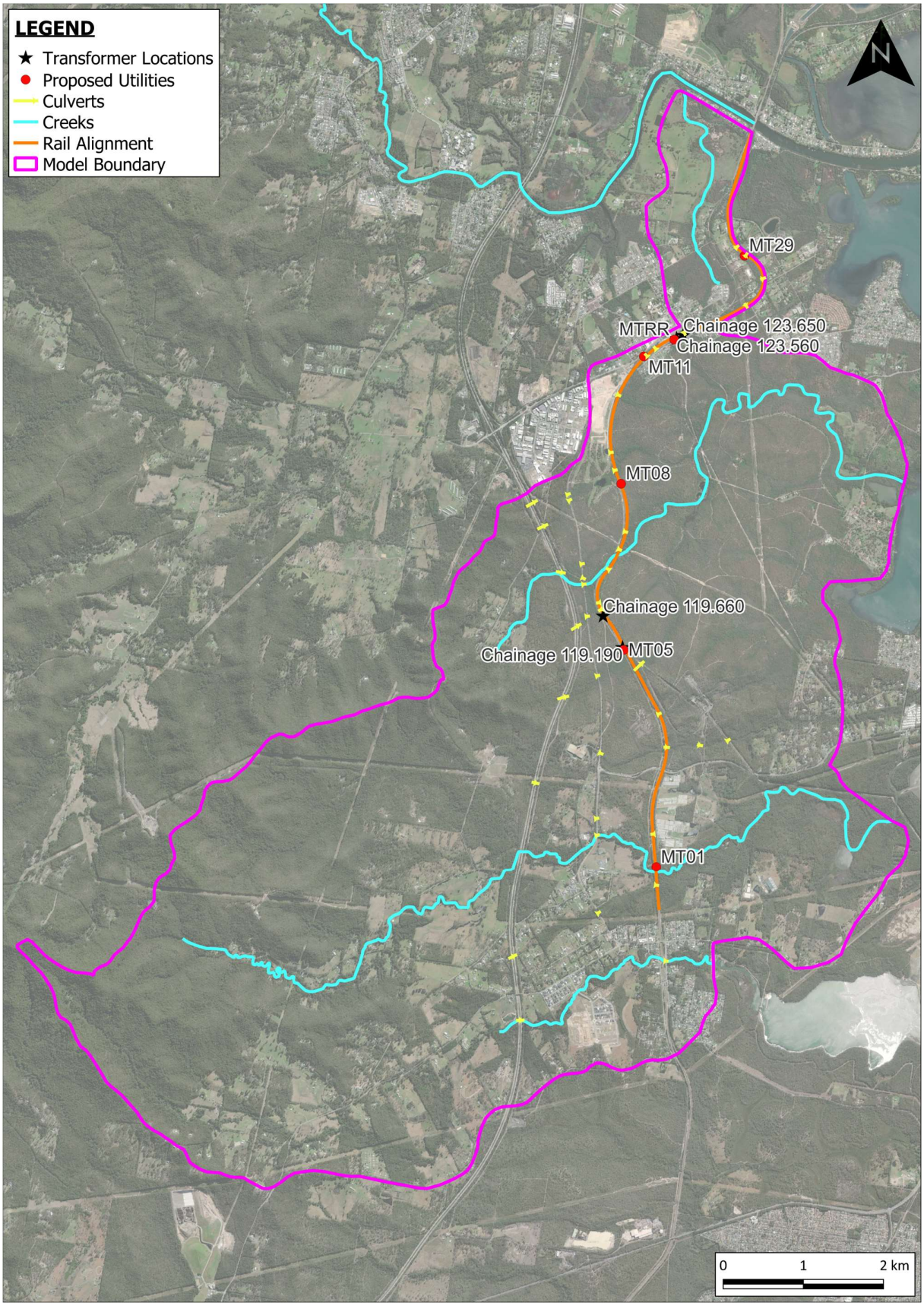

LEGEND
Transformer Locations
Proposed Utilities
Culverts
Creeks
Rail Alignment
Model Boundary
N
MT29
MTRR
Chainage 123.650
Chainage 123.560
MT11
MT08
Chainage 119.660
Chainage 119.190
MT05
MT01
0
1
2 km

Figure 4: TUFLOW Model with Boundary

6.4 Boundary Condition

This model considered direct rainfall (rain on grid) over the catchment area for all modelled flood events and uses a catchment boundary condition with a slope of 0.01. The modelling approach is detailed in the following sections.

6.5 Material Roughness

Refer to Section 4- Table 2 for details.

6.6 Hydraulic Results

The model was run for a given Annual Exceedance Probability (AEP) flood event for various durations and all the temporal patterns using and ensemble analysis. The temporal pattern that generated the closest peak flow to the median of all the temporal patterns were adopted as a critical temporal pattern for each duration.

Through this process, a critical duration at a specific location is determined.

It is not feasible to run all storm events with a fine resolution due to excessive run times, which would not add value to the purpose of investigation. To select the design storm events in a reasonable timeframe, the following approach was used:

- Run the full ensembles for the 1% AEP storm event.
- Identify the critical duration / temporal pattern at the proposed utilities buildings as shown in Figure 4, based on the peak water levels.
- Run the observed critical duration runs for the remaining design storm events.

The critical duration and the corresponding temporal patterns at those locations are shown in Table 6.

Table 6: Design Storm Event Selection

Name	Location	1% AEP storm event
MT01	Approximately 116.300km, on the Up Side	0020m TP10
MT05	Approximately 119.150, on the Down Side	0010m TP07
MT08	Approximately 121.380km, on the Up Side	0010m TP07
MT11	Approximately 123.090km, on the Down Side	0010m TP07
MTRR	Approximately 123.520km, on the Up Side	0010m TP07
MT29	Approximately 125.300km, on the Down Side	0025m TP01

All the critical durations/temporal pattern for different storm events reported in the table are used in the 2d modelling and the max envelope of results are prepared for the flood analysis/assessment.

6.7 Peak Flood Level Verification

Peak flood levels surrounding the Mannering Creek and Wyee Creek catchment area have been sampled from the (WMA water, 2021) flood model to validate against the SMEC TUFLOW rain on grid model. The results are displayed in Table 7. It is important to note that the exact location of the reporting locations is not known and has been based solely off *FIGURE 2H* from (WMA water, 2021) as shown in Figure 5. As such, some caution should be taken towards the comparison in peak water levels as this is not considered a like for like comparison. An example of this can be observed at reporting point 'MSWC2' where the TUFLOW model has predicted a water surface level of 25.6 m AHD and the WMA report has reported 21.91 m AHD in the 1% AEP event. The terrain level observed at this location is 25.68 m AHD (ie. dry) which is well above the levels reported by WMA, which suggests there are differences in DEM levels between the WMA model and the TUFLOW model used in this report.

The comparison shows that most of the results from the TUFLOW model show a good agreement across all design storm events, differing by no more than 16%.

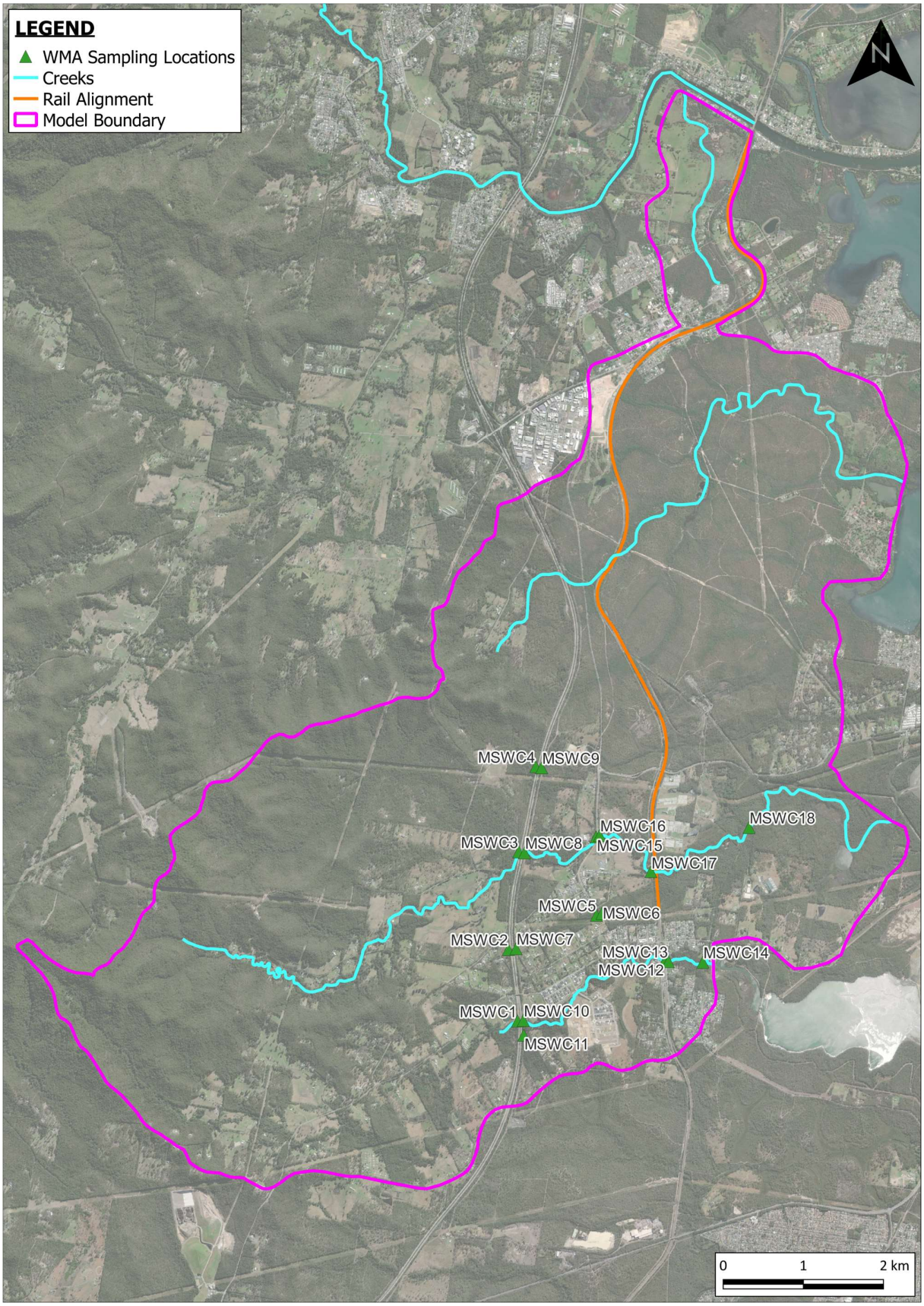


Figure 5: Study Area of WMA Report - Mannering Creek, Swampy Creek and Wyee Creek

Table 7: Peak flood level (m AHD) verification against (WMA water, 2021)

ID	Location	Terrain level (m AHD	Peak flood level (m AHD)											
			20%			5%			2%			1%		
			TUFLOW [1]	WMA [2]	Ratio [2] / [1]	TUFLOW [1]	WMA [2]	Ratio [2] / [1]	TUFLOW [1]	WMA [2]	Ratio [2] / [1]	TUFLOW [1]	WMA [2]	Ratio [2] / [1]
*MSWC1	Mannering Ck upstream M1	23.66	24.43	26.32	1.08	24.79	27.44	1.11	25.04	28.07	1.12	25.26	28.52	1.13
*MSWC2	Swampy Ck upstream M1	25.68	25.54	21.51	0.84	25.57	21.57	0.84	25.59	21.82	0.85	25.6	21.91	0.86
MSWC3	Wyee Ck upstream M1	15.09	16.47	17.15	1.04	17.12	17.81	1.04	17.46	18.2	1.04	17.72	18.47	1.04
MSWC4	Northern Ck upstream M1	23.23	23.12	21.6	0.93	23.13	21.91	0.95	23.15	22.27	0.96	23.21	22.5	0.97
MSWC5	Swampy Ck upstream Wyee Rd	9.63	10.74	10.32	0.96	11.07	10.64	0.96	11.29	10.93	0.97	11.46	11.12	0.97
*MSWC6	Swampy Ck downstream Wyee Rd	9.01	9.4	9.75	1.04	9.44	9.95	1.05	9.46	10.1	1.07	9.47	10.24	1.08
MSWC7	Swampy Ck downstream M1	21.04	20.89	20.47	0.98	20.9	20.54	0.98	20.9	20.59	0.99	20.91	20.6	0.99
MSWC8	Wyee Ck downstream M1	15.7	16.17	16.31	1.01	16.79	16.77	1	17.07	17.01	1	17.26	17.15	0.99
*MSWC9	Northern Ck downstream M1	24.12	24.3	21.13	0.87	24.35	21.24	0.87	24.36	21.31	0.87	24.39	21.33	0.87
MSWC10	Mannering Ck downstream M1	22.66	24.32	24.64	1.01	24.66	24.87	1.01	24.9	24.97	1	25.07	25.01	1
MSWC11	Downstream M1 180m south of Mannering Ck	26.65	26.55	-	N/A	26.7	-	N/A	26.76	-	N/A	26.79	-	N/A
*MSWC12	Mannering Ck upstream Wyee Rd	14.52	15.5	17.95	1.16	15.91	18.47	1.16	16.23	18.61	1.15	16.52	18.67	1.13
MSWC13	Mannering Ck downstream Wyee Rd	12.95	13.66	13.94	1.02	14.16	14.3	1.01	14.51	14.71	1.01	14.8	14.91	1.01
MSWC14	Wyee channel	10.39	11.65	11.38	0.98	12.02	11.78	0.98	12.26	12.18	0.99	12.48	12.45	1
MSWC15	Wyee Ck upstream Wyee Rd	10.85	12.6	13.18	1.05	13.07	13.68	1.05	13.32	13.77	1.03	13.52	13.82	1.02
MSWC16	Wyee Ck downstream Wyee Rd	10	12.51	12.81	1.02	12.89	13.03	1.01	13.02	13.11	1.01	13.11	13.17	1
MSWC17	Wyee Ck upstream railway	7.42	8.44	8.86	1.05	8.97	9.41	1.05	9.23	9.68	1.05	9.39	9.85	1.05
*MSWC18	Downstream Wyee channel	1.08	3.11	3.59	1.15	3.62	4.1	1.13	3.96	4.47	1.13	4.15	4.68	1.13

MSWC19	Wyee Ck upstream Mannering Bay	N/A	N/A	1.33	N/A	N/A	1.79	N/A	N/A	2.24	N/A	N/A	2.42	N/A
MSWC20	Mannering Bay	N/A	N/A	1.27	N/A	N/A	1.71	N/A	N/A	2.18	N/A	N/A	2.35	N/A
MSWC22	Mannering inlet	N/A	N/A	0.82	N/A	N/A	0.82	N/A	N/A	0.82	N/A	N/A	0.82	N/A

* Likely areas with differences in model terrain

6.8 Flood Maps

The various maps showing flood levels, flood depth and velocity is shown in various figures in Appendix A. Please refer to Appendix B for the hazard maps. Refer to Appendix C for flood assessment for CSR pits.

6.8.1 Flood Results at Proposed Utilities Sites

The estimated flood levels and the flood depths for the existing conditions were reported at the proposed building locations as shown in Figure 4. For each of the building locations and transformers, a cross section was generated across the building and transformer and the track to access the flooding.

Refer Figure 6 to Figure 15 for the water surface elevations and flood depth in the 1% AEP with Climate Change scenario.

A summary of the results has been provided in Table 8.

For serviceability and mitigating risks to the electrical and signalling equipments to cover the uncertainties and resilience in design with the climatic changes of 18.5%; and the following free board has been adopted in flood advice in general.

- 500 mm of free board when subjected to flooding risks from major streams or from the regional flooding.
- 300 mm of free board when subjected to flooding risk from fringes floods and minor overland flows, open swales etc.

These values generally are adopted from various documents - Austroads, Council's Flood Management Guidelines (LMCC DCP 2014 – Rev27), Australian Building Codes Board, Sydney Water.

Based on the flood study results, flood advice for each for the Finished Floor Level (FFL) of the building and transformer as summarised in Table 8 as a min. However, if there are no risk to structure, equipments and operation these advice levels may be reduces based on risk and consequence assessment of each site. All the equipments be installed above the recommended flood advice levels.

Table 8: Flood Impacts at Building Locations and Transformers and Flood Advice/Recommendations.

Building Name	Topography [m AHD]	Water Surface Elevation [m AHD]	Water Depth [mm]	Flood Level Advice (m AHD) for Finished Floor Level	Flood Advice and Recommendations
MT01	11.06	11.11	40	11.3 (However it is recommended that any equipments are to set above 11.66 m AHD) as a min.	Flooding is occurring from flows in the side track drainage. It is recommended the building be moved away from cess drain to the north. The location is risk to flooding from the major creek. (Flood level advice is provided based on agreed level in the Flood Level Advice Workshop – 2023-Dec-06 – to suit the existing ground and avoid the construction difficulty)
MT05	33.63	33.66	30	33.66	Area is flood free. Existing ground level is appropriate. Avoid sloping areas.
MT08	22.63	22.65	20	22.80	Fringe flooding from cess drain. It is recommended the transformer is moved away from the low part of the cess drain to the north.
MT11	33.11	33.11	-	33.11	Area is flood free. Existing ground level is appropriate. Avoid sloping areas.
MTRR	35.35	35.35	-	35.35	Area is flood free. Existing ground level is appropriate. Avoid sloping areas.
MT29 125.300 km (Downside)	18.44	18.78	340	19.29	Experiences overland flooding from cess drain / open drain. It is recommended the transformer is moved towards higher ground in the south .
Transformer#1 (119.200)	35.27	35.27	-	35.27	Area is flood free. Existing ground level is appropriate. Avoid sloping areas.
Transformer#2 (119.660)	29.73	29.79	60	30.29	Experiences overland flooding from cess drain / open drain. It is recommended the transformer is moved towards higher ground in the south .
Transformer#3 (123.560)	35.17	35.17	-	35.37	Area is flood free. However, likely to flood in Cess drain from local flooding. It is recommended the transformer is raised 500 mm above the existing ground level.
Transformer#4(123.650)	35.71	35.71	-	35.71	Area is flood free. Existing ground level is appropriate. Avoid sloping areas.

7. Flood Hazard

The Australian Government, Australian Institute for Disaster Resilience has characterised the flood hazard rating used within this technical memorandum. The different hazard levels are described in Table 9 and a visual chart showing the relative depth velocity gradient charts is displayed in Figure 16.

Table 9: Hazard Vulnerability Classification (Australian Institute for Disaster Resilience, 2014)

Hazard Vulnerability Classification	Description
H1	Generally safe for vehicles, people and buildings.
H2	Unsafe for small vehicles.
H3	Unsafe for vehicles, children and the elderly.
H4	Unsafe for vehicles and people.
H5	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure.

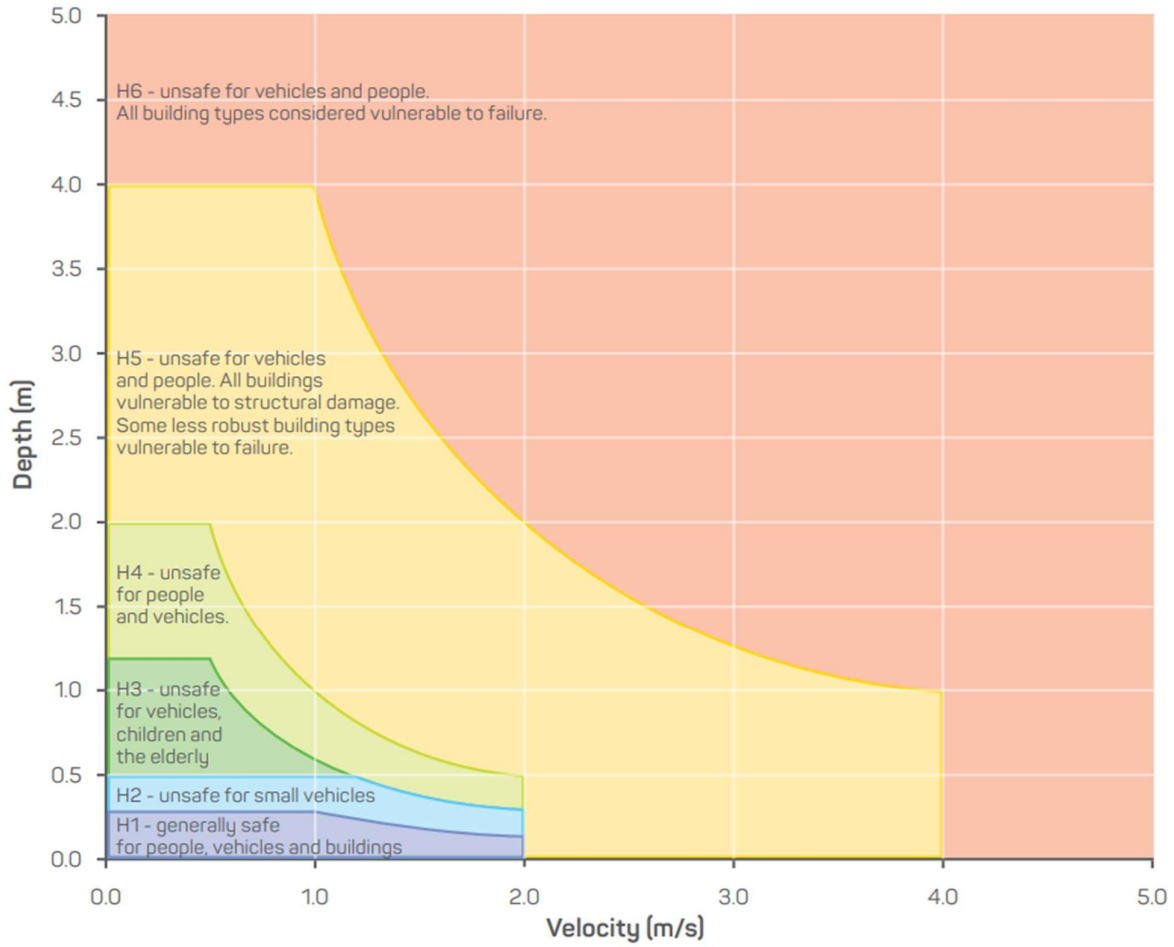


Figure 16: Flood Hazard Category Chart (Australian Institute for Disaster Resilience, 2014)

8. Recommendations

It is recommended to adopt the flood advice prepared in

Table 8 that the location of MT01, MT08, MT29 and the transformer at chainage 119.660 are revised in order to avoid flood impacts from the 1% AEP with climate change scenario.

9. References

ARR. (2019). *Limits of Applicability*. Retrieved from ARR: https://rffe.arr-software.org/limits.html

Australian Institute for Disaster Resilience. (2014). *Technical flood risk management guideline: Flood hazard.* Retrieved from https://knowledge.aidr.org.au/media/1891/guideline-7-3-technical-flood-risk-management.pdf

Babister, M., Ball, J., Nathan, R., Weeks, W., Weinmann, E., Retallick, M., & Testoni, I. (2019). *Australian Rainfall and Runoff: A Guide to Flood Estimation.* Commonwealth of Australia (Geoscience Australia).

WMA water. (2021). *Flood Studies for Eight Residual Lake Macquarie Waterway Tributary Catchments.* Lake Macquarie City Council.

Appendix A – Flood Depth and Flood Velocity Maps

Appendix B – Flood Hazard Maps

Appendix C – Flood Assessment for CSR Pits

A5. Biodiversity Assessment

SMEC

Member of the Surbana Jurong Group

Biodiversity Assessment

Morisset and Vales Point Resignalling

Client Reference No. WS3217431338
Prepared for: Sydney Trains
5 February 2024

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1. Introduction

1.1 Purpose

Sydney Trains is proposing to provide a new signalling system in the Morisset and Vales Point area on the Central Coast & Newcastle (CCN) Line in New South Wales (NSW). The Morisset and Vales Point Re-Signalling Proposal (the proposal) will upgrade existing and expired equipment to a new train control system using the Advance Train Running Information Control System (ATRICS).

SMEC is preparing an REF to accompany the detailed design phase of the proposal. This Biodiversity Assessment has been prepared to inform the REF of potential ecological impacts associated with the proposal on threatened and migratory species, endangered populations and threatened ecological communities (TECs) listed under the New South Wales *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Proposed works summary

The proposals scope of works includes signalling work including six new buildings, track work, underground and overhead cabling and other supporting activities as described below.

1.2.1 Track works and Perway Siding

The track work upgrades being proposed include the removal of existing cross overs (2AB and 12AB) and the installation of new cross overs MT53 and MT56. Crossover MT53A/B will be located south of Morisset Station, and crossover MT56A/B will be located north of Morisset station.

The existing non electrified Up refuge will be removed and replaced with a new perway siding from chainage 123.445 km on a new alignment and at a new length of 541.5 metres. The construction of the perway siding will require additional earthworks for the new alignment. Connection of the Main Line to the perway siding will be via a new turnout MT55A and a new catchpoint MT55B. The catch point is located before OHW portal N123+434 and is based on standard configuration. The catchpoint proposed has been designed to minimise the potential risk of runaway and driver signal over with a 33 metre long land zone with a ballast mound.

Further detail of the proposal scope and design is located in Appendix A of the REF.

1.2.2 Signalling and train control systems

The proposal includes six additional signal buildings (MT01, MT05, MT08, MT11, MTRR and MT29) at various points within the rail corridor as shown by Figure 1–1. The purpose of these signalling buildings is to house signalling and power equipment. The list of buildings required, and their locations are detailed in Table 1–1.

Buildings MT01, MT05, MT08, MT11 & MT2 are designed for BAL-FZ bushfire rating as per the bushfire hazard risk assessment report (Appendix B of the REF). The construction of the MT05 building will require vegetation clearance to the boundary fence and a 30-metre asset protection zone (APZ) created north of the building to adequately reduce the bushfire hazard risk. Building MT29 will require a flame zone for construction by adding a 1m concrete path and maintaining existing vegetation to the boundary fence. Several mature trees (not managed by Sydney Trains) will require trimming to the boundary fence so as to not overhang the building.

Building MTRR is within a bushfire zone but does not require significant vegetation removal.

Building MT11 is not located in the flame zone and so is not required to be designed for BAL rating, other than the standard bushfire requirements.

Design of the buildings includes absence of gutters and downpipes consistent with Sydney Trains preferences to reduce ongoing maintenance. Civil design of the outflow areas from the building roofs has considered this design element.

Table 1–1: Proposed buildings and locations

Name	Location	Type
MT01	Approximately 116.300km, on the Down Side	Brick Building, Type 1
MT05	Approximately 119.150km, on the Up Side	Brick Building, Type 2
MT08	Approximately 121.380km, on the Up Side	Brick Building, Type 1
MT11	Approximately 123.090km, on the Down Side	Brick Building, Type 1
MTRR	Approximately 123.520km, on the Down Side	Brick Building, Type 3
MT29	Approximately 125.300km, on the Down Side	Brick Building, Type 1

New track-side infrastructure is required to be installed at various locations along the length of the proposal which include:

- Signal posts and guards indicators
- Axle counters
- Automatic Train Protection (ATP) Balise groups.

The presence of this new equipment aligns with the ground disturbance extent of combined service routes (CSR) as noted below.

1.2.3 Overhead wiring

The proposed track work between 119km to 124km has direct and indirect impacts to the Overhead Wiring (OHW) in order to support the track and signalling upgrades. This includes new wiring runs and stanchions to suit the reconfigured signalling works and track layouts. In addition, decommissioning of redundant existing wiring and structures will be required. At the new crossovers, new infrastructure will be required including portal structures, signal gantries, a new mast cantilever structure, wires and guy anchors. Where crossovers are removed, the crossover wire, associated cantilever arrangements and structures would need to be decommissioned. Only OHW affected by the resignalling works and track layout alterations would be altered.

The OHW scope also includes:

- A new overhead wiring structure to be built at N123+706 due to an inadequate existing structure at 123+696. The existing structure will require removal alongside the removal of the structure at N123+326
- Removal of OHW infrastructure for cross-over N119+083
- Wire Run N-X0119A, N119+120, N119+166
- Anchor/guy arrangement for N119+083 and N119+217/N119+219
- Removal of OHW mast 123+401 is proposed as this location will form part of the catch point landing zone.

1.2.4 Combined services route

A new CSR network was recently installed by Sydney Trains in the rail corridor and would be utilised by this proposal where feasible. The proposal scope includes requirements to upgrade or repair the existing galvanised steel troughing (GST) and construct any additional GST or service trenching as required to carry new/existing cables to facilitate the proposal.

New and existing trenched cable routes would be used to install cables for signalling, communications, compressed air and electricity. Cables would run between new signalling buildings and from the proposed new signalling equipment rooms to nearby infrastructure.

Low voltage cable routes would be installed at a minimum depth of approximately one metre.

Buried in-ground cables and pipes would have a minimum cover of 800 millimetres. Where conduits are within paved areas the depth may be reduced to 300 millimetres from the surface. New GST is proposed where it is not practicable to install buried conduits.

New cables pits are proposed for signalling, communications, low voltage and compressed air. The existing pits would be reused to allow conduits from the existing CSR network to connect local routes to trackside equipment.

New under-line crossings (ULXs) are proposed where signalling, communications and electrical cables are required to cross the rail corridor. They consist of buried in-ground cables in the track formation at a minimum depth of 1.6 metres for signalling and communications, and a minimum depth of two metres for electrical cables. Compressed air crosstie ULXs are required at 300 metre intervals. ULX trenching for the main route is 0.5 metres (top of trench) to 2.5 metres wide (bottom of trench), and typically two metres deep (maximum four metres).

1.2.5 Electrical

The proposed works include commissioning of two new 11kV/415V padmount transformers as the primary source of supply for building MTRR (at Morisset Station) and MT05 (Vales Point).

These would be installed within Sydney Trains property as close as possible to the signalling buildings. The primary supply will be the Sydney Trains 11kV network, with the pad mount transformers to step down the Sydney Trains 11kV feed to a 415V supply.

Electrical upgrades would include:

- Power supply upgrades to signalling and OHW, including new low voltage and high voltage cable installation in both existing and new inground conduits and above ground service troughs
- Upgrade of 1500V DC feeder from Morisset substation to the OHW network
- Earthing and bonding as required for all new and modified structures and equipment installed.

1.2.6 Drainage

It is proposed to modify and/or re-use the existing drainage for the proposed new tracks, where practicable for the Proposal. New intertrack drainage would be installed within the vicinity of the new crossovers and adjacent to the new perway siding, which would connect to existing drainage pits that currently discharge to existing channels. At approximately chainage 123 km, a concrete pipe has been designed to run below the proposed train landing zone. This pipe is to be concrete encased to protect it from live and dead loads.

Roof water runoff from buildings is to discharge freely onto existing terrain away from the building structure and captured by the existing drainage system where practicable.

The detailed design completed by SMEC propose that a separate split discharge of the 6-foot drainage be installed rather than the single drain drainage. This was based on the hydrology and the hydraulic assessment which showed the existing drainage ULXs within the new the new siding track area have adequate capacity to capture the localised stormwater flows. As a result, splitting the 6-foot drainages and connecting the subsoil drainage to the nearest existing drainage ULX is considered a better option than a single-run surface drain proposed at the concept stage.

The length of the proposed 6-foot drainage sections is approximately 300 metres. A total of 10 drainage pits are proposed along the drainage alignment. Pit levels and buried pipes will range between 0.8m to 3.453m depths to tie into the existing drainage ULXs.

The proposed drainage depths and consequential proposed ground disturbance depths associated with ULX and pit trenching are 4m for ULX trenching a 3m for pits at the deepest approximate excavations. The width of proposed drainage trenches would be approximately 1m-1.5m.

1.2.7 Summary of Ground Disturbance Works

Table 2-2 below summaries the ground disturbance depths in order to assess the potential environmental impacts.

1.1.1 Summary of Ground Disturbance Works

Table 1–2 below summaries the ground disturbance depths in order to assess the potential environmental impacts.

Table 1–2: Proposed buildings and locations

Activity	Approximate Depth (m)	Approximate Footprint (m)
CSR Trenching	Main Route: 1 (minimum) to 2 (maximum) Local Route 1 to 1.2 (typically)	Main Route: Corridor of 1 (minimum) to 2.5 (maximum) Local Route: Corridor of 0.45 to 0.6 (typically)
ULX Trenching	2 (typically) 4 (maximum)	Main Route 0.5 (minimum) (Bottom of trench) 2.5 (maximum) (Top of trench)
Pits Trenching	Buried Route Pits 1.8 (typically) ULX Pit 2.2 (minimum) 3 (maximum)	Buried Route Pits 1.5 by 1.5 ULX Pit 2.2 by 2.2 (typically)
Removal of signal posts	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 (maximum) Piled Footing: 1 to 3 (maximum) Note: piles may not require removal)	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 Piled Footing: 1 to 3 (maximum) note that piles may not require removal
Installation of Signal Posts	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 0.5 to 1 (maximum) Piled Footing: 1 to 3 (maximum)	Dependent on existing foundation (pad/pile) and height (e.g. access ladder). Maximum disturbance will likely be: Pad footing: 1.5 by 3 Piled Footing: assume piled foundation will have a pad on top equal to above dimensions (i.e. 1.5 by 3)
Installation of OHW Structures	Piles: 5.5 (maximum) Guy Footings: 2.1 (maximum)	0.9 diameter pile with a 1 by 1 square pile cap (typically). 1.2 diameter pile with a 1.3 by 1.3 square pile cap (maximum). Guy Footing: 1.5 by 2.5 (maximum)
Installation of Signalling Buildings	2 assumed (inclusive of CSR conduits coming under buildings from pits) up to 5m deep piles	Approximately 12.7 by 6.1 (including a 1m wide concrete path that encircles the building) for signalling buildings MT01, MT08, MT11 and MT29. Dimensions for MT05 are 14.2 by 6.1 (larger power room) and for MTRR are 15.7 by 6.1 (larger signal relay room).

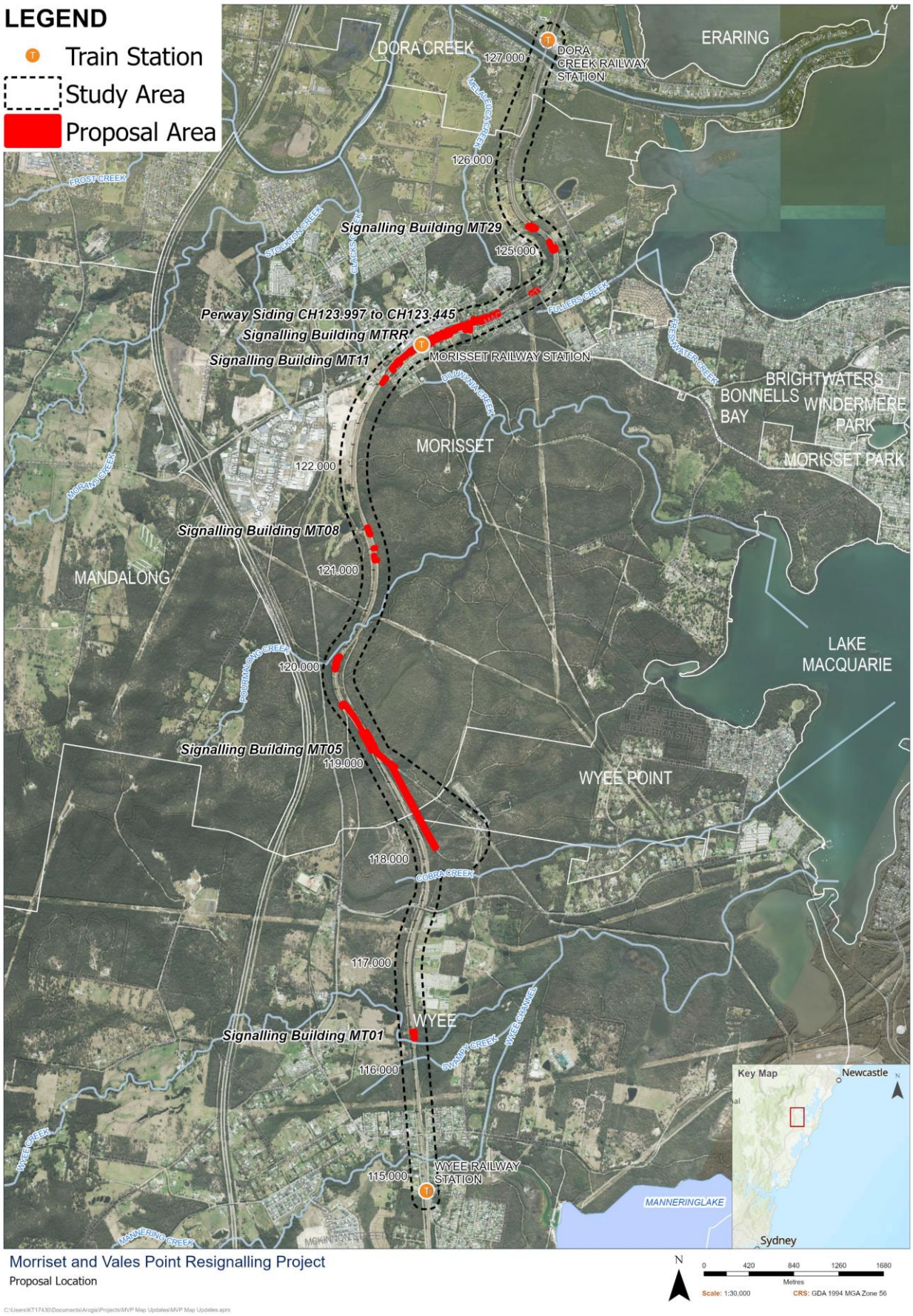


Figure 1–1: Project location.

1.3 Construction methodology

The following construction methodology is proposed for delivery of the proposal.

1.3.1 Geotechnical investigations

A geotechnical desktop study has been completed as part of the concept design phase of the proposal to assess currently available information in the region to inform expected ground conditions and provide interdisciplinary guidance. Additional geotechnical investigations including boreholes and test pits have been carried out during detailed design to assess the ground conditions and footing requirements for the proposed new overhead wiring structures, ULX locations and under-boring works. Investigations have also been undertaken to confirm the existing ballast depth at bridges and proposed crossover locations.

Potholing and service locating would also be carried out during detailed design subject to relevant approvals to locate interfacing or intersecting CSR routes to determine structure foundation locations.

1.3.2 Stage 1 –site establishment

Site establishment would be carried out prior to construction, during standard working hours, and would include:

- Establishing environmental controls including erosion and sediment controls, signage and fencing;
- Setup of proposed site compounds (site office, amenities, materials storage etc); and;
- Stockpiling of rail infrastructure, materials, ballast, capping, subgrade, stabilised sand and imported fill if required.

Establishment of temporary construction site compounds, turnout assembly areas, material handling and laydown areas would be required to support construction activities. Four suitable areas on the Up-side of the rail corridor have been identified to support the works around Morisset Station within existing cleared areas.

These areas will contain site offices, meeting rooms, toilets, storerooms, meal room, change rooms, first aid facilities, material storage, dangerous goods storage, site security and construction vehicle parking.

Access to these areas would need to be negotiated with Sydney Trains and assessed against the existing rail corridor cadastral boundary for impacts on any other stakeholders who may require consultation.

In addition to the temporary construction site compounds, there would be a requirement for establishment of temporary satellite compounds and amenities within the rail corridor. Each of these satellite areas would have a small site office, toilets and a laydown area for material and construction machinery. These areas would be secure with temporary construction fencing and relocated to suit the advancement of works along the rail corridor.

1.3.3 Stage 2 – construction: signal works

Signal works would be carried out during standard construction hours and possession periods. Minor civil works associated with the signal works (such as new cable routes and installation of signal posts and signal buildings) would be carried out during possession periods where the works cannot be completed during standard construction hours due to safety or operational constraints. Other minor signalling works would be undertaken during standard construction hours. The signal works include:

- Demolition of existing signal foundations
- Removal and installation of signalling equipment
  - Installation of signalling equipment room foundations and signal foundations outside the danger zone with excavator
  - Enabling/reconfiguration of equipment within signalling equipment room (hand tools and light vehicles)
  - Cable installation in existing and new CSR
- Install prefabricated concrete signal bases and signals at designated locations for new cable routes to be installed to enable new signal infrastructure
  - Survey new signal route

  - Excavate trench (about one metre deep) for signal route
  - Lay plastic PVC conduits to house new signal cables
  - Install pre-fabricated concrete pits, connecting the PVC conduits
  - Backfill the trenches with approved materials
  - Under-boring or directional drilling of new undertrack cable routes and installation of conduit
  - Minor drainage works to accommodate signal infrastructure
- Install pad-mounted high voltage electrical equipment including transformers.

The track works and OHW scope will utilise track possessions, typically carried out over a 48-hour period from 2:00 am Saturday to 2:00 am on Monday morning.

1.3.4 Construction: track works and out of hours works

Track works would involve removal of redundant rail infrastructure which may include:

- Cutting of existing disused track into smaller portions
- Removal of dis-used track using lifting equipment
- Removal of old sleepers (may require minor excavation with a five-tonne excavator)
- Removal of associated mechanical signalling equipment
- Full reconditioning of track subgrade.

Associated overhead wiring work would require excavation and anchoring of new footings, and installation of the new overhead wiring structures, wire runs and associated components.

Any work within three metres of the nearest active rail track (at any height above or below the rail corridor) is considered to be the work in the rail danger zone. Track works are typically carried out within the danger zone. Some track works may be carried out during standard working hours where safety and operational mechanisms can feasibly be put in place. However, the majority of track works would be carried out during scheduled track possessions which limits impact to the rail network and protects worker safety and infrastructure integrity.

Track possessions are a pre-planned period during which the rail line is blocked to trains to permit work to be carried out on or near the operating rail line. They are typically carried out over a 48-hour period from 2:00 am Saturday to 2:00 am on Monday morning.

1.3.5 Stage 3 – testing, commissioning, and decommissioning

Prior to entering operational service, testing and commissioning activities would be carried out, including:

- New signalling equipment including signals, points, axle counters, interlocking
- New electrical assets
- New wire runs.

Decommissioning would take place for redundant points, signals and track circuits throughout the alignment. Redundant relay-signal huts and equipment would be removed by use of an excavator, and concrete breaker for foundations.

1.3.6 Stage 4 - site rehabilitation

Site rehabilitation and demobilisation works would include:

- Removal of fencing, site amenities, waste and environmental controls
- Rehabilitation of disturbed areas.

1.3.7 Plant and equipment

Plant and equipment likely to be required to undertake the Proposal works include:

- excavators
- hand and power tools
- bobcats
- compactors
- generators
- Day maker lighting
- front end loader
- concrete trucks
- concrete pumps
- cranes
- hi-rail trucks
- hi-rail elevated work platforms
- tip trucks
- steel saws
- concrete saws
- jackhammers
- chainsaws
- backhoes
- storage containers
- Non-destructive digging equipment.

2. Methodology

2.1 Desktop assessment

The Study area includes the areas between Wyee Station and Dora Creek Station and is contained with the rail corridor on Sydney Trains owned land. The construction has a southern limit of 116.000km north of central station, Sydney between Wyee Station and Vales Point Junction and a northern limit of 126.900km between Morisset and Dora Creek stations.

Database searches were performed on a rectangular search area over 10 kilometres wide (as shown in Appendix A) to search for sighting records of threatened species, or the possible presence of threatened ecological communities.

Data sources reviewed included:

- Bionet – the website for the Atlas of NSW Wildlife database records (TBDC) (DPE 2023a)
- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool with a 10km buffer surrounding the track alignment
- NSW SEED mapping portal (providing a range of baseline environment data, including the latest State vegetation mapping (SVTM) (DPE 2023b) and Lake Macquarie LGA Vegetation Community Map 2022 (VIS ID 5117).
- The NSW Bionet Vegetation Database (DPE 2023c) to check known vegetation associations with threatened species and TECs
- NSW DPI Fisheries Spatial Data Portal (DPI 2023a).
- Coastal management areas identified by the *Resilience and Hazards SEPP 2022*.

2.2 Field survey

Ecological surveys were conducted by an experienced SMEC ecologist on 20 September 2023. The weather was 29°C and sunny with light winds. The survey area included locations where vegetation clearing may occur, or where other potential impacts were identified during preparation of the draft REF.

The survey area included:

- Sites of the signalling huts MT05, MT11, MT29 including at least a 30-metre buffer
- The perway siding extension
- Observation of the corridor between these sites including the riparian area around the Pourmalong Creek under bridge.

The objective of the survey was to identify the presence of any threatened species, migratory species, or threatened ecological communities (TECs) in the survey areas. The general flora survey and fauna habitat assessment followed techniques outlined within the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004 working draft).

The aims of the survey were to:

- Verify current vegetation mapping
- Determine whether any vegetation communities conform to the descriptions of TECs listed under the BC Act and/or EPBC Act (e.g. Swamp Sclerophyll Forest)
- Assess the type and extent of habitat for threatened and migratory species, including:
  - The vegetation communities present
  - The presence and locations of foraging resources for fauna (e.g. flowering/fruiting trees, Koala food trees)
  - The presence and locations of shelter and breeding sites for fauna (e.g. tree hollows, hollow logs, large raptor stick nests).
- Observation of weeds or pests managed under the NSW *Biosecurity Act 2015*

- Perform targeted survey for threatened flora species.

Targeted searches for threatened flora species were conducted using the transect method outlined in the *Survey guide for the Biodiversity Assessment Methodology* (DPIE 2020). The target species were those found to have a high likelihood of occurrence as identified by the desktop reviews. The species targeted during survey included, but were not limited to:

- Charmhaven Apple (*Angophora inopina*)
- Biconvex Paperbark (*Melaleuca biconvexa*)
- Black-eyed Susan (*Tetratheca juncea*).

The survey date was within the TBDC recommended times of year for all three species.

2.3 Limitations

A proposed electrical connection to the Ausgrid power lines, at approximately 119.600 (North of the MT05 signal building) was a late addition to the detailed design. The location of the trench connecting the power easement to the rail corridor has only been ground inspected for ecological values, although the results of desktop research is given in the following section.

3. Results

3.1 Existing environment

3.1.1 Locality

The Proposal site is the suburb of Morisset within the Lake Macquarie City Council local government area (LGA). The site is surrounded by large tracts of bushland situated between the Pacific Motorway to the west and Lake Macquarie to the east.

3.1.2 Planning layers

One area of study area is mapped within the proximity area of the Coastal Wetland layer under the *Resilience and Hazards SEPP 2021* Figure 3–1south of Dora Creek. There are no works within areas of coastal wetland.

3.1.3 Site topography and hydrology

The topography of the rail corridor between Dora Creek and Wyee Station is generally undulating with some low-lying areas where it is intersected by multiple creek lines. Minor waterways intersect with the study area (including Dora Creek, Pourmalong Creek, Cobra Creek, Wyee Creek, Swampy Creek and Mannering Creek) and a drain from Morisset Station (Dillwynia Creek leading into Pourmalong Creek), as shown in Figure 3–2

The vegetation of the Study area and surrounds typically consists of dry sclerophyll forest, heathlands, woodlands, swamp forests, heaths and wetlands. Large tracts of vegetation and creek lines also feature within the landscape and provide habitat for a variety of threatened species and ecological communities.

High and moderate potential groundwater dependent ecosystems have been mapped by the Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas (Figure 3–3) in the study area along. These areas are scattered along the proposal location with high potential areas tending to be found in drainage lines and depressions.

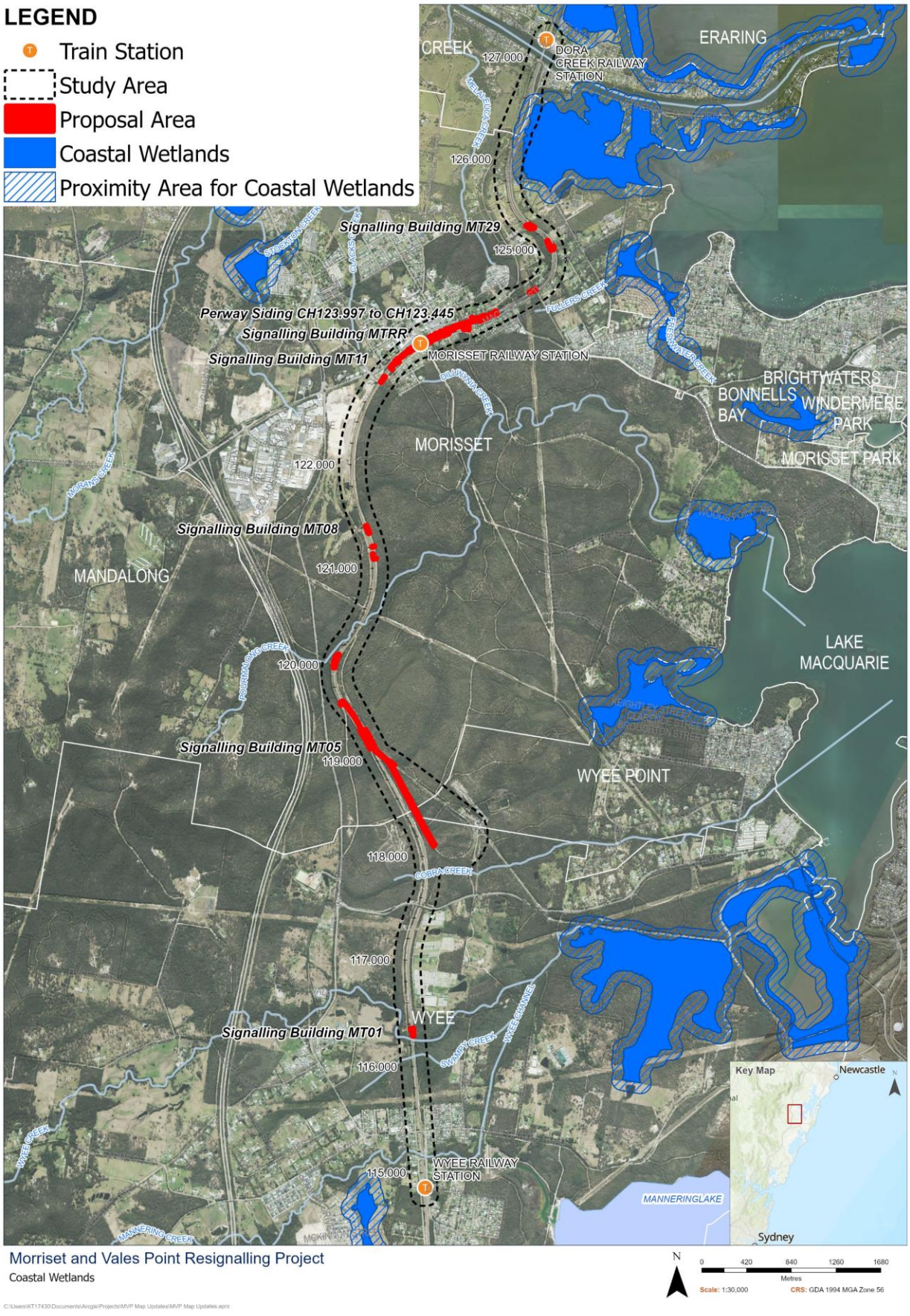


Figure 3–1: Coastal wetlands mapping.

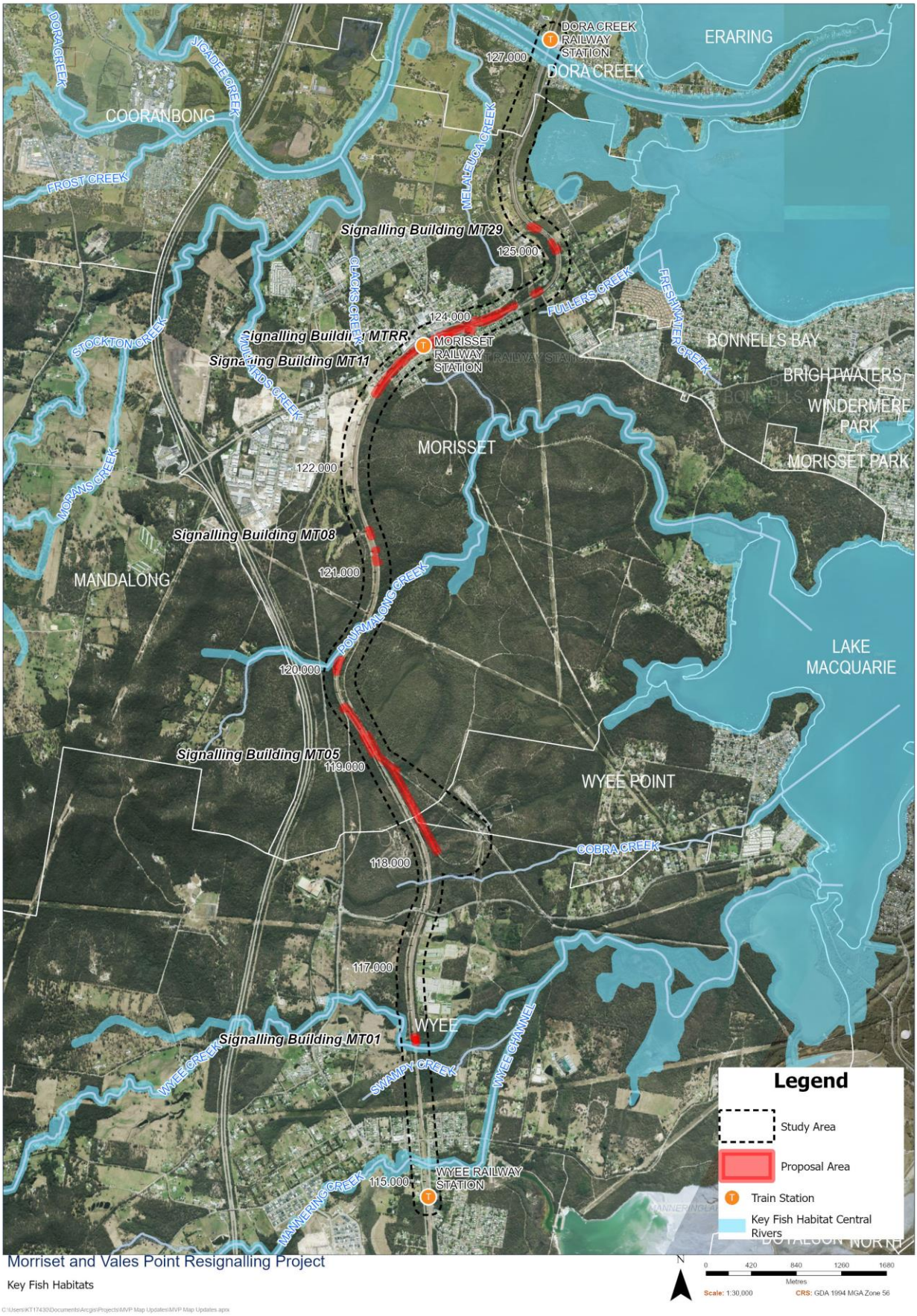


Figure 3–2: Waterways and DPI fish habitat mapping.

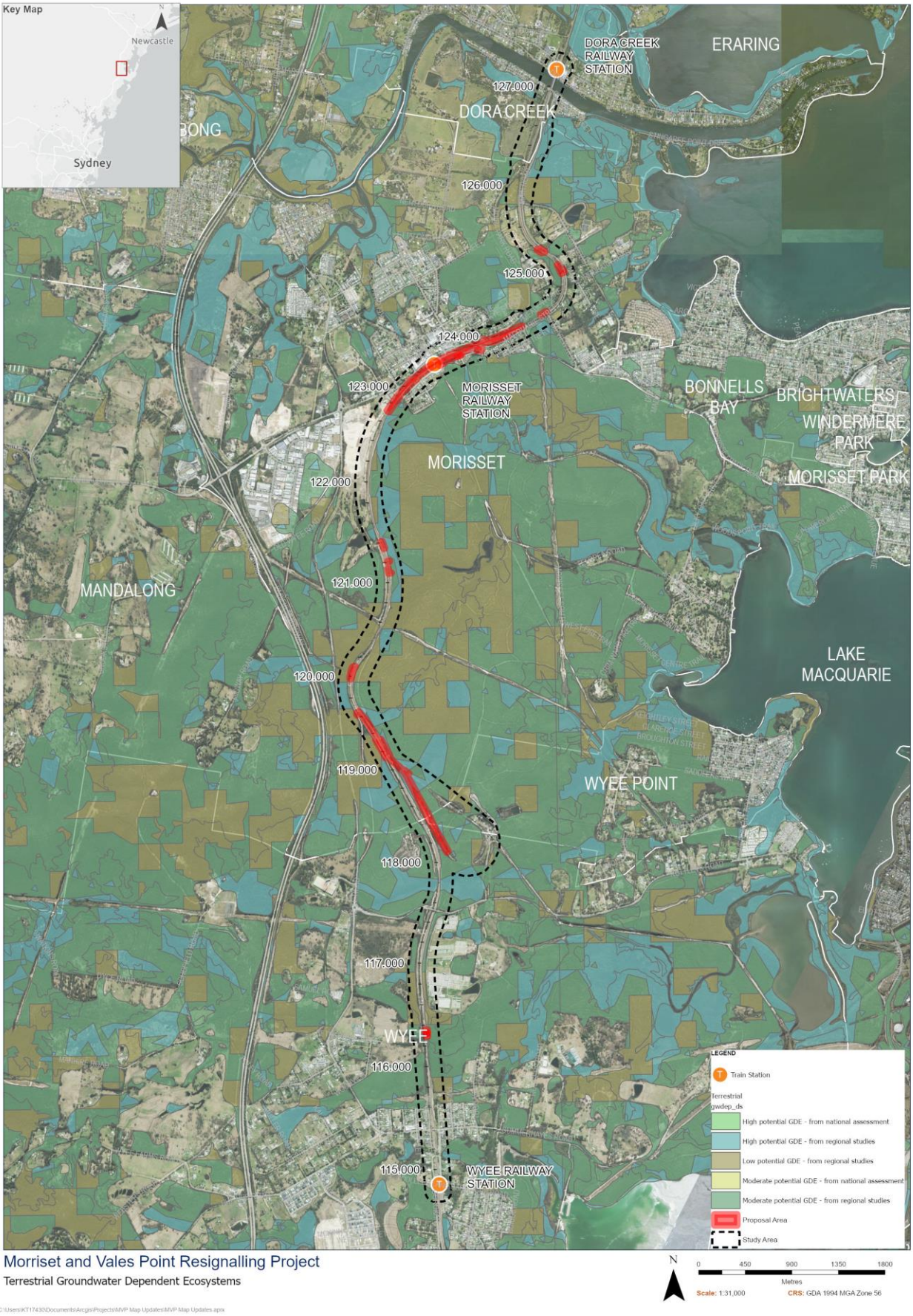


Figure 3–3: Terrestrial Groundwater dependant ecosystems.

The proposal site contains three soil landscapes that all typical of the Central Coast lowlands, which are described in Table 3–1.

Table 3–1: Soil landscapes

Soil landscape	Topography	Vegetation
Doyalson	Generally undulating rises with local relief to 30 m and slope gradients <10%. Broad crests and ridges and long gently inclined slopes are the major landform elements. Drainage lines are broad. Rock outcrop is usually absent.	The eucalypt open-forest has been extensively cleared although some small areas of disturbed bushland remain. Common tree species include scribbly gum (*Eucalyptus haemastoma*), red bloodwood, brown stringybark (*E. capitellata*), smooth-barked apple and grey gum. Understorey species include hill banksia (*Banksia spinulosa* var. *collina*), banksia (*B. oblongifolia*), and mountain devil (*Lambertia formosa*). Paperbarks occur in poorly drained areas.
Gorokan	Undulating low hills and rises with local relief <30 m and slope gradients <15%. Broad crests and ridges with long gently inclined slopes and broad drainage lines. Rock outcrop is absent.	Generally partially cleared low open-forest. Extensive clearing has occurred in urban and grazing areas. Common tree species include smooth barked- apple, scribbly gum, red bloodwood, brown stringybark, and forest oak (*Allocasuarina torulosa*). Common understorey species include mountain devil, hill banksia, banksia, flaky-barked tea-tree (*Leptospermum attenuatum*), and broad-leaf drumsticks (*Isopogon anemonifolus*). Paperbarks occur in poorly drained areas and along drainage lines.
Wyong	Generally broad (2 km), poorly drained, deltaic floodplains and alluvial flats. Slope gradients <3% and local relief <10 m. Levees, meander scrolls, oxbows and swamps are common. Low lying, slightly elevated terraces are occasionally present.	The original closed-forest has been extensively cleared and replaced with pasture. Remaining species include *Melaleuca linariifolia* and prickly-leaved paperbark (*M. styphelioides*), woollybutt (*Eucalyptus longifolia*) and swamp mahogany. Some Sydney blue gum (*E. saligna*) occurs along the better drained levee banks and terraces whilst swamp oak (*Casuarina glauca*) often line tidal channel banks.

3.1.4 Bioregion

The site is with the Wyong subregion of the Sydney Basin bioregion (IBRA 7). The Sydney Basin Bioregion is characterised by a temperate climate, warm summers, mild winters, and no dry season.

3.1.5 Vegetation

The rail corridor is predominantly cleared for the purposes of rail operation, and vegetation is routinely trimmed, treated or removed to maintain access tracks and rail infrastructure. The corridor traverses urban areas at Dora Creek, Morisset and Wyee; however, there are large areas of native vegetation adjacent to the corridor between Morisset and Wyee, and also just south of Dora Creek (Figure 3–4**Error! Reference source not found.**). While the rail corridor itself is unlikely to provide suitable habitat for fauna species, fauna may traverse the rail corridor or forage along the edges.

Morisset Station, where the bulk of the proposed works is to occur, is located within an urban area which has been modified and disturbed over a long period of time. Most of the native vegetation of the Morisset Station area has been cleared and replaced by landscaping including native and exotic flora (Aurecon, 2021a). Vegetation around the station area is limited to mown grass adjacent to the rail track, as well as planted trees and hedges approximately 20 metres from the tracks. Native vegetation is limited to regrowth adjacent the rail corridor

The new NSW Eastern Plant Community Types (PCTs) have been adopted for vegetation classification within the state. The NSW Statewide Vegetation Map (DPE 2023b) shows nine PCTs within a hundred metre buffer of the study area

(Figure 3–4; Table 3–2). Vegetation mapping was ground-truthed at the survey locations, but not in all parts of the study area.

Table 3–2: PCTs within 100m of the study area

PCT ID	PCT Name	TEC associations
3583	Hunter Coast Lowland Scribbly Gum Forest	No
4020	Coastal Creekflat Layered Grass-Sedge Swamp Forest	Swamp Sclerophyll EEC
3998	Lower North Creekflat Mahogany Swamp Forest	Swamp Sclerophyll EEC
3435	Hunter Coast Lowland Flats Damp Fores	No
3582	Hunter Coast Lowland Apple-Bloodwood Forest	No*
3906	Northern Lowland Clay Wet Heath	Swamp Sclerophyll EEC
4036	Hunter Coast Lake Flats Apple Forest	No*
3995	Hunter Coast Paperbark-Swamp Mahogany Forest	Swamp Sclerophyll EEC
4056	Southern Estuarine Swamp Paperbark Creekflat Scrub	Swamp Oak EEC

* PCT 3582 and 4036 are associated with TECs geographically restricted outside of the site's bioregion or locality

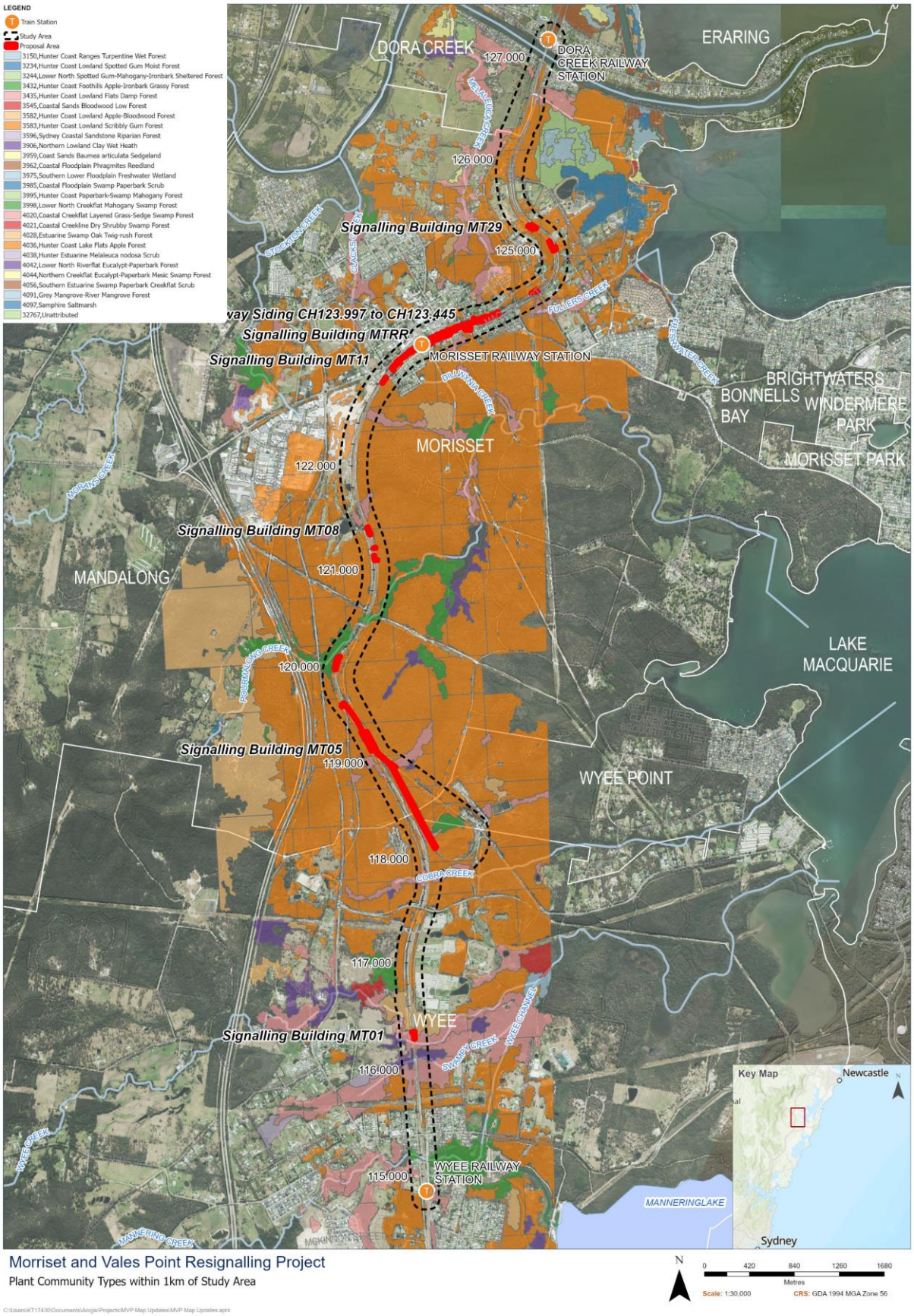


Figure 3–4: Plant community mapping

3.1.6 Threatened Ecological Communities

Potential TECs were identified using the current Statewide Vegetation Type Mapping and referencing the known PCT to TEC associations with the locality available from the Bionet Vegetation Classification database as of 29 September 2023. The likely locations of TECs are shown in Figure 3–5.

Two potential TECs were identified within a 100m buffer of the study area and are given in Table 3–3.

Table 3–3: TECs mapped in the study area

Threatened Ecological Community	BC Act	EPBC Act
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Endangered
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Endangered

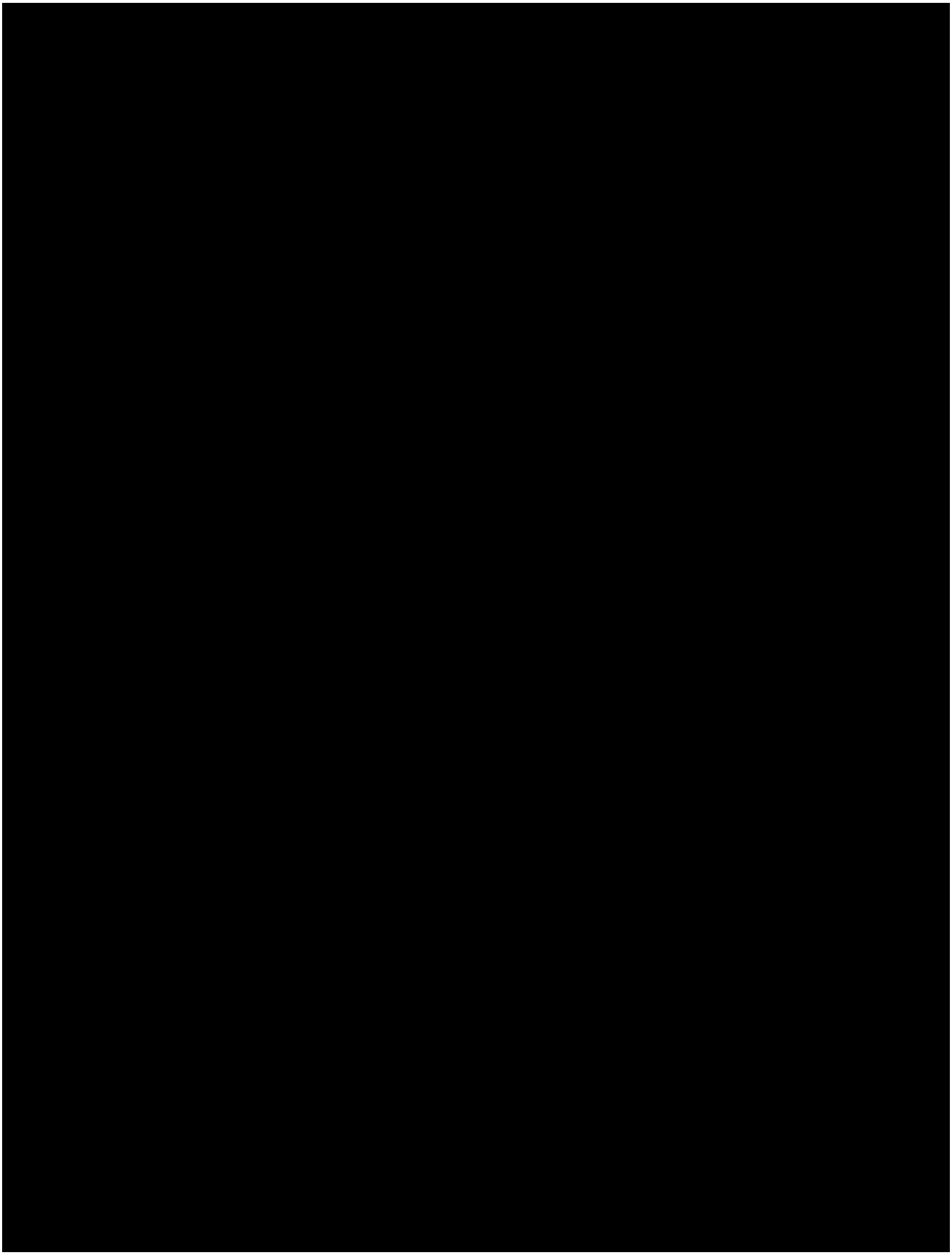


Figure 3–5: Threatened ecological communities

3.1.7 Threatened Fauna

3.1.7.1 Threatened fauna habitat

There are limited important habitat features for threatened fauna within the study area and detailed descriptions of the observations at key sites are presented in Section 3.2. The managed vegetation within the rail corridor may provide occasional foraging resources or passage for smaller or mobile animals, however the corridor exclusion fencing restricts connectivity for larger terrestrial animals to culverts and rail overbridges. There is a limited amount of native vegetation proposed to be directly impacted and its characteristics are described in section 3.1.5. This vegetation is all low-quality regrowth, is edge effected and without large trees.

No hollow bearing trees were identified in the study area. There was an absence of tall emergent trees or large stick nests that could support nesting sites for large raptors such as Osprey, White-bellied sea-eagle and Little eagle, although these species are likely to fly over the site at times.

Open spaces such as the rail corridor can provide flyways for a range of microbats known to occur in the locality, however the proposal area does not contain roosting or breeding sites such as caves or tree hollows. Bridges and culverts can provide roosting sites for some threatened microbats including Southern Myotis (*Myotis Macropus*) or Little Bent -wing bats (*Miniopterus australis).* No nesting sites were not found in the Pourmalong creek bridge, and the proposal does not involve disturbance or modification of any culverts or bridges.

The proposal is to avoid impacts within riparian corridors by maintaining suitable setback from larger streams including Wyee Creek, Swampy Creek and Pourmalong Creek. Some minor tributaries of Pourmalong Creek cross through the Proposal Area in culverts running underneath the corridor. The proposed works on the embankment above these culverts is not considered to be impacting vegetated riparian habitat.

3.1.7.2 Species Assessment

Seventy-eight threatened fauna species and populations were identified through the BioNet sighting records and the Protected Matters Search Tool (PMST). Because of the site's proximity to the coast and Lake Macquarie, an array of marine animals had records as sharks and cetaceans, which have not been include in this total. Results of the NSW Fisheries Spatial Data search does not identify known habitat for any threatened freshwater fish species in the study area and associated waterways. An additional 24 non-threatened migratory birds listed under the EPBC act were also identified through the PMST.

Following desktop research, 18 species (listed in Table 3–4) were found to have a moderate likelihood of occurrence in the study area. Observation during site survey did not identify important habitat for any of the species. Some species may at times pass through the site or feed opportunistically, however none have a high likelihood of occurrence and have not been further assessed for significant impact.

None of the watercourses in or near the study area are known to be habitat for threatened aquatic species as mapped on the Fisheries NSW Spatial Data Portal (DPI 2023a)

The Likelihood of Occurrence Table for all species is given in Appendix A which contains more details of the habitat requirement of each species.

Table 3–4: Species with a moderate likelihood of occurring in the study area

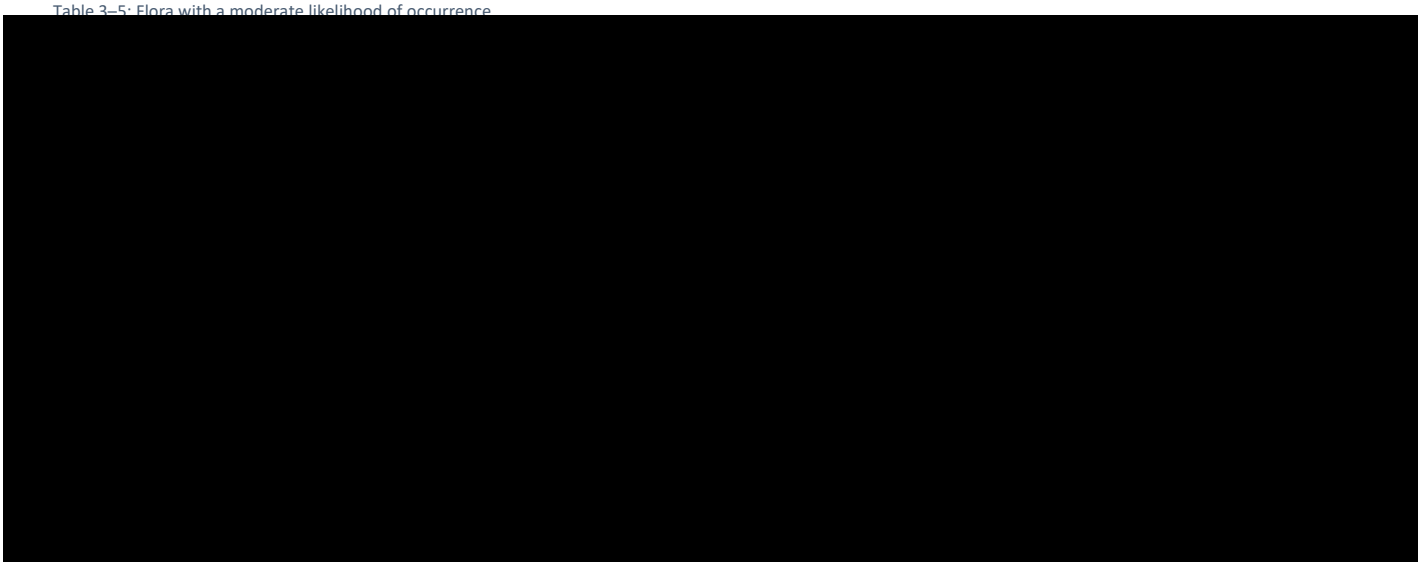
[redacted]

* V = Vulnerable, E= Endangered CE= Critically Endangered

3.1.8 Threatened Flora Species

Thirty-one threatened flora species found through the BioNet and PMST desktop research were considered for likelihood of occurrence in the study area (Appendix A). Survey for threatened flora species which targeted areas of potential native vegetation clearing did not identify any of the following species considered to have a moderate likelihood of occurrence despite being performed during a suitable time of year for all species. Although survey does not rule out the possibility of soil stored seeds, none of the species are considered have a high likelihood of occurring within the corridor considering historic ground disturbance.

Table 3–5: Flora with a moderate likelihood of occurrence



3.2 Survey findings

3.2.1 Rail corridor

The rail corridor is typically about 40 metres wide and cleared of native vegetation and constrained within exclusion fencing. An unsealed access track is usually present on one side of the track, and both sides in some sections. An example of managed corridor is shown in Figure 3–6. The width of the corridor provides a sufficient buffer area in which to mitigate any indirect impacts to native vegetation outside the corridor fence. The fence will also provide exclusion of machinery outside the corridor. Field survey for vegetation and faunal habitat surveys was limited to accessible areas within the corridor, and distance observation of areas outside the fence line. The survey results for each of the survey areas are presented separately in the following sections.

Figure 3–6: Rail corridor approximately 2km south of Morisset station looking north.

3.2.2 MT05 site

3.2.2.1 Proposed works

A signalling building is to be built on cleared ground within the corridor and nearby vegetation cleared to the north of the structure proposed to create a fire asset protection zone (APZ). The vegetation to be cleared is shown in Figure 3–7. Mapping of the vegetation communities are shown in Figure 3–8.

Figure 3–7: View looking north (down -side) from the site of the proposed hut of vegetation within the rail corridor to be cleared

3.2.2.2 Survey findings

The MT05 hut site is on cleared and managed ground within the rail corridor, however there is a narrow strip of vegetation along the corridor fence line that is specified to be cleared for 30 metres northward by the Bushfire Risk Assessment Report. Outside the fence the vegetation is already cleared for a power line easement. The vegetation proposed to be cleared is native regrowth of local shrub species and is narrow and fragmented. One mature tree for removal was noted and can be seen in the foreground of Figure 3–7. The tree is a Scribbly Gum (*Eucalyptus haemastoma*). Other trees include juvenile Black she-oak (*Allocasuarina littoralis*). The vegetation community is consistent with the mapped PCT 3583: Hunter Coast Lowland Scribbly Gum Forest and the full species list recorded is given in Appendix B. This community is not associated with any threatened ecological communities. No threatened flora species were found during the threatened flora transect survey, and no important habitat for the target threatened fauna species is present. Vegetation mapping shows PCT 4020 is present to the south of the hut site, which can be associated with the Endangered Swamp Sclerophyll TEC.

3.2.2.3 Impact Summary

Table 3–6: Biodiversity values and impacts summary at MT05 site

PCT	PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
TEC	No TEC associated with this community
Habitat Summary	• Native shrub layer which is narrow and fragmented • No fallen logs or tree hollows. • Limited leaf litter cover, ground disturbance including dumped gravel and soil. • No important habitat for likely threatened fauna. She-oak trees are immature and do not provide feed for Glossy black cockatoo.

	• *Eucalyptus haemastoma* is ranked as a low use Koala feed tree (DECC 2008)
Proposal Impact	Clearing of approximately 550m2 of low condition native vegetation including one mature locally indigenous tree- scribbly gum (*Eucalyptus haemastoma*).

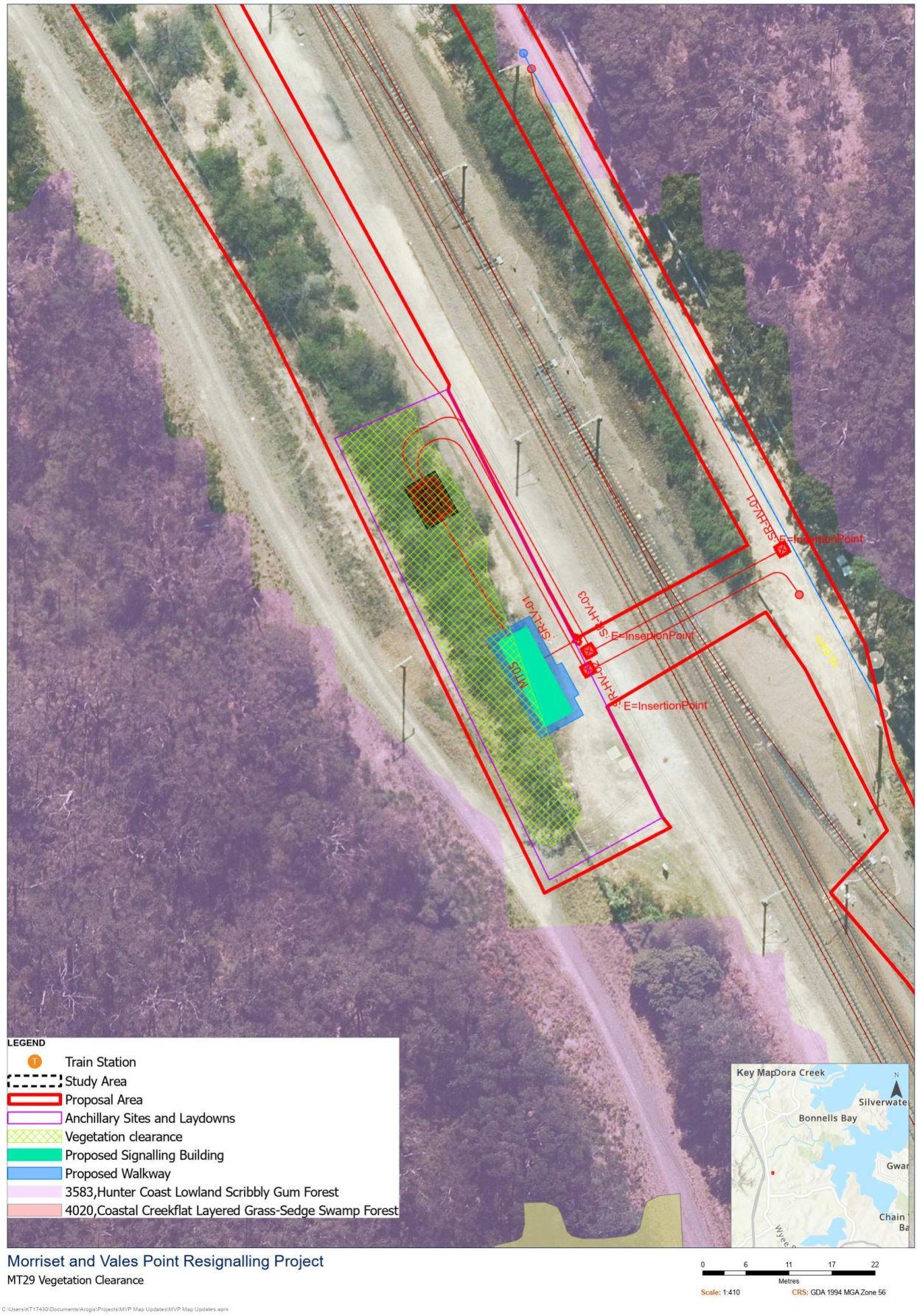


Figure 3–8: MT05 site vegetation.

3.2.3 MT11 site

3.2.3.1 Proposed works

A signalling building is to be built. No requirements for native vegetation clearing were identified in the Bushfire Hazard Risk Assessment.

Figure 3–9: Site of MT11, looking north-west towards Dora Street in the distance.

3.2.3.2 Survey findings

The proposed MT11 hut site is in an area of cleared and managed land within the corridor. Grasses and ground cover species were largely exotic. NSW vegetation mapping indicates the presence of native vegetation PCT 3583: Hunter Coast Lowland Scribbly Gum, between the corridor and Dora Street. The native species found along the fence line were indicative of this community. The main trees were Black casuarina (*Allocasuarina littoralis*) and Sydney red gum (*Angophora costata*). Shrubs included *Lambertia formosa*, *Petrophile pulchella* and *Dillwynia retorta*. The ground layer included kangaroo grass (*Themeda triandra*), Blady Grass (*Imperata cylindrica*), *Lomandra longifolia* and *L. obliqua*.

Several of the trees just outside the fence line appear planted. They are evenly spaced Willowy bottle brush (*Callistemon salignus*), seen in the background of Figure 3–9. The vegetation is highly disturbed with many weeds including honeysuckle (Lonicera japonica), Coolatai Grass (*Hyparrhenia hirta*) and Camphor laurel (*Cinnamomum camphora*). The full plant species list is given in Appendix B. No threatened flora species were found. A plain sun orchid (*Thelymitra nuda*) was found flowering although no other orchid species were observed. The vegetation at the site is narrow and fragmented and is not likely to provide important habitat for threatened fauna species.

3.2.3.3 Impact Summary

Table 3–7: Biodiversity values and impacts summary at MT05 site

PCT	PCT 3583: Hunter Coast Lowland Scribbly Gum
TEC	No TEC associated with this community
Habitat Summary	Narrow fragment of native vegetation, no fallen logs, no tree hollows, limited leaf litter cover. No important habitat for the likely threatened fauna.
Proposal Impact	Impacts to Biodiversity expected to be negligible. No formal APZ treatments required. Minor branch trimming possible. Spread of weeds possible.

3.2.4 Perway siding site

3.2.4.1 Proposed works

The existing siding (see current endpoint in Figure 3–10), will be extended 9.5 metres northward parallel to the track.

Figure 3–10: Current endpoint of the perway siding looking northward where it would be extended.

3.2.4.2 Survey findings

The location for the extension of the perway siding is within a highly disturbed area of the corridor close to the track. The ground cover is almost entirely composed of exotic grasses including Coolatai grass, Red Natal grass, Couch, Bidens and Plantain (*Plantago lanceolota*). The full species list in Appendix B. No threatened flora species were identified, fauna habitat value was low and no impacts to biodiversity are seen as likely.

3.2.4.3 Impact summary

The location of the proposed perway siding extension does not contain native vegetation or habitat for threatened species and there is a very low likelihood of impact to biodiversity at this site.

3.2.5 MT29 site

3.2.5.1 Proposal works

A signalling building is to be built at the location shown in Figure 3–11, and approximately 200 square metres of regrowth vegetation within the corridor fence proposed to be cleared. Vegetation would be removed where on Sydney Trains land where it is within the 20 metres surrounding the proposed structure, including pruning of tree branches overhanging the fence (see Figure 3–12).

Figure 3–11: The MT29 hut location looking south with regrowth vegetation proposed to be cleared on the right.

Figure 3–12: Fence line adjacent to MT29 site looking south, showing overhanging tree branches that would be pruned.

3.2.5.2 Survey findings

Survey found that the vegetation near the proposed hut was consistent with the STVM mapped PCT 3583: Hunter Coast Lowland Scribbly Gum (see Figure 3–13). The canopy trees (requiring branch pruning) included Scribbly Gum (*Eucalyptus haemastoma*) and Sydney red Gum (*Angophora costata*). Also present in the vegetation for clearing was black she oak (*Allocasuarina littoralis*), cheese tree (*Glochidion ferdinandii*), and prickly leaf paperbark (*Melaleuca nodosa*). The full species list from the survey are given in Appendix B. No threatened flora species or important threatened fauna habitat features were found. The tree pruning is unlikely to impact the health of the trees, being an estimate 10 – 15% of the trees canopy and would not require offset under Sydney Trains biodiversity policy. Pruning is to follow AS 4373-2007 Pruning of amenity trees, and an arborist consulted if there is a doubt regarding future health or safety of the trees. It is understood that permission to prune the trees over the corridor is not required from the neighbouring property, however a request or notification out of courtesy is recommended.

3.2.5.3 Impact summary

Table 3–8: Biodiversity values and impacts summary at MT29

PCT	PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
TEC	No TEC associated with this community
Habitat Summary	Native vegetation within corridor fence is young re-growth. No fallen logs or tree hollows No important habitat for likely threatened fauna.
Proposal Impact	Clearing of approximately 200 square metres of low condition native vegetation. Minor tree pruning which is unlikely to impact tree health.

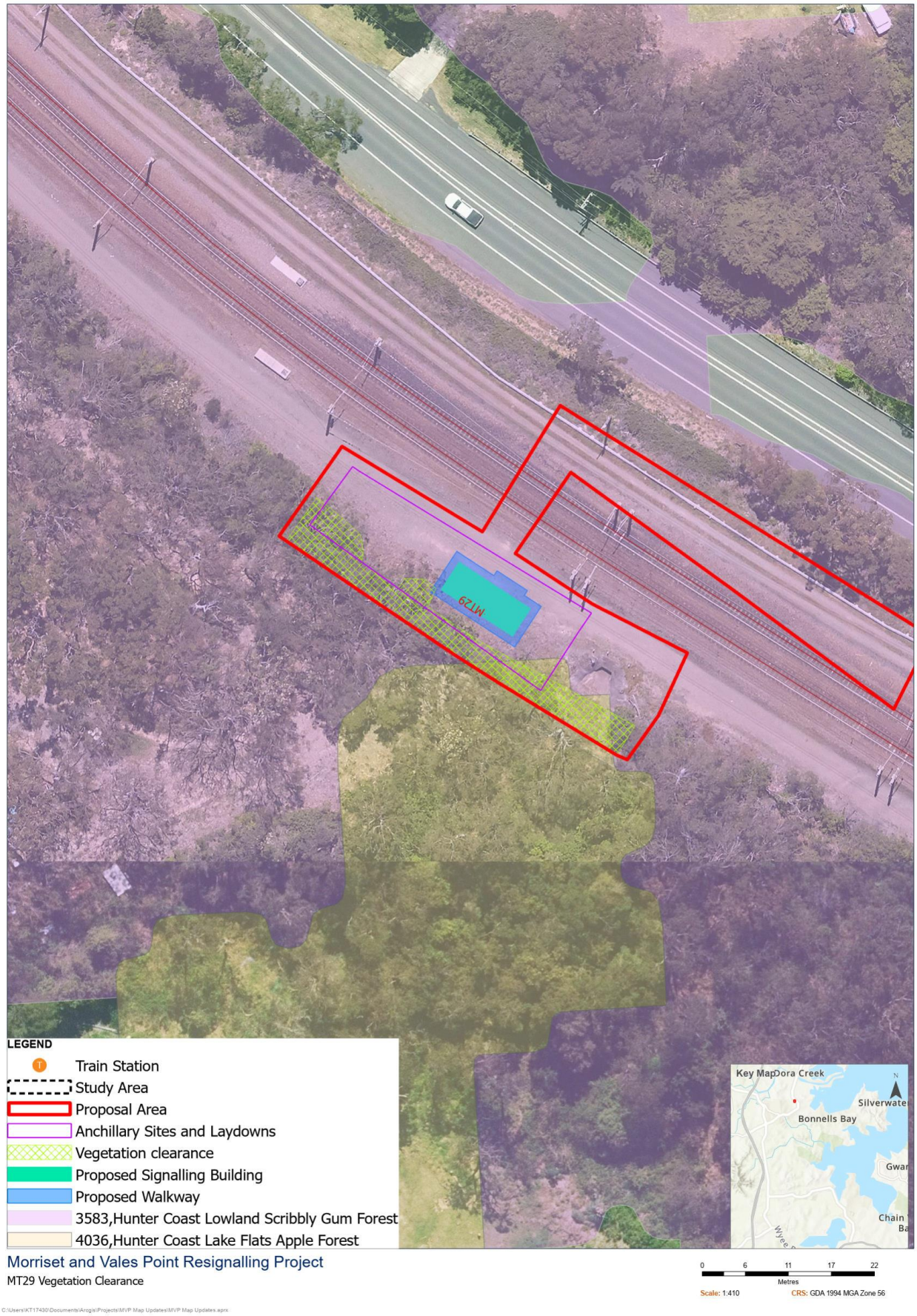


Figure 3–13: MT29 site vegetation.

3.2.6 MTRR Site

3.2.6.1 Proposed works

A signalling building is proposed to be built on the existing clear area of the rail depot to the east of Morisset station. The location is shown in Figure 3–14.

Figure 3–14: MTRR Hut site on the level foreground, viewed looking south.

3.2.6.2 Survey findings

The site is located near vegetation growing on the embankment between the depot and Macquarie Street. Existing mapping indicates areas of PCT 3583 Hunter Coast Lowland Scribbly Gum Forest. The vegetation contains a canopy of mainly Sydney redgums (*Angophora costata*), sweet pittosporum (*Pittosporum undulatum*) and camphor laurel (*Cinnamomum camphora*). There were negligible other native shrubs or ground covers and the area has a very high cover of weeds including Lantana, Honeysuckle and Morning Glory (*Ipomoea indica*). The vegetation community lacks the diversity required to provide a definitive PCT, however given the limited species, the existing mapping and the landform, non-threatened PCT 3583 is the best fit. No tree hollows were observed in the survey area. Minor branch trimming is the only potential direct impact.

3.2.6.3 Impact summary

Table 3–9: Biodiversity values and impacts summary at MT29

PCT	PCT 3583: Hunter Coast Lowland Scribbly Gum Forest
TEC	No TEC associated with this community
Habitat Summary	Canopy trees, mostly *Angophora costata*, which provide good foraging for nectar feeding fauna

	No tree hollows Shrub and ground layer mostly exotic weeds No important habitat for likely threatened fauna.
Proposal Impact	Negligible impacts to biodiversity likely.

3.2.7 Pourmalong Creek

3.2.7.1 Proposed works

No clearing of vegetation is proposed in this location, and it is outside the Proposal Area but will be used incidentally for access. There are sighting records of Squirrel gliders within 100 metres of the bridge. No impacts to the riparian zone are expected. The corridor access track crosses Pourmalong Creek via a causeway made of gravel and ballast. Similar crossings are found on the access track crossings at Wyee Creek and Swampy Creek.

Figure 3–15: Bridge and gravel causeway over Pourmalong Creek, looking north east.

3.2.7.2 Survey findings

Habitat survey of the underside of the bridge with a torch no evidence of use by Microbat species or spaces likely to be potential habitat for bats. The rail corridor surrounding the bridge does not contain native vegetation, in contrast to mapping shown on the NSW State-wide mapping. A layer of ballast lines much of the creek bed (Figure 3–15). A shallow pool of water in the creek was turbid and contained plague minnows (*Gambusia holbrooki*), which suggest the main creek line is not good breeding habitat for frogs. No hollow bearing trees near could be seen adjacent to the corridor from accessible vantage points.

3.2.8

3.2.8 Weeds

The mown areas of the rail corridor are mostly covered in exotic vegetation, typically common grasses that respond well to disturbance and mowing. Some woody weeds and vines were found along the corridor fence line. All weeds on the site would require management during the proposed works to prevent their threat to the local environment as they are covered by the General Biosecurity duty of the NSW Biosecurity ACT, which is written as follows:

General Biosecurity Duty

All pest plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

During the survey, seven weeds were observed, which also have more specific duties under the Act as outlined in Table 3–10. Exotic species identified at the survey site are listed in Appendix B.

Table 3–10: Weeds noted during the survey which have specific duties under the NSW Biosecurity Act

Common name and species	Measures for the Hunter Region (LLS) under the Biosecurity Act
Crofton weed (*Ageratina adenophora*)	**Regional Recommended Measure** Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Blackberry (*Rubus fruticosus*)	**Regional Recommended Measure** Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Bridal creeper (*Asparagus asparagoides*)	**Regional Recommended Measure** An exclusion zone is established for all land in the region, except the core infestation which includes Dungog Local Government Area, Lake Macquarie Local Government Area, Cessnock Local Government Area, Mid Coast Local Government Area. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Pampas grass (*Cortaderia* species)	**Regional Recommended Measure** An exclusion zone is established for all land in the region, except the core infestation which includes parts of: Lake Macquarie Local Government Area. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
African lovegrass (*Eragrostis curvula*)	**Regional Recommended Measure** Land managers should mitigate the risk of new weeds being introduced to land used for grazing livestock. Land managers should mitigate spread from their land. Plant should not be bought, sold, grown, carried or released into the environment.
Coolatai grass (*Hyparrhenia hirta*)	**Regional Recommended Measure (for Regional Priority - Asset Protection)** Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

Common name and species	Measures for the Hunter Region (LLS) under the Biosecurity Act
Lantana (*Lantana camara*)	**Regional Recommended Measure** Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

4. Potential Impacts

Following the full implementation of the mitigation measures identified in Section 5, the Proposal is unlikely to result in significant adverse impacts to native vegetation and other biodiversity values.

All construction works would be carried out within the rail corridor, and predominantly in areas subject to regular slashing/clearing for ongoing track maintenance and access (as approved works authorised by TfNSW). The majority of the new assets would either be installed within or close to the ballasted rail track area or around the existing signals or signal cabinet/huts. Where possible, the new infrastructure would utilise existing conduits for power and signal connections. In circumstances where there is no additional capacity in existing conduits; preference would be given to installing GST and if this is not possible, underground conduits to connect new assets would be excavated.

4.1 Direct impacts

4.1.1 Physical injury of fauna

Fauna is unlikely to be impacted by the proposed works, although there is a low risk that animals could potentially be injured by a vehicle or equipment or fall into an open trench and become trapped or injured.

4.1.2 Habitat loss

The Proposal area would result in a maximum clearance of 0.035 hectares of native vegetation, comprising:

- 0.055 hectares (550m^2) of regrowth Hunter Coast Lowland Scribbly Gum Forest (PCT 3583) within the corridor fence near the site of MT05 and,
- 0.0212 hectares (212m^2) of regrowth (PCT 3583) within the corridor fence including pruning overhanging branches include as part of this vegetation, near MT29.

A total of 0.0762 ha of PCT 3583 would be cleared. This vegetation community is well represented outside of the proposal area and do not represent any BC Act or EPBC Act-listed TECs. Given the minor area of vegetation to be removed, and the control measures in Section 5, it is considered unlikely that the Proposal would significantly impact any conservation significant fauna or flora species. The current Proposal area does not require any vegetation modification or clearing within 250 metres of Squirrel Glider records.

Trimming of native vegetation may be required along the access tracks to ensure plant, vehicles and/or equipment can safety access the signal location. Any trimming activities are expected to be minor and given the extent of the surrounding bushland, trimming is not expected to significantly impact fauna habitat and does not involve tree removal. Trimming is to be limited to less than 20% of the canopy or trees are to be offset under TfNSW policy.

There is a low risk of damage to other stands of existing vegetation due to stockpiling of materials or vehicle movements. Appropriate control measures, such as fencing, would be installed to ensure the risk of damage to existing vegetation is minimised.

4.1.3 Aquatic habitat

There are no direct impacts to Key Fish Habitat or threatened fish habitat. The corridor access tracks crosses Pourmalong Creek and Wyee Creek, both mapped as Key Fish Habitat by DPI. Vehicles crossing is part of routine maintenance activities. It is understood that the Pourmalong Creek crossing is likely to be used during the proposed works, but the Wyee Creek crossing is not required for construction access. The crossing at Pourmalong Creek is already a gravel causeway and will not result in creek bed disturbance or affect water quality. If additional material is required to be laid within either of these stream beds, even temporarily, a Fisheries Permit would be required.

4.2 Indirect impacts

4.2.1 Weeds

The most likely indirect impact arising from construction activities is the introduction, establishment and spread of weeds within the proposal area and to adjoining areas of vegetation. Weed establishment and spread generally results from soil disturbance and excavation as well as use of equipment that may carry weed propagules. This could include species listed as noxious under the *Biosecurity Act 2015*.

4.2.2 Noise

Vehicle, plant and construction equipment would temporarily increase noise pollution within the Proposal area. This can cause disruption to normal fauna activity and lead to stress, avoidance, or departure of species from an area during construction. The extent of such impacts would be dependent upon the volume and frequency of the source and received levels, other sources of anthropogenic noise, and the noise dispersal characteristics of the local environment, and the habituation or sensitisation of fauna to the noise. It is considered unlikely that noise emissions associated with the Proposal in the context of an operational trainline would present a significant impact upon local fauna.

4.2.3 Pollution and hydrological impacts

During construction, there is potential for sediment, uncontrolled stormwater runoff, and hazardous materials (e.g., disturbance of acid sulphate soil, hydrocarbon spills from equipment) to enter the surrounding environment, however these are impacts upon biodiversity are unlikely to be significant with implementation of the proposed mitigation measures in the REF and this report. The proposal introduces minor areas of non-permeable surfaces, mainly the roofs of signalling buildings. Alteration to surface drainage patterns though new drainage works discussed in the hydrology assessment (SMEC 2023) are minor and connect into existing drainage routes. No alterations to groundwater levels or impacts to groundwater dependent ecosystems are likely from the proposal.

4.2.4 Lighting

Lighting has the potential to affect fauna behaviour. However, as the proposed works would predominantly be undertaken during the day, this is unlikely to have a significant impact.

4.3 Key threatening processes

Key Threatening Processes are listed under Schedule 4 of the BC Act and EPBC Act. Relevant Key Threatening Processes to the Proposal include:

- Clearing of native vegetation
- Introduction and spread of plant pathogens (e.g., dieback (*Phytophthora cinnamomi*) and Exotic Rust Fungi)
- Introduction and spread of invasive species.

There are no relevant Key Threatening Processes that have the potential to affect biodiversity values within the Proposal area. The proposed vegetation removal is not of a scale to cause significant impacts, and the proposed weed control and equipment hygiene measures recommended would not contribute to spread of pathogens or invasive species.

4.4 Operational impacts

There is no potential for operational impacts to biodiversity as a result of the Proposal. Rail traffic remains the primary operational process with rail traffic growth expected to grow organically despite the proposal.

5. Mitigation measures

- Construction staff will be made aware of the biodiversity constraints.
- Any disturbed areas of the site must be revegetated using locally indigenous species in accordance with EMS-06-GD-0074 Revegetation Guide and EMS-06- TP-0066 Revegetation Technical Specification Template. The exception will be APZ areas which will retain only a short ground layer.
- All vegetation trimming and removal work will be carried out in accordance with AS 4373-2007 Pruning of amenity trees and AS 4970-2009 Protection of Trees on Development Sites. No hollow bearing trees are to be removed or trimmed without approval. Trees nominated for retention will be marked on all plans.
- Limit pruning of trees on the property adjacent to MT29 to less than 20% of the canopy. Consultation with the property owner is recommended.
- Threatened and protected species and ecological communities:
  - No work to be carried out in the areas mapped as TECs (Figure 3–5). These areas are to be marked on construction site maps and demarcated on site as no-go areas.
  - If threatened and/or protected flora or fauna species are identified, work in the vicinity of the subject flora or fauna would stop immediately. A spotter/catcher or ecologist would be engaged to survey the area, in conjunction with Sydney Trains' Environmental Officer, and advise on species management.
  - Construction works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained. Works must not recommence until Sydney Trains has provided written approval to do so.
  - A site survey and an environmental impact management plan by an ecologist shall be created should any threatened species be recorded during the works.
  - Should the design be modified to alter the area or extent of vegetation removal, further ecological impact assessment must be undertaken.
- Fauna (general)
  - The site-specific CEMP must include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES), or Council for domestic species.
  - Trenches/excavations would be covered at the end of each day, and inspected before they are backfilled, to ensure that no fauna species are harmed.
- Native vegetation (general)
  - The extent of approved clearing and/or trimming must be clearly delineated and minimised where possible.
  - Construction areas will be kept to a minimum and be clearly demarcated to prevent accidental damage to native vegetation.
  - Stockpiles, plant, equipment and materials storage are to be located on existing cleared lands away from the drip zone of trees or other native vegetation, with appropriate sediment erosion controls implemented.
  - Vehicle turning circles and parking areas shall be clearly marked and will occur in areas free of native vegetation.
  - Where space within existing conduits is not available, GST is to be preferred over underground conduits to connect new assets.
  - Where trenching or excavation is required for installing new underground conduits or crossings, the route or location will be modified or altered to avoid any damage to trees or tree roots, where possible
- Weeds and pathogens:

- Weed control measures are to be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during construction. This would include the management and disposal of weeds in accordance with the Biosecurity Act 2015. Such measures will include:
- Any vegetation removal would be assessed by an ecologist to ensure that any identified noxious weeds are removed appropriately.
- Weeds shall be treated and disposed of appropriately and not mixed with other vegetation to be mulched for reuse.
- Piles of cleared vegetation should be mulched as soon as practicable after clearing and mulch reused at the signal location where possible.
- Soil and vegetation that could contain weed material should be removed from machinery prior to any movements off site.
- Should any priority weeds be encountered, appropriate management and disposal of these weeds must be carried out.
- Prevention and management measures for plant pathogens, including Phytophthora cinnamomic and the fungus responsible for chytridiomycosis should be incorporated into the CEMP or and focus on the following key protocols:
  - Vehicles, machinery, equipment entering the site should be inspected to be free of obvious soil contamination or implement appropriate hygiene protocols including wash down and/or disinfection measures.
  - Ensure that contaminated soil or plant material is not brought onto the site.

5.1 Offsets

The Sydney Trains Biodiversity Offsets Calculator has been used to determine whether biodiversity offsets are required for the proposed works (EMS-06-WI-0177). The purpose of the calculator is to make calculations of biodiversity offsets in accordance with the EMS-06-OR-1006 Biodiversity, objective and consistent across Sydney Trains projects.

The appropriate offsetting category for vegetation clearing is Item 4: Remnant Native Vegetation. This category covers clearing of a native vegetation community not supporting any threatened species, populations or vulnerable endangered, or critically endangered vegetation communities. In answer to the impact questions in Table 5–1, the vegetation represents minor portions of the surrounding vegetation patches, will not cause isolation of fragmentation of vegetation and are not potential shelter or breeding habitat for threatened species. Therefore, a minor offset has been calculated.

Table 5–1: Remnant native vegetation offsets, Item 4 from Table 7 in Sydney Trains Biodiversity Offsets Calculator.

Impact Question & Answer	Mitigation Measures	Minor Offset Options (no to all questions)
1. Of the main body of vegetation, does the native vegetation being removed account for 20% or more of the canopy cover? Answer: **NO**	• Seek an alternative location and/or modify the activity to minimise impacts • Ongoing bush revegetation/ weed control • Minimise loss of fauna during clearing activities	1. Where possible: Undertake bush revegetation over the entire remnant (including the disturbed areas) for a 2-year period to encourage rehabilitation of the site, using locally native species. Ensure that all weed species are targeted during the period AND Contribute $10/m2 of native vegetation community that will be disturbed to the BOF OR 2. If the above is not possible, contribute $15/m2 of native vegetation community that will be disturbed to the BOF
2. Will any remaining native vegetation become isolated from a main vegetation body. Answer: **NO**		
3. Is there potential that the area would be used by one or more threatened fauna species for: • Shelter • Breeding		

Answer: **NO**

Trees removed as part of the native vegetation above do not require separate offsetting. If any isolated trees are removed, they area also subject to offset under EMS-06-WI-0177. Minor pruning is the only impact expected of individual trees and therefore do not require offset under Sydney Trains policy. The offset requirement for locally native trees is provided in Table 5–2.

Table 5–2 Locally native tree offsets from the Sydney Trains Biodiversity Offsets Calculator

Impact Question & Answer	Mitigation Measures	Minor Offset Options (No to all questions or pruning only)	Moderate Offset Options
1. Is there potential that the locally native tree would be used by one or more threatened fauna species for: • Shelter • Breeding Answer: **NO**	• Limit tree removal to that required • Minimise loss of fauna during clearing activities • Notification when impacting immediate neighbour (i.e., loss of amenity) • Community consultation, where in high profile locations, e.g. shopping centre	**Pruning** 1. No offset is required for minor pruning of foliage only that does not affect the continued health of the locally native tree (i.e., pruning is not of the trunk or primary branches of the tree) UNLESS 2. For pruning of primary branches or tree trunk – contribute $100 to the BOF for each locally native tree pruned in this manner **Tree Removal** 1. Contribute $300 to the BOF for each locally native tree removed	1. Where possible: Revegetation required in the same area (at least 50m2 for each locally native tree removed), using locally native tree, shrub and ground cover species as per EMS-09-TP-0066 AND Contribute $300 to the BOF for each locally native tree removed AND If the tree contained hollows, then install 3 or more nest boxes for each tree hollow removed in adjacent trees (or nearby areas) or on posts. OR 2. If revegetation is not an option: If the locally native tree contained hollows, then install 3 or more nest boxes for each tree hollow removed in adjacent trees or on posts AND
2. Is there a hollow present? Answer: **NO**			
3. Is there potential that the area would be used by one or more threatened fauna species for: • Shelter • Breeding Answer: **NO**			

5.1.1 Offset Summary

762m^2 of non- threatened native vegetation (PCT 3583) is proposed to be cleared for firebreaks around signalling huts MT05 and MT29. Regeneration is not an offset option as firebreaks must remain cleared permanently. Offset option 2 from Table 5–1 is therefore appropriate: contribute $15/m2 of native vegetation community that will be disturbed to the Sydney Trains Biodiversity Offset Fund.

This is a total of $11,430. (762 square metres x $15)

Note: the actual figure will be updated to reflect CPI changes as the dollar values used are from the calculator specifications written in 2009.

Locally indigenous trees which may require pruning at MT11, MT29 and MTRR should not require offsetting if pruning remains minor. Should heavy pruning of primary branches or complete removal be required, an offset per tree given in Table 5–2 for Minor Offsets should be used, i.e. contribute $300 per tree to the BOF (CPI adjusted). Note that invasive Camphor laurel trees present at MT11 and MTRR are exempt from offset on removal.

6. Conclusion

The proposal limits direct impacts to the highly modified landscape within the rail corridor. 762 square metres of native Hunter Coast Lowland Scribbly Gum Forest (PCT 3583) would be cleared. This vegetation is low condition regrowth and does not represent a threatened ecological community. No important habitat for threatened flora or fauna is to be directly impacted. Indirect impacts outside the proposal area have a low potential to harm threatened species or communities more, provided standard construction mitigation measures are applied.

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the Biodiversity Conservation Act, 2016, therefore a Species Impact Statement or BDAR is not required. The proposal is not likely to significantly impact threatened species, ecological communities, or migratory species, within the meaning of the EPBC Act.

In-stream works within creeks mapped as Key Fish Habitat is not proposed, therefore a Fisheries permit from DPI is not required.

References

Centre for Plant Biodiversity Research (Canberra) and Slee, A.V. (2006). EUCLID eucalypts of Australia. CSIRO Publications.

Cropper, S.C. (1993). Management of Endangered Plants. CSIRO Publications Victoria.

DECC. (2008). Recovery plan for the koala (Phascolarctos cinereus). Sydney: NSW Department of Environment and Climate Change.

Department of Planning and Environment (2023a) NSW BioNet Atlas species sightings. Available at https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet [Accessed 22 Oct 2023]. NSW Department of Planning and the Environment, Parramatta, NSW.

Department of Planning and Environment (2023b) NSW State Vegetation Type Map – Edition C1.1.M1. Available at https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map [Accessed 22 Oct 2023].

Department of Planning and Environment (2023c). BioNet Vegetation Classification. https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx {Accessed 22 Oct 2023}

Department of Primary Industries (DPI) (2023) NSW WeedWise. Available at https://weeds.dpi.nsw.gov.au/ [Accessed August 2023]. Department of Primary Industries, Orange, NSW.NSW Department of Primary Industries (2023a) Fisheries NSW Spatial Data Portal. Available at https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal [Accessed 22 Oct 2022]

Department of Planning, Industry and Environment (DPIE 2020). Surveying threatened plants and their habitats: NSW Survey guide for the Biodivesity Assessment Methodology. State of New South Wales Department of Planning and the Environment, Parramatta, NSW.

NSW Office of Environment and Heritage (OEH), (2018). Threatened Species Test of Significance Guidelines. Office of Environment and Heritage, Sydney.

NSW Scientific Committee (2011), Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - Determination to make a minor amendment to Part 3 of Schedule 1 of the Threatened Species Conservation Act

Richardson, F.J., Richardson, R.G. and Shepherd, R.C.H. (2016). Weeds of the south-east: an identification guide for Australia (No. Ed. 3). CSIRO.

Robinson, L. (2003). Field Guide to the Native Plants of Sydney. Kangaroo Press, Sydney.

SMEC (2023) REF Consistency Assessment. Unpublished report for Sydney Trains August 2023.

Appendix A: Likelihood of occurrence table

Appendix B: Flora species recorded

Appendix C: Bionet Atlas Search Results

Appendix D: Protected Matter Search Tool Results

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A6. Aboriginal Due Diligence Assessment

Memo: Morisset and Vales Point Resignalling - Aboriginal Cultural Heritage Addendum due diligence report for Detailed Design phase

Project: 231022 – Morisset and Vales Point Resignalling	**Date**:19 December 2023
Client: SMEC	**Contact**: [redacted]

Author: [redacted]

1.1 Introduction

Transport for NSW engaged Extent Heritage Pty Ltd (Extent) to prepare an Aboriginal Cultural Heritage Due Diligence report for the proposed Morisset and Vales Point Resignalling works in December 2020. The purpose of that report was to inform a Review of Environmental Factors for the installation of a new signalling system on the Main North Line at Morisset.

Artefact Heritage was engaged by SMEC to prepare an addendum Aboriginal Cultural Heritage Due Diligence report due to design updates to the signalling system to be installed for the proposed Morisset and Vales Point Resignalling Works.

This addendum Aboriginal Cultural Heritage Due Diligence report provides an update to the report prepared by Extent in 2020, with an updated search completed on 2 November 2023 (see Section 1.5.1) of the Heritage NSW Aboriginal Heritage Information Management System (AHIMS) site register, and consideration of the Lake Macquarie Local Environment Plan (LEP) Sensitive Aboriginal Cultural Landscape mapping, and updated advice based on design changes since 2020.

This advice has been prepared with reference to:

- Extent Heritage Pty Ltd (Extent), 2020. *Aboriginal Cultural Heritage Due Diligence – Morisset Rail Resignalling Project*. Report to Aurecon.
- Lake Macquarie City Council (LMCC), 2011. *Lake Macquarie Aboriginal Heritage Management Strategy.*
- DECCW, 2010. *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales.*

The study area is located within the boundaries of Bahtabah Local Aboriginal Land Council (LALC) in the Lake Macquarie Local Government Area (LGA).

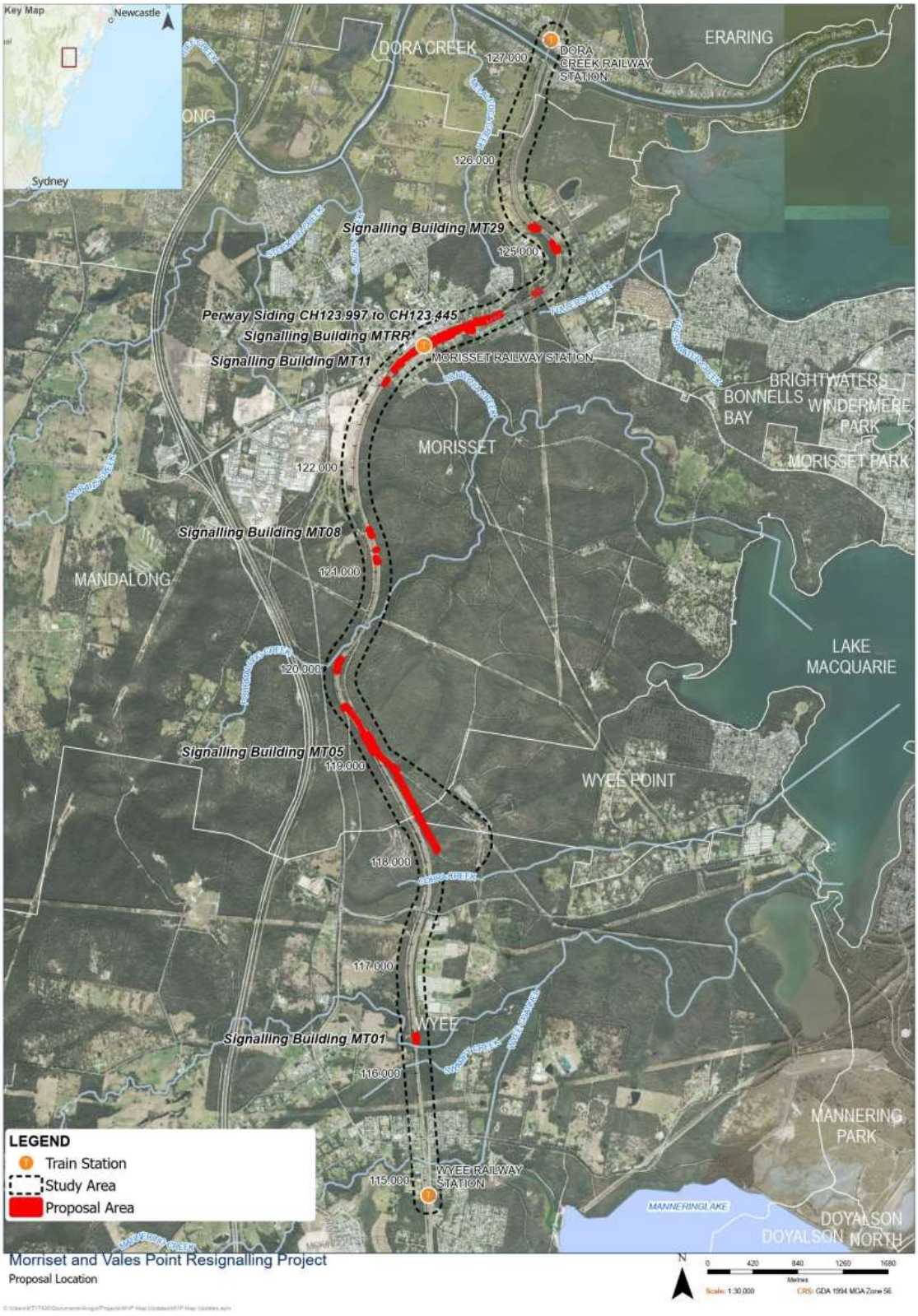
1.2 Limitations

The study area has not been considerably altered since the previous site inspection was undertaken in 2020, as such an additional site inspection was not undertaken. This report should be read in conjunction with the Aboriginal Cultural Heritage Due Diligence Report prepared by Extent in 2020.

1.3 The study area

The proposed works will take place between 116.000 km and 126.900 km on the Main North Line, approximately 45 km south of Newcastle. This area includes the resignalling works, as well as construction of warehousing facilities, office, dock office, car parking facilities and associated landscaping. The study area is outlined in Figure 1.

Figure 1: Study area



1.4 Proposed works

A detailed overview of the proposed works is provided in the detailed design.

1.4.1 Combined Service Route (CSR)

The proposed CSR would utilise existing ULXs (service crossings beneath a rail line), Galvanised Steel Trough (GST), buried routes and pits where possible. New containments would be installed to facilitate connections to buildings and equipment for the following services:

- Communications
- Signalling
- High voltage
- Low voltage.

Between concept and detailed design, proposed ULXs have been designed for new locations, or removed, based on updates from signalling equipment locations and additional signalling details (such as tail cable, electronic unit and signalling pit and pad). See Figure 3 to Figure 13 below for details.

1.4.2 Electrical

The electrical scope of works would include the construction of new building MT05 including:

- New underground to overhead (UGOH) poles
- New transformers - 11kv/415v padmount and isolation padmount (2)Service route from UGOH poles to 11kv/415v transformer to building
- Services route from isolation transformer to building.

The scope would also include construction of new building MTRR including:

- New UGOH poles
- New transformers – 11kv/415v padmount and isolation padmount (2)
- Services route from UGOH poles to 11kv/415v transformer to building
- Services route from isolation transformer to building.

The changes between concept and detailed design include the following:

- New locations of UGOH poles by approximately 285m
- Relocation of MT05 building by approximately 150m
- New ULX to facilitate UGOH (some ULX has been removed from the scope)
- Relocation of 11kv/415 transformer
- Extension of the service route by approximately 150m.

1.4.3 Track

The scope of works for track would include:

- Removal of existing crossovers 2A/B and 12A/B
- Installation of new crossovers MT53A/B and MT56A/B
- Removal and renewal of the Up Refuge to Perway siding
- New MT55A Turnout and MT55B catchpoint to connect the Perway Siding to the Up Main.

The track scope of works would remain unchanged from concept design. Changes between concept and detailed design include:

- Extension of the Perway Siding by approximately 9.5m
- Change in Tie-in Locations.

The above proposed works are identified in the below Figures**Figure 3**Figure 13.

1.5 Archaeological context

Extent prepared an Aboriginal Cultural Heritage Due Diligence report for the study area in 2020. Extent (2020) completed an extensive search of the Aboriginal Heritage Information System (AHIMS) for the due diligence process on 6 November 2020. That AHIMS search identified 51 registered sites and one gazetted Aboriginal place (Lake Macquarie Resting Place). Of those registered Aboriginal sites one AHIMS site (AHIMS ID 45-3-4337) was identified [redacted]

That report identified one AHIMS site (AHIMD ID 45-3-4337) located within the study area.

AHIMS ID 45-3-4337 was identified through a test excavation program (Extent, 2020:11). It is recorded as a low density, subsurface artefact scatter, comprising two stone artefacts within a context of low archaeological integrity. [redacted] Based on the distance between AHIMS ID 45-3-4337, Extent determined AHIMS ID 45-3-4337 was unlikely to be impacted by the proposed Morisset Rail Resignalling Works project (Extent, 2020:11).

The majority of the registered Aboriginal sites were outside the study area and consisted of artefact sites. The distribution of Aboriginal sites across the searched area was determined to be directly correlated with landform, land disturbances and proximity to permanent water sources. Extent's assessment was based on historical research, location of known Aboriginal sites and regional spatial patterns on the Lower Hunter and Upper Central Coast regions, and findings of previous archaeological assessments.

Extent determined that as proposed ground disturbing works within the study area will be limited to the construction, operation, and maintenance of railway track, there was low potential for sub-surface Aboriginal objects within the study area. The report found that the artefact located within the study area was outside of any proposed works areas and would not be affected as a result of the proposed works, and recommended no further reporting was required.

1.5.1 Aboriginal Heritage Information Management System (AHIMS) search

NOTE: The location of Aboriginal sites is considered culturally sensitive information. It is advised that this information, including the AHIMS data appearing on the heritage map for the proposed works be removed from this report if it is to enter the public domain.

An updated extensive search of the AHIMS site register (Client Service ID 835766) was completed on 2 November 2023 for the same area as the previous Extent report, which was designed to provide a search area larger than the study area. The parameters of this search were:

The search determined that there are 53 registered Aboriginal sites and one gazetted Aboriginal place (Lake Macquarie Resting Place) within the search area. As identified in the Extent (2020) report, there is one registered Aboriginal site within the study area (AHIMS ID 45-3-4337). An additional two Aboriginal sites had been registered within the AHIMS site search area and outside the study area since Extent's (2020) report was prepared (AHIMS ID 45-3-4533 and AHIMS ID 45-3-4588).

The AHIMS database lists Aboriginal sites using twenty standard site features, of which ten were found within the extensive search (OEH, 2012) summarised in Table 1.

The nature and location of the registered sites is a reflection of the past Aboriginal inhabitation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient.

The majority of registered Aboriginal sites consists of artefact sites (50.94%). Based on the AHIMS search results it is unlikely that additional sites would be located within the rail corridor, due to historic land disturbance. However, additional sites have been and may be located within the undeveloped areas surrounding the rail corridor, especially in locations where there are permanent water sources. The distribution of recorded sites within the AHIMS extensive search area is shown in Figure 2 through Figure 13.

1.5.2 Lake Macquarie Sensitive Aboriginal Cultural Landscape

The *Lake Macquarie Aboriginal Heritage Management Strategy (2011)* defines Lake Macquarie City Council's intent to work toward cultural reconciliation and sustainable management of Council's Aboriginal cultural resources in the City's landscape. The strategy aims to achieve the sustainable management of Aboriginal cultural heritage values and sets out the mechanisms by which Council will achieve specific outcomes in collaboration with the local Aboriginal community.

Clause 7.7 of the Lake Macquarie Local Environment Plan 2014 addresses Aboriginal cultural heritage in Lake Macquarie and states the following:

> *7.7 Development on sensitive Aboriginal landscape areas*
>
> *(1) The objective of this clause is to recognise and conserve sensitive Aboriginal landscape areas.*
>
> *(2) The consent authority may require an Aboriginal Heritage Impact Statement to be prepared before granting consent to the carrying out of development on land identified as "sensitive Aboriginal landscape area" on the Sensitive Aboriginal Landscape Area Map.*

Sensitive Aboriginal Cultural Landscapes have been identified within the Lake Macquarie LEP on the basis of Aboriginal archaeological evidence, landscape features that have been described in historic records, and recognise traditionally important places of importance to the contemporary community regardless of the condition of those landscapes.

An outline of the study area and proposed works in proximity to the Lake Macquarie Sensitive Aboriginal Cultural Landscape is provided in Figure 3 to Figure 13.

Figure 2: AHIMS extensive search and detail of Aboriginal sites registered since 2020

Redacted for Public Display

1.6 Assessment of archaeological potential and sensitivity

Archaeological potential is closely related to levels of ground disturbance. However, other factors are also taken into account when assessing archaeological potential, such as whether the area is within a sensitive landform unit.

1.6.1 Archaeological sensitive landforms and ground disturbance

Particular landforms in NSW are known to have been favoured locations for repeated or long-term occupation and, hence, more likely to retain archaeological evidence of past Aboriginal use. The Due Diligence Code of Practice identifies five landscape features that indicate the likely existence of Aboriginal objects these include:

- Within 200m of water, or
- Located within a sand dune system, or
- Located on a ridge top, ridge line, or headland, or
- Located within 200m below of a cliff face, or
- Within 20m of or in a cave, rock shelter, or cave mouth (DECCW, 2010)

Extent (2020) reported that there were multiple creek lines flowing through the study area resulting in portions of the study area being located on archaeologically sensitive landforms. The due diligence assessment determined that the study area has been subject to extensive disturbances from vegetation clearing, construction of rail structures and railway infrastructure, and had been considerably modified through ground works including installation of subsurface infrastructure. No Aboriginal objects or areas of archaeological potential were identified within the proposed works area.

The study area lies partially within the Lake Macquarie Sensitive Aboriginal Cultural Landscape. The study area crosses multiple creek lines, including Dora Creek which runs through the northern part of the study area. The southern part of the study area is intersected by Wyee Creek, Cobra Creek, and Pourmalong Creek. Alluvial deposits such as these have the potential to contain middens and flaked artefacts, particularly on deltas of the major creeks, such as Dora Creek. Very large midden deposits are known to have occurred in this terrain, with a diversity of estuarine shell species present. Gentle foot slopes may contain midden, with or without flaked stone artefacts, which may remain beneath older structures. Open campsites and artefact scatters may also be present, were common but are likely to be in a disturbed context. This terrain may also reveal scarred trees, which may have once been common but are now very rare.

Archaeological potential is closely related to levels of ground disturbance. However, other factors are also taken into account when assessing archaeological potential, such as whether artefacts were located on the surface, and whether the area is within a sensitive landform unit according to the predictive statements. The Due Diligence Code of Practice defines disturbed land:

> *Sec 7.5 (4) For the purposes of this clause, land is disturbed if it has been the subject of human activity that has changed the lands surface, being changes that remain clear and observable.*

This includes disturbed land via:

(a) soil ploughing

(b) construction of rural infrastructure

(c) clearing of vegetation

(e) construction of buildings and the erection of other structures

(f) construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure)

Extent (2020) identified that the majority of the study area has been subject to various past ground disturbances and modification of the landscape which include vegetation clearance, construction of structures and rail tracks, earth movement and installation of subsurface cables and utilities.

The due diligence assessment (Extent 2020) determined that the study area demonstrated low archaeological potential for Aboriginal objects to be present in sub surface ground deposits, based on the background information, the known previous ground disturbances and Aboriginal site distribution in the region.

The study area demonstrates low archaeological potential for Aboriginal objects to occur beneath the ground surface, based on the following information:

- The additional Aboriginal sites registered with AHIMS since the previous search was undertaken in 2020 (AHIMS ID 45-3-4533 and AHIMS ID 45-3-4588) are not located within the study area and would not be impacted by the proposed works.
- The detailed design footprint for proposed works in the rail corridor is no larger than the concept design footprint which was assessed in the due diligence report by Extent (2020).

In summary, although the study area is situated across a number of sensitive landforms, the proposed works are limited to disturbed land within the rail corridor. Changes to the development footprint of proposed works have not been enlarged or changed to include any additional areas compared to Extent (2020). As a result, it is unlikely that Aboriginal objects will be located within the works footprint.

Based on the sensitive landforms within the region and the proximity of the proposed works to permanent water sources, it is possible that Aboriginal sites may be located within the study area outside the works footprint and existing rail footprint, particularly in relation to the creek lines associated with the Lake Macquarie Sensitive Aboriginal Cultural Landscape, however there are no proposed works occurring in these areas at present.

1.7 Conclusions and recommendations

The following conclusions and recommendations regarding Aboriginal cultural heritage are based on consideration of:

- statutory requirements under the *National Parks and Wildlife Act 1974* as amended.
- the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010).

- the results of the AHIMS search and review of Lake Macquarie Sensitive Aboriginal Landscape Map.
- the likely impacts of the proposed works.

It was found that:

- The detailed design construction footprint is no larger than the concept design footprint that has been previously assessed.
- Although the proposed works are partly within the Lake Macquarie Sensitive Aboriginal Cultural Landscape and other sensitive landform types, the portions of rail corridor that overlap with the proposed works footprint have been subject to extensive past ground disturbance (Extent 2020: 13) and represent 'disturbed landscapes'.
- One AHIMS site (AHIMS ID 45-3-4337) is located within the study area. As the detailed design footprint is no larger than the concept design footprint which was assessed in the previous due diligence report by Extent (2020), the location of AHIMS ID 45-3-4337 will not be impacted by the proposed works.
- The detailed design is unlikely to result in adverse impact to sensitive Aboriginal landscapes or Aboriginal sites. The due diligence report by Extent (2020) identified that the area of proposed works had low potential to contain Aboriginal sites or places.

It is recommended that:

- A copy of this addendum due diligence should accompany the preliminary Aboriginal cultural heritage due diligence report prepared by Extent in 2020.
- There are unlikely to be Aboriginal objects within the study area. It is recommended that no further Aboriginal heritage assessment or investigations are required, and the proposed works can proceed with caution.
- Any changes to proposal that will result outside the works footprint must be subject to additional Aboriginal heritage assessment.
- Unexpected Aboriginal objects remain protected by the *National Parks and Wildlife Act 1974*. If any suspected Aboriginal objects are uncovered in the course of construction activities, all work in the vicinity should cease immediately, and the procedures outlined in the Sydney Trains Unexpected Archaeological Finds Procedure (EMS-09-PR-0164) must be followed.
- Aboriginal objects must not be harmed without an Aboriginal Heritage Impact Permit (AHIP).

1.8 Appendices

1.8.1 Appendix 1 – AHIMS Extensive search results

Redacted for Public Display

1.8.2 Appendix 2 - Aboriginal Cultural Heritage Due Diligence report (Extent 2020)

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

10 December 2020

[redacted]

[redacted]

Re: Aboriginal Cultural Heritage Due Diligence – Morisset Rail Resignalling Project

Aurecon ('the proponent') has commissioned Extent Heritage Pty. Ltd. ('Extent Heritage') to undertake an Aboriginal cultural heritage due diligence assessment for the proposed Morisset Rail Resignalling Project. The proposed works will take place between 116.000 km and 126.000 km on the Main North Line, approximately 45 km south of Newcastle (hereafter, the 'study area'). It is understood that this assessment is to inform a Review of Environmental Factors for the installation of a new signalling system that will include a new train control system located in the Broadmeadow Control Centre. The project will require modification of the Automatic Train Protection (ATP) equipment that is presently being installed as a result of the new signalling design and allow for future migration to Digital Systems European Train Control Systems (ETCS) L2.

This assessment was undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW [now Heritage NSW] 2010), within the legislative context of *National Parks and Wildlife Act 1974* (the 'NPW Act'). The details and results of this assessment is derived from desktop research, a search and review of the Aboriginal Heritage Information Management System (AHIMS) maintained by Heritage NSW – Department of Premier Cabinet (DPC) and a site inspection. The purpose of this assessment is to determine the Aboriginal archaeological potential of the site and whether further detailed Aboriginal cultural heritage assessment and Aboriginal community consultation is warranted in accordance with Heritage NSW – DPC guidelines and the NPW Act.

Please note that this letter report is only designed to provide preliminary constraints and opportunities advice as well as guidance on the need for any further Aboriginal cultural heritage assessment and compliance obligations. This report does not meet the statutory requirements under the *National Parks and Wildlife Regulations 2019* to support an application for an Aboriginal Heritage Impact Permit (AHIP) in accordance with Section 90 of the NPW Act.

[redacted]

Furthermore, this report does not consider historical archaeological heritage and is not sufficient to support an application for a permit under Section 60 or 140 of the *Heritage Act 1977*.

If you have any queries regarding this due diligence assessment, please do not hesitate to contact me on [redacted]

Yours sincerely,

[redacted]

EXTENT HERITAGE ADVISORS

1. Background and purpose of document

Extent Heritage was commissioned by the proponent to undertake an Aboriginal cultural heritage due diligence assessment in advance of the installation of a new signalling system within Main North Line between 116.000 km and 126.900 km (the 'study area') (Figure 1). The study area is located within the boundaries of the Bahtabah Local Aboriginal Land Council (LALC) in the Lake Macquarie Local Government Area (LGA).

The proposed works will involve the following:

- Establishment of a new interlocking at Morisset and Vales Point with train detection and train protection throughout study area.
- Upgrades to signalling, posts, points, guard indicators, trackside phones and huts.
- Provide interface for connection to the new ATRICS control system for the Morisset and Vales Point; installation, testing and commissioning.
- Upgrading existing cable containment and associated infrastructure and design for new local services and main CSR interface.
- Power supply upgrades to signalling and overhead wiring as well as earthing and bonding as required.
- New structures to be reconfigured to suit signalling works and track layouts.
- New and realigned track as required and new tangential turnouts, catchpoints, special track works, and terminations as required.
- Civil works as necessary to support the track, signal and building upgrades.
- Drainage mitigation.
- Establishment of new OHWS footings to a depth of up to 3.5m.

The purpose of this assessment is to determine the Aboriginal archaeological potential of the site prior to the proposed development and whether further detailed Aboriginal cultural heritage assessment and Aboriginal community consultation is warranted in accordance with Heritage NSW – DPC guidelines under the NPW Act.

In New South Wales (NSW), Aboriginal objects and places – whether registered or as yet undiscovered – are afforded statutory protection under the NPW Act. Under Section 86 of the NPW Act, it is an offence to disturb, destroy or deface Aboriginal objects and places without the approval of the Chief Executive of Heritage NSW. A breach of Section 86 of the NPW Act could result in prosecution and fines in excess of $1 million. Heritage NSW – DPC provides a series of guidelines as a framework for identifying and managing Aboriginal heritage and the cultural heritage interests of Aboriginal parties within development planning contexts. The due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects*

in New South Wales (DECCW 2010) is the first step in this series of guidelines, and is intended to identify whether or not a proposed activity is likely to harm Aboriginal objects and places. Further information on the legislative context is provided in Appendix A.

This assessment was undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010), within the legislative context of the NPW Act. The details and results of this assessment are derived from desktop research and a search and review of the Aboriginal Heritage Information Management System (AHIMS) maintained by Heritage NSW – DPC and a site inspection. No Aboriginal community consultation was undertaken during this assessment.

Please note that this letter report only addresses the proposed development at the study area according to the brief provided by the proponent. It is an initial investigation of constraints and opportunities pertaining to identified existing and potential Aboriginal heritage sites and places within and around the study area. This report does not meet the statutory requirements under the *National Parks and Wildlife Regulations 2019* to support an application for an AHIP in accordance with Section 90 of the NPW Act.

Similarly, the report does not consider historical archaeological heritage and would not be sufficient to support an application for a permit under Section 60 or 140 of the *Heritage Act 1977*.

2. Existing environment

Geology, geomorphology and soils

The subject area is located in the Wyong sub-bioregion of the Sydney Basin bioregion. Bioregions are large areas characterised by broad, landscape-scale natural features and environmental processes that capture geophysical patterns at an ecosystem scale. Sub-regions delineate significant geomorphic patterns within a bioregion, and are based on finer differences in geology, vegetation and biophysical attributes (Murphy 1993). The Wyong sub-region is characterised by the undulating sandstone-based landscape of the Lower Hunter and Central Coast region of NSW, comprising rolling hills and sandstone plateau outliers with beach, dune and lagoons of coastal barriers interspersed with coastal cliffs and rock platforms. These geomorphic features dictate the type and form of Aboriginal sites potentially present in the subject area, with higher potential for rockshelters, rock engravings and grinding grooves; as well as midden sites, campsites and burials in sand dune contexts, along the coastline or estuarine lake systems.

The study area is primarily located across the Gorokan Soil Landscape and Doyalson Soil Landscape, with discrete channels of the Wyong Soil Landscape along drainage lines associated with Lake Macquarie (Figure 2). Typically, Doyalson soils comprise a loamy sand topsoil (up to 200 mm deep) overlying clayey sand (up to 300 mm) and sandy clay loam (over 1 m). The local relief is up to 30 m with slopes less than 10% and broad crests and ridges, along gently inclined slopes and broad drainage lines (Murphy 1993:50).

The Gorokan Soil Landscape is characterised by a topsoil of loose, dark brown loamy sand (100 – 500 mm deep), overlying hardsetting, clayey sand (200 – 500 mm deep) and strongly pedal clay (up to 1.5 m deep). The local relief is greater than <30 m with slopes less than 15% and broad crests and ridges, along gently inclined slopes and broad drainage lines (Murphy 1993:62).

The Wyong soil is an alluvial landscape characterised by deep (more than 2 m) loam overlying clay, with occasional splays and lenses of sand and sandy clay loam occurring throughout the soil profile. Local relief is less than 10 m and slopes are less than 3%, such that levees, meander scrolls, oxbows and swamps are common. The Wyong soil landscape is prone to severe stream bank erosion, flooding and seasonal waterlogging such that evidence of Aboriginal occupation, if present, is likely to have been destroyed (Murphy 1993:79-80).

Vegetation and hydrology

Native vegetation communities of the Doyalson, Gorokan and Wyong Soil Landscapes have been extensively cleared as a result of European development; particularly along urbanised foreshore developments of Lake Macquarie (Dallas et al. 1993:6; Murphy 1993; ERM 2009:3).

Common native species include scribbly gum (Eucalyptus haemastoma), red bloodwood (E. gummifera), brown stringy bark (E. capitellata), smooth barked apple (Angophora costata) and grey gum (E. punctata), with paperbark present along drainage lines (Murphy 1993:49).

The study area is intersected at several points by multiple creek lines (Figure 4). Dora Creek is the largest of the creeks and runs through the northern portion of the study area. The southern portion of the study area is intersected by Wyee Creek, Cobra Creek, and Pourmalong Creek.

Historical land use and disturbances

Past land uses inform Aboriginal archaeological assessments because such activities influence the integrity of the Aboriginal archaeological record. This is most notable in shallow soils, where even minor historical activities can be detrimental to the survivability of cultural deposits.

In 1823, Lieut-colonel James Thomas Morisset made an overland journey from Newcastle to Sydney, camping overnight under a tree on the western side of Lake Macquarie, immediately east of the current location of the Morisset railway Station. The Morisset railway station was established in 1886 during a period of Crown subdivision. By 1887 many allotments had been purchased and residential structures and associated roads have been established. The Morisset-Dora Creek deviation was established in 1902 and arrangements for a duplication of the track commenced in 1911. Historical aerials from 1966 indicate that the alignment of the current railway track has not been significantly modified.

Overall, it is likely that ground disturbing activity within the study area is limited to the construction, operation and maintenance of the railway track.

EXTENT HERITAGE ADVISORS AUSTRALIA AND THE ASIA PACIFIC

3. Archaeological context

Aboriginal History of the Lower Hunter and Central Coast Region

The Lower Hunter and Central Coast region was occupied and used by Aboriginal people for thousands of years prior to British colonisation. Within the Lower Hunter and Central Coast, lakes, creeks, floodplains, swamps and woodlands provided Aboriginal people with rich and varied resource zones and occupation areas. Aboriginal sites across the region provide tangible evidence of an on-going link with the long history of Aboriginal use and occupation of the area.

The Awabakal people are the traditional owners of the Lake Macquarie area. Their territory extended across a vast area (as much as 1,800 km², according to early anthropologist Norman Tindale (1974)); from the Fern Bay/ Stockton locale north of the Hunter River south to the Tuggerah Lakes, and from the Sugarloaf Ranges and Watagan Mountains in the west to the NSW coastline (AHMS 2014). The majority of information regarding this language group comes from the work of Reverend Lancelot Edward Threlkeld, who produced the Awabakal word/vocabulary lists and, with the assistance of local Awabakal people, translated Christian scripture into the Awabakal language. Threlkeld observed that the Awabakal language was similar to the neighbouring Wonnarua, Darkinjung and Worimi languages (Gunson 1974:4; South East Archaeology 2012:37). Evidently, a shared language enabled the transmission of knowledge, customs and lore as well as items and resources from a vast area. Accounts of the mobility of local Aboriginal people, held in the University of Newcastle archives (Rita Smith Collection) state that:

The Awabakal and Darkinoong [sic] held an annual Corroboree (feasting, signing & dancing) at Kanangra (Nords Wharf)… large numbers of natives could be seen making there [sic] way towards Nords Wharf, for days before the Corroboree (Maynard 2015:17).

Another known Aboriginal meeting place was at 'Kourumbung' (Coorangbong), where Awabakal clans reportedly clashed over territorial access to land (Clouten 1967).

The swamp and wetlands resources of the Lower Hunter and Central Coast region, including its lakes and creeks, were foci for Aboriginal occupation. As well as providing water, fish, shellfish, eels, water rats, waterbirds, frogs, and plants, they also drew terrestrial animals to the water. Lagoon areas allowed access to water and held resources such as eels, fish and a variety of shellfish including mussels, while beached whales were occasionally washed up onto coastal beaches and consumed. Aboriginal fishing methods are known to have been many and varied, and included line fishing from bark canoes, spear fishing in shallow waters and utilising nets, traps and fish poisons. An early Newcastle settler, William Scott, recalled that 'lobsters were caught by the women who, in the sea front dived down among the rocks for them' and that when fishing, 'women used lines [and] the men mostly fished with the spear (Scott 1929:18-19).

In addition to marine resources, Awabakal people utilised the resources of the hinterland around the Watagan Mountains; hunting wallabies, possums, reptiles and other small game. They also collected cobra worms, wild honey, berries, tubers and seeds (Backhouse 1843:379-381). Often, complex food processing techniques were required before some species of yam (*Dioscorea* spp.), roots and seeds (e.g. *Macrozamia* spp.) could be consumed. This involved

roasting or prolonged leaching in water to rid them of their acrid properties so as to render them fit to be eaten (Threlkeld in Gunson 1974:55). The process for preparing cycads was similar, according to James Backhouse, where Awabakal people *roast and pound the seeds of Zamia spiralis, and then place the mass for two or three weeks, in water, to take out the bitter principle, after which it is eaten* (Backhouse 1843:379-381).

Sheltered huts or 'Gunyahs' were constructed using a frame of forked branches secured to the ground. Sheets of bark or brush were placed against the frame, angled against the wind. The front of the shelter was generally left open, facing a small fire.

Aboriginal sites: regional spatial patterns on the Lower Hunter and upper Central Coast regions

There is general consistency in the types and distribution of Aboriginal archaeological sites throughout the Lower Hunter and upper Central Coast regions. The distribution, density and size of sites are largely dependent on environmental context. Middens are found in close proximity to marine, estuarine and less often, freshwater bodies. The strong flooding regime of the Hunter River means that sites on the river margins would have been both protected by alluvial deposition and removed by scouring waters. Rock shelters are only found in areas of exposed sandstone escarpment, and grinding grooves are found in areas of exposed flat beds of sandstone.

The Lower Hunter region study (Hughes 1984: 3) concluded that:

- Sites would be found across the entire Hunter Valley.
- Several site types exist, the most common being open artefact scatters.
- Artefact scatters are most likely to occur on creek banks, especially at creek junctions, with low frequencies found over 100 metres from creeks and on hill slopes and crests.
- Sites will generally decrease in size as associated watercourses decrease in catchment (stream order) size.
- Most archaeological evidence dates to the mid to late Holocene; and technological analysis of stone artefacts may assist in relatively dating sites that cannot be directly dated.

The NSW Department of Environment and Conservation (DEC) published the Aboriginal Cultural Heritage Data Audit as part of the 2005 Department of Planning Comprehensive Coastal Assessment. This collated and presented a review and summary of available data and information on Aboriginal cultural heritage items and values for the Central Coast region. The DEC study considered a total of 384 listed sites in the Lake Macquarie LGA (DEC 2005: Appendix 1). For the 384 sites, 630 site features were recorded, and demonstrate that artefact scatters, shell middens, earth mounds and grinding grooves are the most prevalent in the LGA. With regard to the coastal zone specifically, Aboriginal sites were generally dominated by:

- Shell middens - associated with foreshores, near to abundant shellfish resources and frequently in association with freshwater sources entering the sea. These middens commonly include bone and flaked stone artefacts as well as shell and may also contain human remains.
- Engraved rock art sites - on large exposed flat bedded sandstone panels.
- Occupation evidence in rockshelters with floor deposits - especially those in proximity to a fresh water source and/or food resources such as shellfish areas. Cultural material may include shell, bone, flaked stone artefacts and occasionally human remains. Rockshelters may also contain rock art.

Regional studies and models by Sullivan (1982) and Haglund (1986) reveal that the Central Coast coastline was heavily utilised for highly selective shellfish exploitation, generally resulting in small midden sites containing shallow deposits with limited diversity. Generally, sites with this type of shell assemblage are interpreted to have been used seasonally or occasionally (Dallas et al. 1993), however the archaeological evidence is still inconclusive in this region. Most of the sites distributed around the lakes are located on the eastern side, allowing the exploitation of both the lake and ocean. For this reason, the western shores, including that of Lake Munmorah, Tuggerah Lakes and Lake Macquarie, generally reveal relatively little archaeology. Sites that have been recorded are almost exclusively on the coast and are predominantly shell middens.

Previous archaeological assessments

Wangi Power Station – Dallas (1990)

Dallas undertook an archaeological survey of several parcels of land between Wangi Wangi and Myuna Bay, approximately 6.9 km northeast of the study area. One open midden site was identified on a walking track within the Wangi Wangi Lake Macquarie State Conservation Area. The midden was discontinuous over an area of approximately 50 m and was dominated by cockle and rock oyster species.

Windermere Creek Dredging and Bank Stabilisation – Resource Planning (1992)

Resource Planning undertook an archaeological survey for dredging and stabilisation works at Windermere Creek, approximately 3.5 km east of the study area. One shell midden primarily comprising Sydney Cockle was identified on the swampy land at the junction of Windermere Creek and Lake Petite. An isolated tuff stone artefact was also identified on cleared land nearby.

Morisset Peninsula Sewerage Scheme – Dallas, Navin & McConchie (1993)

Dallas, Navin & McConchie undertook an archaeological survey and augering investigation of the northern and southern foreshores of the Morisset Peninsula (4 – 5 km east of the study area), as part of a proposed sewerage system upgrade. Twelve Aboriginal midden sites were identified along the Lake Macquarie foreshore during the course of the survey.

This included one substantial in-situ midden deposit within the Lakeside site ('M3 Crusader Camp Yarrawonga Point'), on a westerly-facing foreshore flat approximately 30m from the shoreline. The midden was characterised by substantial accumulations of Sydney Cockle (Anadara trapezia) and Southern Mud Oyster (Ostrea angasi) within a dark brown black loam

matrix, and extends for approximately 200 m along the shoreline. It was assessed as having high research potential and moderate to high significance in a local and regional context (Dallas et al. 1993:20).

Geomorphological and hydrological data suggested that shell accumulations at greater than 5m landward from the lake shore and/or at elevations greater than 0.5m above mean water level are more likely of cultural origin. These middens are characterised by an abundance of Sydney Cockle, with some Sydney Mud Oyster, periwinkle, mud creeper and scallop found on foreshore flats, beaches, toes of hills and hillslopes, with more concentrated middens adjacent to permanent creeks and where small freshwater creeks enter the Lake. They were also characterised by an absence of articulated shells and other species. Many had been moderately to extensively disturbed by modern development.

Landcom Crown Homes Site, Morisset – ERM (2009)

Environmental Resources Management was engaged by ADW Johnson to prepare an Aboriginal heritage assessment of a proposed Landcom residential development in the suburb of Morisset, approximately immediately east of the study area. During the survey a previously recorded scarred tree was relocated, and two waterholes and an ochre quarrying site were also identified. The assessment considered that the entire area was a landform of Aboriginal archaeological interest (given its proximity to a number of drainage lines and relatively undisturbed nature) and recommended that further archaeological investigation was warranted.

AHIMS search results

The location of Aboriginal sites is considered culturally sensitive information which must be redacted from this report if it is to enter the public domain.

A search of the AHIMS database was completed on 6 November 2020 for an area of land at datum GDA, zone 56, [redacted] with a buffer of 0 meters. Land surrounding the study area was included within the search parameters to gain information on the regional archaeological context and inform predictive statements regarding the archaeological potential of the study area.

The AHIMS search results identified 51 registered sites and one gazetted Aboriginal place (Lake Macquarie Resting Place). There are 20 standard AHIMS site features and a site can include more than one feature. The frequency of AHIMS site features is included in Table 1 below.

Table 1. Summary of AHIMS features.

Site Feature	Number	Percentage
Artefact	26	50.98%
Hearth, Potential Archaeological Deposit (PAD)	1	1.96%
Shell, Artefact	7	13.73%
Potential Archaeological Deposit (PAD)	6	11.76%

Site Feature	Number	Percentage
Water Hole	3	5.88%
Stone Arrangement	1	1.96%
Shell, Potential Archaeological Deposit (PAD)	1	1.96%
Artefact, Potential Archaeological Deposit (PAD)	2	3.92%
Shell	2	3.92%
Modified Tree (Carved or Scarred)	2	3.92%
Total	51	100.00%

One Aboriginal site, Mannering Creek AS1 (AHIMS ID 45-3-4337) is [redacted] AHIMS ID 45-3-4337 is a low density, subsurface artefact scatter, comprised of two stone artefacts, identified through a test excavation program within a context of low archaeological integrity. [redacted] It is unlikely that AHIMS ID 45-3-4337 will be impacted by the proposed works.

The distribution and nature of Aboriginal sites is a reflection of past landscape utilisation and can be used to generate predictive statements regarding the location of additional archaeological resources. The majority of the registered Aboriginal sites consist of artefact sites (50.98%). The distribution of AHIMS sites across the region is directly correlated to landform, land disturbances, and proximity to permanent water sources. Based on the results of the AHIMS search, it is unlikely that additional sites will be located within the rail corridor, due to historic land disturbance. However, additional sites may be located within undeveloped areas of land surrounding the rail corridor, especially in location close to permanent water sources.

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4. Site inspection

An inspection of the study area was completed by [redacted] (Senior Heritage Advisor, Extent Heritage) on 16 November 2020 with [redacted] (Protection Officer, Sydney Trains) and [redacted] (Consultant, Aurecon Heritage) acting as escort. The aim of the site inspection was to gain an overall impression of the intactness of the study area and identify whether Aboriginal objects occur, or are likely to occur, beneath the ground surface. A combination of vehicle and pedestrian inspection was utilised. The inspection of the study area was limited to the locations of the proposed works, between the Vales Point Balloon Loop and Morisset Station. A handheld GPS was used to record the teams tracks and a photographic record was kept of representative sections of the study area.

The Morisset Station was located on a slope landform which rises to the north and descends to the south. The land has been subject to cut and fill works to establish a flat plain for the station and associated car parking (Figure 5). The station has been subject to several phases of upgrade since establishment, including the installation of electronic signalling, public telephones, display monitors, electronic ticketing facilities, public toilets, drinking fountains, and security cameras (Figure 6, Figure 7 and Figure 8). Vegetation within the station area was limited to manicured grass adjust to the rail track and introduced trees and hedges approximately 20 m from the tracks (Figure 9).

The rail alignment south of the Morisset Station is located on an undulating landform that ranging from 15 m – 40 m above sea level. Historic cut and fill works have been completed along the rail alignment between the Morisset Station and the Vales Point Balloon Loop to establish a flat plain for the railway tracks (Figure 10 and Figure 11). Portions of this area have been cut through the sandstone bedrock, removing any potential archaeological deposits (Figure 12). Subsurface utilities and power exchanges were located across the alignment of the track, indicting additional subsurface disturbance across this area (Figure 13). Vegetation was limited to regrowth adjacent the rail corridor. Two east-west orientated, ephemeral tributaries of Pourmalong Creek where found to cross the rail line between the Morisset Station and the Vales Point Balloon Loop. Rail bridges have been established at the location of both creeklines (Figure 14). The land surrounding the creeklines has been subject to ground disturbing works from the establishment of subsurface utilities and bridges.

A steep downward slope was identified immediately east of the Vales Point Balloon Loop (Figure 15). In additional the landform on which the loop had been established was found to be a flat plain, indicating that the landscape had been artificially established through the importation of fill material (Figure 16).

An attempt was made to visit the location of AHIMS ID 45-3-4337 [redacted] However, at the time the site inspection was completed, a construction compound had been established and access was not possible. Based on information from the site card, it is unlikely that AHIMS ID 45-3-4337 extends into the rail corridor.

No Aboriginal objects or areas of archaeological potential were identified during the inspection.

5. Assessment of archaeological potential

The assessment of archaeological potential is based on the consideration of two factors, the presence of archaeological sensitive landforms across the study and any identified ground disturbance to these landforms.

Archaeologically sensitive landforms

Particular landforms in NSW are known to have been favoured locations for repeated or long-term occupation and hence, more likely to retain archaeological evidence of past Aboriginal use. Within the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010:12), five landscape features (aside from historically undisturbed land in general) have been identified to have potential for Aboriginal objects or places to be present:

- Within 200 m of waters.
- Within a sand dune system.
- On a ridge top, ridge line or headland.
- Within 200 m below or above a cliff face.
- Within 20 m of, or inside a cave, rock shelter, or a cave mouth.

Multiple major creeklines flow through the study area. As a result, portions of the study area are located on archaeologically sensitive landforms (Figure 4).

Ground Disturbance

This due diligence assessment has identified that the majority of the study area has been subject to various past ground disturbances including clearing of vegetation, construction of various permanent structures, rail tracks, artificial modification of the landscape, vegetation clearance, earth movement, and installation of subsurface cables and utilities.

Based on background information, Aboriginal site distributions in the region, and known levels of disturbance at the site; it is considered that the study area demonstrates low archaeological potential for Aboriginal objects to occur beneath the ground surface.

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6. Conclusions and recommendations

One AHIMS site, AHIMS ID 45-3-4337, is located within the study area. Based on the description of works, the location of AHIMS ID 45-3-4337 will not be impacted by the proposed works. No areas of Aboriginal archaeological potential were identified within the study area. As a result, the following recommendations have been made based on the statutory requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010).

- There is low potential for sub-surface Aboriginal objects or places to be present in the study area. Further archaeological investigation or Aboriginal stakeholder consultation is not required, and development may proceed with caution.
- Based on the description of the proposed works, the location of AHIMS ID 45-3-4337 will not be impacted by the proposed works. It is recommended that the location of AHIMS ID 45-3-4337 is marked on all relevant construction plans and all project personnel are informed that the site is not to be impacted. Where impacts to AHIMS ID 45-3-4337 are required to facilitate the proposed works, an approved AHIP must be obtained from Heritage NSW – DPC.
- If the development footprint is enlarged or changes to include any part of adjacent lots, investigation in the form of another Aboriginal cultural heritage due diligence assessment would be required in line with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010).
- Unexpected finds remain protected under the NPW Act. If any Aboriginal objects are uncovered during completion of the proposed works, procedures outlined in the Sydney Trains Unexpected Archaeological Finds Procedure must be followed.
- If human remains are discovered, the Coroners Act requires that all works should cease and the NSW Police and the NSW Coroner's Office should be contacted. Aboriginal burials which occur outside of designated cemeteries are protected under the National Parks and Wildlife Act, and should not be disturbed. Interpreting the age and nature of skeletal remains is a specialist field, and an appropriately skilled archaeologist or physical anthropologist should therefore be contacted to inspect the find and recommend an appropriate course of action. Should the remains prove to be Aboriginal in origin, you are required to notify Heritage NSW – DPC and the Local Aboriginal Land Council. Notification should also be made to the Commonwealth Minister for the Environment, under the provisions of the Aboriginal and Torres Strait Islander Heritage Protection Act.

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Table 2. Site specific responses to the generic due diligence process (DECCW 2010: 9-14).

1. Will the activity disturb the ground surface or any culturally modified trees? **Yes.** The proposed development includes the establishment of new surface and subface infrastructure. *No culturally modified trees are present in the study area.*	*Proceed to Question 2a.*
2a. Are there any relevant confirmed site records or other associated landscape feature information on AHIMS? **Yes.** The AHIMS database indicates that one low density, subsurface artefact scatter (AHIMS ID 45-3-4337) is located within the southwest portion of the study area.	*Proceed to Question 2b.*
2b. Are there any other sources of information of which a person is already aware? **No.** The research undertaken for this assessment did not identify any other relevant sources of information indicating the presence of sites within the study area.	*Proceed to Question 2c.*
2c. Are there any landscape features that are likely to indicate presence of Aboriginal objects? **No.** Several waterways flow through the study area, but the study area has been subject to extensive ground disturbance and is unlikely to contain additional Aboriginal objects.	*Proceed to Question 3.*
3. Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided? **Yes.** AHIMS ID 45-3-4337 is located on private property, separated from the rail corridor by two fences.	*Proceed to Question 6.*
4. Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely? **No.** Desktop assessment and site inspection indicates that the study area contains a low level of sub-surface archaeological potential. This conclusion is based on moderate to high levels of ground disturbance.	**Proceed with caution.**

7. Figures

Figure 1. Location of the study area.

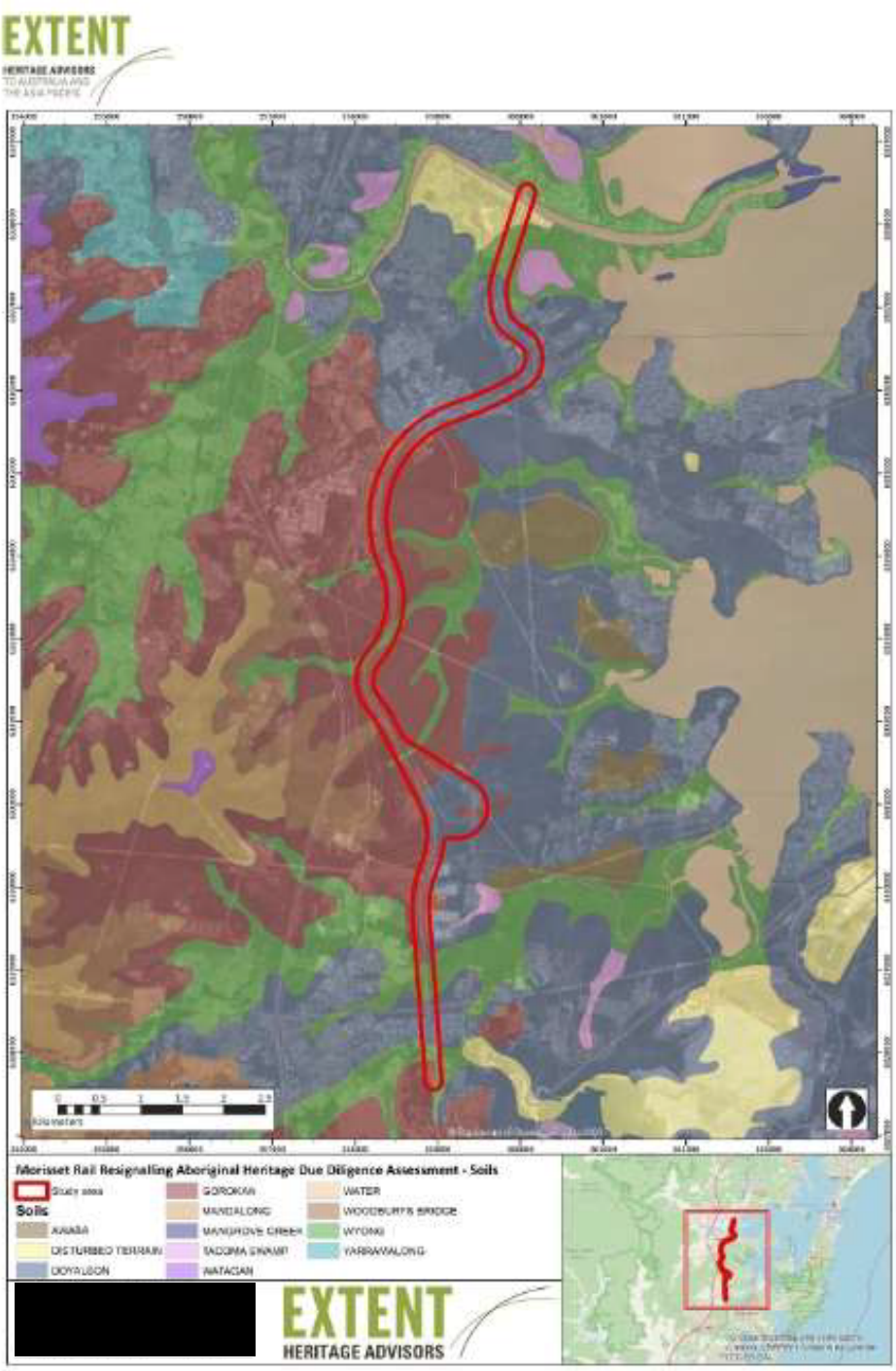

Figure 2. Soil landscapes across the study area.

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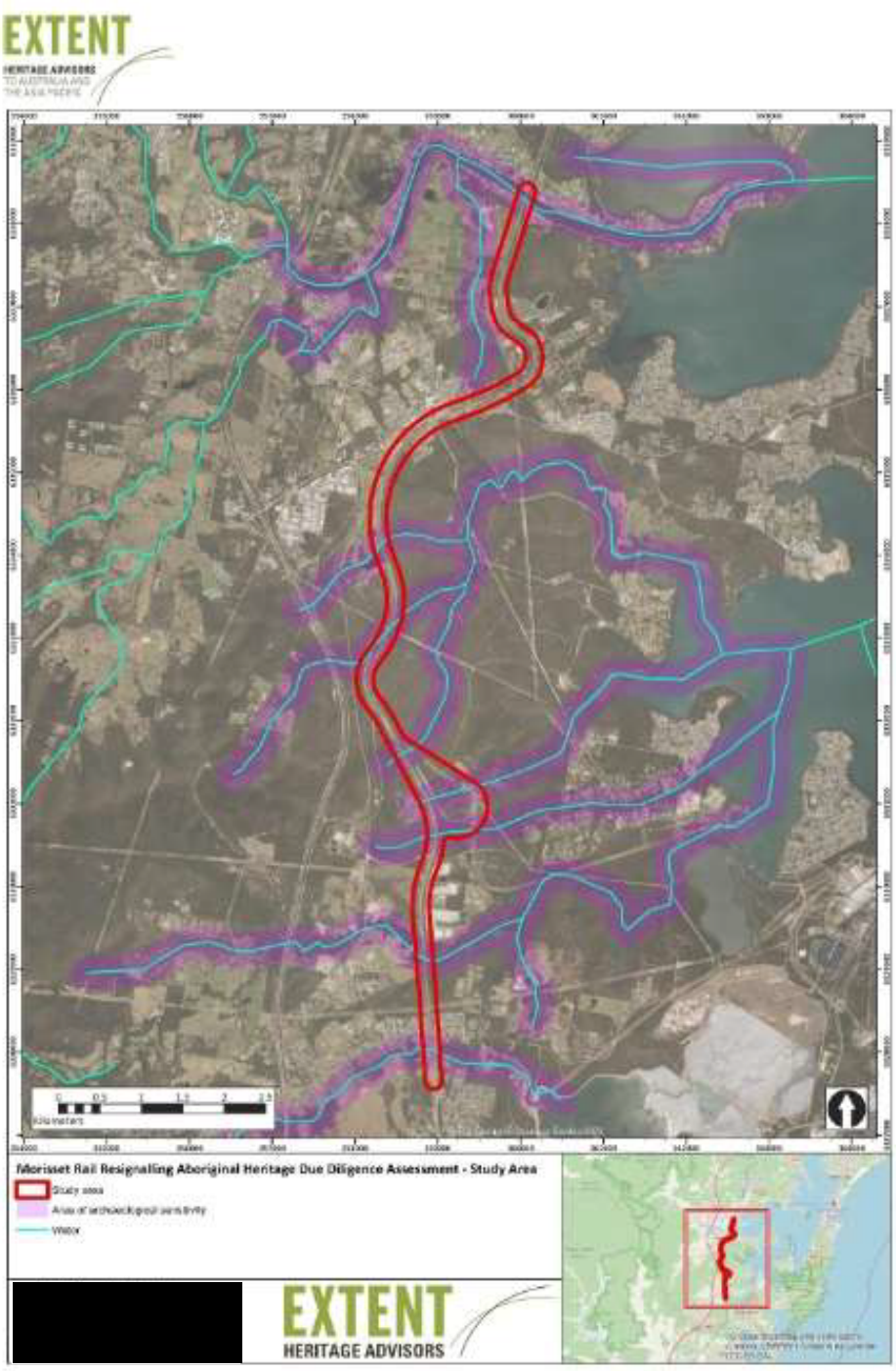

Figure 4. Archaeologically sensitive landforms.

Figure 5. View south showing the cut into the sloping landform to establish Morisset Station.

Figure 6. View south across Morisset Station

Figure 7. View south across Morisset Station

Figure 8. View north or existing signals and infrastructure immediately north of the Morisset Station.

Figure 9. View south of vegetation to the east of Morisset Station.

Figure 10. View north showing vegetation clearance and imported fill material.

Figure 11. View north of retaining wall established to maintain cut of rail line.

Figure 12. View south of cut into bedrock

Figure 13. View east showing electrical substation and infrastructure within the rail corridor between Morisset Station and Vales Point.

Figure 14. View east of bridge established between Vales Point and Morisset station.

Figure 15. View north-east showing the height of the fill used to establish the Vales Point Balloon Loop

Figure 16. View south of artificial terrace landform established for the Vales Point Balloon Loop.

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References

AHMS 2014. Tarro to Beresfield Trunk Water Main Replacement Aboriginal Cultural Heritage Assessment. Prepared for Hunter Water Australia.

Backhouse, J. 1843. *Narrative of a Visit to the Australian Colonies*. London: Hamilton, Adams and Co..

Clouten, K.H. 1967. Reid's Mistake: The Story of Lake Macquarie from its Discovery until 1890. Prepared for Lake Macquarie Shire Council.

Dallas, M. 1990. *Archaeological survey of the Wangi Power Station site*. Unpublished report prepared for Gutteridge, Haskins and Davey Pty Ltd.

Dallas, M., Navin, K. and McConchie, D. 1993. *Archaeological Investigation of the Morisset Peninsula Sewerage Scheme*. Consultancy report prepared for Public Works Department Hunter Sewerage Project.

Department of Environment and Conservation 2005. *Comprehensive Coastal Assessment: Aboriginal Cultural Heritage Data Audit / NSW Department of Environment and Conservation*.

ERM 2009. Landcom Crown Homes Site Morisset: Aboriginal Heritage Assessment. Consultancy report prepared for ADW Johnson.

Gunson, N. (ed) 1974. *Australian reminiscences & papers of L.E. Threlkeld, missionary to the Aborigines, 1824-1859, 2 vols*. Australian Institute of Aboriginal Studies, Canberra.

Haglund, L. 1986. Assessment of the Prehistoric Heritage in the Lake Macquarie Area. Prepared for Lake Macquarie City Council.

Hughes, P.J. and Sullivan, M.E. 1999. 'A 5000 Year Old Shell Midden near Tea Gardens, New SouthWales', in J. Hall and I.J. McNiven (eds.), *Australian Coastal Archaeology*. The Australian University, Canberra. pp219 – 228.

Maynard, J. 2015. *Whose Traditional Land?* University of Newcastle, Newcastle.

Murphy, C.L. 1993. *Soil Landscapes of the Gosford-Lake Macquarie 1:100 000 Sheet*. Soil Conservation Service of NSW, Sydney.

Resource Planning 1992. *Report of an Archaeological Survey at Windermere Creek, Lake Macquarie*. Consultancy report prepared for Lake Macquarie City Council.

Scott, W. 1929. *Recollections - The Port Stephens Blacks*. Chronicle Press: Dungog.

Sullivan, M.E. 1982. Aboriginal Shell Middens in the Coastal Landscape of NSW. Unpublished PhD Thesis, Australian National University.

Tindale, N. 1974. *Aboriginal tribes of Australia : their terrain, environmental controls, distribution, limits, and proper names*. ANU Press, Canberra.

Appendix A. Information on legislation

EXTENT HERITAGE ADVISERS TO AUSTRALIA AND THE ASIA PACIFIC

A.1. Commonwealth Legislation

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Aboriginal and Torres Strait Islander Heritage Protection Act was enacted at a Federal level to preserve and protect areas (particularly sacred sites) and objects of particular significance to Aboriginal Australians from damage or desecration. Steps necessary for the protection of a threatened place are outlined in a gazetted Ministerial Declaration (Sections 9 and 10). This can include the preclusion of development.

As well as providing protection to areas, it can also protect objects by Declaration, in particular Aboriginal skeletal remains (Section 12). Although this is a Federal Act, it can be invoked on a State level if the State is unwilling or unable to provide protection for such sites or objects.

Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act provides for the protection of natural and cultural heritage places. The Act establishes (amongst other things) a National Heritage List (NHL) and a Commonwealth Heritage List (CHL). Places on the NHL are of natural or cultural significance at a national level and can be in public or private ownership. The CHL is limited to places owned or occupied by the Commonwealth which are of heritage significance for certain specified reasons.

Places listed on the NHL are considered to be of State and local heritage value, even if State or local various heritage lists do not specifically include them.

The heritage values of places on the NHL or the CHL are protected under the terms of the EPBC Act. The Act requires that the Minister administering the EPBC Act assess any action which has, will have, or is likely to have, a significant impact on the heritage values of a listed place. The approval (or rejection) follows the referral of the matter by the relevant agency's Minister.

Native Title Act 1993

The Native Title Act provides recognition and protection for native title. The Act established the National Native Title Tribunal to administer native title claims to rights and interests over lands and waters by Aboriginal people. The Tribunal also administers the future act processes that attract the right to negotiate under the Native Title Act 1993.

The Act also provides for Indigenous Land Use Agreements (ILUA). An ILUA is an agreement between a native title group and others about the use and management of land and waters. ILUAs were introduced as a result of amendments to the Native Title Act in 1998. They allow people to negotiate flexible, pragmatic agreements to suit their particular circumstances.

An ILUA can be negotiated over areas where native title has, or has not yet, been determined. They can be part of a native title determination, or settled separately from a native title claim. An ILUA can be negotiated and registered whether there is a native title claim over the area or not.

A.2. NSW state legislation

Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act (EP&A Act) requires that environmental and heritage impacts are considered by consent authorities prior to granting development approvals. The relevant sections of the EP&A Act are:

- Part 4: Development that requires consent under consideration of environmental planning instruments.
- Part 5: An assessment process for activities undertaken by Public Authorities and for developments that do not require development consent but an approval under another mechanism.

Where Project Approval is to be determined under Part 4 (Division 4.1) of the Act, further approvals under the *National Parks and Wildlife Act 1974*, are not required. In those instances, management of Aboriginal heritage follows the applicable Aboriginal assessment guidelines and any relevant statement of commitments included in the Development Approval.

National Parks and Wildlife Act 1974

The National Parks and Wildlife Act (NPW Act) provides blanket protection for Aboriginal objects (material evidence of Indigenous occupation) and Aboriginal places (areas of cultural significance to the Aboriginal community) across New South Wales. An Aboriginal object is defined as:

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

An Aboriginal place is any place declared to be an Aboriginal place by the Minister for the Environment, under section 84 of the Act.

It is an offence to disturb Aboriginal objects or places without a permit authorised by the Director-General of the Office of Environment and Heritage. In addition, anyone who discovers an Aboriginal object is obliged to report the discovery to Heritage NSW – DPC.

The operation of the NPW Act is administered by Heritage NSW – DPC. With regard to the assessment of Aboriginal cultural heritage, Heritage NSW – DPC has endorsed the following guidelines:

- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010),
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010),

- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010), and
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (2011).

Aboriginal Land Rights Act 1983

The Aboriginal Land Rights Act allows for the transfer of ownership to a Local Aboriginal Land Council of vacant Crown land not required for an essential purpose or for residential land. These lands are then managed and maintained by the Local Aboriginal Land Council.

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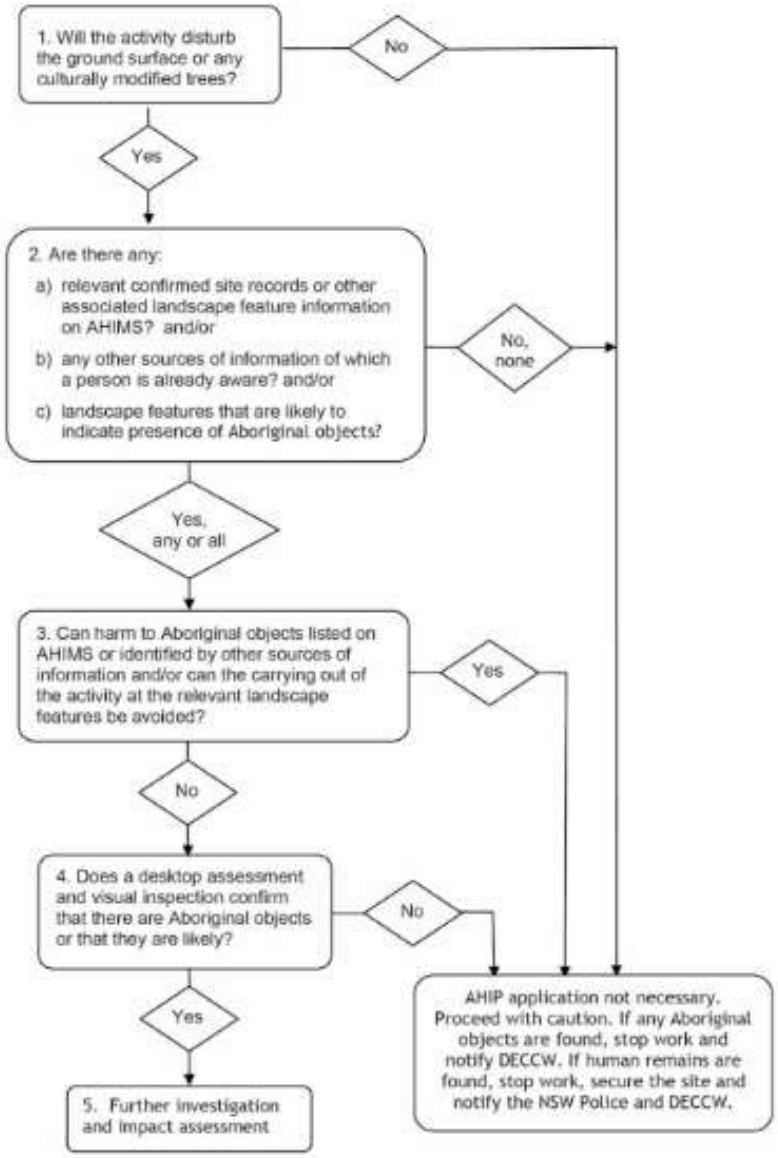
Appendix B. Due diligence flow chart



Appendix C. AHIMS search

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A7. Historical Impact Assessment

Memo: Morisset to Vales Point (MVP) Resignalling Proposal: Non-Aboriginal (historical) archaeological inputs for Detailed Design phase

Project: Morisset to Vales Point (MVP) Resignalling Proposal	**Date:** 19 December 2023
To: [redacted]	**From:** [redacted] Artefact Heritage and Environment

1.1 Introduction

In 2021, A Preliminary Heritage Impact Assessment (HIA) report was prepared by Aurecon for the Morisset and Vales Point (MVP) Resignalling Works proposal to inform a draft Review of Environmental Factors (REF).[1] The draft report concluded that the study area had generally low non-Aboriginal (historical) archaeological potential and made the following recommendation:

- During detailed design, further specialist archaeological advice should be sought if impacts are likely to change.

Consequently, Artefact Heritage Services Pty Ltd (Artefact) have been engaged by CCG Architects to provide non-Aboriginal (historical) archaeological inputs for the detailed design phase of the Morisset to Vales Point resignalling proposal.

This report summarises the findings of the concept design phase non-Aboriginal (historical) archaeological impact assessment conducted by Aurecon in 2021 and provides an updated impact assessment based on the detailed designs provided by SMEC in 2023.

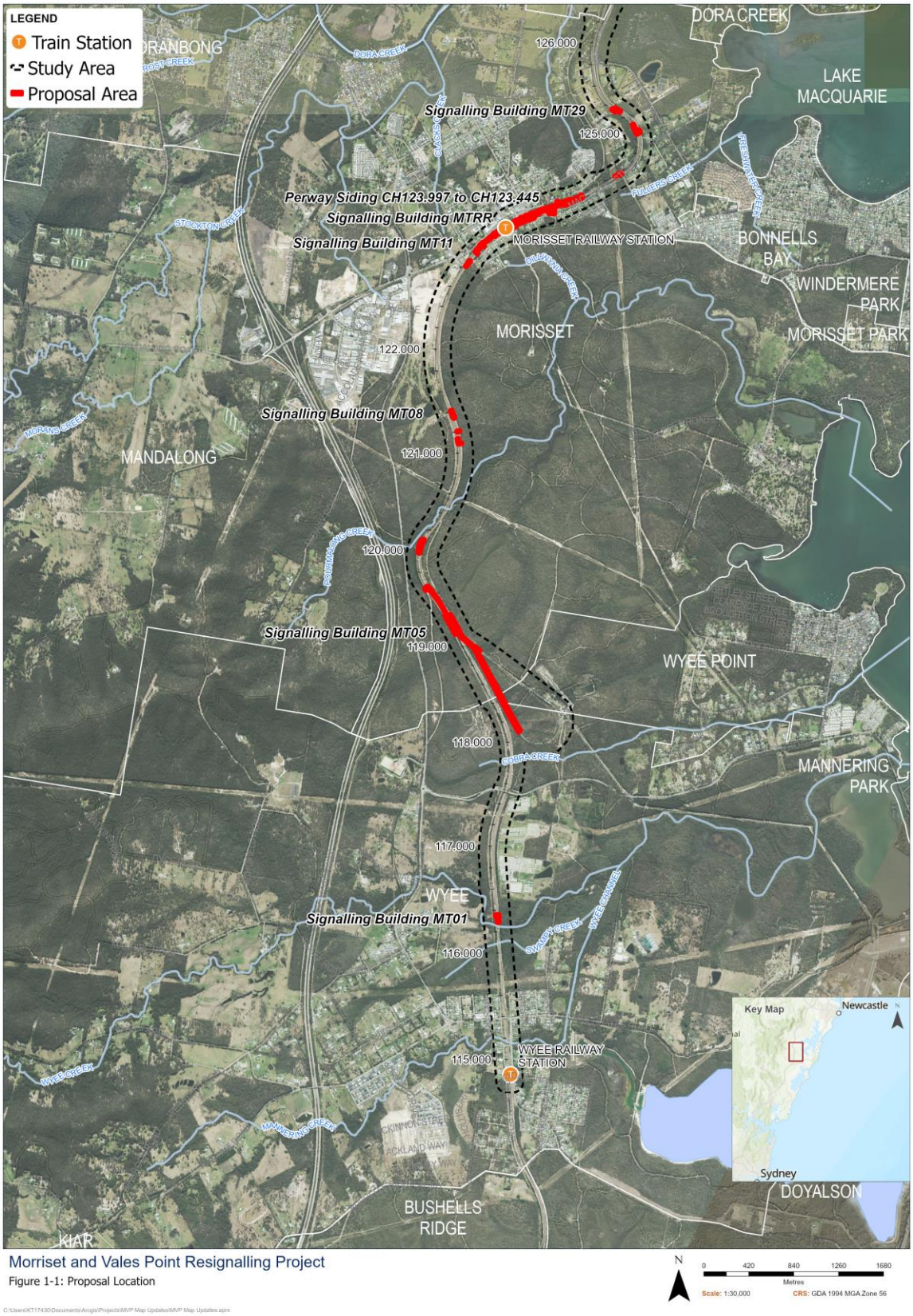
This report was prepared by [redacted] (Heritage Consultant) and [redacted] (Technical Director) both of Artefact.

1.1.1 The study area

The proposed works are located on the Main North Line approximately 45km south of Newcastle, with the southern limit of the study area at 116.000 km (between Wyee and Vales Point) and the northern limits at 126.900 km (between Morisset and Dora Creek). The study area is located within the Lake Macquarie local government area (LGA) and includes the Morisset Railway Station and Vales Point Balloon Loop.

[1] Aurecon, *Morisset and Vales Point Resignalling Works, preliminary Heritage Impact Assessment,* for Sydney Trains, 14 May 2021.

Figure 1: Study area



1.1.2 Key objective

The key objective of the MVP resignalling proposal is for provision of a new signalling system in the Morisset and Vales Point area, to upgrade existing and expired equipment to a modern computer-based interlocking system known as the Advanced Train Running Information Control System (ATRICS), that can be remote controlled from a new Control Centre at Wyong.

1.2 Exclusions and assumptions

This updated impact assessment is based on the findings of the preliminary assessment of archaeological potential and significance prepared by Aurecon in the 2021 HIA report. Historical overlays have been prepared to refine this assessment.

This document includes an updated search of statutory heritage registers including the NSW State Heritage Register (SHR), relevant S170 Heritage and Conservation Registers, Lake Macquarie Local Environmental Plan (LEP) 2014 and other supporting registers and reports including the NSW State Heritage Inventory (SHI) and Lake Macquarie Development Control Plan (DCP) 2014. This search was undertaken on the 17 October 2023.

This report provides an updated assessment of the potential impact of the detailed design on non-Aboriginal (historical) archaeological resources and provides recommended mitigation measures in line with legislative requirements.

This report assesses non-Aboriginal (historical) archaeological potential only and does not assess Aboriginal or built heritage.

1.3 Updated Heritage register searches

An updated search of all above registers was undertaken on 5 September 2023. The results are displayed below in Table 1 and did not identify any new listed heritage items. Listed heritage items and their curtilages are shown in Figure 2.

Table 1: Applicable listings to heritage items located in the vicinity of the study area

Item Name	Significance	Item/Listing Number	Relevant Legislation
Morisset Railway Station Group and Residences	Local	TAHE Heritage and Conservation Register (SHI 4801056)	*Heritage Act* 1977
Dora Creek Railway Underbridge	Local	TAHE Heritage and Conservation Register (SHI 4803388)	*Heritage Act* 1977
Garden Suburb to Wyee, Railway Line	Local	TAHE Heritage and Conservation Register (SHI 4805752)	*Heritage Act* 1977
Tree – Morisset's Campsite	Local	Lake Macquarie LEP 2014 (Item No.120)	Lake Macquarie LEP 2014

Item Name	Significance	Item/Listing Number	Relevant Legislation
Great Northern Railway	Local	Lake Macquarie LEP 2014 (Item No.189)	Lake Macquarie LEP 2014
Stationmasters house	Local	Lake Macquarie LEP 2014 (LEP #119)	Lake Macquarie LEP 2014
Wyee coal conveyor railway loop	Local	Lake Macquarie LEP 2014 (LEP #225)	Lake Macquarie LEP 2014
Mullard Chambers Building	Local	Lake Macquarie LEP 2014 (LEP #230)	Lake Macquarie LEP 2014
Community Hall	Local	Lake Macquarie LEP 2014 (LEP #231)	Lake Macquarie LEP 2014

1.4 Heritage management framework

There are several items of State legislation that are relevant to the study area. A summary of these and the potential legislative implications follow.

1.4.1 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be significant to the State are listed on the SHR and cannot be demolished, altered, moved or damaged, or their significance altered without approval from the Heritage Council of NSW.

There are no items within the study area listed on the SHR.

1.4.1.1 The 2009 'Relics provisions'

The Heritage Act also provides protection for 'relics', which includes archaeological material or deposits. According to Section 139 (Division 9: Section 139, 140-146):

(1) A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance is carried out in accordance with an excavation permit.

(2) A person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.

(3) This section does not apply to a relic that is subject to an interim heritage order made by the Minister or a listing on the State Heritage Register.

(4) The Heritage Council may by order published in the Gazette create exceptions to this section, either unconditionally or subject to conditions, in respect of any of the following:

a. Any relic of a specified kind or description,

b. Any disturbance of excavation of a specified kind or description,
c. Any disturbance or excavation of land in a specified location or having specified features or attributes,
d. Any disturbance or excavation of land in respect of which an archaeological assessment approved by the Heritage Council indicates that there is little likelihood of there being any relics in the land.

Section 4 (1) of the Heritage Act (as amended in 2009) defines a relic as:

> *…any deposit, artefact, object or material evidence that:*
>
> *relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local heritage significance*

A relic has been further defined as:

> *Relevant case law and the general principles of statutory interpretation strongly indicate that a 'relic' is properly regarded as an object or chattel. A relic can, in some circumstances, become part of the land be regarded as a fixture (a chattel that becomes permanently affixed to land).*[2]

Excavation permits are issued by the Heritage Council of NSW, or its Delegate, under Section 140 of the Heritage Act for relics not listed on the SHR or under Section 60 for relics listed on the SHR. An application for an excavation permit must be supported by an Archaeological Research Design and Archaeological Assessment prepared in accordance with the NSW Heritage Division archaeological guidelines. Minor works that will have a minimal impact on archaeological relics may be granted an exception under Section 139 (4) or an exemption under Section 57 (2) of the Heritage Act.

Definition of works

The Heritage Act includes archaeological 'works' as a separate category to archaeological 'relics'. Exposure of a 'work' does not trigger reporting obligations under the Act. The following examples are commonly considered to be 'works': former road surfaces or pavement, kerbing, evidence of former infrastructure (such as drains or drainage pits where there are no relics in association), tram and train tracks and ballast and evidence of former rail platforms and bridges.

1.4.2 Section 170 registers

Under the Heritage Act all government agencies are required to identify, conserve and manage heritage items in their ownership or control. Section 170 (s170) of the Act requires all government agencies to maintain a Heritage and Conservation Register (s170 Register) that lists all heritage assets and contains an assessment of the significance of each asset. They must also ensure that all items inscribed on its list are maintained with due diligence in accordance with State Owned Heritage Management Principles approved by the Government on advice of the NSW Heritage Council. These principles serve to protect and conserve the heritage significance of items and are based on NSW heritage legislation and guidelines.

[2] *Assessing Significance for Archaeological Sites and 'Relics'*, Heritage Branch, Department of Planning, 2009:7.

The study area includes the following items listed on the Transport Asset Holding Entity (TAHE) s170 Register:

- Morisset Railway Station Group and Residences (SHI 4801056)
- Dora Creek Railway Underbridge (SHI 4803388)
- Garden Suburb to Wyee, Railway Line (SHI 4805752).

Morisset Railway Station Group and Residences, TAHE Heritage and Conservation Register #4801056

Morisset Railway Station is located in a large open area between Dora and Macquarie Streets at the centre of Morisset. The station comprises two platforms, a station building (with incorporated signal box); modern waiting room; modern footbridge; and two railway residences. The main approach to the station is by means of a forecourt off Dora Street which, along with the adjacent Lions Park, creates a landscaped setting for the main station building. There are car parks adjacent to the station, accessed from both Dora and Macquarie Streets. The southern car park is located on the former siding and goods yard.

The Station Building and Signal Box is the principle building at Morisset Railway Station and was constructed in 1938. Its exterior features a corrugated metal hipped roof, cantilevered steel-framed awning on the platform (southern) side with a box gutter, timber framed windows and doors, brick windowsills and lintels, and some original terrazzo thresholds. Internal finishes are simple with rendered walls, fibre cement ceilings and some original furniture remain extant such as timber benches in the waiting room/ticket office. The Signal Box retains its internal original fabric including a 34 lever mechanical signalling frame, timber framed pulling list, timber framed Morisset control panel (dated 1963), Vales Point control panel (push button type), timber cabinets with signal logs and keys, timber telephone cabinet, warning bells, detonator box, padlocks, and shelving.

Statement of significance

The NSW SHI database contains the following statement of significance for the item:

> *Morisset Railway Station has heritage significance at a local level. Opened in 1897 Morisset station had a direct impact on the development of the local area, with the central commercial area of Morisset growing around the station. The current station building, built in 1938, physically represents the growth of Morisset in the 1930s, associated with the opening of Morisset Hospital and in particular the increasing demand on rail transport created by the Hospital. The current form of the station group reflects changing technological and social requirements of the station since the late [1]9th century. The Station has aesthetic significance as a good example of a 1930s railway station building with a highly intact incorporated signal box, with simple detailing typical of the interwar period. The two residences, particularly the Station Master's Residence, are good representative examples of the standard design Type J1 and J2 railway residences that were constructed for several decades from the 1880s.*
>
> *A Eucalyptus sp. tree on the southern boundary of the station ('Morisset's tree') has local heritage significance as a rare remnant tree that may predate European*

settlement of the area, and which is historically associated with James Thomas Morisset, early military Commandant of the Newcastle penal settlement..[3]

The 2021 Aurecon HIA report found that the following heritage items would not be impacted based on the concept design scope of works, so their details and statements of significance have not been reproduced here:

- Dora Creek Railway Underbridge, TAHE Heritage and Conservation Register #4803388
- Garden Suburb to Wyee, Railway Line, TAHE Heritage and Conservation Register #4805752.

There have been no changes in potential impact to these heritage items as a result of the detailed design.

1.4.3 Environmental Planning and Assessment Act 1979 (NSW)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process. The EP&A Act also requires that local governments prepare planning instruments (such as LEPs and DCPs) in accordance with the EP&A Act to provide guidance on the level of environmental assessment required.

The proposal area falls within the boundaries of the Lake Macquarie City Council LGA. Schedule 5 of the Lake Macquarie LEP 2014 includes a list of items/sites of heritage significance within this LGA.

The study area falls within the boundaries of the Lake Macquarie LGA. The study area is therefore subject to the Lake Macquarie LEP 2014.

1.4.4 Lake Macquarie LEP 2014

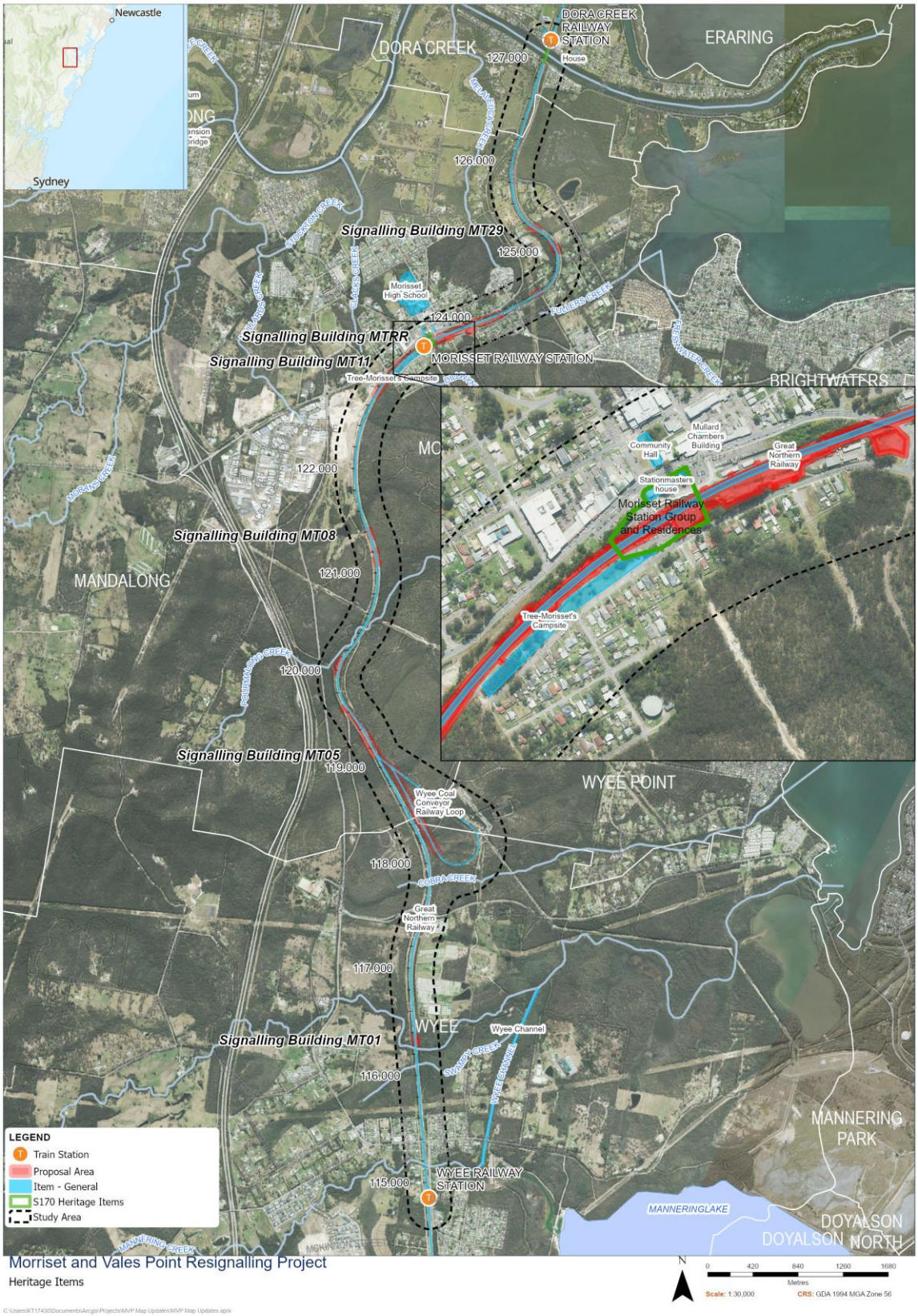
The aim of the LEP in relation to heritage is to conserve the heritage significance of heritage items and Heritage Conservation Areas (HCAs), including associated fabric, settings, views and archaeological sites. The LEP list items of heritage significance within the LGA and specifies aims and objectives to be addressed in any Development Application (DA). Clause 5.10 outlines the provisions which apply to heritage conservation and requirements in relation to development applications affecting a heritage item or within a HCA.

The study area contains the following items listed in Schedule 5 of the Lake Macquarie LEP 2014:

- Stationmasters house (LEP #119)
- Tree-Morisset's Campsite (LEP #120)
- Great Northern Railway Alignment (LEP #189)
- Wyee coal conveyor railway loop (LEP #225)
- Mullard Chambers Building (LEP #230)
- Community Hall (LEP #231).

[3] Office of Environment and Heritage, 2009. 'Morisset Railway Station Group and Residences'. Viewed 4 September 2023 at: https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=4801056

Figure 2: Heritage map. Source: SMEC



1.5 Archaeological Context

Aurecon previously prepared an assessment of non-Aboriginal (historical) archaeological potential and significance for the study area as part of the 2021 HIA. This assessment identified key areas with potential to contain significant historical archaeological resources.

There was some inconsistency throughout the report regarding the identified levels of archaeological potential.

The areas were identified as below and are illustrated in Figure 3:

- Zone 1* - Morisset Station (Low – moderate potential).
    - Zone 1.1 – Former Down Yards (Low – moderate potential)
    - Zone 1.2 – Former Up Yards (Low – moderate potential)
- Zone 2 - Vales Point Loop (Low potential).
- Zone 3 - The remaining railway corridor from Dora Creek to Wyee Station (Low potential).

Aurecon concluded that the subsurface historical archaeological potential across all zones was generally low.

*Note that the Aurecon report assessed the archaeological potential of Zone 1 as being being both 'low' and 'moderate.' This assessment has therefore assumed that the overall archaeological potential of Zone 1 is Low to moderate.

1.5.1 Zone 1: Morisset Station

Aurecon made the following conclusions: *There is low potential for subsurface deposits or works associated with the former 19th Century platform or the former c.1910 platform on the Down side including all buildings and structures pre-dating the current Station due to the broad-scale clearance, demolition and disturbance that occurred at duplication in the c.1910s and electrification in the c.1980s.*

Structural remains from historical phases 2 – 3 including stone foundations, concrete coping, original footings, or gravel associated with the former platform surfaces, or elements of rail infrastructure such as rail tracks, sleepers, services, roads and pathways, remnant landscaping, culverts, and water receptacles would all be considered 'works' under the Act and not 'relics' under the Heritage Act. They would therefore not be covered by the archaeological 'relics' provisions of the Act.

The potential archaeological resource was assessed as being unlikely to reach the threshold for local or state significance.[4]

1.5.1.1 Zone 1.1 – Former Down Yards

Aurecon made the following conclusions:

There is a low potential for any subsurface deposits or works associated with historical archaeology. This includes any former structure footings of the Sheds and jib crane located within the Yards, stone or concrete or timber materials associated with these structures, buried track and timber sleepers from former sidings, the stone embankment associated with the Loading Bank as well as tools would be considered 'works' under the Act works' and not 'relics' under the Heritage Act. They would therefore not be covered by the archaeological 'relics' provisions of the Act. Rubbish and ash

[4] Aurecon, 14 May 2021, p. 137

pits associated with the stabling of goods in the former Yards would consist of fragmented remains and would be considered deposits.

Although there have been high levels of disturbance in the former Down Yards, the method of demolition is unknown, however the gradient of the Yard remains largely flat suggesting that a full removal of all materials associated with the former structures was completed, and any potential deposits or works are likely to be fragmented or ephemeral.[5]

It is noted that a brick embankment is extant on the Country side of the former Yards, which can be seen on the 1965 historical aerial, see Figure 70. This embankment is likely to have been part of the Loading Bank site.

The potential archaeological resource was assessed as being unlikely to reach the threshold for local or state significance.

1.5.1.2 Zone 1.2 – Former Up Yards

Aurecon made the following conclusions:

There is low potential for any subsurface deposits or works associated with the former Up Yards. The former stockyards and dam, dating from c.1880s, have the least potential for any remains. The dam was likely filled in and/or drained and any potential for subsurface deposits is low to nil. Timber posts and fencing associated with the stockyards were removed in 1967 and would likely have been fully demolished. If any resources remain they would be considered 'works' and not 'relics' under the Heritage Act. They would therefore not be covered by the archaeological 'relics' provisions of the Act. If found, any deposits would likely be highly fragmented and ephemeral.

Any potential works associated with former c.1910s sidings are also likely to be extremely disturbed, and the likelihood of buried track and / or timber sleepers is very low.

The yards have since been used for stockpiling and storage, which would have involved the levelling and coverage of the area within the last 20 to 30 years. This suggests that any potential for subsurface archaeological remains of the former Up Yards is extremely low.

The potential archaeological resource was assessed as being unlikely to reach the threshold for local or state significance.[6]

1.5.2 Zone 2: Vales Point Loop

Aurecon made the following conclusions:

There is low potential for historical subsurface archaeological deposits or works within this area as it was largely undisturbed bushland until 1970. Historical plans and secondary sources do not indicate any areas that would yield historical archaeological remains.

Historical aerials of the area in the 1960s show that this area was bushland. Historical archaeological potential is low to nil.

The potential archaeological resource was assessed as being unlikely to reach the threshold for local or state significance.[7]

[5] Aurecon, 14 May 2021, p. 136
[7] Aurecon, 14 May 2021, p. 137
[7] Aurecon, 14 May 2021, p. 137

1.5.3 Zone 3: Remainder of the study area

Aurecon made the following conclusions:

There is low to nil potential for any subsurface works or deposits associated with the colonial development in the area or the construction of the line in the late 19th Century. Most former known structures such as signal huts have been removed, replaced, or demolished, largely between the 1960s and 1980s, so remains are likely to be extremely disturbed and fragmented or non-existent.

This includes potential subsurface deposits or works associated with former c.1915 brick culverts or former c.1880s brick culverts, former c.1910s Down Refuge Siding on the City side of Morisset Station, the former c.1880s saw mill located on the Country side of Morisset Station, the former c.1920s Dora Street Road Overbridge, and any other structures or infrastructure associated with early colonial and rail development along the study area such as timber posts and fencing, timber sleepers, track, structure footings, or any rubbish or ash pits. Redevelopment and constant disruption of the archaeological record in the rail corridor has resulted in very low to no potential for any such remnants to remain intact.

The potential archaeological resource was assessed as being unlikely to reach the threshold for local or state significance.[8]

1.5.4 Archaeological context summary

Table 2 includes a summary of the historical archaeological context of the study area.

Table 2: Updated impact assessment based on 2023 Detailed Designs and Aurecon's historical archaeological assessment (2021)

Phase of historical development	Zone	Item	Potential for survival	Significance
Phases 2-3	All zones	Artefact bearing deposits associated with early rail history 1880s-1930s of the Morisset area	Low	Nil
Phase 1	All zones	Early colonial structures associated with exploration and early settlement	Nil	Local
Phase 2	Zone 1, 1.1 and 1.2	c.1880s Morisset Station platform and station building; c.1880s goods shed, loading bank, sidings, stockyards, dam	Low to Moderate	Nil
Phase 3	Zone 1	c.1910 Down Platform at Morisset	Low to Moderate	Nil
Phases 2-3	Zone 1, 1.1 and 1.2	Rail infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles	Low	Nil

[8] Aurecon, 14 May 2021, p. 138

Phase of historical development	Zone	Item	Potential for survival	Significance
Phases 2-3	Zone 2 and 3	Corridor infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles and wells	Low to Nil	Nil

Figure 3: Overview of archaeological potential. Aurecon 2021, Figure 11, p. 139

1.6 Proposed works

The following provides an overview of the proposed works for the project as they relate to historical archaeological matters, based on the following detailed designs provided on 20 September 2023:

- 30013326-SR-153
- 30013326-SR-154
- 30013326-SR-155.

The Detailed Design changes occur within the rail corridor and existing study area. The review identified the following proposed changes in the Detailed Design:

1.6.1 Changes near Morisset Station (near chainage 123.00km to 124.00km)

1. Extension of Perway Siding by 9.5 m towards Newcastle (located at approximately 124.000 km)
2. Separate split discharge of the 6-foot drainage (located near Morisset Station) as opposed to single surface drainage run
3. Elimination of the new drainage ULX at 123+500km from the concept design.
4. Change in overhead wiring structures (OHWS) comprised of:
    a. Additional newly proposed OHWS N123+706, removal of OHWS N123-696 and removal of OHWS N123+326.

1.6.2 Changes near chainage 121.000km

5. ULX08 has been aligned to chainage 121.090 due to the topography limitations (steep batter) (Figure 2-11). Environmental constraints mapping at these locations is shown in Figure 2-2.

1.6.3 Changes near chainage 119.000km

6. Adjustments to the location of new Signalling Building MT05 (located at approximately 119.150 km).
7. Establish an Asset Protection Zone (APZ) of 30m and potential vegetation clearing as part of bushfire control measures at Signalling Building MT05 (located at approximately 119.150 km).
8. Change in overhead wiring structures (OHWS) comprised of
    a. Removal of OHW infrastructure for cross-over N119+083:
        i. Wire Run N-X0119A, N119+120, N119+166
        ii. Anchor/guy arrangement for N119+083 and N119+217/N119+219
9. Reduction in CSR scope with track leading to Vales Point Power Station Loop no longer part of the scope.

Overview plans of updated works are provided in Figure 4 to Figure 17.

1.7 Historical Archaeological Impact Assessment

1.7.1 Zone 1: Morisset Station

The following assessment of impact was prepared by Aurecon in 2021 for the concept design:

There is low likelihood that these works will impact on significant historical archaeology within Zone 1, 1.1 and 1.2. Intact remains associated with the c.1880s Morisset Station or the c.1910 Down Platform including building footings or materials and artefact bearing deposits from early phases could have the potential to hold significance at the local level however resources are likely to be highly fragmented which would result in little significance. The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Intact remains associated with the c.1880s former Morisset Station Down and Up Yards including building footings or materials and artefact bearing deposits from early phases are unlikely to hold local-level significance. Rail infrastructure remnants such as track, sidings, sleepers and landscape features would be considered 'works' as opposed to 'relics' and would not meet the threshold for local significance and/or research value.

Excavation impacts within Zone 1 would include the following (see Figure 15 to Figure 17 and Figure 6 to Figure 7):

- Removal of existing track
- Construction of proposed track
- Construction of proposed signalling building
- Trenching for the installation of signalling infrastructure
- Installation of electrical pits
- Installation of HV and LV feeders
- Installation of drainage and drainage pits.

The former up refuge and stock sidings, as identified by Aurecon, intersects partially with a location proposed for the installation of drainage and removal of track rail (see Figure 18). This location is within the active rail corridor and the former siding is unlikely to remain intact in this location.

With the exception of the former up refuge and stock sidings, potential archaeological items identified by Aurecon and present on historical plans do not intersect with the proposed works within this zone.

Overall, within Zone 1, excavation works proposed as part of the detailed design are unlikely to result in significant impacts to potential archaeological remains.

Figure 15: Proposed excavation works within Zone 1. Source: SMEC

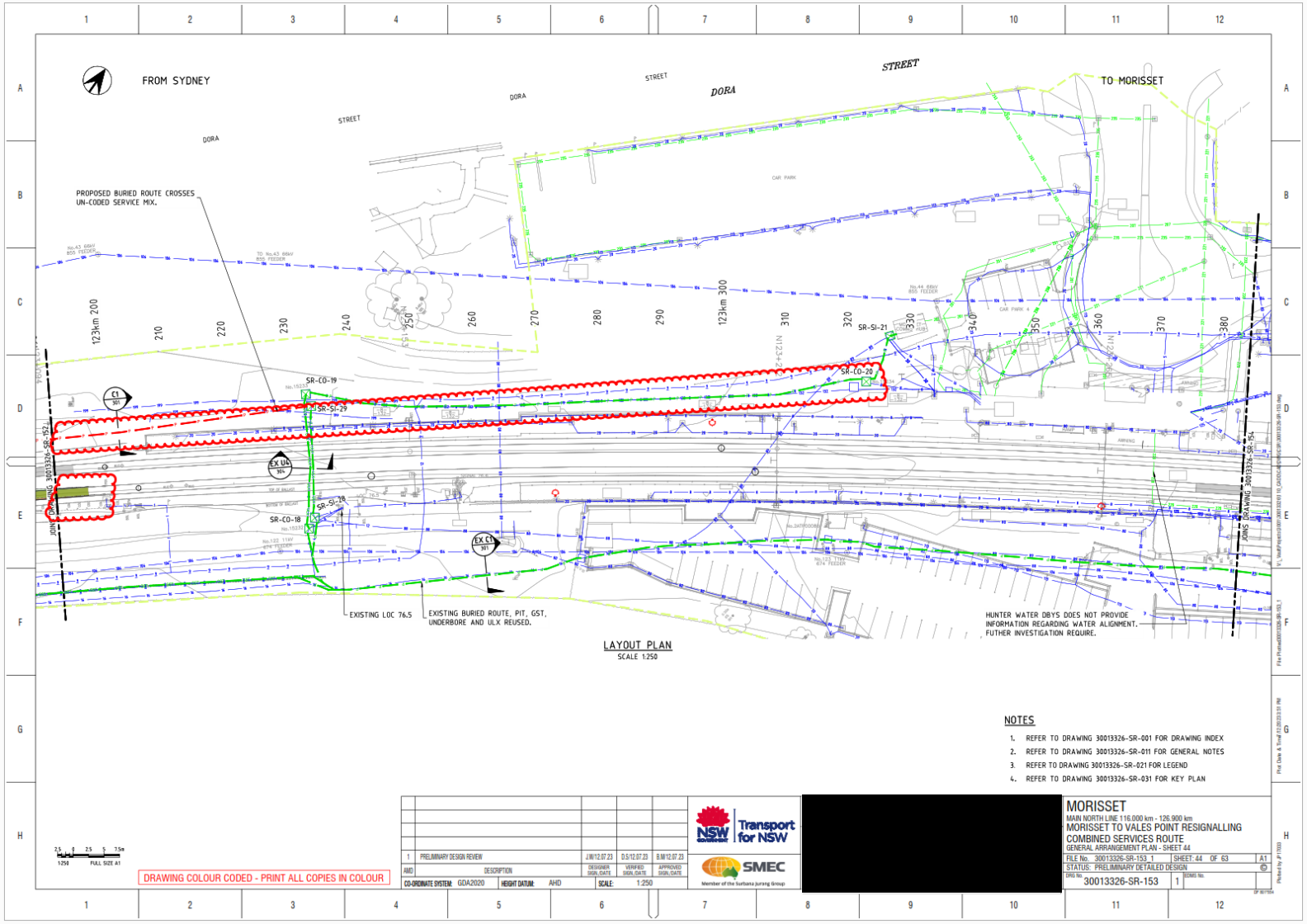


Figure 16: Proposed excavation works within Zone 1. Source: SMEC

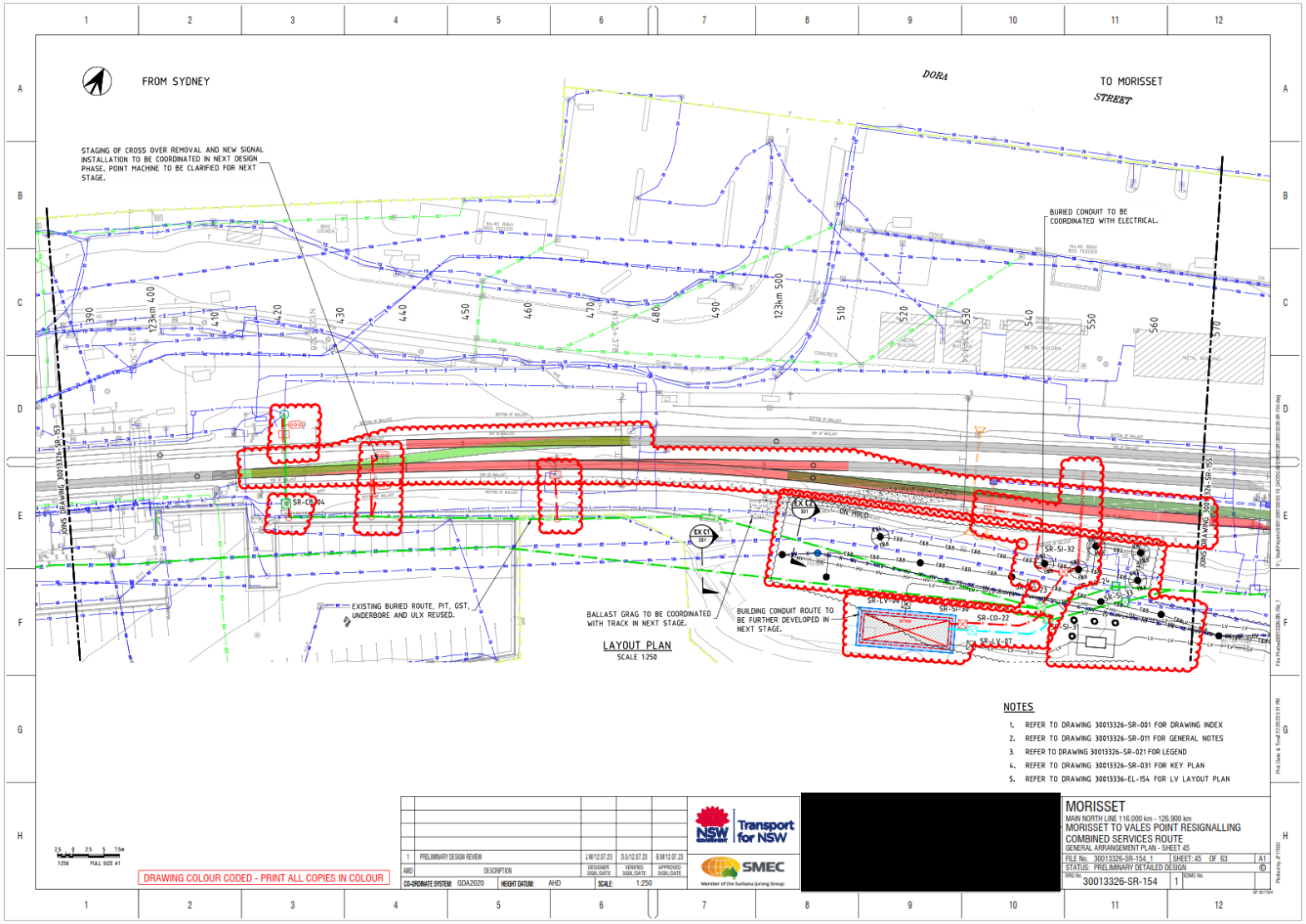


Figure 17: Proposed excavation works within Zone 1. Source: SMEC

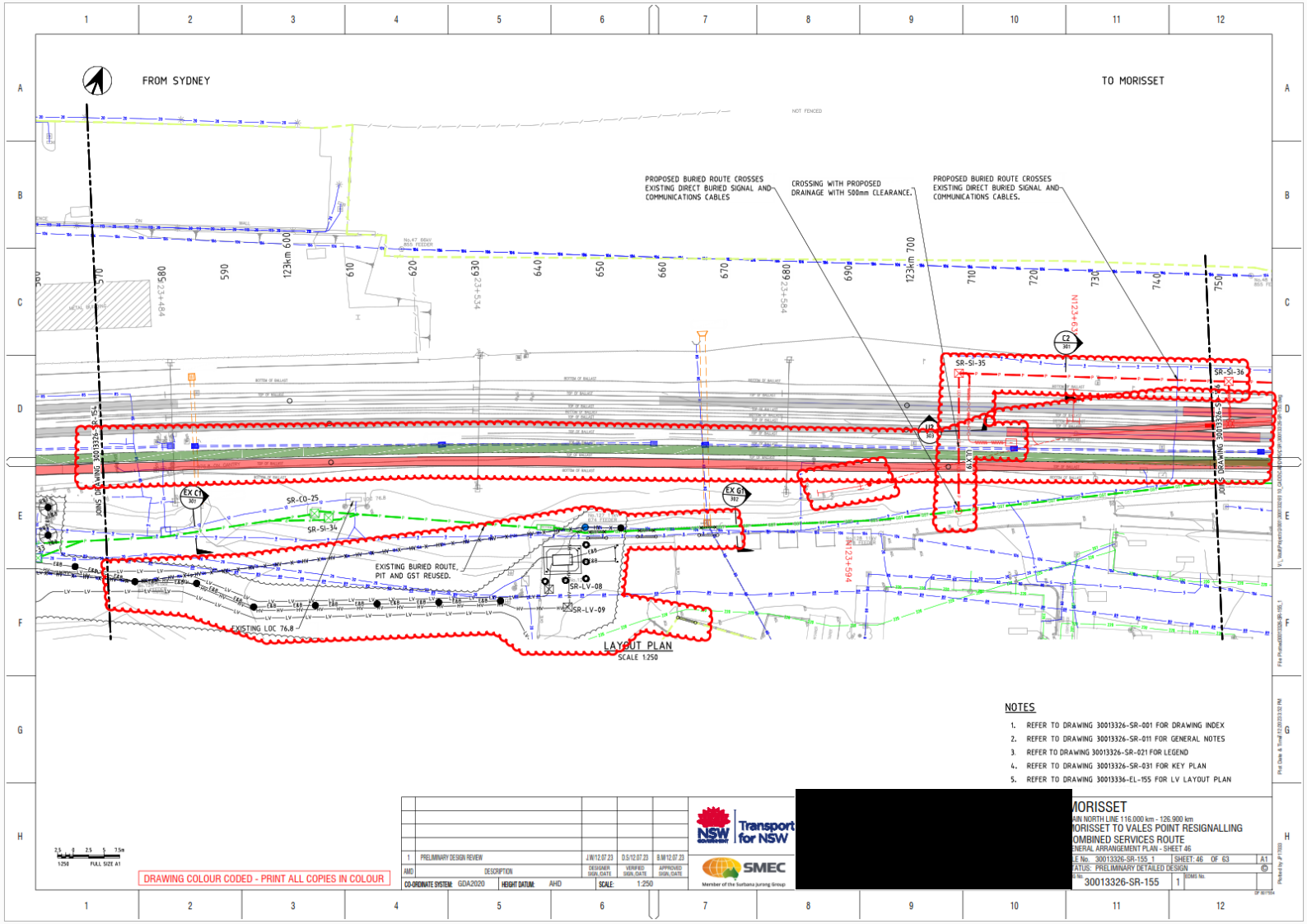
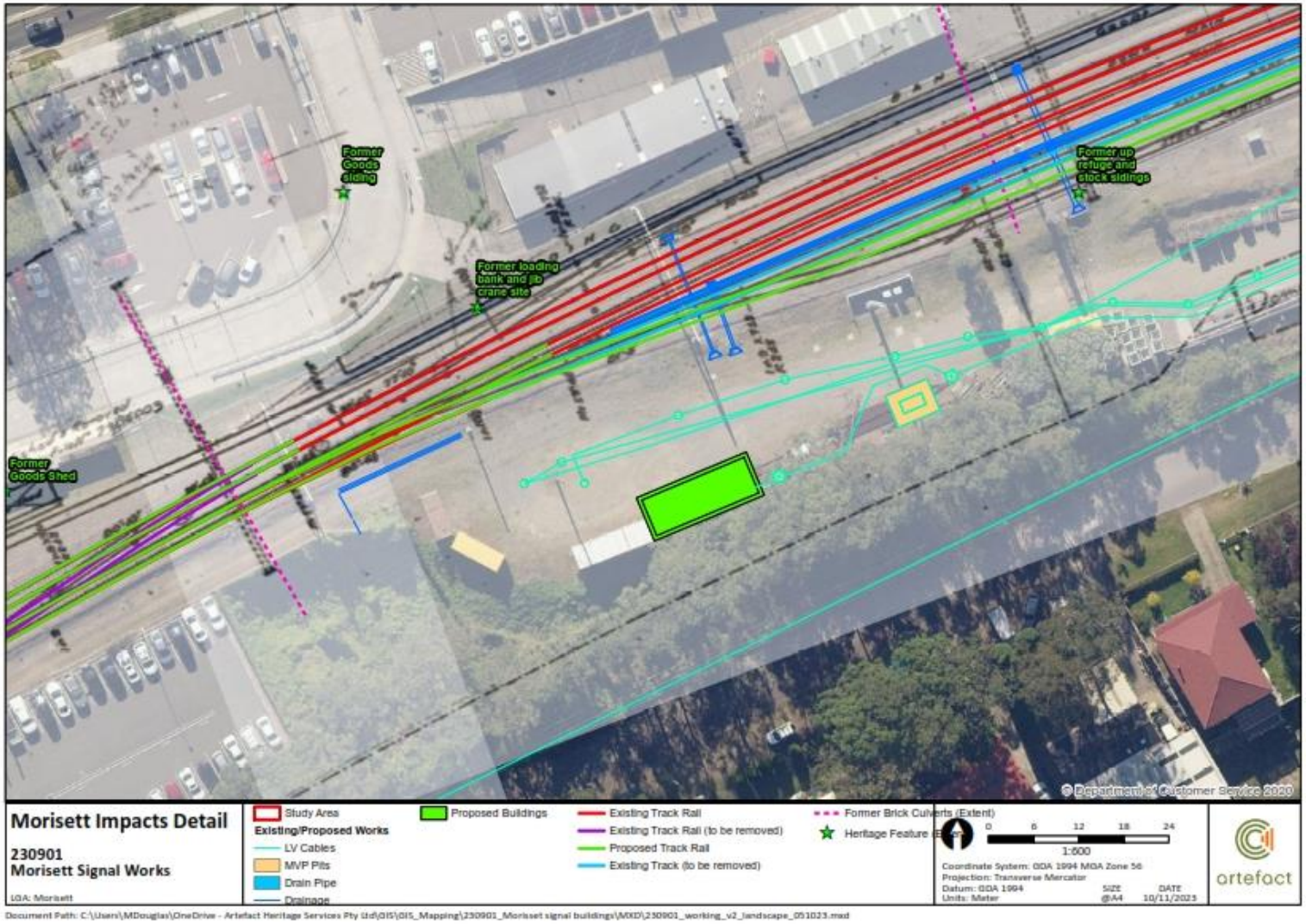


Figure 18: Overlay of proposed excavation works within Zone 1 on 1915 plan of Morissett Railway Station, showing the site of the former up refuge and stock siding.



1.7.2 Zone 2: Vales Point Loop

The following assessment of impact was prepared by Aurecon in 2021 for the concept design:

There is low to nil likelihood that these works will impact on significant historical archaeology within Zone 2. No known significant historical archaeology has been identified in the Balloon Loop which was undisturbed bushland until its construction in 1970. The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Rail infrastructure remnants such as track, sidings, sleepers and landscape features would be considered 'works' as opposed to 'relics' and would not meet the threshold for local significance and/or research value.

Limited excavation works would occur within the area identified as Zone 2. Minimal excavation impacts would be associated with the following works occurring predominantly on the western periphery of Zone 2 (see Figure 19 to Figure 21):

- Removal of existing GST
- Installation of HV and LV feeders
- Trenching for the installation of signalling infrastructure
- Installation of points.

The majority of these works are located within the ballasted track to the west and outside Zone 2. Due to this zone have limited archaeological potential, the removal of GST and other minor excavation works are unlikely to result in impacts to significant archaeological resources.

Figure 19: Proposed excavation works adjacent to Zone 2. Source: SMEC

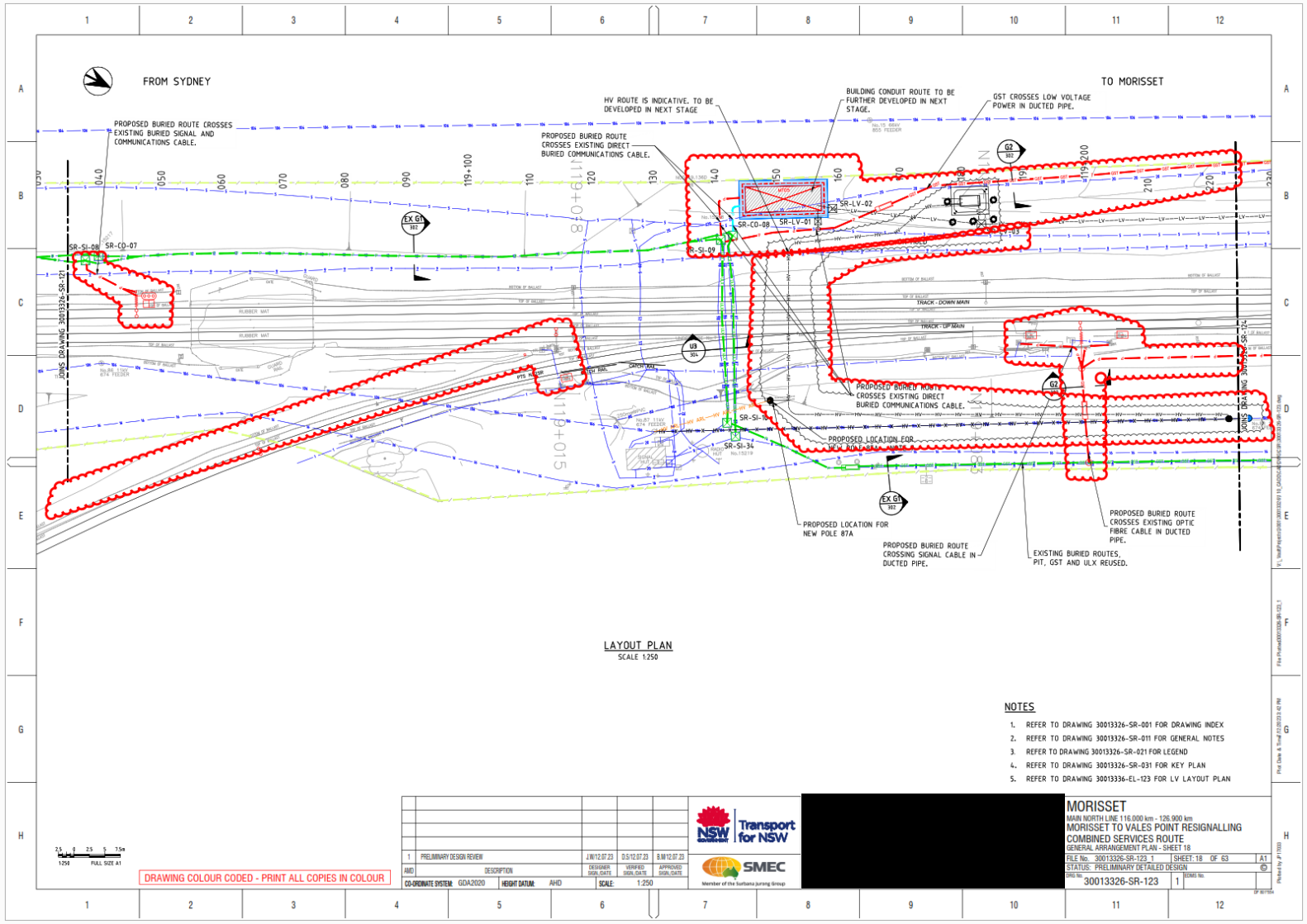


Figure 20: Proposed excavation works adjacent to Zone 2. Source: SMEC

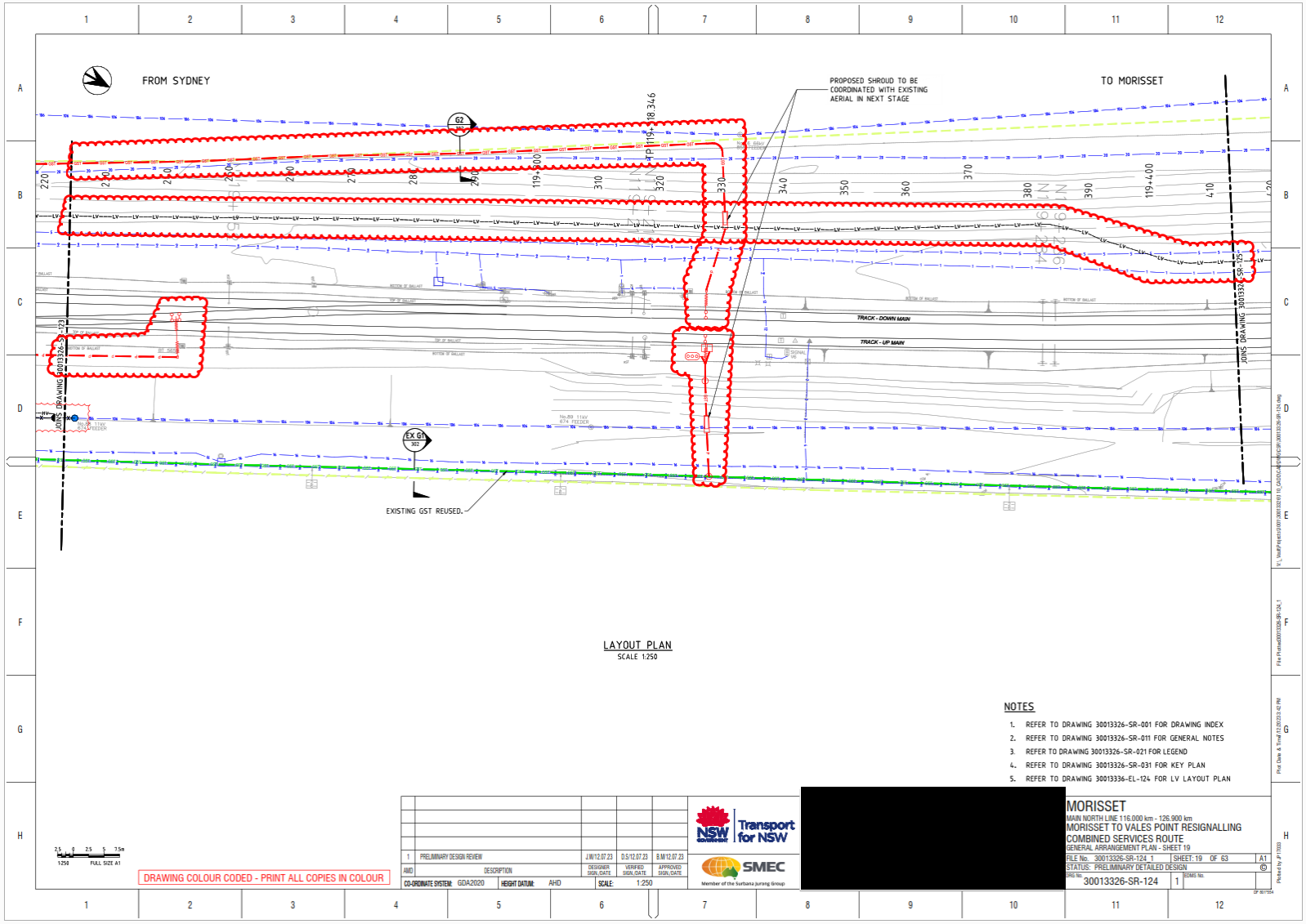
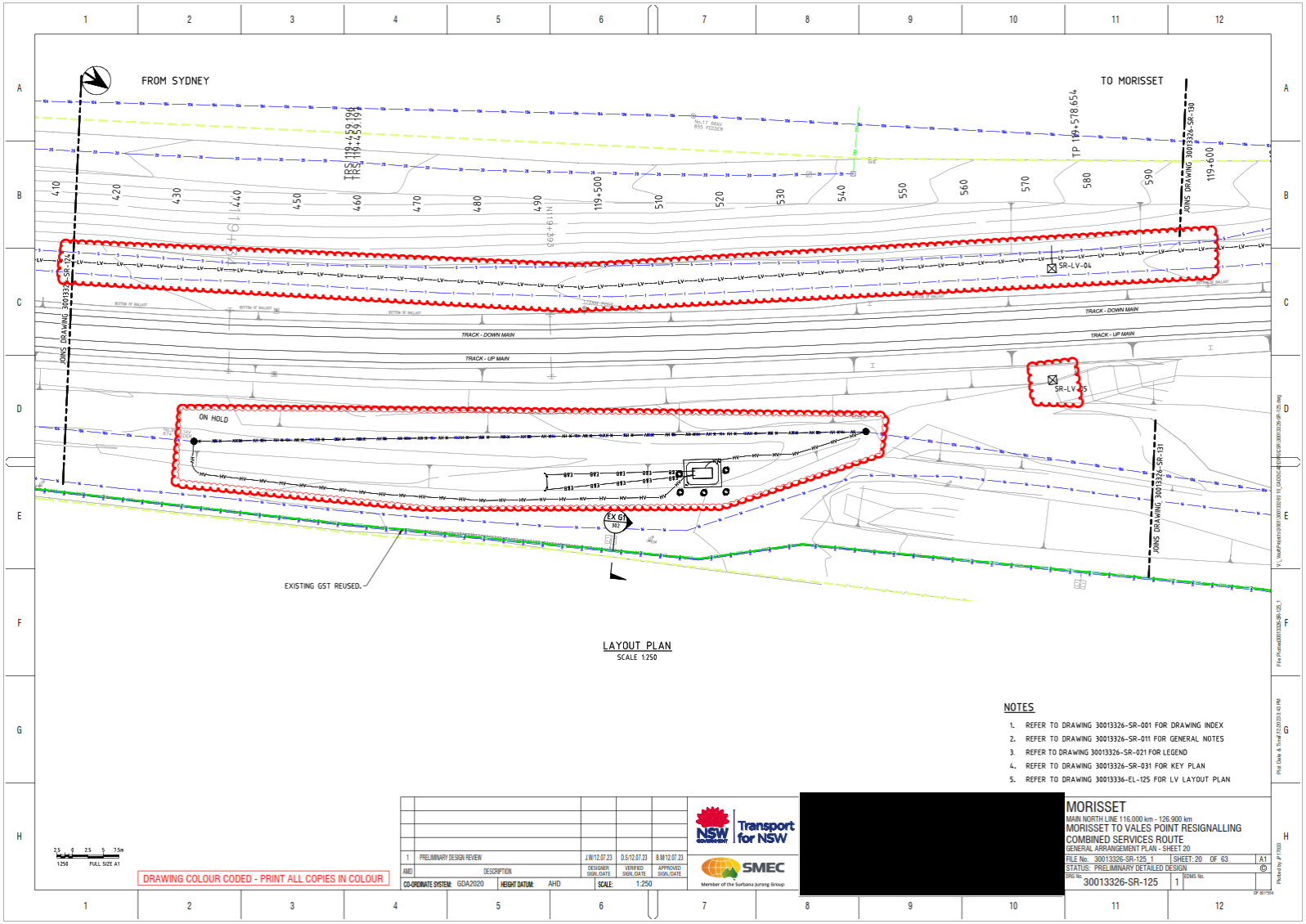


Figure 21: Proposed excavation works adjacent to Zone 2. Source: SMEC



1.7.3 Zone 3: Remainder of the study area

The following assessment of impact was prepared by Aurecon in 2021 for the concept design:

There is low to no likelihood that these works will impact on significant historical archaeology within Zone 3. The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Artefacts or deposits associated with Phase 1 and 2 may hold value at a local-level, however may not be intact or substantial enough to meet the threshold for significance.

Zone 3 was assessed by Aurecon as having nil to low potential to contain an archaeological resource unlikely to reach the local significance threshold.

The detailed design consists of excavation impacts similar in scope to concept design. The location of excavation impacts has altered in some locations, as outlined in Section 1.5 and illustrated in Figure 4 to Figure 11, but overall, the overall extent of excavation works as proposed by the detailed design remains largely consistent.

1.7.4 Summary

The following table summarises the finding of the Concept Design phase historical archaeological impact assessment conducted by Aurecon in 2021 and provides an updated impact assessment based on the Detailed Designs provided in 2023.

Table 3: Updated impact assessment based on 2023 Detailed Designs and Aurecon's historical archaeological assessment (2021)

Phase of historical development	Zone	Item	Potential for survival	Significance	Level of Potential Impact (Concept Design)	Level of Potential Impact (Detailed Design)
Phases 2-3	All zones	Artefact bearing deposits associated with early rail history 1880s-1930s of the Morisset area	Low	Nil	Low	Low
Phase 1	All zones	Early colonial structures associated with exploration and early settlement	Nil	Local	Nil	Nil
Phase 2	Zone 1, 1.1 and 1.2	c.1880s Morisset Station platform and station building; c.1880s goods shed, loading bank, sidings, stockyards, dam	Low to Moderate	Nil	Low	Low
Phase 3	Zone 1	c.1910 Down Platform at Morisset	Low to Moderate	Nil	Low	Low

Phase of historical development	Zone	Item	Potential for survival	Significance	Level of Potential Impact (Concept Design)	Level of Potential Impact (Detailed Design)
Phases 2-3	Zone 1, 1.1 and 1.2	Rail infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles	Low to Moderate	Nil	Low	Low
Phases 2-3	Zone 2 and 3	Corridor infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles and wells	Low to Nil	Nil	Low	Low

1.8 Conclusions

- The changes from concept design to detailed design have been assessed, and it is considered works are unlikely to result in adverse impact to significant archaeological 'works.' The 2021 archaeological assessment identified that the study area had overall limited potential to contain an intact and significant archaeological resource associated with previous uses of the study area, or earlier phases of The Great Northern Railway.
- Detailed design is unlikely to result in impacts to archaeological 'relics,' therefore approval under s139 of the NSW Heritage Act is not required.

1.9 Recommendations

- Further specialist archaeological advice should be sought if the design changes in any way.
- The Sydney Trains Unexpected Finds Procedure *'EMS-09-PR-0164 Unexpected Archaeological Finds' must* be implemented for all ground disturbing works. Additional assessment and/or approvals may be required prior to works continuing in the affected area(s) based on the nature of the discovery.
    - Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW *Heritage Act.*
- Sydney Trains do not need to fulfil the consultation requirement under the TISEPP to notify Lake Macquarie Council of impacts to local heritage as impacts are expected to be low or negligible. However, should more substantial archaeological remains of local significance be identified, the Council would be notified in accordance with the relevant TISEPP condition.

REFERENCES

Assessing Significance for Archaeological Sites and 'Relics', Heritage Branch, Department of Planning, 2009:7.

Aurecon, *Morisset and Vales Point Resignalling Works, preliminary Heritage Impact Assessment,* for Sydney Trains, 14 May 2021.

Office of Environment and Heritage, 2009. 'Morisset Railway Station Group and Residences'. Viewed 4 September 2023 at: https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=4801056

A8. Statement of Heritage Impact

[redacted]
Program Manager
Major Works – Engineering & Maintenance
Sydney Trains

14 February 2024

Dear[redacted]

RE: TfNSW Heritage approval to undertake works to Morisset Railway Station Group and Residences (s170 #4801056) and Garden Suburb to Wyee, Railway Line (s170 #4805752).

This letter responds to information provided in the following specialist reports and construction drawings:

- *RE: Aboriginal Cultural Heritage Due Diligence – Morisset Rail Resignalling Project* (memo report) prepared by Extent Heritage, December 2020.
- *Morisset and Vales Point Resignalling - Aboriginal Cultural Heritage Addendum due diligence report for Detailed Design phase* (memo report) prepared by Artefact Heritage, December 2023.
- *Morisset and Vales Point Resignalling Works Preliminary Heritage Impact Assessment*, prepared by Aurecon, May 2021.
- *Morisset to Vales Point (MVP) Resignalling Proposal: Non-Aboriginal (historical) archaeological inputs for Detailed Design phase* (memo report) prepared by Artefact Heritage, December 2023.
- *Statement of Heritage Impact Morisset and Vales Point Resignalling Program*, prepared by CCG Architects, January 2024.

Construction Drawings

- 30013326-ST-001-REP (with appendices)
- 30013326-PW-001-REP
- 30013326-EL-001-REP
- 30013326-DR-001-REP
- 30013326-OH-001-REP
- 30013326-UT-001-REP
- 30013326-EL-002-REP Earthing Lightning
- 30013326-HD-001-MEM

A summary of the results of the above assessments is provided in *MVP Resignalling Project Heritage Approval Assessment*, prepared by[redacted] (Heritage Specialist – Resignalling), February 2024 to aid in the production of this endorsement.

It is understood that the proposal includes the following:

- Track
  - Removal of two crossovers and their replacement with two new
  - Removal of existing Up Refuge track and installation of new Perway Siding
  - Replacement and installation of turnouts, catchpoints, and other trackworks

- Signalling
    - Decommissioning and isolation of the mechanical interlocking signalling system, and its relays, at the Morisset Station Signal Box
    - Removal of 22 signal-relay huts
    - Construction of a new interlocking at Morisset and Vales Point
    - Construction of a new brick signalling building at Morisset (MTRR), and an additional five brick signalling buildings (MT01, MT05, MT08, MT11, and MT29)
    - Installation of train protection systems throughout
    - Removal of signal posts
    - Replacement of guard indicator lights on the Morisset Station platforms
- OHWS
    - New crossovers and staunchions to support the track and signalling, involving excavations up to 0.9m in diameter and 6m in depth
- Drainage
    - New intertrack drainage to be installed next to the new tracks, to connect to existing pits
    - New cess drains
    - A new concrete pipe at approx. chainage 123km
- CSR
    - New and existing cable services routes will be used to install cables for signalling, communications, compressed air and electricity. CSR trenching for the main route requires trenching approximately 1m wide, and 1-2m depth, while local CSR trenching is 0.4m to 0.6m wide and 1 to 1.2m in depth.
- Electrical
    - Commissioning two new 11kV/415V padmount transformers as a power supply to the MTRR and MT05 buildings,
    - Power supply upgrades to signalling and OHW,
    - Earthing and bonding

The proposal has been assessed by a Transport for NSW Heritage Specialist and it is considered that the works are endorsable under the State Agency Management Principles (SAMP). No items of State heritage significance are likely to be affected as a result of the proposal, not will there be any significant impact to items listed on a Local Environmental Plan.

Works are in accordance with Section 3.4 of the SAMP *'An asset of local heritage significance can only be demolished or unsympathetically changed following a detailed evaluation involving specialist heritage advice that has shown there is no prudent or feasible alternative.'* The works represent a level of 'unsympathetic change' to the Morisset Railway Station Group, however this impact has been mitigated wherever possible (SoHI Section 9.1) and there is no feasible alternative for the works (SoHI Section 6.1.4).

The works allow the continued use of the operational asset as a railway station, and the loss of technical knowledge associated with the specific management of signalling infrastructure in this location will be appropriately interpreted. Based on the above, Sydney Trains is not required to obtain external heritage approval from Heritage NSW or the office of the Heritage Council of New South Wales.

Please note these works are endorsed based on the following conditions:

Changes to the proposal

- Further specialist heritage advice should be sought if the design changes in **any** way. Additional and/or updated Aboriginal heritage, non-Aboriginal (historical) archaeological reporting, and Statement of Heritage Impact reports will be required.

Decommissioning

- The signal room should be decommissioned in accordance with Sydney Trains *EMS-09-PR-0231 Decommissioning Heritage Assets,* including completion of the Decommissioning Heritage Assets Checklist.
- In accordance with the design, the following significant elements should be conserved in situ: Lever frame, interlock, relays, and moveable heritage.
- The relay room should be closed and made secure as part of its decommissioning.

Additional Reporting

The following reporting is required to be completed.

- Photographic and video archival recording of the signal room
- Photographic recording of timber sleepers in the refuge to be removed
- A Moveable Heritage Audit
- Heritage Interpretation Plan.
- An audit of the relay room, once the room is decommissioned, by an appropriate specialist should be made, to establish the significance of any of the electrical items and their potential for reuse
- A Heritage Asset Maintenance Plan for Morisset Railway Station should be prepared to guide the maintenance and ongoing repair of the place. This should be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned.

During Construction

The following will need to occur during construction:

- All contractors and staff must be briefed on site-specific heritage issues prior to commencing works. If there is a change of project staff or contractor during the length of the project, a further site briefing must be undertaken.
- Heritage documents (such as SoHI, specifications, approvals) and records of heritage site briefings must be retained on site for the duration of the works.
- Site inspections may be undertaken by a Transport for NSW Heritage representative throughout the duration of the approval as part of environmental audits to ensure compliance with conditions.
- Due care must be taken in the vicinity of identified heritage structures and fabric. No construction materials are to be stockpiled or stored against heritage items or trees.
- Any accidental damage caused to heritage items/fabric must be reported immediately through Sydney Trains SHEM. Damage is to be made good in accordance with specialist heritage advice.
- All areas impacted by the work must be cleaned and made good after completion of works.
- The Sydney Trains Unexpected Finds Procedure *'EMS-09-PR-0164 Unexpected Archaeological Finds'* must be implemented for all ground disturbing works. Additional assessment and/or approvals may be required prior to works continuing in the affected area(s) based on the nature of the discovery. If there are any unexpected finds during the works, all work in the vicinity should cease immediately and the procedures outlined in the above document should be followed.
- Heavy plant and equipment must avoid movements in and around heritage structures and fabric and significant trees, with heritage sensitive areas demarcated during

operation. A Tree Protection Zone must be installed and maintained around the site of the Morisset Campsite Tree.

- Removed sections of interlocking and channel rodding will need to be managed in accordance with the Sydney Trains Movable Heritage Guidelines, and a briefing note be prepared for the donation of this material to Transport Heritage NSW.
- All new conduit works must be undertaken in accordance with ***Sydney Trains Technical Note: Installation of New Electrical and Data Services at Heritage Sites (2019)***.
- All new fixings must be undertaken in accordance with ***Sydney Trains Technical Note: Fixing Methods at Heritage Sites (2019)***.

Post Construction

- The existing heritage inventories should be updated.

The above conditions are to be included in a Construction Environmental Management Plan (CEMP).

Please do not hesitate to make contact if you have any questions.

Kind regards,

Heritage Specialist
Transport for NSW
[redacted]
Environment | Safety, Environment and Regulation
7 Harvest Street, Macquarie Park NSW 2113
www.transport.nsw.gov.au

*** Keep this correspondence on file as a record of internal heritage approval ***

Transport
for NSW

Statement of Heritage Impact

Morisset and Vales Point Resignalling Program

January 2024

NSW GOVERNMENT

transport.nsw.gov.au

Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which we work and live.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the lands, waters and seas and their rich contribution to society.

Document control

Document owner	Transport for NSW
Approved by	Heritage Specialist, Resignalling
Document number	EMS-HE-TT-0100
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Versions

Version	Amendment notes
A	CCG draft
B	CCG revision post ST comments
C	Final
D	Submission

Definitions

Term	Definition
CSR	Combined Services Route
LEP	Local Environmental Plan
OHW	Overhead Wiring
REF	Review of Environmental Factors
SHI	NSW State Heritage Inventory
SHR	NSW State Heritage Register
SOHI	Statement of Heritage Impact
TAHE S170	Transport Asset Holding Entity Section 170 Heritage and Conservation Register
Transport	Transport for NSW

Executive Summary

On the Great Northern Railway near Morisset on the NSW Central Coast, approximately 45km south of Newcastle, Sydney Trains proposes to upgrade signalling works to provide for a new means of train control, Advanced Train Running Information Control System (ATRICS). This upgrade is required as part of broader modernisation which will improve the safety, consistency, and reliability of the Sydney and NSW rail network. Since Morisset Railway Station Group and the Great Northern Railway, as well as some surrounding items, are listed on various NSW heritage registers, and enjoy protection as places of cultural significance, Sydney Trains is required to fully consider the heritage impact of works, as part of a Review of Environmental Factors (REF).

This document has been commissioned by Sydney Trains to update a Preliminary Heritage Impact Assessment (HIA) which was produced by Aurecon in 2021.[1] This HIA was an assessment of the proposed physical, visual, and setting impacts of the upgrade works, as well as on the historical archaeology of the site and the railway line. This updated Statement of Heritage Impact (SoHI) more fully assesses the impacts of the proposed works, taking into account the detailed design which has proceeded since 2021.

There will be impact on some of the items, particularly on the Morisset Railway Station Group which has an electro-mechanical signal box to be decommissioned, and a neutral impact on the broader Great Northern Railway where there will be trackwork, construction of new signalhuts, and civil works. The moderately adverse heritage impacts of the decommissioning of the Morisset signal box will be mitigated by way of a number of activities to record its use, to document working practices there, preserve its fabric in place, and to create local heritage interpretation.

Under the *State Agency Heritage Guide*,[2] as part of the REF process, after considering the nature of the listing of the places to be affected and considering the impact of the works on those places' cultural significance, heritage approval for works to these items may be made internally by a qualified Sydney Trains heritage specialist.

Project summary

The Morisset and Vales Point (MVP) Resignalling Proposal will upgrade existing and expired equipment to a new train control system. This will involve construction of a new signalling building near Morisset Railway Station and another five signal huts in the corridor, modification of track alignments and overhead wiring (OHW), new Combined Services Route (CSR) installations, and associated civil work. It will also involve the decommissioning of the existing signal box at Morisset.

Summary of heritage items and impacts

Summary of heritage items and impacts

Heritage Item	Listing	Significance	Proposed Works	Impacts
Morisset Railway Station Group and Residences	TAHE S.170 item 4801056	Local	Removal of all existing signals and associated infrastructure, decommissioning of the signal box Construction of signal huts and MTRR bungalow	Moderate adverse

[1] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment' (Sydney Trains, May 2021).
[2] NSW Heritage Office, *State Agency Heritage Guide: Management of Heritage Assets by NSW Government Agencies* (Parramatta: NSW Heritage Office, n.d.), http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/StateAgencyHeritageGuide.pdf.

Heritage Item	Listing	Significance	Proposed Works	Impacts
Great Northern Railway/ Garden Suburb to Wyee, Railway Line	Lake Macquarie LEP 2014 item 189 TAHE S.170 item 4805752	Local	Removal of signals and infrastructure, construction of signals huts	Neutral
Tree—Morisset's Campsite	Lake Macquarie LEP 2014 item 120	Local	None	Nil
Dora Creek Railway Underbridge	TAHE S.170 item 4803388	Local	None	Nil

Recommendations and mitigation measures

Recommendations currently being actioned

- Preparation of an updated Statement of Heritage Impact (i.e. this document),
- Photographic and video archival recording of the signal box room,
- A Moveable Heritage Audit,
- Preparation of a Heritage Interpretation Plan.

Recommendations still to be actioned

- The signal box should be decommissioned in accordance with Sydney Trains EMS-09-PR-0231 *Decommissioning Heritage Assets,*
- Conservation of significant elements, especially the lever frame, interlock, relays, and moveable heritage, in-situ,
- Completion of the Decommissioning Heritage Assets Checklist,
- The relay room should be closed and made secure as part of its decommissioning. An audit of the relay room, once the room is decommissioned, by an appropriate specialist should be made, to establish the significance of any of the electrical items and their potential for reuse,
- Updating of existing heritage Inventories,
- A Heritage Asset Maintenance Plan for Morisset Railway Station should be prepared to guide the maintenance and ongoing repair of the place. This should be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned.
- Photographic recording of timber sleepers in the Refuge to be removed,
- Installation and maintenance of a Tree Protection Zone around the Morisset Campsite Tree,
- Further specialist archaeological advice should be sought if the design changes in any way.
    - The Sydney Trains Unexpected Finds Procedure '*EMS-09-PR-0164 Unexpected Archaeological Finds*' must be implemented for all ground disturbing works. Additional assessment and/or approvals may be required prior to works continuing in the affected area(s) based on the nature of the discovery.

- Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW *Heritage Act*.
- These stop-work and *Unexpected Finds* procedures to be included in a Construction Environmental Management Plan (CEMP).

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1. Introduction

The Morisset Railway Station and the Main Northern Line are items of heritage significance, listed on the Transport Asset Holding Entity (TAHE) S.170 list and the Lake Macquarie Local Environmental Plan (LEP)'s Schedule 5.10 list, and are protected by NSW law. Accordingly, a consent authority must consider the impact on heritage before granting any approval for works. This Statement of Heritage Impact (SoHI) is an assessment of these heritage impacts, which updates a Preliminary Heritage Assessment undertaken by Aurecon in 2021 as part of a Review of Environmental Factors (REF).[3]

1.1 Proposal background

Morisset is on the Main Northern Line between Sydney and Newcastle, on the Central Coast. The railway in this section, as well as the Vales Point balloon loop which existed to deliver coal to the former Vales Point power station, has part-manual control from a signal box at Morisset Railway Station. The Morisset and Vales Point (MVP) Resignalling project will decommission this signal box, provide new train control systems using Advanced Train Running Information Control System (ATRICS) to be controlled from Wyong Regional Control Centre (WRCC), install network upgrades associated with this system, and improve the capacity of the line.

Key features of the Project would include track work and signalling works, supported by:

- construction of a new signalling building at Morisset Station and an additional five signal buildings at various points along the rail corridor;modification of track alignments at Morisset Station;
- overhead wiring (OHW) changes;
- new combined services route (CSR);
- new electrical and communications connections; and
- new site drainage.

As an inevitable consequence of the works, the existing signal box located within Morisset station will be decommissioned, as its equipment will be made redundant.

1.1.1 Proposal area

The proposed works will be entirely contained within the railway station and rail corridor, on TAHE owned land between 116.00km and 126.900km on the Main North Line. The area addressed in this report (the proposal area) is between Wyee Station and Dora Creek Station, approximately 12km of track, with actual construction occurring at specific locations within the area as outlined below.

[3] Aurecon; Sydney Trains, *Review of Environmental Factors: Morisset and Vales Point Resignalling Project*, Final draft rev. G (Transport for NSW, 2021).

Figure 1-1: Proposal area. (Aurecon, 2021)

1.1.2 Heritage items

Morisset Railway Station is a culturally significant railway station on the Central Coast. It is part of a complex of related heritage items within and adjacent to the proposal area, which are listed at section 1.1.3 below. Aurecon's findings were that works would affect the Morisset Railway Station Group, and the Great Northern Railway (Garden Suburb Line), with other elements and items left unaffected.

The railway line which links Newcastle with Sydney via the Hawkesbury has been known, and is known, variously as the Great Northern Railway (GNR), Great Northern Line, Main Northern Line, Garden Suburb Line, Newcastle Line, and other names. These are used interchangeably in historical and current reference to the same railway line, but vary between the listings which protect it. These are all the same heritage item. To avoid confusion, and since there is only one railway line which is the subject of works and this report, 'Great Northern Railway' and 'GNR' have been used.

The Great Northern Railway is a duplicated railway line, part of the rail link between Sydney and Newcastle, that runs north-south through the Central Coast and crosses the Hawkesbury River. It was a late 19th century colonial infrastructure achievement and is significant locally, listed on both the TAHE S.170 list and Lake Macquarie LEP list.

The railway station itself consists of two side platforms serving a duplicated line, the GNR itself, which is also of cultural significance. On Platform 2 there is an interwar platform building, constructed in 1938, which houses an integral Signal Box, currently in ongoing use to control local train movements.

There is an overhead pedestrian overpass (of contemporary construction) with two lifts, and contemporary platform buildings on Platform 1. This railway station is listed on the TAHE S.170 register.

A number of other significant items are within the proposal area, but will not be affected by works. Outside the rail corridor on the Morisset town side, to Dora Road, there are two significant cottages, a Stationmaster's Residence and a Gatekeeper's Residence. On the other side, where there is a car park, there is a significant tree marked with a plaque that commemorates Major Morisset's camp site.

1.2 Previous reporting

A Review of Environmental Factors (REF) is being prepared under Part 5, Division 5.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act) to determine the potential environmental impacts of the proposal, which included a Preliminary Heritage Impact Assessment (by Aurecon). This document made an assessment of the environmental impacts of works at the earlier stage of design. The REF in turn required that an updated assessment of heritage impact be made to properly consider the heritage impact of changes and updates in design, and consider mitigations.

Further to the updated assessment of the impact of works on non-Aboriginal (historical) heritage, an updated historical archaeological assessment has been prepared (by Artefact) which updates the Preliminary Heritage Assessment (by Aurecon) in terms of prospective impact on any potential archaeological items. The results of this updated assessment form part of this document and inform the appropriate approval pathway.

1.2.1 Heritage listings

Table 1-1: Morisset Railway Station Group and Residences

Detail	Requirement
Street Address	Dora Street, Morisset NSW 2264
Heritage listings	Section 170 Heritage and Conservation Register (S170)—4801056

Detail	Requirement
Statement of Significance	Morisset Railway Station has heritage significance at a local level. Opened in 1897 [sic] Morisset station had a direct impact on the development of the local area, with the central commercial area of Morisset growing around the station. The current station building, built in 1938, physically represents the growth of Morisset in the 1930s, associated with the opening of Morisset Hospital and in particular the increasing demand on rail transport created by the Hospital. The current form of the station group reflects changing technological and social requirements of the station since the late 19th century. The Station has aesthetic significance as a good example of a 1930s railway station building with a highly intact incorporated signal box, with simple detailing typical of the interwar period. The two residences, particularly the Station Master's Residence, are good representative examples of the standard design Type J1 and J2 railway residences that were constructed for several decades from the 1880s. A Eucalyptus sp. tree on the southern boundary of the station ('Morisset's tree') has local heritage significance as a rare remnant tree that may predate European settlement of the area, and which is historically associated with James Thomas Morisset, early military Commandant of the Newcastle penal settlement.[4]
Conservation Management Plan/Strategy/Heritage Asset Action Plan	Is there a site CMP/CMS/HAAP? ☐ Yes ☑ No
Site description and photographs	CONTEXT Morisset Railway Station is located in a large open area between Dora and Macquarie Streets at the centre of Morisset. The station comprises two platforms, a station building (with incorporated signal box); modern waiting room; modern footbridge; and two railway residences. The main approach to the station is by means of a forecourt off Dora Street which, along with the adjacent Lions Park, creates a landscaped setting for the main station building. There are car parks adjacent to the station, accessed from both Dora and Macquarie Streets. The southern car park is located on the former siding and goods yard. STATION BUILDING & SIGNAL BOX (PLATFORM 2) (1938) Exterior: The principal building at Morisset Railway Station is on the Down line: a single storey brick building dating from 1938 with a corrugated metal hipped roof. This functional building lacks the elaborate detail associated with earlier twentieth century station designs, and has a cantilevered steel-framed awning on the platform (southern) side with a box gutter. The station features timber framed double hung sash windows and doors, with brick window sills and lintels, and some original terrazzo thresholds remain extant. A c.1990s ramp (with hand rail) leading from the ticket office to the platform is a visually intrusive item. Simple brick chimneys remain at both the east and west ends of the building. The eastern end of the building contains a Type H2 signal box with large sets of sliding windows with clear glazing. Internal: Morisset station building has simple internal finishes with rendered walls, fibre cement ceilings with battens and tiled floors (modern). Some original furniture remains extant, including original timber benches in the waiting room/ticket office. Two single timber rollover indicators are on display in the waiting room ticket area. They include clock faces, no foot pedals and are covered with protective perspex sheets. A rare timber sliding door top hung from a metal track leads from the ticket

[4] NSW Heritage, 'NSW Heritage', State Heritage Inventory, 2022, https://www.hms.heritage.nsw.gov.au/App/Item/SearchHeritageItems Morisset Railway Station Group, TAHE S.170 list.

Detail	Requirement
	office to the signal box. Internally, the Signal Box retains a high degree of original fabric including a 34 lever mechanical signalling frame, timber framed pulling list, timber framed Morisset control panel (dated 1963), Vales Point control panel (push button type), timber cabinets with signal logs and keys, timber telephone cabinet, warning bells, detonator box, padlocks, shelving, etc. The signal box has a raised timber floor, with interlocking equipment below. A separate relay room has equipment from the c1960s and more recent upgrades.

Figure 1-2: Morisset Railway Station from the overpass

Figure 1-3: Morisset Railway Station signal box

Figure 1-4: Morisset Railway Station signal box (interior)

Figure 1-5: Morisset Railway Station signal lever interlock mechanism

Table 1-2: Great Northern Railway

Detail	Requirement
Street Address	Extent of rail corridor through Lake Macquarie LGA.
Heritage listings	Section 170 Heritage and Conservation Register (S170)— 4805752 (as Garden Suburb To Wyee, Railway Line) Lake Macquarie Local Environmental Plan (LEP) listing – No. 189
Statement of Significance (Great Northern Railway)	SIGNIFICANCE - 1993: At State level, the Main Northern Line (Great Northern Railway) changed the relationship of Sydney & the North, by speeding up communications & transport. It changed profoundly the relationship of Newcastle with its hinterland & the north, & the standing of Newcastle as a great commercial centre. It confirmed the importance of Newcastle as a great coaling port, comparable with Cardiff in Wales. Locally, the railway brought changes to the pattern of development of Lake Macquarie. It was the route by which Lake Macquarie coal was carried to its markets. It linked the towns & villages of western Lake Macquarie with Newcastle, & was a way for holidaymakers to reach the Lake. It opened the Lake to residential development &, since electrification, has become a commuting link to both Newcastle & Sydney for residents of Lake Macquarie.

Detail	Requirement
	LEVEL of SIGNIFICANCE - 1993: State Significance - high Regional Significance - high Local Significance - very high Group Significance - very high[5]
Conservation Management Plan/Strategy/Heritage Asset Action Plan	Is there a site CMP/CMS/HAAP? ☐ Yes ☑ No
Site description and photographs	Section of the Short North Line through Lake Macquarie LGA. See separate listings for the significant elements along the line. -Awaba Railway Jib Crane -Cardiff Railway Workshops -Cockle Creek Former Railway Station and Bridge Piers -Cockle Creek Railway Bridge -Dora Creek Railway Bridge -Fassifern Railway Station Group -Fassifern to Toronto Branch Railway Line -Morisset Railway Station Group -Teralba Railway Residence -Tickhole Railway Tunnel

Figure 1-6: Great Northern Railway (toward Newcastle)

Figure 1-7: Example of channel rodding pivot in the rail corridor

Table 1-3: Heritage items not impacted by proposed works

Detail	Heritage item	Approximate distance from proposal (metres) from Morisset Railway Station
Heritage items in the vicinity not impacted by the proposed works	• The Morisset Camp Tree • The Station Masters' Residence • The Gatekeepers' Residence • Morisset Community Hall (77 Dora Street Morisset)	• 119m • 50m • 75m • 90m

[5] NSW Heritage Great Northern Railway, TAHE S.170 list.

Detail	Heritage item	Approximate distance from proposal (metres) from Morisset Railway Station
	• The Mullard Chambers Building (71 Dora Street Morisset) • Morisset High School • Dora Creek Railway Underbridge • Wyee Coal Conveyor Loop	• 145m • 330m • 2,950m • 4,600m

1.3 Methodology

This Statement of Heritage Impact (SOHI) has been prepared as one concise report that combines an assessment of heritage impact (by CCG) and an archaeological assessment (by Aurecon and Artefact) of built (non-Aboriginal) heritage and historical archaeological impacts from the proposal. A memorandum assessing the archaeological impact of the proposal is appended to this document.

This report was prepared by CCG Architects following site visits on the 17th April and 20th September 2023, a review of relevant documentation, and attendance at relevant meetings. The methodology for this report is consistent with the proposal brief and the standard methodology for SOHI. This report is informed by the following guiding documents:

- *Assessing heritage significance* (Department of Planning and Environment, 2023)
- *Guidelines for preparing a statement of heritage impact* (Department of Planning and Environment, 2023)
- *Material threshold policy*, (Heritage NSW, Department of Planning, Industry and Environment, 2020).
- *Assessing Significance for Historical Archaeological Sites and 'Relics'*, (Heritage Branch, NSW Department of Planning, 2009)
- *Investigating Heritage Significance: A guide to identifying and examining heritage items in NSW*, (NSW Government through the Heritage Council of NSW, 2021).
- *Design in Context: Guidelines for Infill Development in the Historic Environment* (NSW Heritage Office and Royal Australian Institute of Architects, 2005)
- *The Burra Charter* (Australia ICOMOS, 2013)
- *NSW Heritage Manual* (NSW Heritage Office & Department of Urban Affairs and Planning NSW Heritage Manual, 1996)

1.4 Limitations

This SOHI is an update of the Preliminary Heritage Assessment (by Aurecon), conducted in 2021 when the project was at concept stage. This Preliminary Heritage Assessment made a very comprehensive historical investigation which, for the sake of brevity, is summarised below. No further primary source research has been undertaken to supplement this historical investigation.

1.5 Authorship

This document was written by [redacted] CCG Architects.

2. Statutory context and heritage listings

2.1 The Burra Charter

The Australia *ICOMOS Charter for Places of Cultural Significance, The Burra Charter, 2013* (Burra Charter), while not a piece of legislation or statutory instrument, provides a best practice standard for managing cultural heritage places in Australia. The Burra Charter defines the principles for the conservation of places of cultural significance. The conservation principles contained in the Burra Charter include the conservation and management of places of cultural significance, including the retention of an appropriate setting and related places and related objects which contribute to the cultural significance of places.

2.2 Heritage Act 1977

The NSW *Heritage Act 1977* (the Act) is the principal Act for the management of NSW's environmental heritage. Under the Heritage Act, 'items of environmental heritage' include places, buildings, works, relics, moveable objects, and precincts identified as significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. The Heritage Act also protects 'relics', which can include archaeological material, features and deposits. Items protected by law may be included on a number of different lists, with different effects, described in turn below. A search of these lists and inventories was made on the 3rd of April 2023, and later throughout the review of this document, to establish the presence or otherwise of significant items. In each case the list or map was searched for items within the area and in the Morisset urban area nearby.

2.2.1 State Heritage Register (SHR)

The *Heritage Act* requires (in Part 3A) the NSW Heritage Council to keep a Register of items which are culturally significant to the State of NSW as a whole. State significant items can be listed on the NSW SHR and are given automatic protection under the *Heritage Act* against any activities that may damage an item or affect its heritage significance.

Any works which would have more than a minor impact on the significance of an item the SHR must be approved by Heritage NSW as the regulator of the Act in NSW. This approval takes the form of a Section 60 application. In some circumstances, a Section 60 approval may not be required if works are undertaken in accordance with the *Standard Exemptions for Works Requiring Heritage Council Approval* (Heritage NSW, 2020) or in accordance with agency specific or site-specific exemptions. Under Section 57(2) of the Act Transport for NSW have delegated authority to use the RailCorp Agency Specific Exemptions to approve minor works or maintenance activities within railway sites on TAHE (formerly RailCorp) land, which would not have an adverse impact to the State heritage significance of a site.

A search of the SHR and the State Heritage Inventory was made on the 3rd April 2023, as well as the NSW Planning Portal, of the sites covered by the immediate site of decommissioning works (Morisset Railway Station at Dora Street Morisset) and the proposal area for construction (the Great Northern Railway). No items of State significance were identified on the Register, thereforenone will be affected by the proposal.

2.2.2 Section 170 Heritage and Conservation Register

The *Heritage Act* requires all government agencies to identify and manage heritage assets under their ownership and control. The relevant agency for this document, TAHE, maintains a 'Section 170' register for the

items under its management.[6] This list is also kept current and is accessible by way of the State Heritage Inventory. A search of this Register for known heritage items located within the proposal area was made on the 3rd April 2023 and the following items identified:

- Morisset Railway Station Group and Residences, Dora Street, Morisset, [item no.] 4801056
- Garden Suburb To Wyee, Railway Line, Extent of rail corridor through Lake Macquarie LGA, [item no.] 4805752
- Dora Creek Railway Underbridge, Macquarie Street Dora Creek, [item no.] 4803388

Government agencies must also ensure that all items entered on its register are maintained with due diligence in accordance with *State Owned Heritage Management Principles* (Heritage Council, 2005). These principles serve to protect and conserve the heritage significance of identified sites, items and objects and are based on relevant NSW heritage legislation and statutory guidelines. Proposals to alter or demolish assets of State significance must be referred to the NSW Heritage Council.

2.3 Environment Planning and Assessment Act 1979

The *Environmental Planning & Assessment Act 1979* (EP&A Act) is administered by the Department of the Premier and Cabinet and provides planning controls and requirements for environmental assessment in the development approval process. The EP&A Act has three main parts of direct relevance to environmental cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment process for local government (consent) and Part 5 which relates to activity approvals by governing (determining) authorities.

2.3.1 Local Environmental Plan

The Lake Macquarie Local Environmental Plan 2014 (LEP) is the applicable local planning instrument for the Lake Macquarie City Council LGA, which contains the proposal area. The Lake Macquarie LEP aims to make local environment provisions for land in Lake Macquarie in accordance with relevant standard environmental planning instruments under Section 33A of the EP&A Act. This LEP includes a schedule (Schedule 5) of items of cultural heritage which are significant locally. A search was made on the 3rd April 2023 for locally listed items and the following items were identified:

- Great Northern Railway, Line passes through Lake Macquarie City from Garden Suburb to Wyee WATANOBBI NSW, Lake Macquarie [LGA], LEP item 189
- Morisset Community Hall (77 Dora Street Morisset), LEP item 231
- The Mullard Chambers Building (71 Dora Street Morisset), LEP item 230
- The Dora Creek Railway Underbridge (as part of the Great Northern Railway LEP listing above, but also independently listed on the S.170 register)
- Tree—Morisset's Campsite, LEP item 120

Of these three items only the first (the Great Northern Railway) is within the project area and likely to be affected by works.

2.4 State Environmental Planning Policy (Transport and Infrastructure) 2021

[6] NSW Transport, *Section 170 Heritage and Conservation Register* (Sydney: Railcorp, 2016), https://www.transport.nsw.gov.au/projects/community-engagement/sydney-trains-community/heritage-and-conservation-register.

State Environmental Planning Policy (Transport and Infrastructure) 2021 (the Transport and Infrastructure SEPP) aims to facilitate the effective delivery of transport and infrastructure across NSW. The Transport and Infrastructure SEPP outlines the planning rules for these works and facilities, including:

- Where such development can be undertaken
- What type of infrastructure development can be approved by a public authority under Part 5 of the EP&A Act following an environmental assessment (REF) (known as 'development without consent')
- What type of development can be approved by the relevant local council, Minister for Planning or Department of Planning under Part 4 of the EP&A Act (known as 'development with consent')
- What type of development is exempt or complying development
- The relationship of other statutory planning instruments to the Transport and Infrastructure SEPP.

Table 2-1: listings summary

Item	Listing no.	Inside or outside proposal area	Approximate distance from proposal	Likely impact
Great Northern Railway	Lake Macquarie LEP item 189 TAHE Heritage and Conservation Register #4805752 (as Garden Suburb To Wyee, Railway Line)	Inside	0m	Yes
Morisset Railway Station Group and Residences	TAHE Heritage and Conservation Register #4801056	Inside	0m (Railway Station) 50m (Station Master's Residence) 75m (Gatekeeper's Residence)	Yes
Morisset Community Hall	Lake Macquarie LEP item 231	Outside	90m	No
Mullard Chambers Building	Lake Macquarie LEP item 230	Outside	145m	No
Dora Creek Railway Underbridge	TAHE Heritage and Conservation Register #4803388	Inside	2,950m	No
Tree—Morisset's Campsite	Lake Macquarie LEP item 120	Outside	119m	No
Morisset High School	Lake Macquarie LEP item 117	Outisde	330m	No
Wyee coal conveyor loop	Lake Macquarie LEP item 225	Outside	4,600m	No

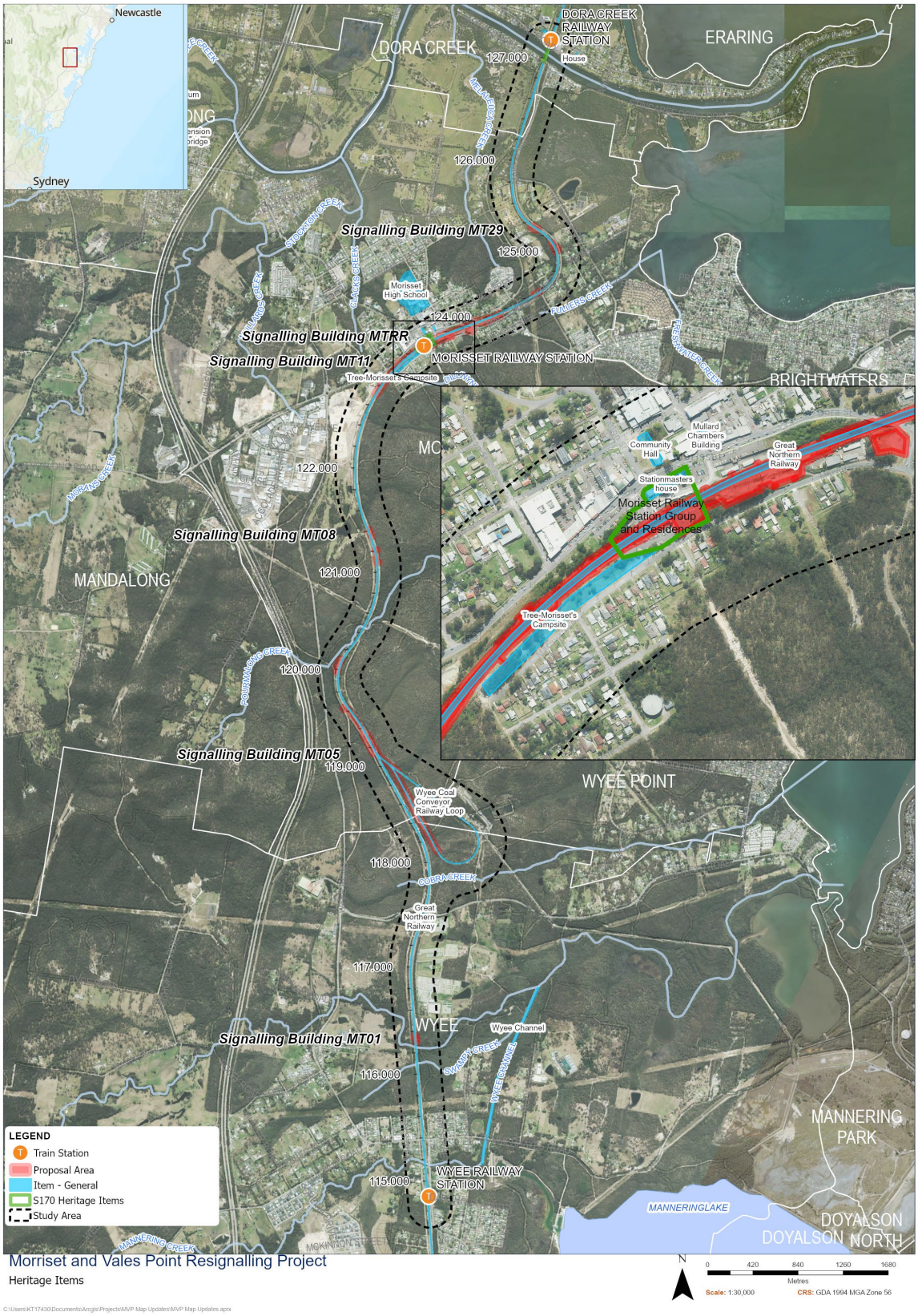


Figure 2-1: Heritage items within the proposal area

3. Historical context

The below is an abbreviated history of the place and the area, which is based largely on history provided in the Aurecon Preliminary Heritage Assessment.[7] No additional historical background research has been undertaken, and this above report should be referred to for historical background.

3.1 Railways

The first railways in the Lake Macquarie region were built to serve the coal mining industry, and specifically as colliery railways, from 1863 onwards. These were exclusively for the use of the mines, and did not carry passengers apart from coal and rail workers on these private lines. A line at Catherine Hill Bay for example, connected the colliery directly to a ship loading jetty, while a private workers' train ran until 1955 from Broadmeadow to the South Waratah Colliery.[8] The Vales Point balloon loop which is attached to the line is a modern such colliery railway, built to deliver coal to the former Vales Point Power Station.

The development of the Great Northern Railway, known in early construction as the Main Northern Line, running eventually from Sydney to Newcastle, by contrast, was meant as a far more major exercise in colonial development. No easy land transport route existed either for human or goods transport. This link, which was to replace the sea link as the major line of ground communication and trade between Sydney and the Hunter, was a considerable investment for the Colonial Government and was contemporaneous with the growth of rail lines throughout NSW—and to the other then Colonies—which were 'always… as political in their import as they were economic'.[9] The physical parts were no less important as sources of pride to the colonial mind than the link itself. The Union Bridge Company which won the tender to construct the Hawkesbury bridge, boasted that this 'largest structure of the kind in Australia… shall possess scientific perfection of design, stability in all its parts'.[10] This bridge, now an item of State heritage significance, was opened in 1888, linking the two railway lines which had been built to meet there, from Strathfield in the south and from Newcastle in the north.[11]

[7] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', sec. 4.
[8] Hunter History Consultants, *Lake Macquarie Thematic History* (Newcastle: Heritas Architecture, 2010), 103.
[9] John Gunn, *Along Parallel Lines: A History of the Railways of New South Wales* (Melbourne: Melbourne University Press, 1989), 72.
[10] Gunn, 190.
[11] NSW Heritage, 'NSW Heritage' https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=5012052.

Figure 3-1: Railway Station, Morisset, NSW, 25 February 1896. University of Newcastle Living Histories, https://www.flickr.com/photos/uon/4045222122/

3.2 Morisset

The township of Morisset draws its name from James Thomas Morisset (1780–1852), a soldier in the Napoleonic wars, who was a commandant of the Newcastle penal colony, praised by both Governor Macquarie and Commissioner Bigge (who were, respectively, on opposing sides of the penal-garrison vs. expansion question in the early 19thC politics of colonial affairs). He was associated with clashes with the Wiradjuri people in his later command at Bathurst in 1824, and with convict mutinies when he was in command at Norfolk Island in 1826, where he gained a reputation as a disciplinarian.[12] A tree near the railway station (addressed below) is identified with a plaque as a site where he camped.

[12] Vivienne Parsons, 'James Thomas Morisset (1780–1852)', in *Australian Dictionary of Biography* (Canberra: National Centre of Biography, 1967), https://adb.anu.edu.au/biography/morisset-james-thomas-2482.

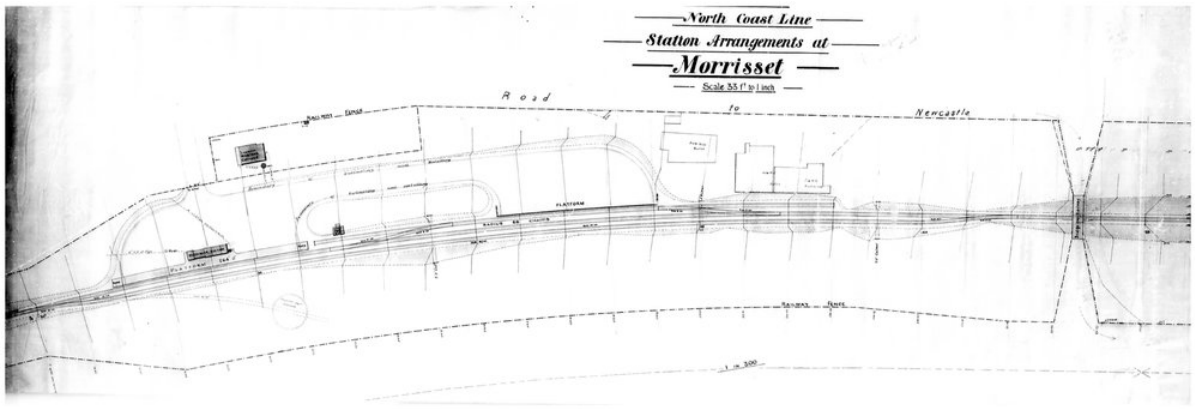


Figure 3-2: Morisset Railway Station Arrangements Diagram. N.d. (ARHS, supplied)

Morisset was one of the original railway stations on the Main Northern Line (later GNR) once its section was opened in 1887, as a single line, duplicated in 1911, the arrangement of permanent way which endures. The first station building, shown in Figure 3-1 and Figure 3-3, was a timber structure, on the original single side platform. The station grew through the early 20th century to include goods infrastructure including a jib crane, goods shed, and signals, indicating the reliance of the town on the railway (as opposed to the roads). A new brick station building was built in 1938, with an integral signal box (addressed below), likely to accommodate the increase in traffic from the Morisset Hospital.[13]

Figure 3-3: Postcard of Morisset Railway Station. Hunter Photo Bank. c.1901. https://newcastle-collections.ncc.nsw.gov.au/library?record=ecatalogue.70388

The main road transport roadway until late in the 20th century between Sydney and Newcastle ran to the east of Lake Macquarie, isolating Morisset and other towns to the west, rather than to the west of the Lake as the F3, now M1, motorway does. This motorway, now the primary means of land communication between Sydney and Newcastle, was begun in 1965, with the deviation taking in Morisset only coming under construction in 1983. Until this relatively late extension of the motorway, Morisset (and its nearby neighbour, Cooranbong)

[13] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', 99.

were served by rail as a primary means of transport to Sydney and Newcastle, without a 'first class' road linking them outside the local area. As shown in military maps of the area, from 1926 (Figure 3-4) and 1959 (Figure 3-5), the growth of Morisset in the mid-twentieth century was accordingly slow; and the town until the 1960s was primarily based around its train station, with the only high-quality local road, Cooranbong Road, linking that town to the rail, rather than to a city beyond.

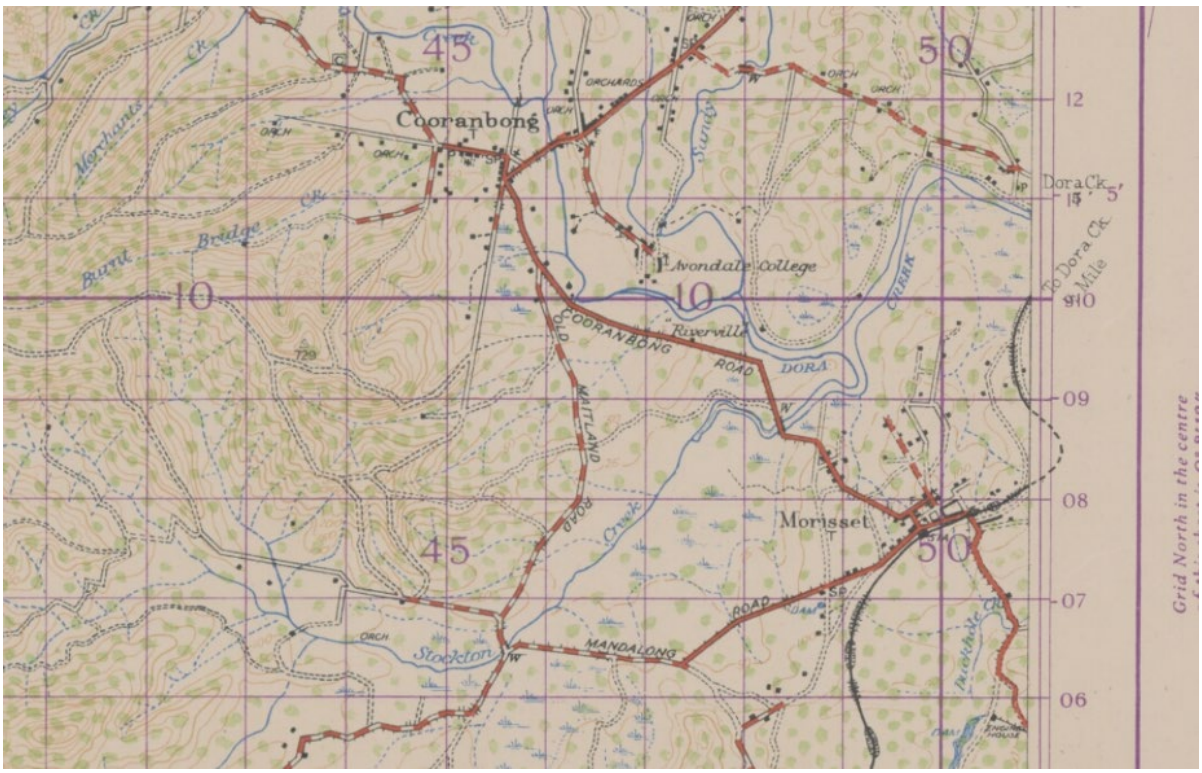


Figure 3-4: Morisset, New South Wales, 1926. Great Britain. War Office. General Staff, Australian Section, and Green H.J. http://nla.gov.au/nla.obj-778240395
Note the 'road formed' (meaning unsealed), or 'metalled' indicated by the coloured dashes, which are the roads linking Morisset/Cooranbong to Maitland and Sydney.

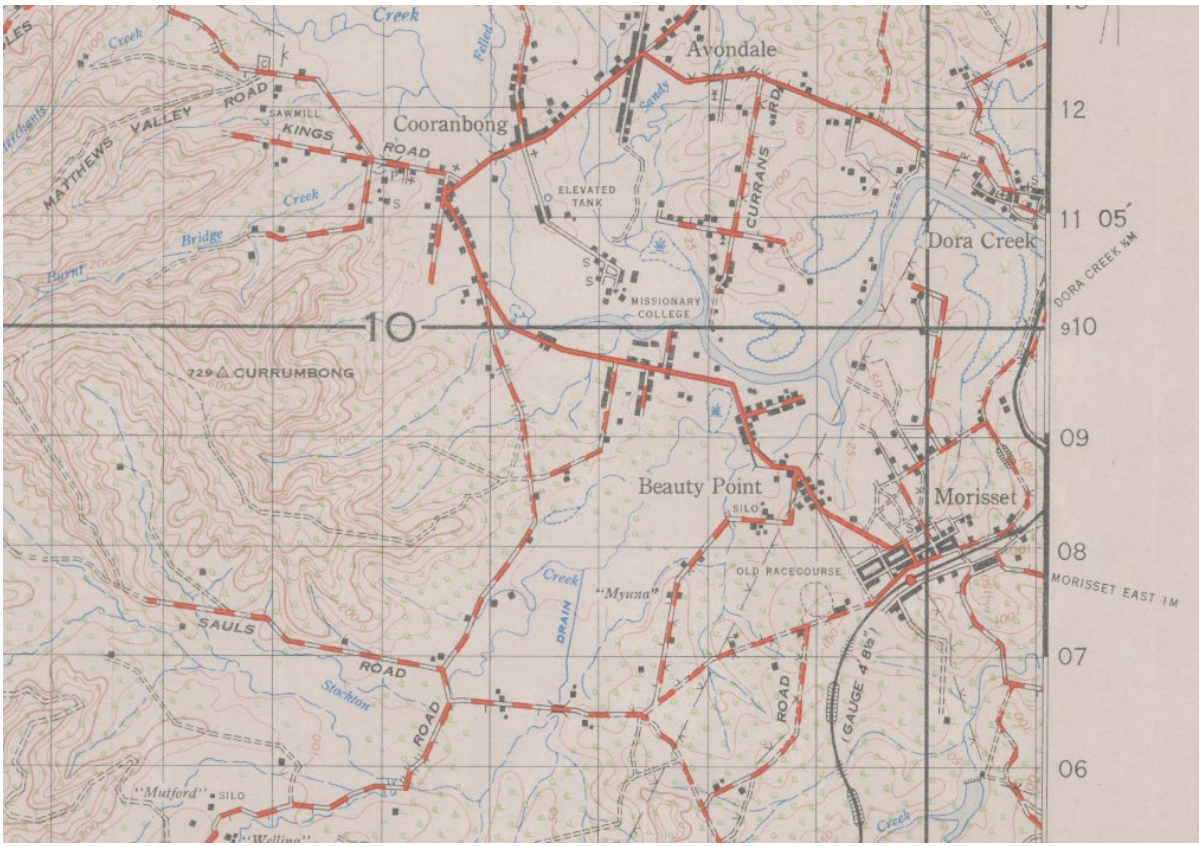


Figure 3-5. Morisset, New South Wales. Produced by Royal Australian Army Survey Corps, 1959. http://nla.gov.au/nla.obj-778240439

Note the relative low rate of suburban growth in the post-war in Morisset, and the unchanged quality of the roads (the dashed roads are 'third class', meaning unsealed).

Figure 3-6: Morisset Railway Station (September, 1969). Newcastle Morning Herald, 1969. Newcastle Libraries, Hunter Photo Bank https://newcastle-collections.ncc.nsw.gov.au/library?record=ecatalogue.75393
Note relevant station elements which are no longer present: the signage above the doors, and the semaphore style signals (in the background near the locomotive) which have been superseded and long since removed.

3.3 Signal box

As indicated by Robert Taaffe's study of NSW signal boxes, interlocking signals were installed at Morisset from the construction of the railway itself, originally a Type H9 machine, then an F10 signal box which endured until 1938.[14] This first set of signals is no longer extant at the station and was presumably demolished. A 'NSWR Type A – 36-lever mechanical signalling frame with a timber pulling list' was built into the new, distinctively inter-war brick platform building in 1938. Aurecon's Preliminary Heritage Assessment examined a number of similar and contemporary signal boxes, at Wyong, Gosford, Berry, Casino, and concludes:

> that Morisset Signal Box fits the profile of a Type H1 signal box whereby the Station was re-built, and the signal box moved from being a standalone structure to being incorporated into the main station building.[15]

It is likely that the NSW Railways management saw the combination of signalling infrastructure with the platform building as desirable from a costs point of view, combining the physical control over train movements with managerial control over staff and the movement of goods, and presence of staff for passengers.[16]

[14] Signal Boxes of NSW Railways and Tramways, Vol. 4 Gazetteer – Main North – Strathfield to Woodville Junction. 2020, cited in Aurecon, 108.
[15] Aurecon, sec. 4.4.
[16] Robert Taaffe, Signal Boxes of NSW Railways and Tramways, cited in Aurecon, 112.

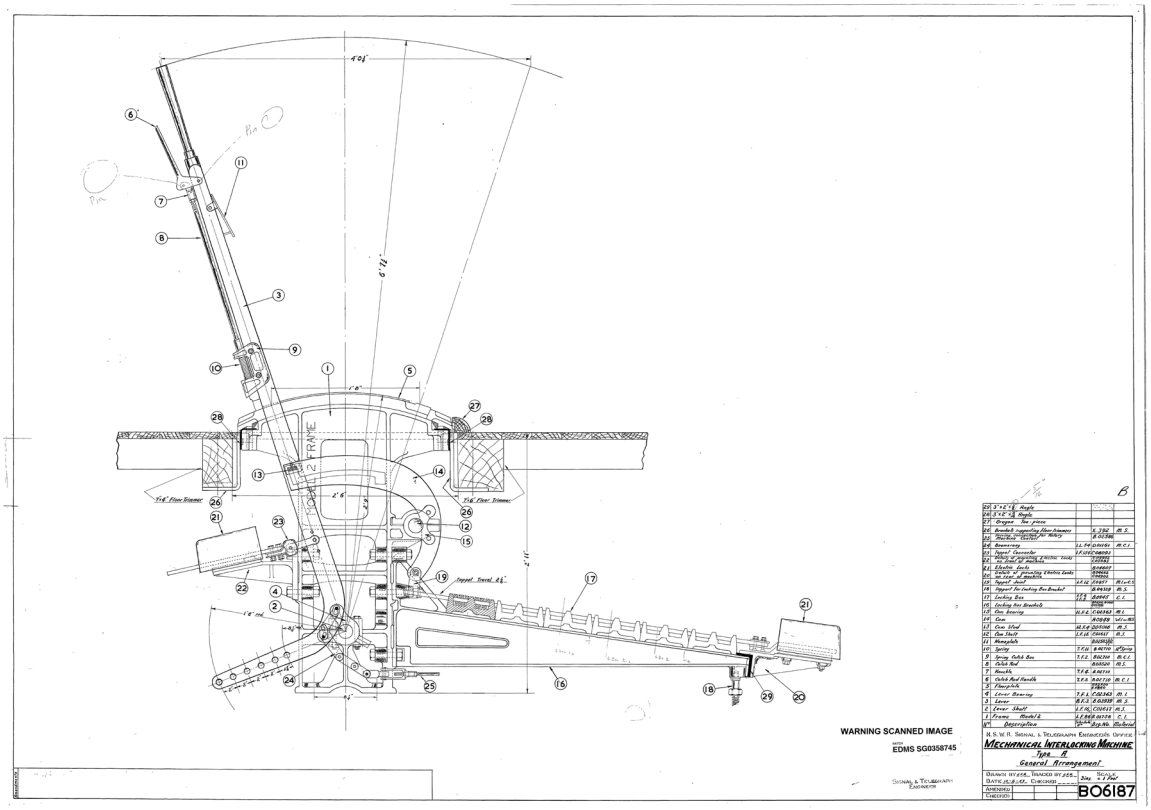


Figure 3-7: 'Type A Lever Frame'. (ARHS, supplied)

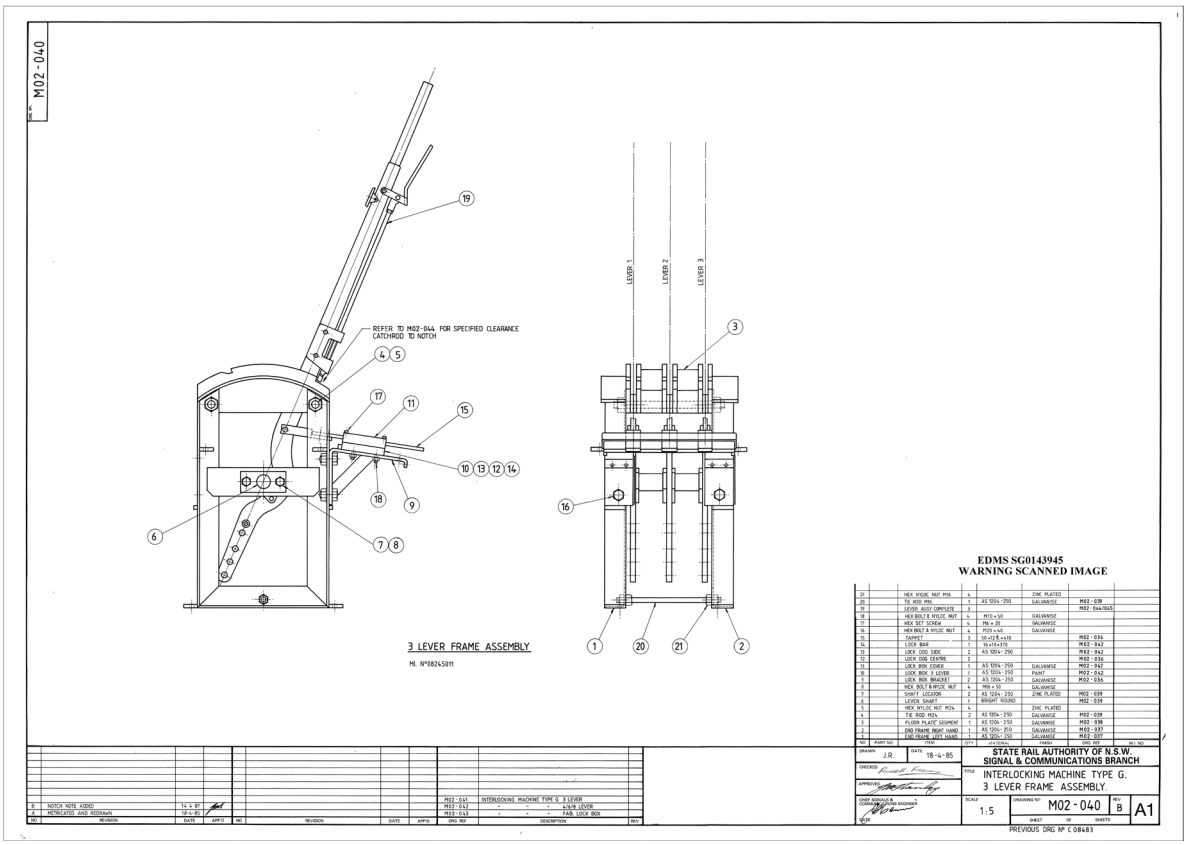


Figure 3-8: 'Type G Lever Frame' (ARHS, supplied). See also Figure 4-2

3.4 Previous physical changes

The following is a highly abbreviated chronology of physical changes in the European history of Morisset and Morissset Railway Station and nearby.

- 1823: Major Morisset camps near the future site of the Morisset Railway Station.
- 1887: Opening of Morisset Railway Station on the Main Northern Line
- 1888: Construction of the Hawkesbury Bridge to link Sydney and Newcastle
- 1910–1911 Duplication of the railway line
- By 1910: A footbridge was in place for pedestrians to cross the line
- 1938: Construction of the new brick platform building and signal box
- 1960s: Installation of 'a timber framed Indicator Panel and Relay Room was added to Morisset Signal Box'.[17]
- 1970: Construction of the Vales Point Balloon Loop
- 1980: Removal of a down Refuge Siding
- 1980s: Re-siting of a set of outdoor signal levers
- 1984: Electrification of the Great Northern line
- 1996: Construction of the new overhead footbridge including lifts
- c2018: Closure of ticket windows

[17] Aurecon, sec. 4.3.2.

4. Heritage significance

Aurecon's Preliminary Heritage Assessment makes assessments, at length and according to the proper guideline for *Assessing Heritage Significance,* of each of the elements of the place. For reasons of length and repetition these are not reproduced here.[18] The Aurecon report did not however provide a Statement of Significance of the concise summary kind used in the State Heritage Inventory and S.170 lists. The Statements of Significance below for the places to be affected are reproduced from these pre-existing lists.

A Statement of Significance is provided for the Morisset Railway Station Group and Residences on the Transport for NSW's S170 item inventory sheet on the SHI.[19] It is as follows:[20]

> Morisset Railway Station has heritage significance at a local level. Opened in 1897 [sic] Morisset station had a direct impact on the development of the local area, with the central commercial area of Morisset growing around the station. The current station building, built in 1938, physically represents the growth of Morisset in the 1930s, associated with the opening of Morisset Hospital and in particular the increasing demand on rail transport created by the Hospital. The current form of the station group reflects changing technological and social requirements of the station since the late 19th century. The Station has aesthetic significance as a good example of a 1930s railway station building with a highly intact incorporated signal box, with simple detailing typical of the interwar period. The two residences, particularly the Station Master's Residence, are good representative examples of the standard design Type J1 and J2 railway residences that were constructed for several decades from the 1880s.
>
> A Eucalyptus sp. tree on the southern boundary of the station ('Morisset's tree') has local heritage significance as a rare remnant tree that may predate European settlement of the area, and which is historically associated with James Thomas Morisset, early military Commandant of the Newcastle penal settlement.

Another pair of Statements of Significance, for the Main Northern Line (on which Morisset Railway Station is located) is provided in the SHI[21] The first is from the Local Environmental Plan's list:

> At State level, the Main Northern Line changed the relationship of Sydney & the North, by speeding up communications & transport. It changed profoundly the relationship of Newcastle with its hinterland & the north, & the standing of Newcastle as a great commercial centre. It confirmed the importance of Newcastle as a great coaling port, comparable with Cardiff in Wales.
>
> Locally, the railway brought changes to the pattern of development of Lake Macquarie. It was the route by which Lake Macquarie coal was carried to its markets. It linked the towns & villages of western Lake Macquarie with Newcastle, & was a way for holidaymakers to reach the Lake. It opened the Lake to residential development &, since electrification, has become a commuting link to both Newcastle & Sydney for residents of Lake Macquarie.

The second is from the S.170 listing:[22]

> Section of the Short North Line through Lake Macquarie LGA. See separate listings for the significant elements along the line.

[18] Department of Planning and Environment, 'Assessing Heritage Significance' (NSW Department of Planning & Environment, 2023), https://www.environment.nsw.gov.au/research-and-publications/publications-search/assessing-heritage-significance.
[19] Department of Planning and Environment.
[20] NSW Heritage, 'NSW Heritage' https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=4801056.
[21] NSW Heritage https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=1910139.
[22] NSW Heritage https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=4805752.

4.1.1 Significance of the proposed work areas

The proposed work areas can be identified broadly as:

- The railway station platform, building, and signal box,
- The signalling infrastructure including signalling locations,
- Overhead wiring items, and
- Track, including crossovers, a siding, including civil works.

Aurecon in their Preliminary report identified three specific areas for targeted significance assessments, on the basis that they were the key historic and industrial elements present and relevant to the project. These statements are reproduced below.[23]

Figure 4-1: signal box interior. See also Figure 3-7

Morisset Station Signal and Relay Room

The Morisset c.1938 lever-based and mechanical interlocking system and the Vales Point 1980s relay-based interlocking system, with associated push-button control panels, telephones and other equipment in the Signal Room are considered to be important to the history of railway technology and development in the Morisset and Lake Macquarie area. The historic relays in the relay room and historic rodding underneath the platform is also of historic importance. These all form a historic collective of signalling equipment from two different periods of signalling technology.

[23] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', sec. 2.1.6.

Figure 4-2: 1930s ground frame, installed in location c.1980s. See also Figure 3-8

Existing c.1930s ground frame, installed in location during 1980s electrification

Ground frames are an example of a rail signalling technology which are no longer manufactured but remain operational in many regional areas within the network, largely utilised in emergency situations. This frame is illustrative of the development in signal technology in the early 20th Century, and the adaptability of this technology at the present day Morisset Station group not being installed until the 1980s period of electrification of this line.

Figure 4-3: Standard track signal, Morisset

Figure 4-4: Standard guard's indicator with fresnel lens

Existing c.1980s or post-1980s signals

Standard signals at Morisset Station and at Vales Point date from the 1980s or post-1980s period of redevelopment in signal technology throughout the NSW network. This system is largely the most present technology within the network.

5. Assessment of historical archaeological potential and significance

Historical (non-Aboriginal) archaeological potential is defined as the potential of a site to contain any archaeological material. This archaeological potential is assessed by identifying former land uses and associated features through historical research and evaluating whether subsequent actions (either natural or human) may have impacted on evidence of these former land uses.

5.1 Previous studies

Two relevant studies of historical archaeological potential at Morisset Railway Station exist, and their findings are summarised below.

The first is Section 5 of the 2021 Preliminary Heritage Assessment by Aurecon, which was based on a desktop review of archaeological background information, identification of development, findings from 2020–2021 site inspections, and review and input from external historical archaeologists. This study found no previous archaeological studies to have been undertaken within the boundary of the Morisset Vales Point Resignalling project; all previous archaeological reports in Lake Macquarie having focused on areas and sites outside the relevant area.[24]

The second is an updated assessment memorandum made in 2023 by Artefact of the same area, to provide historical archaeological inputs based on the detailed design phase.[25]

5.2 Phases of development

The four key phases of historical development identified by Aurecon relevant to the study area were:

- Phase 1 – Early exploration, land grants and settlement (1790s – 1860s)
- Phase 2 – Construction of the railway (1880s)
- Phase 3 – Duplication of the railway (1910 – 1930s)
- Phase 4 – Post-war development and electrification (1940s onward).

A table from Aurecon's report setting out the timeline of relevant physical developments is reproduced below.

Figure 5-1: Phases of historical development

Historical Phase	Historical event or development in Lake Macquarie Region	Historical event or development at Morisset	Date
Phase 1 Early exploration and settlement (1790s – 1860s)	Captain William Reid mistakenly sails into Lake Macquarie, thinking it was "Coal River" near Newcastle		1800

[24] Aurecon, sec. 5.
[25] Artefact, 'Memo: Morisset Station Resignalling Project: Non-Aboriginal (Historical) Archaeological Inputs for Detailed Design Phase' (Artefact Heritage and Environment, 20 December 2023).

Historical Phase	Historical event or development in Lake Macquarie Region	Historical event or development at Morisset	Date
	Major Morisset exploration of the region	Major Morisset camped overnight somewhere near the current location of Morisset.	1823
	Rev. Lancelot Threlkeld of the London Missionary Society established his first Aboriginal mission on the north-eastern side of the Lake at Bahtahbah.		1826
	Establishment of first saw mills and collieries in the region	Much of Morisset remained largely unsettled and in possession of the Crown	1830s – 1840s
Phase 2 Construction of the railway (1880s)	The first colliery railway in Lake Macquarie was opened		1863
		Dora Street overbridge (road bridge) built Two saw mills noted on historic plans likely to have been constructed, less than km north-east of Morisset Station, near current Dora Street road bridge Former goods shed, goods siding, loading bank, and stockyards likely also constructed	1880s
	The Great Northern Railway construction was completed	Railway constructed through Morisset First settlements start to arrive around Morisset	1887
		Dora Creek underbridge built	1889
Phase 3 Duplication of the railway (1910 – 1930s)	The Great Northern Railway Line duplicated	During duplication works, the Up and Down platforms were constructed, original 1880s single platform on Down side demolished	1910
		New station building constructed including new signal box	1938
Phase 4 Post war development and electrification (1940s onward)		Dora Creek underbridge replaced	1954

Historical Phase	Historical event or development in Lake Macquarie Region	Historical event or development at Morisset	Date
		Stock yards removed and some original station buildings removed	1960s
	Vales Point Power Station becomes operational	Vales Point balloon loop connection opened to support delivery of local coal to power station	1978 – 1980
		Goods shed demolished	1979
	Electrification of the line between Gosford and Newcastle		1984
		Down refuge siding, stock siding, goods siding, loading bank and jib crane all removed	1980s
		Dora Street overbridge replaced, Down platform extended to the City side of Morisset Station and Up platform (Platform 1) rebuilt with c.1910s platform being demolished	1980s

5.3 Archaeological potential and significance

Three archaeological 'zones' were identified in Aurecon's 2021 report for investigation. These were Morisset Station, the Vales Point Loop, and the remainder of the study area. The potential and likely significance that this report identified for each of these zones follow.[26]

Potential Archaeological Impacts, Zone 1—Morisset Station and former Yards

There is low likelihood that these works will impact on significant historical archaeology within Zone 1, 1.1 and 1.2. Intact remains associated with the c.1880s Morisset Station or the c.1910 Down Platform including building footings or materials and artefact bearing deposits from early phases could have the potential to hold significance at the local level however resources are likely to be highly fragmented which would result in little significance. The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Intact remains associated with the c.1880s former Morisset Station Down and Up Yards including building footings or materials and artefact bearing deposits from early phases are unlikely to hold local-level significance. Rail infrastructure remnants such as track, sidings, sleepers and landscape features would be considered 'works' as opposed to 'relics' and would not meet the threshold for local significance and/or research value.

Potential Archaeological Impacts, Zone 2—Vales Point Balloon Loop

There is low to nil likelihood that these works will impact on significant historical archaeology within Zone 2. No known significant historical archaeology has been identified in the Balloon Loop which

[26] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', 160--161.

was undisturbed bushland until its construction in 1970 The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Rail infrastructure remnants such as track, sidings, sleepers and landscape features would be considered 'works' as opposed to 'relics' and would not meet the threshold for local significance and/or research value.

Potential Archaeological Impacts, Zone 3—Remainder of the study area

There is low to no likelihood that these works will impact on significant historical archaeology within Zone 3. The proposed works are unlikely to impact on substantially intact or significant archaeological remains, and archaeological items are unlikely to be intact or substantial enough to meet the threshold to be defined as 'relics'. Artefacts or deposits associated with Phase 1 and 2 may hold value at a local-level, however may not be intact or substantial enough to meet the threshold for significance.

The following table is reproduced from Artefact's memo, summarizing the historical archaeological context:

Table 5-1: historical archaeological context and significance (2021)

Historical Phase	Zone	Item	Potential for survival	Significance
Phases 2-3	All zones	Artefact bearing deposits associated with early rail history 1880s-1930s of the Morisset area	Low	Nil
Phase 1	All zones	Early colonial structures associated with exploration and early settlement	Nil	Local
Phase 2	Zone 1, 1.1 and 1.2	c.1880s Morisset Station platform and station building; c.1880s goods shed, loading bank, sidings, stockyards, dam	Low to Moderate	Nil
Phase 3	Zone 1	c.1910 Down Platform at Morisset	Low to Moderate	Nil
Phases 2-3	Zone 1, 1.1 and 1.2	Rail infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles	Low	Nil
Phases 2-3	Zone 2 and 3	Corridor infrastructure, remnant footings; rail-tracks, sleepers, services, roads and pathways, remnant landscaping, culverts and water receptacles and wells	Low to nil	Nil

Changes to the proposal which were identified at the stage of Detailed Design with the potential to change the archaeological assessment were as follows:

5.3.1 Changes near Morisset Station (near chainage 123.00km to 124.00km)

1. Extension of Perway Siding by 9.5 m towards Newcastle (located at approximately 124.000 km)
2. Separate split discharge of the 6-foot drainage (located near Morisset Station) as opposed to single surface drainage run
3. Elimination of the new drainage ULX at 123+500km from the concept design.

4. Change in overhead wiring structures (OHWS) comprised of:

    a. Additional newly proposed OHWS N123+706, removal of OHWS N123-696 and removal of OHWS N123+326.

5.3.2 Changes near chainage 121.000km

5. ULX08 has been aligned to chainage 121.090 due to the topography limitations (steep batter)

5.3.3 Changes near chainage 119.000km

6. Adjustments to the location of new Signalling Building MT05 (located at approximately 119.150 km).
7. Establish an Asset Protection Zone (APZ) of 30m and potential vegetation clearing as part of bushfire control measures at Signalling Building MT05 (located at approximately 119.150 km).
8. Change in overhead wiring structures (OHWS) comprised of

    a. Removal of OHW infrastructure for cross-over N119+083:

    i. Wire Run N-X0119A, N119+120, N119+166

    ii. Anchor/guy arrangement for N119+083 and N119+217/N119+219

9. Reduction in CSR scope with track leading to Vales Point Power Station Loop no longer part of the scope.

The following table, reproduced from Artefact's 2023 memorandum summarises the finding of the Concept Design phase, takes the assessment made with consideration of the Detailed Design phase, and provides a update and comparison:

Table 5-2: updated archaeological impact assessment

Phase of historical development	Zone	Item	Potential for survival	Significance	Level of potential impact (Concept Design	Level of potential impact (Detailed Design)
Phases 2-3	All zones	Artefact bearing deposits associated with early rail history 1880s-1930s of the Morisset area	Low	Nil	Low	Low
Phase 1	All zones	Early colonial structures associated with exploration and early settlement	Nil	Local	Nil	Nil
Phase 2	Zone 1, 1.1 and 1.2	c.1880s Morisset Station platform and station building; c.1880s goods shed, loading bank, sidings, stockyards, dam	Low to Moderate	Nil	Low	Low
Phase 3	Zone 1	c.1910 Down Platform at Morisset	Low to Moderate	Nil	Low	Low
Phases 2-3	Zone 1, 1.1 and 1.2	Rail infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles	Low to Moderate	Nil	Low	Low

Phase of historical development	Zone	Item	Potential for survival	Significance	Level of potential impact (Concept Design	Level of potential impact (Detailed Design)
Phases 2-3	Zone 2 and 3	Corridor infrastructure; remnant footings; rail-tracks, sleepers, services, roads and pathways; remnant landscaping, culverts and water receptacles and wells	Low to Nil	Nil	Low	Low

The conclusions and recommendations of the updated Archaeological Assessment are reproduced below in full at 7.9.1 and 7.9.2.

Artefact considered that since the 2021 archaeological assessment identified that the study area had overall limited potential to contain intact or significant archaeological resources, it was unlikely that works would result in adverse impact to significant archaeological works.

6. The proposal

The existing signalling system at Morisset will be upgraded to a modern computer-based interlocking system. This requires the replacement of an existing mechanical interlocking system installed in 1938, with colour light signals installed in the 1960s, and relay interlocking installed for the Vales Point loop in 1980. Works below are separated into the various disciplines.

Track works:

- Removal of two crossovers and their replacement with two new,
- Removal of existing Up Refuge track and installation of new Perway Siding, and
- Replacement and installation of turnouts, catchpoints, and other trackworks.

Signalling:

- Decommissioning and isolation of the mechanical interlocking signalling system, and its relays, at the Morisset Station Signal Box,
- Removal of 22 signal-relay huts,
- Construction of a new interlocking at Morisset and Vales Point,
- Construction of a new brick signalling building at Morisset (MTRR), and an additional five brick signalling buildings (MT01, MT05, MT08, MT11, and MT29), and
- Installation of train protection systems throughout,
- Removal of signal posts,
- Replacement of guard indicator lights on the Morisset Station platforms.

Overhead wiring:

- New crossovers and staunchions to support the track and signalling, involving excavations up to 0.9m in diameter and 6m in depth.

Drainage:

- New intertrack drainage to be installed next to the new tracks, to connect to existing pits,
- New cess drains,
- A new concrete pipe at approx. chainage 123km.

Combined Services Route

- New and existing cable services routes will be used to install cables for signalling, communications, compressed air and electricity. CSR trenching for the main route requires trenching approximately 1m wide, and 1-2m depth, while local CSR trenching is 0.4m to 0.6m wide and 1 to 1.2m in depth.

Electrical

- Commissioning two new 11kV/415V padmount transformers as a power supply to the MTRR and MT05 buildings,
- Power supply upgrades to signalling and OHW,

- Earthing and bonding,

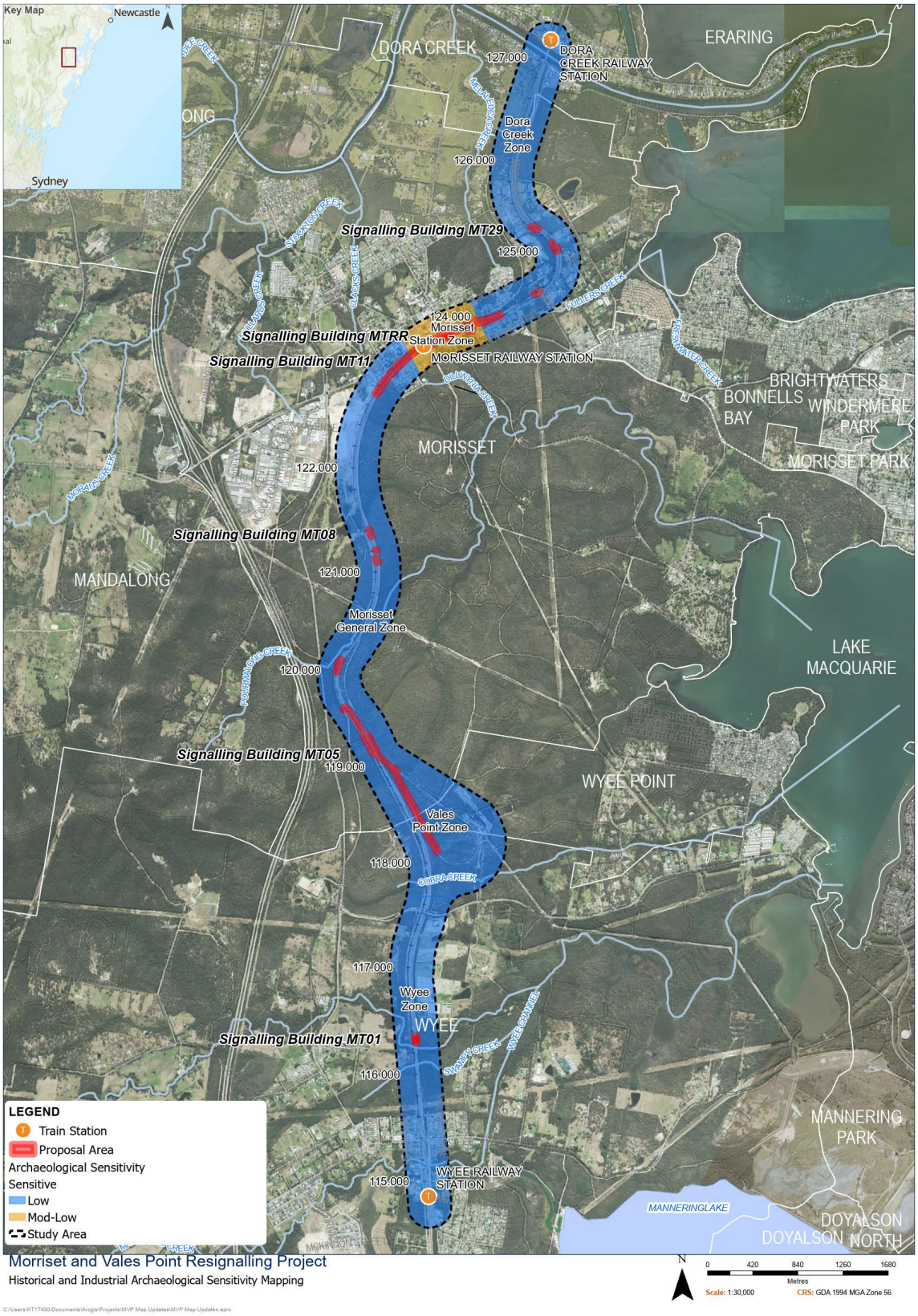


Figure 6-1: Historical and Archaeological Sensitivity Mapping, including locations for proposed buildings

6.1.1 Change from concept to detailed design

The Preliminary Heritage Assessment by Aurecon made a series of findings and recommendations about the prospective impact of works as they were then in 2021 proposed. The purpose of this document is to update these findings and recommendations, assessing the impact of any changes, and to update any recommendations made by Aurecon that would need to be addressed at the detailed design stage.

The following details of changes from concept design, which was assessed in 2021 by Aurecon, to detailed design which is assessed in this document, is reproduced from a SMEC REF Consistency Assessment, an accurate record of changes made to the design, of 13 September 2023 and gives an outline, discipline by discipline, of meaningful changes to the proposal.

Track works

- Minor changes to vertical alignment of the two new crossovers are proposed. Changes proposed will reduce the number of vertical lowers required during construction. The magnitude of changes 5-40 mm within the existing development footprint.
- Minor changes to super ramps before and after MT53AB are proposed. The magnitude of changes are 5-40 mm within the existing development footprint.
- The Perway Siding has been extended by 9.5m towards Newcastle. The alignment of the Perway Siding has been slightly adjusted from the concept design. The length of the siding has been extended from 532.5m by 9.5m to 541.5m toward the country end to 123+997km, to account for the clear standing room required from signal MT22.

Signalling works

- Signalling buildings MT05 has been relocated approximately 100m to chainage 119.150 km from chainage 119.250km.
- No gutters to be installed, ensure that the concrete coping around building is wider than the building eves so that water run off falls on concrete and not on the ground
- A Bushfire Hazard Assessment (Building Code and Bushfire Hazard Solutions Pty Ltd, 2023) was prepared to inform the Signalling Buildings design.
- A 30m APZ is recommended to be created at building MT05. This potentially involves removal of one tree and vegetation along the fence to the north of building MT05 (Figure 2–4). A conservative estimate of 200m2 (0.02ha) of vegetation clearing is expected. This vegetation is associated with Dry Schlerophyll Forest. This vegetation is well represented outside of the Proposal area and does not represent any BC Act or EPBC Act- listed TECs.

Drainage

- Separate split discharge of the 6-foot drainage instead of a single run drain is proposed.
- Based on the hydrology and the hydraulic assessment, the existing drainage ULXs within the new siding track area have adequate capacity to capture the localised stormwater flows. As a result, splitting the 6-foot drainages and connecting the subsoil drainage to the nearest existing drainage ULXs is considered a better option than a single-run surface drain proposed at the concept stage.
- The length of the proposed 6-foot drainage sections is approximately 300m which follows the same alignment of the single run surface drain proposed in the Draft REF scope. A total of 10 drainage pits are proposed along the drainage alignment. Pit levels and buried pipe will range between 0.8m to 3.453m depths to tie into the existing drainage ULXs.
- No gutters on buildings, therefore no concentrated flows from buildings and associated surface drainage required.
- A flood study will be carried out in the next stage to determine the signalling building finished floor levels.

Combined Services Route

- ULX08 location has been changed from chainage 121.135 to chainage 121.090 due to the topography limitations (steep batter).
- CSR scope has been reduced to not include the track leading to Vales Point Power Station Loop. ULX03 and ULX04 are named ULX alignments that are no longer provided with designs due to the reduction of scope.

Electrical

- The location of MT05 has been adjusted.

A general overview of the project area and the location of these works is provided above at Figure 6-1. More specific maps which overlay the proposed works on areas of identified archaeological potential are reproduced from Aurecon's memorandum below at 6.1.3.[27]

6.1.2 Drawing catalogue

Table 6-1: Drawing catalogue for Morisset Railway Station

Drawing Name	Drawing Number	Revision and Date
Cover Sheet	MVP-CCG-AR-DRG-001	3
Drawing index	MVP-CCG-AR-DRG-002	3
Location plan	MVP-CCG-AR-DRG-003	2
Notes & Legend	MVP-CCG-AR-DRG-004	1
MT01,08,11&29 Detail Plans, Elevations & Sections	MVP-CCG-AR-DRG-051	3
MT_05 Detail Plans	MVP-CCG-AR-DRG-052	3
MTRR Detail Plans	MVP-CCG-AR-DRG-053	3
MT01 Site Plan	MVP-CCG-AR-DRG-00101	3
MT05 Site Plan	MVP-CCG-AR-DRG-00101	3
MT18 Site Plan	MVP-CCG-AR-DRG-00101	3
MT11 Site Plan	MVP-CCG-AR-DRG-00101	3
MTRR Site Plan	MVP-CCG-AR-DRG-00101	3
MT29 Site Plan	MVP-CCG-AR-DRG-00101	3
Details Sheet 1	MVP-CCG-AR-DRG-00201	1
Details Sheet 2	MVP-CCG-AR-DRG-00202	1

[27] Artefact, 'Memo: Morisset Station Resignalling Project: Non-Aboriginal (Historical) Archaeological Inputs for Detailed Design Phase', 15–18.

Drawing Name	Drawing Number	Revision and Date
Details Sheet 3	MVP-CCG-AR-DRG-00202	1

6.1.3 Detailed overview of proposed design changes overlaid on areas of archaeological potential

A series of maps were prepared by Aurecon overlaying the proposed works on areas of archaeological potential, and are reproduced below.

6.1.4 Proposal justification

Context

Transport for NSW has an overarching *Long Term Transport Master Plan* and a *Future Transport Strategy 2056* which are modernisation plans for the rail network in Sydney and NSW. As well as the general reliability and operating/maintenance cost benefits from modernisation, these plans also respond to specific recommendations from the Waterfall (2004) and Glenbrook (2001) Special Commissions of Inquiry.[28]

These Inquiries made recommendations about the importance of signalling upgrades, including that:

- Network control should be centralised, including the functions currently performed by signallers,
- Train controllers should be able to effectively and safely control train movements from a central location,
- These systems should be compatible throughout the rail network, and
- There should be interoperability of communications throughout the whole of the NSW network.

The *Future Transport 2056* plan has the objective of moving to a digital systems program, particularly including the replacement of obsolete train control technology with the Advanced Train Running Information Control System (ATRICS). The Signalling and Control Systems Strategy further indicated that throughout the whole network, 'All remaining mechanical signalling and Signal Boxes are to be replaced as soon as practical. Any interim changes to mechanical locking systems shall be avoided and instead used to support the requirement for early replacement'.[29]

MVP Overall justification

Resignalling of the Morisset to Vales Point area is required, as the existing mechanical interlocking system is life expired, and contains infrastructure that will not support a modernised, reliable and safer remote-controlled system.

Mechanical interlocking is now only utilised at a few discrete locations (which are all in the process of being decommissioned), and parts are no longer readily available when they become damaged or fail. This creates an ongoing operational risk for this infrastructure that can only be solved by movement to a safer remote-controlled system.

Several critical safety incidents over the past 20 years (the Waterfall incident, the Glenbrook incident) have also identified the need for a safer remote-controlled digital system. The move to an ATRICS remote-controlled system is a key action for Transports master planning, in line with providing customers with a safe rail journey.

TfNSW recognises the importance of maintaining the heritage significance of these important structures, through the design and construction phase of the works. In particular, this SoHI report provides mitigation measures to prevent the loss of knowledge for these historical systems (mechanical interlocking) through the production of an oral history and documentary project.

[28] The Hon. Peter Aloysius McInerney, 'Final Report of the Special Commission of Inquiry into the Glenbrook Rail Accident' (Parliament of NSW, April 2001), https://www.parliament.nsw.gov.au/la/papers/Pages/tabled-paper-details.aspx?pk=50980; The Hon. Peter Aloysius McInerney, 'Final Report: Special Commission of Inquiry into the Waterfall Railway Accident' (Parliament of NSW, January 2005).
[29] Sydney Trains, 'PL S 44000---Signalling and Control Systems Strategy' (NSW Transport, 1 July 2016), 42, https://www.transport.nsw.gov.au/system/files/media/documents/2018/PL-S-44000-Signalling-and-Control-Systems-Strategy.pdf.

7. Heritage impacts

The following subheadings identifies the components which need to be considered when assessing impacts to a heritage item. It is then followed by a summary of these impacts separated by the proposed works. This assessment has been based upon the drawings listed in Table 6-1.

The following table is reproduced from Aurecon's Preliminary Heritage Assessment and is a guide to the meaning of various levels of impact.[30]

Table 7-1: impact gradings

Ranking	Definition
Major adverse	Actions that would have a severe, long-term and possibly irreversible impact on a heritage item. Actions in this category would include partial or complete demolition of a heritage item or addition of new structures in its vicinity that destroy the visual setting of the item. These actions cannot be fully mitigated.
Moderate adverse	Actions that would have an adverse impact on a heritage item. Actions in this category would include removal of an important part of a heritage item's setting or temporary removal of significant elements or fabric. This could also include changes to an item's use. The impact of these actions could be reduced through appropriate mitigation measures.
Minor adverse	Actions that would have a minor adverse impact on a heritage item. This may be the result of the action affecting only a small part of the place or a distant/small part of the setting of a heritage place. The action may also be temporary and/or reversible.
Neutral	Actions that would have no heritage impact.
Minor positive	Actions that would bring a minor benefit to a heritage item, such as an improvement in the item's visual setting.
Moderate positive	Actions that would bring a moderate benefit to a heritage item, such as removal of intrusive elements or fabric or a substantial improvement to the item's visual setting.
Major positive	Actions that would bring a major benefit to a heritage item, such as reconstruction of significant fabric, removal of substantial intrusive elements/fabric or reinstatement of an item's visual setting or curtilage.

7.1 Physical heritage impacts

There will be substantial trenching work associated with the removal and replacement of OHW and CSR. A new signalling bungalow (MTRR) and five new signalling buildings will be constructed. There will be trackwork, involving the removal and replacement of crossovers, as well as the creation of new drains, cess pits, and other drainage. The design has been developed to avoid impact to other nearby heritage items, particularly:

[30] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', tbls. 1–1.

- The Stationmaster's and Gatekeeper's Residences on Dora Street, and
- The Morisset Campsite Tree, which is in the car park.

Almost all of the physical works will be undertaken on parts of the railway line and permanent way previously identified (by Aurecon in 2021) as not having heritage significance: track ballast, overhead wiring, contemporary signals, and the like. Changes to works involving these non-significant elements will therefore not represent any change, or impact, to significant fabric.

Physical heritage impacts to the Morisset Railway Station will be confined to:

- The decommissioning of the signalling interlocking mechanism, and the associated equipment, and
- Replacement and installation of new guards indicators.

The decommissioning of the signalling equipment will result in an adverse, but unavoidable, impact on heritage. These will be mitigated through:

- Retention of the signalling levers and interlock, and all the moveable heritage of the signal room, on site,
- Recording of the existing state before works, in the form of a Photographic Archival Recording (PAR),
- Interpretation, to be detailed in an Interpretation Strategy and Interpretation Plan, which may involve plaques, signage on the signal box windows, reuse of levers and rod material in installations, and the production of a video documentary about the working practices of the signal box.

The impact of the installation of two guards indicators on the surface of Platforms 1 and 2 will not affect platform fabric of significance, as they will be installed at a location outside the early construction (Platform 2), of late 20th century construction, most likely the 1980s,[31] and on a platform identified by Aurecon as rebuilt in the 1960s (Platform 1). This Platform contributes little to the significance of the station. The remaining guard indicator which is hanging from the Platform 2 awning (Figure 7-1) will be replaced with a new device mounted on a contemporary bracket attached with clamps, of a similar design to a sympathetic wayfinding sign attached nearby (see Figure 7-2). This is a minimally impactful solution, and the best outcome in heritage terms where like-for-like replacement is necessary. The overall impact will be low.

[31] Aurecon, 144.

Figure 7-1: existing guard indicator with fresnel lens, to be replaced

Figure 7-2: platform wayfinding signage with contemporary, sympathetic, bracket fixed with clamps

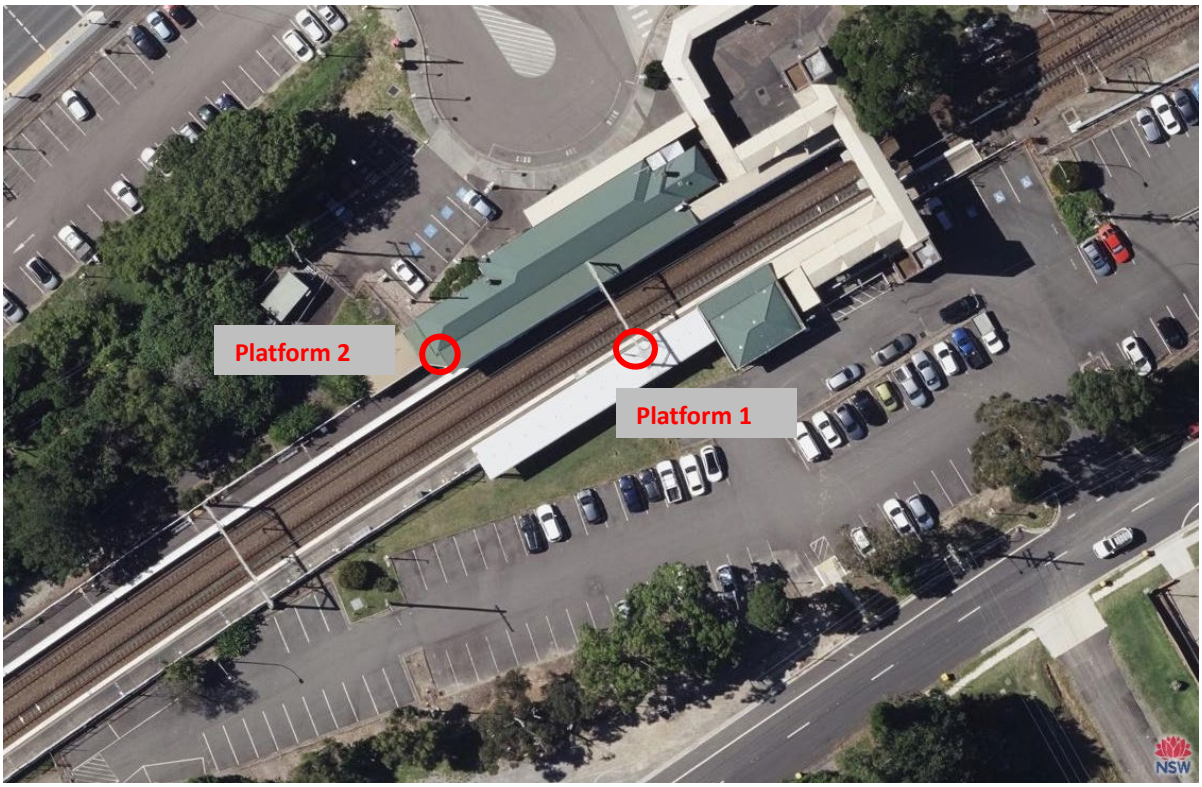


Figure 7-3: aerial image showing the proposed installation locations of the guards' indicators, shown in red circles.

The image above at Figure 7-3 shows the location of the guards' indicators, both in the locations of existing guards' indicators. Platform 1 (as discussed above) is a contemporary platform which contributes little to the significance of the place. The indicator on Platform 2 is attached to the awning of the Platform 2 building which, though located in the c.1910 platform area, is physically part of the c.1938 works, and is likely a device and lens installed at a later (20th century) date.

7.2 Setting, views and vistas

The proposed work is largely confined to elements (signalling equipment, OHW, CSR, drainage and civil) which are either:

- outside the view of the public, are underground or inside buildings and therefore obscured from view, or
- replace rail and signal infrastructure with other similar infrastructure, with the result of a neutral impact.

In addition, for much of the proposed work, the installation of railway signalling and track infrastructure in a rail corridor is appropriate and expected.

Three elements present a risk of impact to the setting of Morisset Railway Station:

- The construction of the MTRR building to the north of the station platforms,
- The construction of building MT11 to the south of the platforms, and
- The removal of previous signalling infrastructure, in particular the 1930s 'Type G' ground frames to be removed.

The buildings are the nearest to the railway station, with all the other buildings proposed for well outside any conceivable view of the public, and not within any heritage curtilages.

The impact of the MTRR building, the closest and largest of the new structures, has been mitigated by:

- Locating it away from the visual envelope of the railway station. Figure 7-7 below shows the minimal visual impact the construction of this building will have to the vista of the rail corridor facing north: this photograph was taken at the extreme end of the accessible platform.

- The MTRR building has been sympathetically designed to match the interwar style of the Morisset Railway Station Group. It has a similar brick profile and colouring, and has a hipped roof.

A design decision was made for the MTRR building to be roofed, instead of with a skillion roof, with a hipped roof of visual similarity to that of the railway station building (the design shown inFigure 7-9: MTRR building (detail)). The MTRR building which is larger, and closer to the railway platforms, will benefit from this visual similarity which does not however seek to imitate or pretend to contemporaneity.

The roofing material will be a Colorbond *Pale Eucalypt* which will be visually similar to the roofs of the platform group. Another green, a *Cottage Green,* which would have been visually distinct, was rejected as being too visually dominant and dark, drawing attention to itself.

The bricks are proposed to be a *Murray Grey* which is a similar, but not imitative, brown to the Platform 2 bricks. Rejected colours included *Simmental Silver* (for its brightness, and potential attractiveness to vandals), and *Bowral Brown* (for its darkness, and as raised in a safety workshop, too close to a red tone which is forbidden within the permanent way).

Figure 7-4: Murray Grey brick colour

Figure 7-5: selected roofing material

Figure 7-6: distances from the Railway Station to buildings MTRR (130m) and MT11 (244m) (CCG)

Figure 7-7: view towards MTRR site looking northeast from Platform 1 at the farthest extent accessible to the public. The approximate position of the MTRR building is circled in red.

Figure 7-8: view toward Morisset Railway Station from the location of the MT11 building. Note that this location has no visibility from or to the railway station platforms

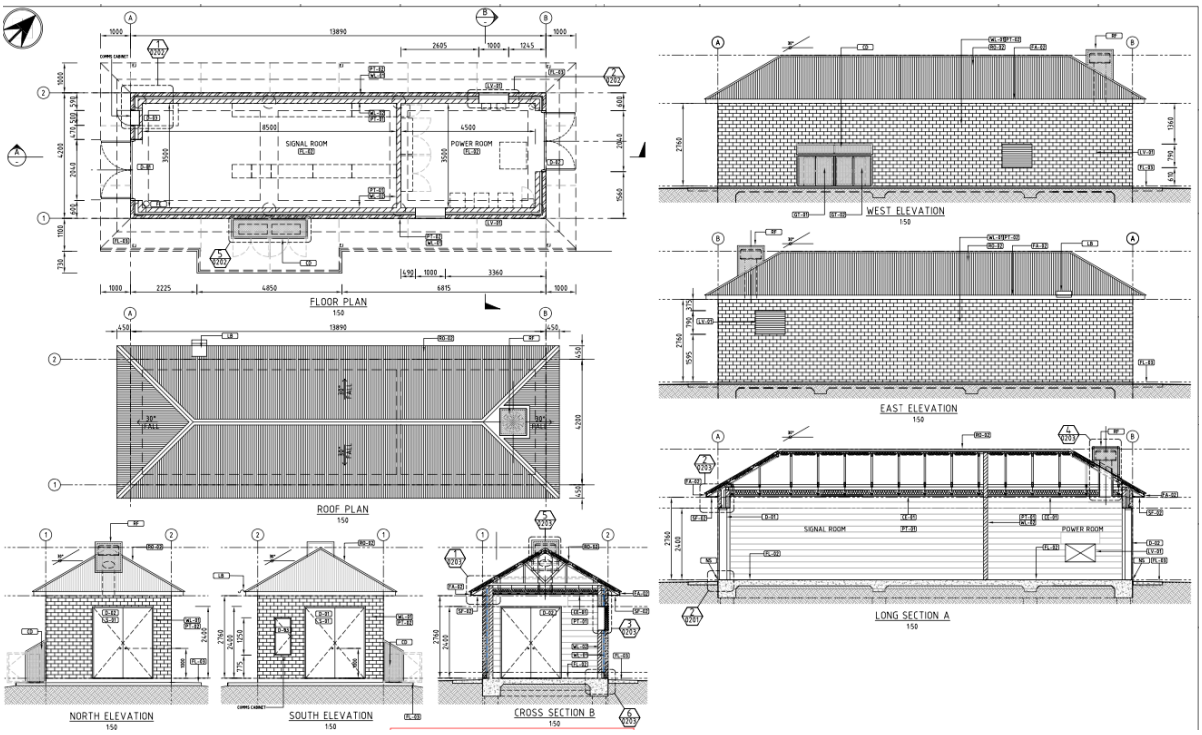


Figure 7-9: MTRR building (detail)

7.3 Landscape

The significance of the Morisset Railway Station Group, and of the Main Northern Line, lie in the historical industrial heritage of the place. No landscape elements of cultural significance (for instance, gardens, landscaped areas, or cultural landscapes) have been identified. No landscape heritage impact is expected.

A distinction should be drawn between the existence of cultural landscape heritage significance and the simple presence of vegetation. Impact on the ecological values of the place and on biodiversity are addressed separately.

7.4 Use

While the functional use of the railway station will not change, since the place will remain in use as an operational suburban railway station, the way Morisset Railway Station is used will change, since its function as a signalling place and a workplace for signallers will be made redundant. There will no longer be mechanical signalling at the station. This type of operation is now rare in the NSW rail network, and it is the decommissioning of the signalling interlocking levers, and the ending of all the associated work practices, that contributes to the adverse heritage impact of the proposal.

By the same token, signalling practices associated with an interlocking installed before the Second World War, and of an even earlier design, are no longer in use as part of a modern rail network, and it is precisely these practices the proposal aims to alter. There is no viable way to indefinitely retain the existing signalling infrastructure in use on the Main Northern Line.

The closure of the signal box as a place of work risks:

- Vandalism, neglect, or deterioration through disuse,
- Theft of items perceived to have market value,
- The eventual loss of irreplaceable intricate technical and tacit knowledge, and work memory.

Some of these risks can be mitigated. Others cannot.

- The last of these is, to an extent, unavoidable, and inherent in the desirable replacement of legacy signalling systems with safer and more capable ones. This can only be mitigated by interpretation, and by the recording of the place and of the work practices of the signallers,
- Vandalism and theft must be addressed by proper securing of the place and ongoing maintenance and cleaning, which are outside the scope of this project.
- It should be noted that Sydney Trains facilities management have an ongoing responsibility to maintain and care for this item, which will not change as the result of these or other works. Maintenance, repair, and cleaning will be made easier through the retention of the station as an operational railway station.

7.5 Demolition

The proposal involves removal of a large number of items (OHW gantries, cabling, and the like) which are of no cultural significance, and of trenching in areas where minimal archaeological potential has been identified.[32] These will have negligible impact on cultural heritage.

As part of the decommissioning of the signalling equipment, it is eventually proposed to cut and remove the signal rodding which connects the signal levers in the Signal Box (shown in Figure 7-10). This is inherent to the decommissioning and is not avoidable. It will be mitigated through recording, by interpretation, and by donation of the removed elements to Transport Heritage for use in their projects, through adaptive reuse.

[32] Aurecon, 155.

Figure 7-10: signal rods and pivots where they emerge from the underfloor of the Signal Room on Platform 2.

7.6 Curtilage

No curtilage impacts (as described in the NSW Heritage Office's *Heritage Curtilages)* are proposed.[33]

7.7 Movable heritage

Movable heritage at the site exists, and includes but is not limited to:

- A signaller's staff,
- Signal lever equipment, including blocks, labels, canvas covers, keys and the like (but not including the levers themselves, the interlock mechanism, and rods, which are not 'moveable' heritage in the relevant sense of the term),
- Blocking equipment for points,
- Electric control panels, with keys, blockers, and other associated items,
- Padlocks,
- A telephone,
- A safe,
- A photograph of former Stationmasters,
- A wooden luggage and goods trolley, and
- Wooden tumbling indicator boards.

[33] Heritage Office, *Heritage Curtilages* (Sydney: Department of Urban Affairs and Planning, 1996).

Works as part of the resignalling project will have inherent impact on the signal box and its movable heritage. The signal levers will no longer be usable in their original function, so the equipment relevant to the use of these levers will also become redundant.

The moderately adverse impact of decommissioning the signal box will be mitigated by the retention of all relevant movable heritage on the site, as well as by the recording of these items in a schedule, the result of a Movable Heritage Audit undertaken according to NSW Heritage's Movable Heritage Principles.[34]

7.8 Aboriginal cultural heritage

Aboriginal cultural heritage has not been assessed in this SOHI. Any appreciation of any Aboriginal cultural heritage as part of a due diligence assessment will be made separately for the purpose of updating the Review of Environmental Factors.

7.9 Historical archaeology

Artefact in their memorandum report made impact assessments on any potential archaeology, updating the assessment from the Concept Design stage (2021) to the Detailed Design stage (2023). A table showing the change in likely impact is reproduced from this report above at Table 5-2. Artefact's conclusions and recommendations are as follows:[35]

7.9.1 Conclusions

- The changes from concept design to detailed design have been assessed, and it is considered works are unlikely to result in adverse impact to significant archaeological 'works.' The 2021 archaeological assessment identified that the study area had overall limited potential to contain an intact and significant archaeological resource associated with previous uses of the study area, or earlier phases of The Great Northern Railway.

- Detailed design is unlikely to result in impacts to archaeological 'relics,' therefore approval under s139 of the NSW *Heritage Act* is not required.

7.9.2 Recommendations

- Further specialist archaeological advice should be sought if the design changes in any way.

- The Sydney Trains Unexpected Finds Procedure '*EMS-09-PR-0164 Unexpected Archaeological Finds*' must be implemented for all ground disturbing works. Additional assessment and/or approvals may be required prior to works continuing in the affected area(s) based on the nature of the discovery.

  - Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW Heritage Act.

- Sydney Trains do not need to fulfil the consultation requirement under the TISEPP to notify Lake Macquarie Council of impacts to local heritage as impacts are expected to be low or negligible. However, should more substantial archaeological remains of local significance be identified, the Council would be notified in accordance with the relevant TISEPP condition.

[34] NSW Heritage Office, *Moveable Heritage Principles* (Sydney: NSW Heritage Office and Ministry for the Arts Movable Heritage Project, 1999).
[35] Artefact, 'Memo: Morisset Station Resignalling Project: Non-Aboriginal (Historical) Archaeological Inputs for Detailed Design Phase', 31.

7.10 Conservation areas

The site is not part of any Heritage Conservation Areas (HCAs), and there will be no impact to any such areas.

7.11 Cumulative impacts

The resignalling works are part of a broader scope of works, involving decommissioning mechanical signalling infrastructure throughout NSW and their replacement with more modern, computer-based, automatic signalling. The *Signalling and Control Systems Strategy* for Sydney Trains aims to remove mechanical and electromechanical mechanisms entirely, for safety and reliability reasons, and for the reasons covered above in the 'Project Justification' in section 6.1.3.

Cumulative negative impact to the collective stock of similar signal boxes as the result of decommissioning will occur. This signal box is rare in use and one of the last three of its kind in the Sydney Trains network and in NSW, and the last Type H box.

While this cumulation is largely outside the scope of this Statement of Heritage Impact, which assesses this specific proposal for works, it should be noted that the works are part of a larger modernisation and replacement project.

The moderately adverse heritage impacts at Morisset are mitigated through the retention of the fabric on site, through recording, and through interpretation. It would be appropriate for the interpretation (addressed in an Interpretation Plan) to acknowledge the broader place of Morisset Railway Station's signal box within the context of NSW signal boxes, and the cumulative impact of their decommissioning.

7.12 Other heritage items in the vicinity

Heritage items in the vicinity, some identified by Aurecon's report and others identified in the preparation of this document, and which have not been subject to change in the design from concept to detailed, that will not be impacted from works include:

- The Morisset Camp Tree
- The Station Masters' Residence
- The Gatekeepers' Residence
- Morisset Community Hall (77 Dora Street Morisset)
- The Mullard Chambers Building (71 Dora Street Morisset)
- Morisset High School
- Wyee Coal Conveyor Loop

7.13 Summary of heritage impacts

Table 7-2: Heritage impact assessment: Morisset Railway Station Group and Residences

SHR Criteria	Statement	Impact Assessment
SHR Criteria a) Historical Significance	Morisset Railway Station has historical significance at a local level. Opened in 1897 Morisset station had a direct impact on the development of the local area, with the central commercial area of Morisset growing around the station. The current station building, built in 1938, physically represents the growth of Morisset in the 1930s associated with opening of Morisset Hospital and in particular the increasing demand on rail transport created by the Hospital.	Neutral. Works will have little physical or visual impact on the internal or external appearance of the railway station building, and none at all on the two residences. The building and station will still retain its full historical significance as a railway station, station building and waiting room, and residences
SHR Criteria b) Historical Association	A Eucalyptus sp. tree with commemorative plaque on the southern boundary of the station has local significance for its historical association with James Thomas Morisset, an early military Commandant of the Newcastle penal settlement.	Neutral. This tree will not be affected by works.
SHR Criteria c) Aesthetic Significance	Morisset Railway Station has aesthetic significance at a local level. Morisset Railway Station is a good example of a 1930s railway station building with incorporated signal box, with simple detailing typical of this period. It is a good example of a 20th century 'Domestic' Station as identified in the Interwar Stations Study (Humphries & Ellsmore, 2002), representing the railways first experimentation with new architectural forms and demonstrates the transition from available domestic models to specific railway architecture in the early decades of the 20th century with new architectural forms and philosophies. The two residences, particularly the Station Master's Residence, are good examples of their type. The station does not have technical significance as the station buildings and infrastructure are examples of well-documented types from this period with no significant, unusual or innovative design variations or subsequent modifications.	Neutral. Works will have minimal physical and visual impact on the railway station building
SHR Criteria d) Social Significance	The place has the potential to contribute to the local community's sense of place and can provide a connection to the local community's history.	Neutral. The railway station's place as a centre of the community's sense of place will be unchanged as the result of works.
SHR Criteria f) Rare Assessment	The railway residences and station buildings at Morisset are common examples of their type and	Neutral.

SHR Criteria	Statement	Impact Assessment
	many examples were constructed throughout the network. While it is uncommon for two residences to be extant adjacent to a station and still in RailCorp ownership, overall, the Morisset Railway Station group is not rare and does not meet the thresholds for significance under this criterion. The Eucalyptus sp. tree on the southern boundary of the station ('Morisset's tree') has local heritage significance as a rare remnant tree that may predate European settlement of the area	The residences and station buildings will be physically retained. The eucalyptus tree will not be affected.
SHR Criteria g) Representative Assessment	The Morisset Railway Station building (1938) is a moderately intact example of an Inter-War station building, although the signal box remains highly intact and, with constant use, retains a high degree of integrity. The Station Master's Residence is a highly intact example of its type. The Gatekeeper's Residence has had its integrity reduced significantly as a result of a series of modifications and additions.	Moderately adverse. The integrity of the signal box will be affected by its decommissioning and its significance will be affected by the end of its use as a working place for controlling trains.
Integrity/Intactness	The Morisset Railway Station building (1938) is a moderately intact example of an Inter-War station building, although the signal box remains highly intact and, with constant use, retains a high degree of integrity. The Station Master's Residence is a highly intact example of its type. The Gatekeeper's Residence has had its integrity reduced significantly as a result of a series of modifications and additions.	Moderately adverse. The use of the signal box as a working place for controlling trains will end as the result of decommissioning.

Table 7-3: Heritage impact assessment: Great Northern Railway

SHR Criteria	Statement	Impact Assessment
Statement of Significance	SIGNIFICANCE - 1993: At State level, the Main Northern Line changed the relationship of Sydney & the North, by speeding up communications & transport. It changed profoundly the relationship of Newcastle with its hinterland & the north, & the standing of Newcastle as a great commercial centre. It confirmed the importance of Newcastle as a great coaling port, comparable with Cardiff in Wales. Locally, the railway brought changes to the pattern of development of Lake Macquarie. It was the route by which Lake Macquarie coal was carried to its markets.	Neutral. The configuration of the Main Northern Line will be unchanged. No elements of intrinsic historical cultural significance have been identified in the rail corridor that are likely to be affected by works. An Archaeological Assessment has also identified a low to nil likelihood of works affecting historical archaeology.

SHR Criteria	Statement	Impact Assessment
	It linked the towns & villages of western Lake Macquarie with Newcastle, & was a way for holidaymakers to reach the Lake. It opened the Lake to residential development &, since electrification, has become a commuting link to both Newcastle & Sydney for residents of Lake Macquarie. LEVEL of SIGNIFICANCE - 1993: State Significance - high Regional Significance - high Local Significance - very high Group Significance - very high	

Table 7-4: Heritage impact assessment summary based on proposed works

Proposed works	**Discussion**
New Services (including CSR routes and pits, OHW, LV and HV routes, pad mounts, general power or water supply, sewerage lines)	
Installation of new CSR, OHW, electrical power supply, signalling cabling, and other infrastructure	Morisset Railway Station: Neutral Great Northern Line: Neutral These are to be installed in the permanent way of the Great Northern Line, which has been assessed (by Aurecon) as having little identified elements of cultural significance. The only signalling work at the Morisset Railway Station will be the replacement of Guard Indicator lights which will be a like-for-like replacement of negligible impact..
Signal Box Decommissioning	
The Morisset Railway Station signal box is to be decommissioned.	Morisset Railway Station: Moderate Adverse Great Northern Line: Neutral The loss of tacit technical knowledge and workplace practices is unavoidable through decommissioning and the shift to automatic signalling. This can be partly mitigated through the recording of workers' and specialists' own experiences and expertise, as part of interpretation. The removal of the channel rodding at ground level will be an adverse physical impact. The adverse heritage impact of the decommissioning of the signal box is not avoidable but can be mitigated through the retention of the apparatus on site, with its movable heritage, and through recording and interpretation.

Proposed works	Discussion
Guard Indicators	
Existing guard indicators will be replaced and added to on Platforms 1 and 2	Morisset Railway Station: Neutral Great Northern Line: Neutral An existing guard indicator fixed to the awning of Platform 2 will be replaced by a modern LED indicator, with a sympathetic bracket. Other guard indicators will affect fabric of little cultural significance.
Construction of MTRR & MT11	
Construction of the MTRR and MT11 buildings are the nearest to the Morisset Railway Station Group	Morisset Railway Station: Neutral Great Northern Line: Neutral No physical impact on any fabric of significance is expected as the result of the construction of these items. The visual impact of the MTRR building is low and mitigated by its positioning and its design; the visual impact of MT11 is nil.

8. Updates to key preliminary heritage assessment findings

The findings of the Preliminary Heritage Assessment made by Aurecon were made on the basis of the then existing concept design. The detailed development of the proposal requires these findings to be updated, and either confirmed or re-assessed, in the light of design changes which have been made. These key findings, and the updated assessment, are covered below.

8.1.1 Key findings of preliminary heritage assessment

The key findings of Aurecon's Preliminary Heritage Assessment are reproduced below, updated after detailed design, and added to in the form of a table:[36]

Table 8-1: Aurecon vs. updated assessment

Aurecon assessment at concept design	Updated assessment after detailed design
The decommissioning of the c.1938 lever frame and mechanical interlocking system, housed in the existing Station Building at Morisset, will have a moderate adverse impact on the historic and technical significance of the Signal Room and is a key heritage impact of this project. Conservation and retention in situ, archival recording and ongoing protection is the recommended approach for the assemblage in line with the Sydney Trains guidelines.	The impact of the decommissioning of the c.1938 lever interlocking system, with the associated lack of tacit knowledge and expertise, and cutting of the channel rodding, will remain *moderately adverse*.
Track works will result in the removal of a post-1920s Up Refuge Siding, including a section of timber sleepers (date unknown). Recording is recommended; however, these works are not likely to detract from the overall heritage values of the GNR alignment or the Garden Suburb to Wyee Railway alignment.	These works remain unlikely to detract from the cultural significance of the GNR or the railway alignment.
The entire length of the Garden Suburb to Wyee Railway alignment will not be adversely impacted however it has the same curtilage as the Great Northern Railway Alignment and impacts associated with the works located in the study area have been assessed against the LEP Great Northern Railway Alignment listing.	These works remain unlikely to detract from the cultural significance of the GNR or the railway alignment.
Morisset Campsite Tree will not be impacted by the proposed works. A Tree Protection Zone, in accordance with the Australian Standard Protection of Trees on Development Sites AS 4970-2009, must be established and maintained for the duration of the works.	Morisset Campsite Tree has been confirmed to be outside the area of proposed works. A Tree Protection Zone should form part of the construction methodology and Construction Environmental Management Plan.
The Dora Creek Railway Underbridge will not be impacted by the proposed works.	No change is proposed to impact on the Dora Creek Railway Underbridge.

[36] Aurecon, 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment', 162.

Aurecon assessment at concept design	Updated assessment after detailed design
Primarily, the resignalling works will interface with contemporary and post-1980s rail infrastructure, particularly track, OHW, signals, huts, CSR, and communications works.	No change is expected to the impact of the resignalling works on the contemporary rail infrastructure.
The design of new building Morisset Relay Room (MTRR) (closest to Morisset station) has been informed by heritage advice and is situated in a manner that maximises separation between the new structure and the c.1938 Morisset Station Building.	Detailed design of the MTRR building has included selection of materials for the brick and roof, which mitigate visual impact. There is overall little change in impact from the construction of this building.
The removal of a series of signalling huts and location cases, and replacement with six new buildings is not expected to negatively impact on built heritage and landscape values throughout the study area, with existing signal huts and location cases dating from the 1980s period of electrification or later.	These signalling huts will still be removed, and they are still not expected to negatively impact on built heritage or landscape values.
No potential subsurface historical archaeology, particularly around Morisset Station, is expected to be impacted by the proposed works. Works (with the exception of the new buildings and some CSR) are largely confined to the highly disturbed rail corridor.	Artefact's updated assessment concluded that 'changes from concept design to detailed design …are unlikely to result in adverse impact to significant archaeological 'works.' The 2021 archaeological assessment identified that the study area had overall limited potential to contain an intact and significant archaeological resource associated with previous uses of the study area, or earlier phases of The Great Northern Railway.'
Retention of any historical or industrially significant equipment or infrastructure within the study area has been considered in line with the requirements of concept design and confirmed items for retention or removal are noted in the assessment. The assessment has provided advice on how the concept design can mitigate or avoid impacts to heritage items within the study area and recommend which heritage items should be kept in-situ.	The lever frame, relay equipment, and many items of moveable heritage will remain in-situ. The heritage items are listed in a Moveable Heritage Schedule, the signal box and station have been recorded in a Photographic Archival Recording, and the retention of the historically significant equipment will be informed by an Interpretation Plan, all of which will mitigate the impact of decommissioning.

8.1.2 Preliminary heritage assessment – detailed design questions

The Preliminary Heritage Assessment provided a number of questions to be addressed in the detailed design. These are reproduced below, and, to the extent it is possible in each case, addressed.

> 5. How can the project secure the lever bay / signal room – e.g. from vermin and rubbish at the point of decommissioning?
>
> > a. This could include vermin proofing over open areas, under doors and in any open spaces in the Signal Room to prevent vermin and rubbish from entering. It is recommended input from a heritage architect be sought for securing the lever bay and signal room.

The security of the signal room in the first instance will be secured by its continuing use as a work space by the staff remaining at Morisset Railway Station. While decommissioning of the signalling will make this equipment redundant, the room will still contain a staff kitchen, a toilet, and amenities.

The retention of the lever rods could be combined with vermin-proofing in the form of wire netting installed to the inside of the underfloor wall.

6. How can the project ensure security of historic signalling equipment and guidance for future maintenance of non-operational equipment?

a. If the historic equipment is left in-situ, security protocols would need to include keeping the rooms locked when un-maned, and increased CCTV for monitoring the room and station when there is less staff available. Future maintenance could include cyclical cleaning, oiling and checking for any weathering. This will need an allocated budget and resourcing plan to ensure the historic equipment is maintained at appropriately.

This question is to a great extent outside the scope of detailed design. The ongoing rostering of railway stations and cyclical maintenance of equipment, and heritage fabric, is a Sydney Trains operational responsibility. A Heritage Asset Maintenance Plan for Morisset Railway Station, in lieu of a full Conservation Management Plan (which would be appropriate for an item of State heritage significance) should be prepared to guide the maintenance and ongoing repair of the place. This should be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned.

7. How much of the connected rodding can be retained in situ, for interpretation and were would it terminate?

a. Keeping all rodding in place would be the preferred heritage outcome however in some instances rodding will need to be cut where it could obstruct infrastructure or could potentially warp by rail traffic. In this case, keeping some rodding visible below the platform would be sufficient to illustrate how rodding technology operated and what it looks like.

As above, though it will require the installation of wire or other vermin-proofing for the underfloor space where the interlock is installed, it is desirable that some visible rodding be retained to interpret the former function of the signal box.

8. How much of the relay equipment should be retained, or is it acceptable to remove them?

a. Keeping relays in place would be the most preferred heritage outcome however more recent styles that have been retrofitted to the system, and stored for spare parts. Any later examples of relays (from the last 10 years) could be removed for this purpose, whilst other examples could remain in-situ with the Relay Room, to illustrate how the equipment was set- up, operated and worked together.

The Relay Room, once the upgraded signalling equipment is installed and confirmed to be functional, should simply be turned off and disconnected from the network. The room and its equipment is difficult to interpret except to specialist signallers and electricians (particularly since, on our visit, we were advised that the room was ‘live’ and to be entered only with care). Re-use of any relay parts (for the repair of other functional relays in other parts of the network, or for the purposes of research) must be assessed according to its impact on heritage at Morisset according to that future need.

Once the relay room is decommissioned and turned off, an audit of these elements should be undertaken, to establish the significance of any of the items, and their potential for re-use elsewhere.

It may be that adverse heritage impact to the non-functional relay room may be offset by a greater positive impact to functional signal infrastructure in another place.

8.1.3 Recommendations of preliminary heritage assessment

Recommendations from the Preliminary Heritage Assessment are reproduced below.

Concept Design stage:

- For items identified to be of high heritage significance (i.e. the mechanical interlocking system (lever frame) and relay systems in the Morisset Signal Box), these should be conserved in situ unless it is unsafe to do so.
- No adverse impacts are expected from proposed removal of track, OHW, structures and signalling infrastructure within the study area due to the age of the equipment dating from the last 30 years and the level of significance being low to nil.
- All heritage mapping provided in this report should be included on mapping and drawings moving forward to ensure the identification and protection of heritage assets.
- A Tree Protection Zone in accordance with the Australian Standard Protection of Trees on Development Sites AS 4970-2009 must be established around Morisset's Tree during completion of the works and this must be marked on all plans.

These assessments and recommendations have been brought forward into the assessment and recommendations of this updated Statement of Heritage Impact.

Detailed Design stage:

This assessment is to be reviewed and updated during Detail Design stage. It should also provide more guidance to project team on mitigation opportunities through design.

Morisset Station and Signal Box

The Sydney Trains EMS-09-PR-0231 Decommissioning Heritage Assets procedure should be enacted for the Morisset Station Signal and Relay Room, including completing (but not limited to) the following:

- Photographic and video archival recording of the room should be undertaken prior to the works commencing.
- Recording of any potential moveable heritage objects in a Schedule of Moveable Heritage.
- Completion of the Decommissioning Heritage Assets Checklist.

These recommendations have also been brought forward into the recommendations of this Document, and in the case of photographic recording and moveable heritage auditing, are, at the time of writing, underway.

Statement of Heritage Impact and Interpretation Plan

A Statement of Heritage Impact should be prepared for the identified listed heritage items above in Table 2-1 prior to the finalisation of the Morisset resignalling works. The following design elements and interpretation concerns should be considered:

- Exploration of further opportunities should be completed during Detailed Design to mitigate heritage impacts from the proposed mounting of a guard indicators, especially the one on the c.1910 area Platform 2 at Morisset. These discussions should refer to the Sydney Trains Heritage Technical Guidelines for Installation of Electrical and Data Services for general requirements, including documentation requirements.

- Provide more guidance on opportunities for adaptive reuse or interpretation at Morisset Signal Box site through an Interpretation Plan.
    - This will include exploring opportunities to keep good and non-obstructive examples of historic or industrially significant rail infrastructure in-situ for public viewing or interpretation (such as the c.1938 lever frame and relays), and to determine opportunities for a practical and safe access to the Signal Box to enable its adaptive reuse, if deemed appropriate.
- Interpretation options could include a small interpretive sign or plaque for the Morisset Signal and Relay Room to convey the historic importance of the equipment and the date of its decommissioning. Furthermore, the corridor side windows of this room give the opportunity for an interpretive display that could be viewed by the public and add to the historic values of the Station.

An Interpretation Plan is being prepared which provides guidance and a set of developed options for the interpretation of the site. Both the options of interpretative plaques, and the use of the side windows in the design of an interpretative display, are proposed in this Plan.

It is noted that difficulties of onsite interpretation due to public access concerns and safety reasons will need to be built upon in this plan.

However, it is recommended that a specialist consultant be engaged to complete this reporting and assessment to provide Sydney Trains with feasible options for the future conservation of the significant equipment inside the Morisset Signal Box.

- Other use options for the Box for railway staff purposes (such as office spaces or as a training facility or education space) could be assessed in this plan.
- Opportunities for offsite interpretation, either at Morisset Station, within the Morisset local area, or at a museum or institution, should also be considered during this plan.
- Sydney Trains Moveable Heritage Guidelines must be considered by this plan. The guidelines state that the removal of movable heritage from its significant context should be avoided unless it is:
    - the sole means of ensuring its security and preservation;
    - on a temporary basis for treatment, exhibition, or during works to buildings and sites (refer to Standard Exemptions for Works Requiring Heritage Council Approval);
    - for cultural reasons;
    - for health and safety;
    - to protect the heritage asset.

This Interpretation Plan is underway and has considered the limitations of the site and the needs of its moveable heritage collection. The signal box will continue to be in partial use by the staff at Morisset Railway Station, since it also contains a staff kitchen, fridges, and toilet.

9. Conclusion

The decommissioning of the 1938 lever frame in the signal box at Morisset Railway Station will have a moderately adverse impact on the cultural heritage of this place. This is not avoidable but is partly mitigated by the retention of the mechanism, and associated moveable heritage items, on-site, and by recording and interpretation.

Other physical and visual impacts include the installation of new guard indicators, which are of negligible physical impact, and the construction of new buildings in the vicinity of the railway station, which are of negligible visual impact.

Little archaeological potential exists, and the project is unlikely to result in adverse impact to significant archaeological 'works'.[37]

The remaining works, which predominantly affect fabric of the post-1980 period or of fabric of little cultural significance, have no impact on cultural heritage.

Table 9-1: Summary of heritage impacts

Heritage Item	Listing	Significance	Proposed Works	Impacts
Morisset Railway Station Group and Residences	TAHE S.170 item 4801056	Local	Removal of all signals and associated infrastructure, decommissioning of the signal box Construction of signal huts and MTRR bungalow	Moderate adverse
Great Northern Railway Garden Suburb to Wyee, Railway Line	Lake Macquarie LEP 2014 item 189 TAHE S.170 item 4805752	Local	Removal of signals and infrastructure, construction of signals huts	Neutral
Tree—Morisset's Campsite	Lake Macquarie LEP 2014 item 120	Local	None	Nil
Dora Creek Railway Underbridge	TAHE S.170 item 4803388	Local	None	Nil

[37] Artefact, 'Memo: Morisset Station Resignalling Project: Non-Aboriginal (Historical) Archaeological Inputs for Detailed Design Phase', sec. 1.8.

9.1 Recommendations and mitigation measures

9.1.1 Approval Pathway

Morisset Railway Station Group, and the Great Northern Railway(Garden Suburb to Wyee, Railway Line), are items of cultural significance on the TAHE S.170 list, and the Great Northern Railway is an item of cultural significance also on the Lake Macquarie LEP. The proposed works would, however, be of negligible heritage impact to the line itself.

An Archaeological Assessment has indicated that approval for excavations under s.139 of the NSW *Heritage Act 1977* is not required.

As no items of State Heritage significance are likely to be affected, nor will there be any likely significant impact to items listed on a Local Environmental Plan, under the *State Agency Management Principles*,[38] heritage approval for works to these items will be made internally by Sydney Trains.

This heritage assessment will support the REF being prepared for the proposed works.

9.1.2 Recommendations and Mitigation measures

The final list of recommendations, which have taken into account the preliminary report for concept design, an updated assessment of archaeological impact, and this report for detailed design, are below:

Recommendations currently being actioned

- Preparation of an updated Statement of Heritage Impact (i.e. this document),
- Photographic and video archival recording of the signal box room,
- A Moveable Heritage Audit,
- Interpretation by way of an Interpretation Plan.

Recommendations still to be actioned

- The signal box should be decommissioned in accordance with Sydney Trains EMS-09-PR-0231 *Decommissioning Heritage Assets,*
- Conservation of significant elements, especially the lever frame, interlock, relays, and moveable heritage, in-situ,
- Completion of the Decommissioning Heritage Assets Checklist,
- The relay room should be closed and made secure as part of its decommissioning. An audit of the relay room, once the room is decommissioned, by an appropriate specialist should be made, to establish the significance of any of the electrical items and their potential for reuse,
- Updating of existing heritage Inventories,
- A Heritage Asset Maintenance Plan for Morisset Railway Station should be prepared to guide the maintenance and ongoing repair of the place. This should be prepared once on-site interpretation, which would require specific maintenance and cleaning, has been designed or commissioned.
- Photographic recording of timber sleepers in the Refuge to be removed,

[38] NSW Heritage Office, *State Agency Heritage Guide: Management of Heritage Assets by NSW Government Agencies* (Parramatta: NSW Heritage Office, n.d.), http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/StateAgencyHeritageGuide.pdf.

- Installation and maintenance of a Tree Protection Zone around the Morisset Campsite Tree,
- Further specialist archaeological advice should be sought if the design changes in any way.
  - The Sydney Trains Unexpected Finds Procedure '*EMS-09-PR-0164 Unexpected Archaeological Finds*' must be implemented for all ground disturbing works. Additional assessment and/or approvals may be required prior to works continuing in the affected area(s) based on the nature of the discovery.
- Should there be any unexpected finds during works, there may be a requirement for a s140 excavation permit to allow impact or removal of the exposed items should they be assessed to be archaeological 'relics' as defined by the NSW *Heritage Act*.
- These stop-work and *Unexpected Finds* procedures to be included in a Construction Environmental Management Plan (CEMP).

10. Bibliography

Artefact. 'Memo: Morisset Station Resignalling Project: Non-Aboriginal (Historical) Archaeological Inputs for Detailed Design Phase'. Artefact Heritage and Environment, 20 December 2023.

Aurecon. 'Morisset and Vales Point Resignalling Works: Preliminary Heritage Assessment'. Sydney Trains, May 2021.

Australia ICOMOS. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*. Australia ICOMOS, 2013. http://australia.icomos.org/publications/charters/.

Department of Planning and Environment. 'Assessing Heritage Significance'. NSW Department of Planning & Environment, 2023. https://www.environment.nsw.gov.au/research-and-publications/publications-search/assessing-heritage-significance.

Gunn, John. *Along Parallel Lines: A History of the Railways of New South Wales*. Melbourne: Melbourne University Press, 1989.

Heritage Council of NSW. 'Investigating Heritage Significance: A Guide to Identifying and Examining Heritage Items in NSW'. NSW Government through the Heritage Council of NSW, 2021.

Heritage Office. *Heritage Curtilages*. Sydney: Department of Urban Affairs and Planning, 1996.

Hunter History Consultants. *Lake Macquarie Thematic History*. Newcastle: Heritas Architecture, 2010.

NSW Heritage. 'NSW Heritage'. State Heritage Inventory, 2022. https://www.hms.heritage.nsw.gov.au/App/Item/SearchHeritageItems.

NSW Heritage Office. *Moveable Heritage Principles*. Sydney: NSW Heritage Office and Ministry for the Arts Movable Heritage Project, 1999.

———. *State Agency Heritage Guide: Management of Heritage Assets by NSW Government Agencies*. Parramatta: NSW Heritage Office, n.d. http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/StateAgencyHeritageGuide.pdf.

NSW Office of Environment and Heritage. *Design in Context: Guidelines for Infill Development in the Historic Environment*. NSW Heritage Office, 2005. http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/DesignInContext.pdf.

NSW Transport. *Section 170 Heritage and Conservation Register*. Sydney: Railcorp, 2016. https://www.transport.nsw.gov.au/projects/community-engagement/sydney-trains-community/heritage-and-conservation-register.

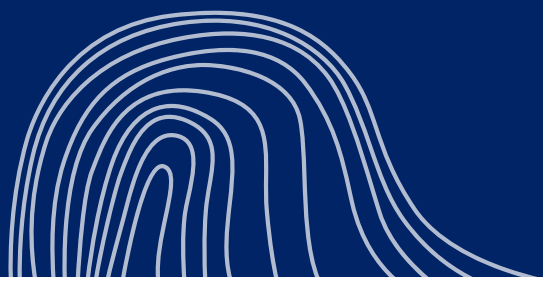
Parsons, Vivienne. 'James Thomas Morisset (1780–1852)'. In *Australian Dictionary of Biography*. Canberra: National Centre of Biography, 1967. https://adb.anu.edu.au/biography/morisset-james-thomas-2482.

Sydney Trains. 'PL S 44000---Signalling and Control Systems Strategy'. NSW Transport, 1 July 2016. https://www.transport.nsw.gov.au/system/files/media/documents/2018/PL-S-44000-Signalling-and-Control-Systems-Strategy.pdf.

———. *Review of Environmental Factors: Morisset and Vales Point Resignalling Project*. Final draft rev. G. Transport for NSW, 2021.

The Hon. Peter Aloysius McInerney. 'Final Report of the Special Commission of Inquiry into the Glenbrook Rail Accident'. Parliament of NSW, April 2001. https://www.parliament.nsw.gov.au/la/papers/Pages/tabled-paper-details.aspx?pk=50980.

———. 'Final Report: Special Commission of Inquiry into the Waterfall Railway Accident'. Parliament of NSW, January 2005.

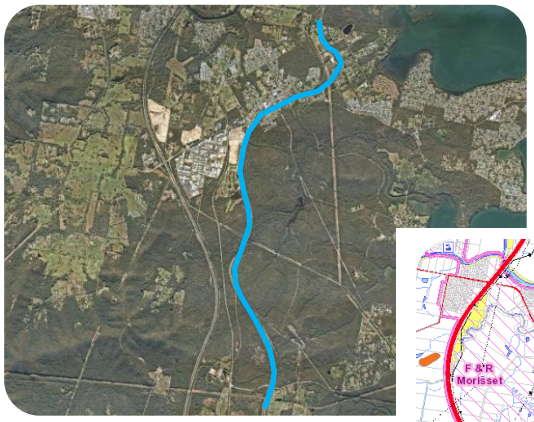


NSW GOVERNMENT

A9. Bushire Hazard Report

SMEC
MORISSET AND VALES POINT RESIGNALLING PROJECT

BUSHFIRE HAZARD RISK ASSESSMENT



6th June 2023

Prepared by:
Building Code and Bushfire Hazard Solutions Pty Ltd.
[redacted]

FPA AUSTRALIA SILVER MEMBER Fire Protection Association Australia

Disclaimer:

This report has been prepared with all care and diligence by Building Code and Bushfire Hazard Solutions Pty Ltd on the request of SMEC, for their Morisset and Vales Point Resignalling Project and is based upon documentation provided for review by SMEC, data gathered from on-site inspections and further research and liaison with relevant agencies and authorities as was considered necessary.

Whilst preparing this report for SMEC (all in good faith), Building Code and Bushfire Hazard Solutions P/L cannot guarantee the absolute safety of any built asset or part thereof or any services or any persons in the vicinity of said assets in times of potentially Catastrophic or Extreme bushfire impact. Building Code and Bushfire Hazard Solutions Pty Ltd takes no responsibility for any damage or loss of property or occupant injury that may be experienced from possible bushfire impact in the future.

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Version Control				
Version	Date	Author	Reviewed by	Details
01	06/06/2023	[redacted]	N/A	Report

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Abbreviations:

APZ	Asset Protection Zone (bushfire)
APZS	'Standards for Asset Protections Zones' (NSW Rural Fire Service)
AS3959	Australian Standard 3959 - "*Construction of buildings in bushfire prone areas – 2018*".
AS1530.8.1	Australian Standard 1530.8.1 – 2007 - *"Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources*".
AS1530.8.2	Australian Standard 1530.8.2 – 2007 - *"Tests on elements of construction for buildings exposed to simulated bushfire attack – Large flaming sources".*
BAL	Bushfire Attack Level kW/m2 (PBP – NSW)
BPMs	Bushfire Protection Measures
CCG	CCG Architects
Council	Lake Macquarie City Council
EPA	Environmental Planning and Assessment Act (NSW) 1979 No 203
FDI	Fire Danger Index (Bushfire Danger Index)
IPA	Inner Protection Area
NCC	National Construction Code
OPA	Outer Protection Area
PBP	Planning for Bushfire Protection – 2019 (NSW Rural Fire Service)
SMEC	SMEC Australia Pty. Limited
SV	NSW Planning Portal Spatial Viewer
TST	Transport Sydney Trains (Transport for NSW)

1.0 Introduction:

CCG Architects have commissioned Building Code & Bushfire Hazard Solutions P/L of Sydney to provide bushfire site assessments and subsequent Bushfire Attack Level (BAL) determination reports relevant for the programmed upgrade of the Morisset and Vales Point Resignalling Project for Sydney Trains. In particular, the built structures known as MT1, MT5, MT8, MT11, MTRR and MT29.

The nominated structures will be non-habitable and contain railway signalling equipment only.

The location of the project is between markers 116.320 and 125.300 on the main northern line in the vicinity of Morisset.

The purpose of this report is to provide Bushfire Attack Level (BAL) rating to the proposed buildings to ensure compliance with AS3959:2018 '*Construction of buildings in bushfire prone areas'*. AS3959 also requires building materials to be compliant with AS1530.8.1 "*Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources" and AS1530.8.2* "*Tests on elements of construction for buildings exposed to simulated bushfire attack – Large flaming sources".*

The precursor to any bushfire assessment in NSW is the application of "Planning for Bushfire Protection – 2019" (PBP) for the purposes of determining BAL levels of Class 1-4 and Class 9 structures. PBP does not directly address Class 5-8 buildings nor Class 10 (unless they are within 6.0m of a dwelling). PBP does however call for Class 5-8 structures to comply with the objectives of PBP in relation to access, water supply and services and emergency planning.

These objectives are not relevant to this project given its unique nature.

For the purposes of providing a 'relative' BAL assessment we have retained the adoption of Table A1.12.5 of PBP so as to provide a common BAL approach at an FDI of 100.

The trigger for any bushfire hazard / risk assessment is if the subject land is deemed as being bushfire prone. Local Councils and the NSW RFS do prepare area maps as does the NSW Planning Portal Spatial Viewer platform. (SV)

The significance being that if the subject land is outside the mapped are it is free of bushfire constructional conditions. If inside the deemed area, then a purpose review of the area is required to complete any assessment.

The bushfire prone land map is subject to change from urban development and other bushland removal factors which may not be altered within the mapped area for up to five (5) years therefore in some cases existing mapped areas may be in error and these areas should be specifically ground truthed.

2.0 Scope:

The scope of this report is confined to:

- A BAL determination for the nominated structures known as MT1, MT5, MT8, MT11, MTRR and MT29.

Other requirements of PBP have been excluded.

3.0 Background:

The main northern railway line (Morisset to Dora Creek) currently has signalling systems and equipment which require upgrading. Sydney Trains are progressively undertaking such a project. Project completion is expected in 2024.

Fire Rescue NSW are the primary response fire fighting agency in the Morisset area. FRNSW will be supported by the NSW Rural Fire Services as necessary.

A review of past bushfire impact history suggests the no notifiable (large) bushfires have occurred since 2017 the closest impacts to the railway were from the Chain Valley Coal loop area and Wyee Road north to Morisset township. No notifiable bushfires have been recorded in recent years north of Morisset township to Dora Creek.

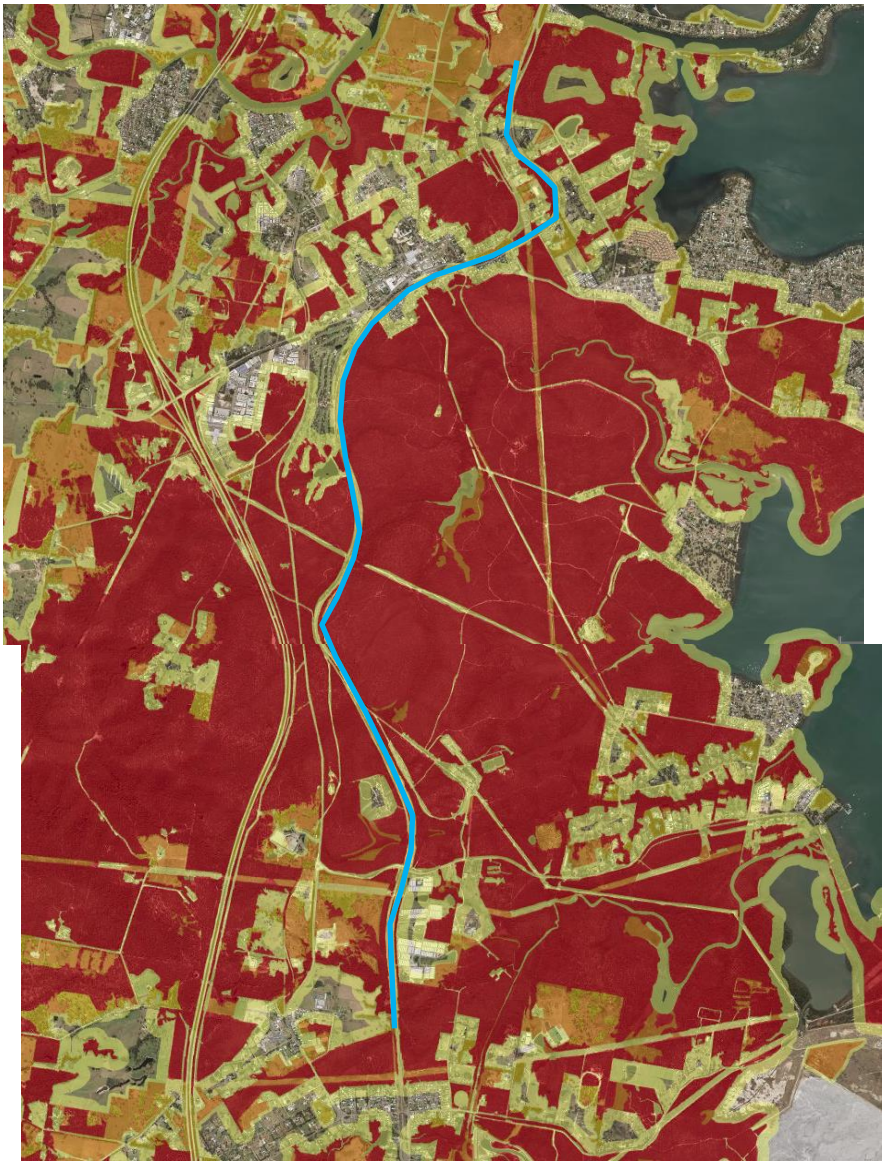

Image 01 – Overall view of currently deemed bushfire prone land and the approximate section of the Main Northern Railway Line under review.
(ack SV)

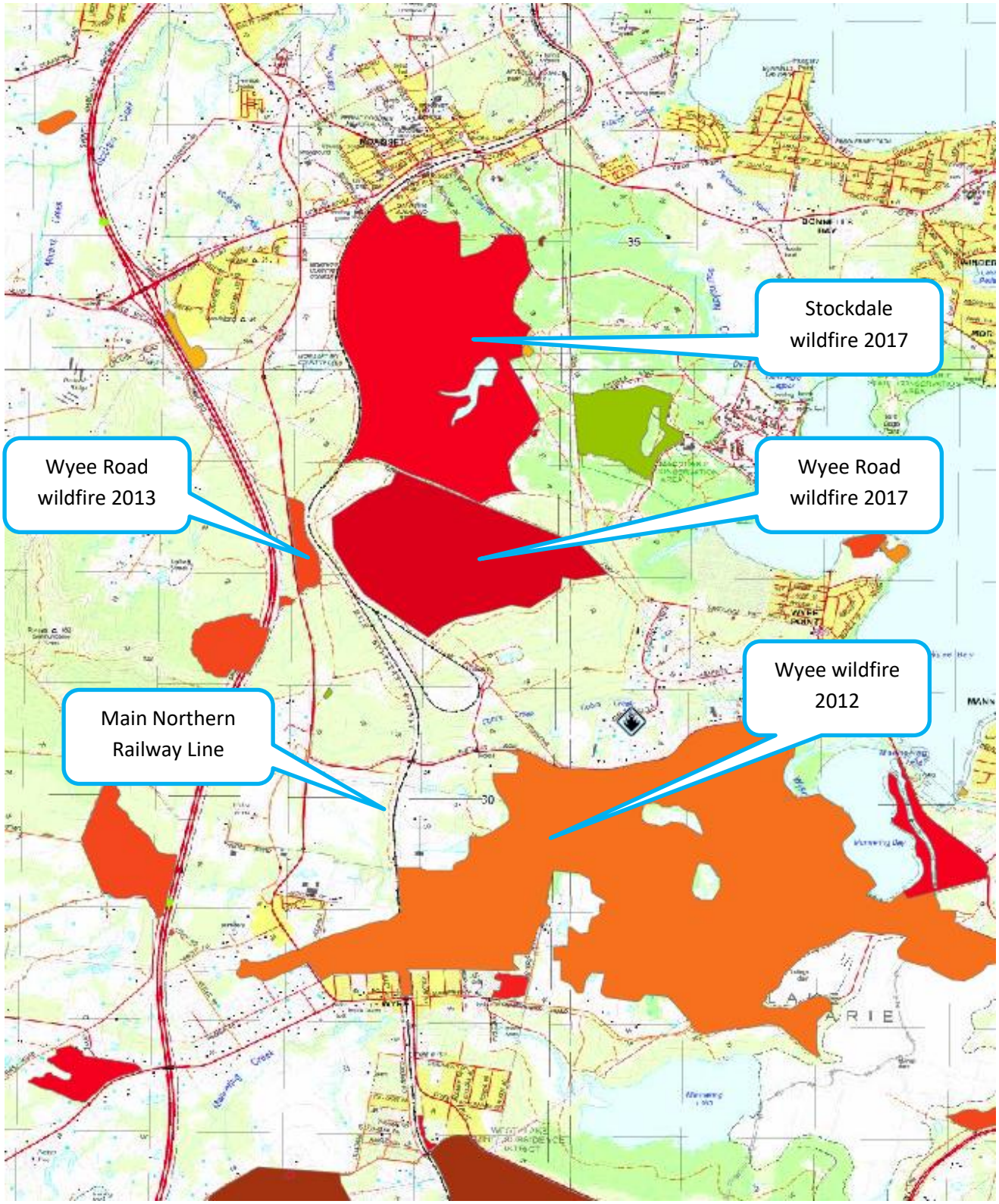

Image 02 General overview of previous bushfire impacts to the Main Northern Railway. (ack: NSWRFS)

4.0 Bushfire Assessment

The following structural BAL assessments have been individually prepared to suit the relevant site. A bushfire prone area map has been provided noting if the site is bushfire prone or not.

4.01 MT1 (Ref: 116+320)

Image 03 – Approximate location of MT1.
(ack: nearmap)

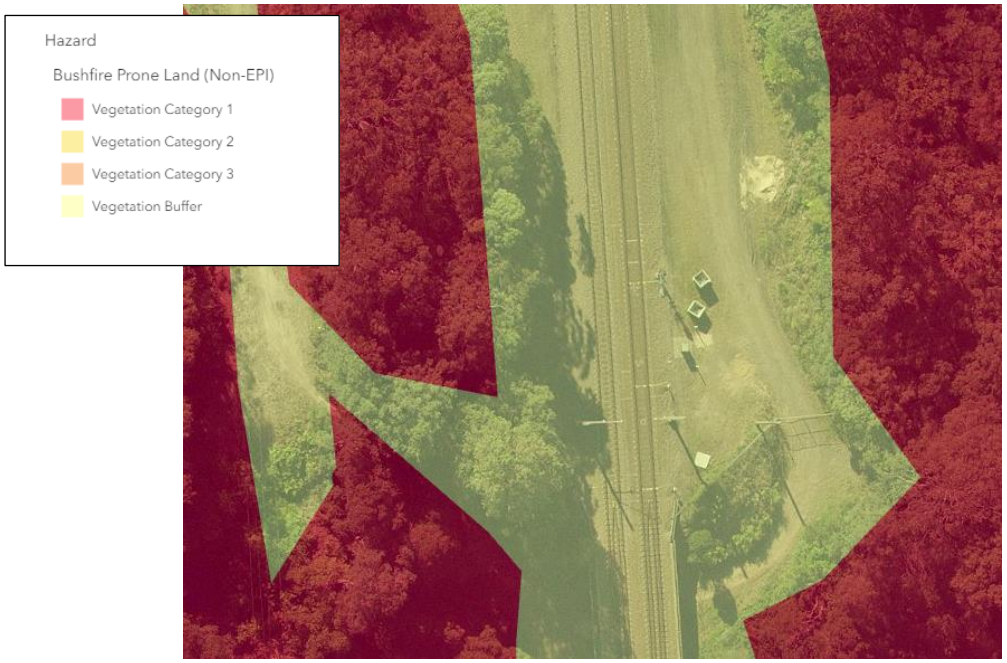

Image 04 – Current bushfire prone land map detail for MT1.
(ack: SV)

Image 05 – Approximate location of the MT1 structure

Image 06 – Eastern aspect forest vegetation

4.01a MT1 BAL Determination

The BAL determination should address predominate vegetation located near to and around a structure and to a distance of 140m. For the purposes of MT1 the vegetation has been assessed as forest.

The slope of the land associated with a subject site is also to be considered. That is, downward slopes tend to accelerate a bushfire up the slope and thus increase its intensity.

In the case of MT1:

Slope	North – 0 level	East - 14 down	South – 0 level	West – 10 down
Veg Type	N/A	Forest	Forest	Forest
Separation Distance (m)	>100	12.0	40.0	16.0
BAL (kW/m2)	N/A	Flame Zone	29.0	Flame Zone

Table 01 – MT1
(Ref: PBP Table A1.12.5)

CCG has provided information drawings that the structure MT1 will consist of:

Floors – concrete slab on ground.

External Walls – Face brick dry pressed / core filled block wall.

Doors – Metal clad, solid cored with 60 minute Fire Resistance Level (FRL).

Roof – Metal clip-lock with insulation blanket.

Fascia's – Folded colour bond steel.

Roof cowls, vents and external openings – Metal mesh screened.

Determination: The proposed building is located within a bushfire prone area which, when examined, calls for Flame Zone construction to two (2) aspects. It is also noted that there is no bushfire shielding present therefore the whole of the building is to be constructed to Flame Zone. The application of AS3959, Section 9 is therefore applicable.

The noted constructional details are acceptable however the roof construction needs to be capable of achieving a Flame Zone rating. Reference should also be made to AS1530.8.1 for detailed requirements.

4.02 MT5 (Ref: 190+160)

Image 07 – Approximate location of MT5.
(ack: nearmap)

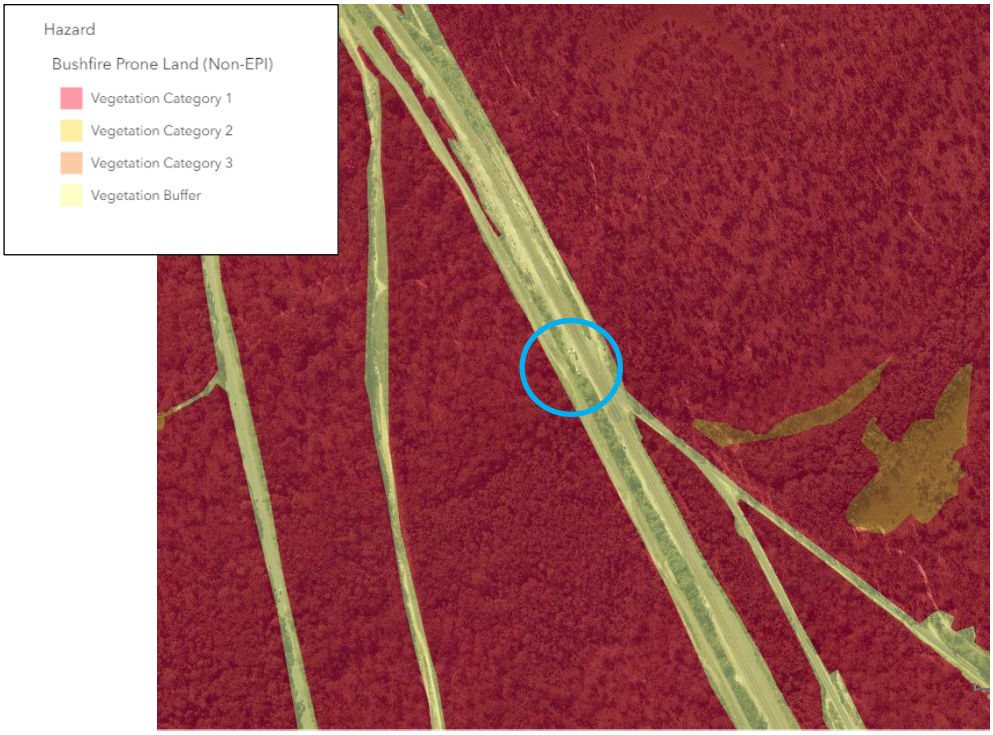

Image 08 – Current bushfire prone land map detail for MT5.
(ack: SV)

Image 09 – View of MT5 approximate location noting rear access gate.

Image 10 - View of tree and vegetation to be removed to boundary fence and extending 30m north of MT5.

4.02a MT5 BAL Determination

The BAL determination should address predominate vegetation located near to and around a structure and to a distance of 140m. For the purposes of MT5 the vegetation has been assessed as forest.

The slope of the land associated with a subject site is also to be considered. That is, downward slopes tend to accelerate a bushfire up the slope and thus increase its intensity.

In the case of MT5:

Slope	North – 0 level	East – 10 Up	South – 3 Down	West – 0 level
Veg Type	Forest	Forest	Forest	Forest
Separation Distance (m)	30.0	33.0	20.0	24.0
BAL (kW/m2)	29.0	29.0	Flame Zone	40.0

Table 01 – MT5
(Ref: PBP Table A1.12.5)

CCG has provided information drawings that the structure MT5 will consist of:

Floors – concrete slab on ground.

External Walls – Face brick dry pressed / core filled block wall.

Doors – Metal clad, solid cored with 60 minute Fire Resistance Level (FRL).

Roof – Metal clip-lock with insulation blanket.

Fascia's – Folded colour bond steel.

Roof cowls, vents and external openings – Metal mesh screened.

Determination: The proposed building is located within a bushfire prone area which, when examined, calls for Flame Zone construction to one (1) aspect. It is also noted that there is no bushfire shielding present therefore the whole of the building is to be constructed to Flame Zone. The application of AS3959, Section 9 is therefore applicable.

The noted constructional details are acceptable however the roof construction needs to be capable of achieving a Flame Zone rating. Reference should also be made to AS1530.8.1 for detailed requirements.

A 30m APZ is to be created to the north along the fence line.

4.03 MT8 (Ref: 121+380)

Image 11 – Approximate location of MT8.
(ack: nearmap)

Image 12 – Current bushfire prone land map detail for MT8.
(ack: SV)

Image 13 – View of MT8 location in front of existing equipment shed.

Image 14 – View of forest hazard to east of proposed building.

4.03a MT8 BAL Determination

The BAL determination should address predominate vegetation located near to and around a structure and to a distance of 140m. For the purposes of MT8 the vegetation has been assessed as forest.

The slope of the land associated with a subject site is also to be considered. That is, downward slopes tend to accelerate a bushfire up the slope and thus increase its intensity.

In the case of MT8:

Slope	North – 0 level	East – 5 down	South – 2 up	West – 4 down
Veg Type	Forest	Forest	Forest	Forest
Separation Distance (m)	66.0	12.0	58.0	50
BAL (kW/m2)	12.5	Flame Zone	12.5	19.0

Table 01 – MT8
(Ref: PBP Table A1.12.5)

CCG has provided information drawings that the structure MT8 will consist of:

Floors – concrete slab on ground.

External Walls – Face brick dry pressed / core filled block wall.

Doors – Metal clad, solid cored with 60 minute Fire Resistance Level (FRL).

Roof – Metal clip-lock with insulation blanket.

Fascia's – Folded colour bond steel.

Roof cowls, vents and external openings – Metal mesh screened.

Determination: The proposed building is located within a bushfire prone area which, when examined, calls for Flame Zone construction to one (1) aspect. It is also noted that there is no bushfire shielding present therefore the whole of the building is to be constructed to Flame Zone. The application of AS3959, Section 9 is therefore applicable.

The noted constructional details are acceptable however the roof construction needs to be capable of achieving a Flame Zone rating. Reference should also be made to AS1530.8.1 for detailed requirements.

4.04 MT11 (Ref: 123+090)

Image 15 – Approximate location of MT11.
(ack: nearmap)

Image 16 – Current bushfire prone land map detail for MT11.
(ack: SV)

The location of MT11 is outside a mapped bushfire prone area therefore no bushfire compliance is required.

Image 17 – View of MT11 structure location, dwellings can be seen over fence. It also appears that the energy authority is maintaining the land between the Sydney Trains and the roadway.

Image 18 – View of narrow forest area requiring some minor APZ treatment.

4.05 MTRR (Ref: 123+520)

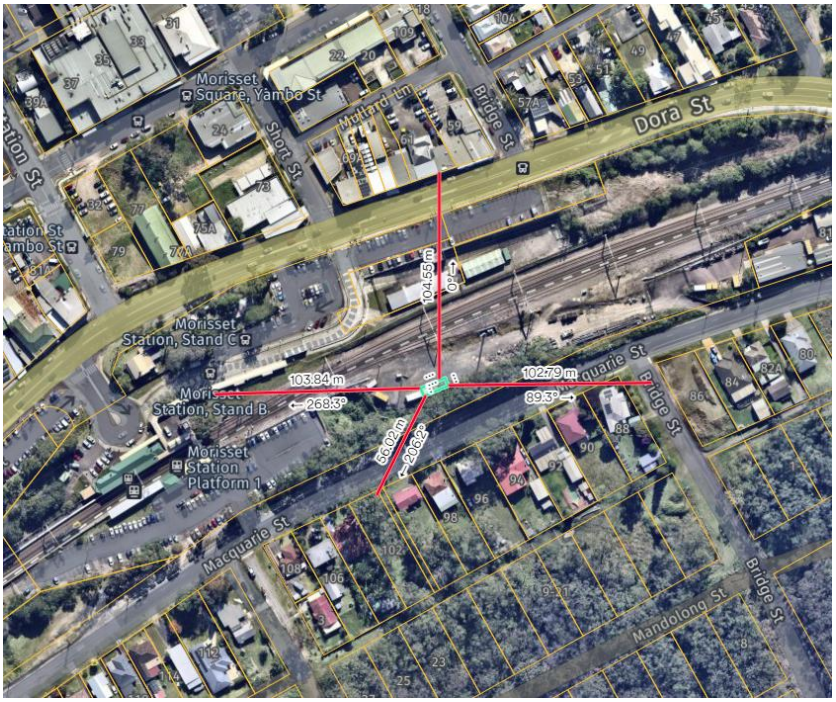

Image 19 – Approximate location of MTRR.
(ack: nearmap)

Image 20 – Current bushfire prone land map detail for MTRR.
(ack: SV)

Image 21 – View of proposed MTRR location.

Image 22 – View of remnant vegetation including heavy weed growth between site and Macquarie Road below.

4.05a MTRR BAL Determination

The BAL determination should address predominate vegetation located near to and around a structure and to a distance of 140m. For the purposes of MTRR the vegetation has been assessed as forest to the southwest.

The slope of the land associated with a subject site is also to be considered. That is, downward slopes tend to accelerate a bushfire up slope and thus increase its intensity.

In the case of MTRR:

Slope	North – 0 level	East – 6 down	South – 10 down	West – 4 up
Veg Type	N/A	N/A	Forest	N/A
Separation Distance (m)	> 100	>100	56.0	>100
BAL (kW/m2)	N/A	N/A	19.0	N/A

Table 01 – MTRR
(Ref: PBP Table A1.12.5)

CCG has provided information drawings that the structure MTRR will consist of:

Floors – concrete slab on ground.

External Walls – Face brick dry pressed / core filled block wall.

Doors – Metal clad, solid cored with 60 minute Fire Resistance Level (FRL).

Roof – Metal clip-lock with insulation blanket.

Fascia's – Folded colour bond steel.

Roof cowls, vents and external openings – Metal mesh screened.

Determination: The proposed building is located in "*buffer zone*" to Category 1 forest vegetation. Whilst the application of PBP is still required the highest BAL rating is 19.0kW/m2 and appears to be well within the current construction design.

On examination of the closest hazard, 102 Macquarie Street, it was found to be managed land with no ground or shrub layer. It good be argued that no risk applies. Notwithstanding, it would be reasonable to ensure that protection against wind driven embers is still carried out in accordance with AS3959.

4.06 MT29 (Ref: 125+300)

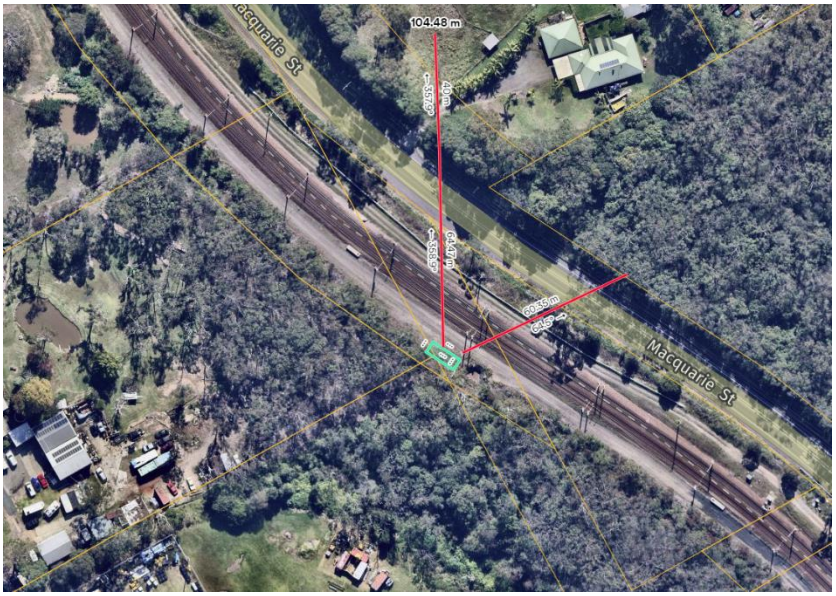

Image 23 – Approximate location of MT29.
(ack: nearmap)

Image 24 – Current bushfire prone land map detail for MT29.
(ack: SV)

Image 25 – View of approximate location or MT29

Image 26 – View of overhanging tree limbs requiring removal to fence line.

4.06a MT29 BAL Determination

The BAL determination should address predominate vegetation located near to and around a structure and to a distance of 140m. For the purposes of MT29 the vegetation has been assessed as forest albeit a narrow strip.

The slope of the land associated with a subject site is also to be considered. That is, downward slopes tend to accelerate a bushfire up slope thus increasing its intensity.

In the case of MT29:

Slope	North – 4 down	East – 10 down	South – 5 up	West – 5 up
Veg Type	Grassland	Forest	Forest	Forest
Separation Distance (m)	83.0	60.0	1.0	1.0
BAL (kW/m2)	N/A	19.0	Flame Zone	Flame Zone

Table 01 – MT29
(Ref: PBP Table A1.12.5)

CCG has provided information drawings that the structure MT29 will consist of:

Floors – concrete slab on ground.

External Walls – Face brick dry pressed / core filled block wall.

Doors – Metal clad, solid cored with 60 minute Fire Resistance Level (FRL).

Roof – Metal clip-lock with insulation blanket.

Fascia's – Folded colour bond steel.

Roof cowls, vents and external openings – Metal mesh screened.

Determination: The proposed building is located within a bushfire prone area which, when examined, calls for Flame Zone construction to two (2) aspects. It is also noted that there is no bushfire shielding present therefore the whole of the building is to be constructed to Flame Zone. The application of AS3959, Section 9 is therefore applicable.

The noted constructional details are acceptable however the roof construction needs to be capable of achieving a Flame Zone rating. Reference should also be made to AS1530.8.1 for detailed material requirements.

Given the proximity of the western boundary fence and forest vegetation which cannot be managed by Sydney Trains, the proposed 1.0m wide concrete path must be provided and maintained. Further, the vegetation from MT29 to the boundary fence must be well managed to APZ standards for an Inner Protection Area. That is equivalent to mown lawn extending at least 20m north and south of the building.

Of additional concern are several mature tree limbs which are or could overhang the building. These are to be removed to the fenced boundary.

5.0 Conclusion

The Morisset and Vales Point Resignalling Project requires the construction of several building structures typically within mapped bushfire prone areas. These structures are purpose built and must reasonably withstand and bushfire impact. A review of the design drawings as provided by CCG indicate that the buildings will be suitable and indeed meet the requirements for “Flame Zone” impact where necessary.

The roof areas whilst fire rated to the NCC Part C, is not noted as being compliant with Australian Standard AS3959 ‘Construction of buildings in bushfire prone area’ - 2018, Section 9 in that any roof system inside a flame zone area must comply with Section 9.6 and, where necessary, AS1530.8.2 for sheeted roofs or Appendix H.

All proposed metal meshing of vents and weep holes should be installed to AS3959, Section 9.4.3. Additional consideration must be given to air vents where a specific amount of outside air is required inside the building, or is to be extracted from the building (eg rotary cowls).

A metal frame with metal mesh covering can be provided so as not to restrict any required operational ait flows.

MT11 is not within a mapped bushfire prone area and is not required to comply with PBP-2019 of AS3959-2018.

Sections of north south railway line have been impacted by bushfire in the past and it would not be unreasonable to expect further impacts in the future. For this reason, it would be appropriate to ensure that where possible bushfire APZ’s are created and maintained around all building structures to reduce possible direct impact. Smoke and ember impact will always be expected.

The 1.0m wide concrete paths are extremely beneficial in reducing or stopping ground fire impacts. However as stated above that where possible APZs are also provided.

The following recommendations may assist in providing reasonable bushfire protection.

6.0 Recommendations

Bushfires in Australia remain as a significant risk to all communities residing within a designated bushfire prone area. Similarly, critical infrastructure is also of paramount concern to service providers (Sydney Trains) and fire services in that have reasonable measures been undertaken to restrict or prevent damage from bushfire. The following recommendations are therefore provided to assist in the protection of the communication assets.

a) Vegetation Management:

1. That where possible bushfire APZs are provided around the building structures to at least 20m in all directions. This means bushland is to be 'managed' but not necessarily removed. NSW RFS does provide a Standard for APZ's which should be referred to contractors where APZ's are to be provided.

2. That all tree branches are removed where they are either overhanging a building structure or they are within 4.0m.

b) Access

1. That where permissions are available, gated access is available to responding fire services in order to reach any of the subject building structures.

Should you have any questions or require further comment please do not hesitate to contact the undersigned.

[redacted]

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

FPA AUSTRALIA SILVER MEMBER Fire Protection Association Australia

7.0 Referenced Documents / Authorities / Systems

The following documents have been referred to in the completion of this report.

- Australian Standard - AS3959 – 2018 Construction of buildings in bushfire prone areas.
- Australian Standard - AS1530.8.1 – 2018 - “Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources”.
- Australian Standard - AS1530.8.2 – 2007 - “Tests on elements of construction for buildings exposed to simulated bushfire attack – Large flaming sources”.
- Plans and documents as supplied by CCG Architects
- National Construction Code (NCC) – Part G (NSW)
- NSW Rural Fire Service, Planning for Bushfire Protection – 2019
- NSW Rural Fire Service, Standards for Asset Protection Zones.

Spatial data systems:

- NearMaps
- Google Maps
- NSW Planning Portal Spatial Viewer.
- NSW Government ‘SEED’ environmental data source.
-

Attachments:

Nil

A10. Noise and Vibration Assessment

Resonate

Morisset and Vales Point Resignalling Project

Construction Noise and Vibration Assessment

S230683RP1 Revision A

Friday, 24 November 2023

Resonate

Document Information

Project	Morisset and Vales Point Resignalling Project
Client	SMEC Australia Pty Limited
Report title	Construction Noise and Vibration Assessment
Project Number	S230683

Revision Table

Report revision	Date	Description	Author	Reviewer
0	03 November 2023	Draft - first issue	[redacted]	[redacted]
A	24 November 2023	Final	[redacted]	[redacted]

Abbreviations

AWS	Automatic Weather Station
BOM	Bureau of Meteorology
CMNVM	Sydney Trains' EMS-10-PR-0048 CONSTRUCTION AND MAINTENANCE NOISE AND VIBRATION MANAGEMENT
CNET	TfNSW Construction Noise Estimation Tool
CNVG	TfNSW Construction Noise and Vibration Guideline (Roads)
CNVS	TfNSW Construction Noise and Vibration Strategy
EPA	Environment Protection Authority
EPL	Environment Protection Licence issued by NSW EPA
ICNG	Interim Construction Noise Guideline
Metro CNVS	Sydney Metro Appendix F Construction Noise and Vibration Standard
NPI	Noise Policy for Industry
NSW	New South Wales
OOH	Out-of-hours (outside oof standard railway maintenance hours specific in O13.1 of Sydney Trains EPL 12208
PPV	Peak Particle Velocity
RBL	The RBL is the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24-hour period used for the ABL). This is the level used for assessment purposes. It is the median value of: • All the day assessment background levels over the monitoring period for the day; • All the evening assessment background levels over the monitoring period for the evening; or • All the night assessment background levels over the monitoring period for the night.
REF	Review of Environmental Factors
RNP	Road Noise Policy
SPL	Sound Pressure Level
SWL	Sound Power Level
TfNSW	Transport for NSW
VC	Generic Vibration Criterion
VDV	Vibration Dose Values
VML	Vibration Management Level

Resonate

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1 Introduction

Resonate Consultants has been engaged by SMEC Australia Pty Ltd on behalf of Sydney Trains to conduct a construction noise and vibration assessment of the proposed Morisset and Vales Point Resignalling Project (the Proposal). In accordance with the Review of Environmental Factors (REF), this construction noise and vibration assessment has been carried out during the detailed design phase of the Proposal.

It is understood that the resignalling works would occur either during standard daytime construction hours or during out-of-hours (OOH) possession weekends from Saturday 2 am to Monday/Tuesday 2 am.

The objective of this report is to document the potential noise and vibration impacts that may be generated due to the resignalling work and to develop feasible and reasonable mitigation measures to reduce the noise impacts on nearby noise sensitive receivers. A number of noise sensitive receivers located near the proposed work sites have been identified to be potential impacted by the works and hence a detailed design phase assessment of noise and vibration impacts is required.

This report presents Resonate's assessment methodology, noise and vibration criteria, and recommended mitigation measures in relation to construction noise and vibration impacts.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A of this report.

2 Proposal description

2.1 The Proposal

Sydney Trains is proposing to provide a new signalling system in the Morisset and Vales Point area on the Central Coast & Newcastle (CCN) Line in New South Wales (NSW) (refer Figure 1). The Morisset and Vales Point Resignalling Project (the Proposal) will upgrade existing and expired equipment to a new train control system using the Advance Train Running Information Control System (ATRICS). This new signalling design requires modification of the Automatic Train Protection (ATP) equipment that is presently being installed. The Proposal would also allow for future digital migration to the European Train Control Systems Level 2 (ETCS L2).

The Proposal involves works at various locations, primarily inside the rail corridor, between Wyee Station and Dora Creek Station, with the focus of activities occurring at Morisset Station. The Proposal is located wholly within the Lake Macquarie City Council Local Government Area (LGA) shown in Figure 1. Construction for the Proposal will require access and temporary occupation of sections of rail reserve on Sydney Trains land, accessible via various corridor access gates along the Proposal alignment. Key features of the Proposal would include track work and signalling works, supported by:

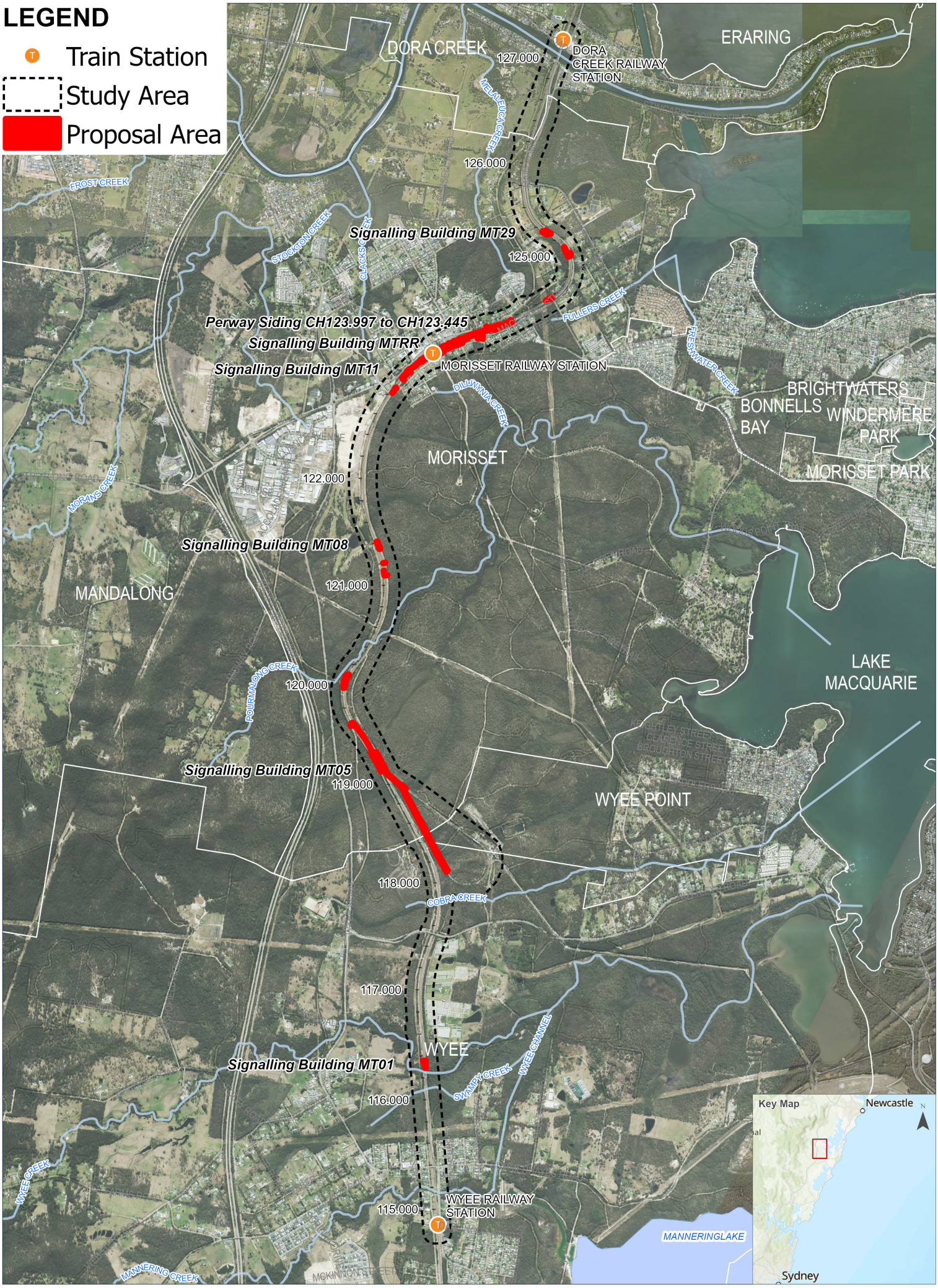
- construction of a new signalling building at Morisset Station and an additional five signal buildings at various points along the rail corridor
- modification of track alignments at Morisset Station
- overhead wiring (OHW) changes
- new combined services route (CSR)
- new electrical and communications connections
- new site drainage.

Network upgrades would allow for capacity of running trains to increase to eight trains per hour with the assumption of trains stopping at each station along the route. Also, headway would be designed for future capacity of ten trains per hour. In addition, the proposed upgrades would improve journey times along the rail corridor.

The key objective of the Proposal is to upgrade the existing signalling system to a modern Computer Based Interlocking (CBI) system in the Morisset and Vales Point area, that will include a new ATRICS based train control system to be located in the Wyong Control Centre (WCC)and Automatic Route Setting (ARS) from the WCC.

The existing mechanical signalling interlocking system currently in use at Morisset was commissioned in 1938. It controls colour light signals, both motor-operated and mechanically operated points. The relay interlocking was installed for the Vales Point area in 1980. This is controlled from a panel within the Morisset signal box. A range of modifications and renewals have been carried in recent years to both interlocking areas since the initial implementations. The signal equipment has exceeded its design life and needs upgrading.
The main objectives of the Proposal are:

- provide capacity for eight trains per hour with the assumption of trains stopping at each station along the route. Headway shall be designed for a future capacity of ten trains per hour
- improve journey times; with the aim that journey times do not exceed the November 2017 or latest timetable.



Morriset and Vales Point Resignalling Project

Proposal Location

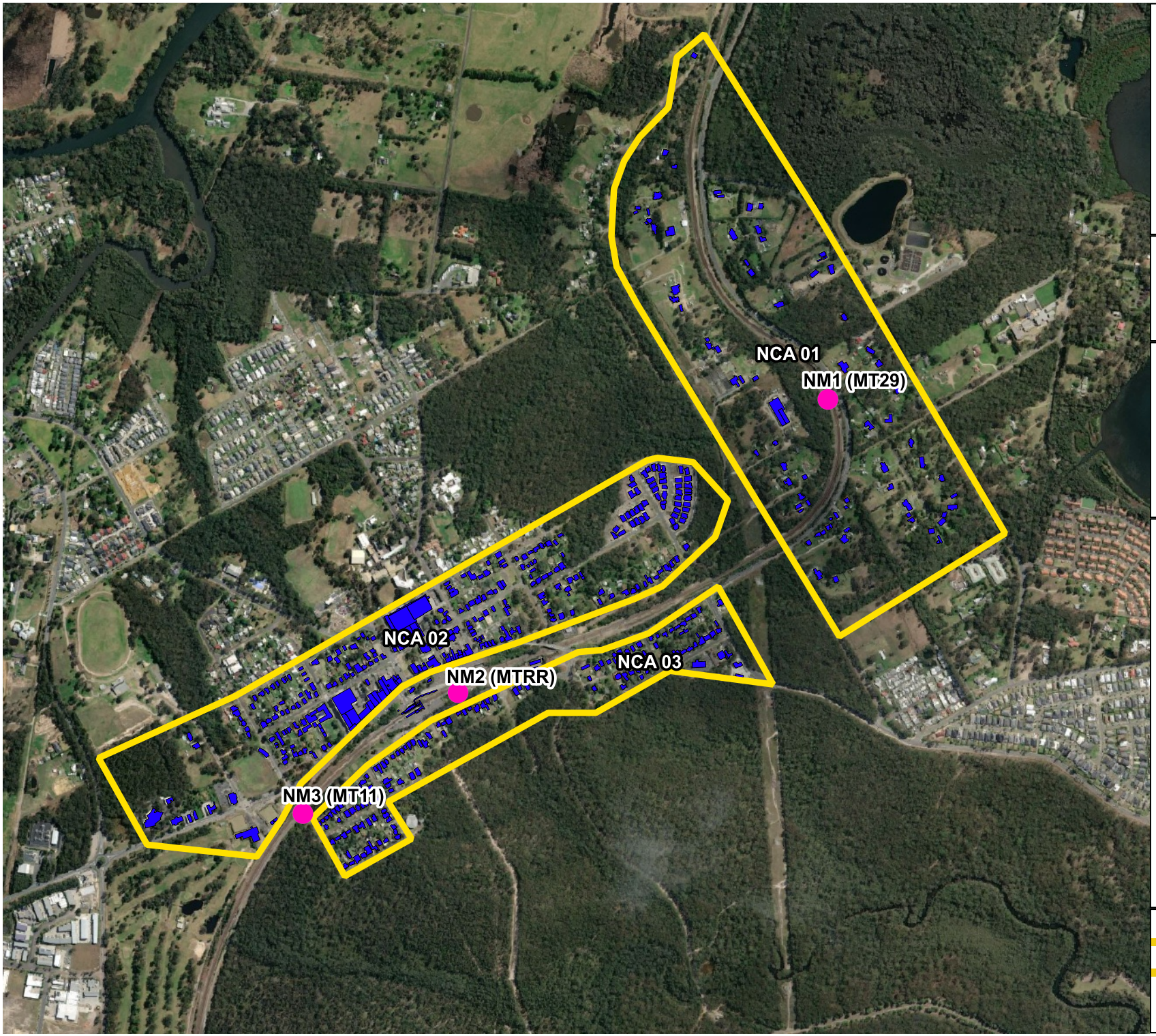
Figure 1: Proposed work locations

C:\Users\KT17430\Documents\Arcgis\Projects\MVP Map Updates\MVP Map Updates.aprx

2.2 Site description

The Proposal site has been established as extending between Wyee Station and Dora Creek Station (approximately 15 kilometres of track), although actual construction activities would occur at specific locations within the rail corridor on Sydney Trains controlled land which is surrounded by a mixture of rural, residential, commercial and industrial land uses. Residential receivers are located in Wyee, Morisset, and Dora Creek however, only residential receivers at Morisset and Wyee would potentially be impacted during construction as works cease before Dora Creek. There are no sensitive receivers noted at the Vales Point Balloon Loop. The noise environment of the area surrounding Morisset Station is generally dominated by rail noise, road noise and industrial or commercial sources.

Noise sensitive receivers near the Morisset Station include residences, a school, a place of worship, passive recreation areas, and active recreation areas such as parks and sports grounds. The locations of nearby sensitive receivers are shown in Figure 2 and Figure 3. The nearest residential receivers are approximately 10 metres from the proposed work site, located in Morisset.



Morisset and Vales Point Resignalling Project

FIGURE 2
Nearest Receivers and Noise Monitoring Locations in Morisset

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- Nearest Morisset receivers
- Noise logger locations
- NCA

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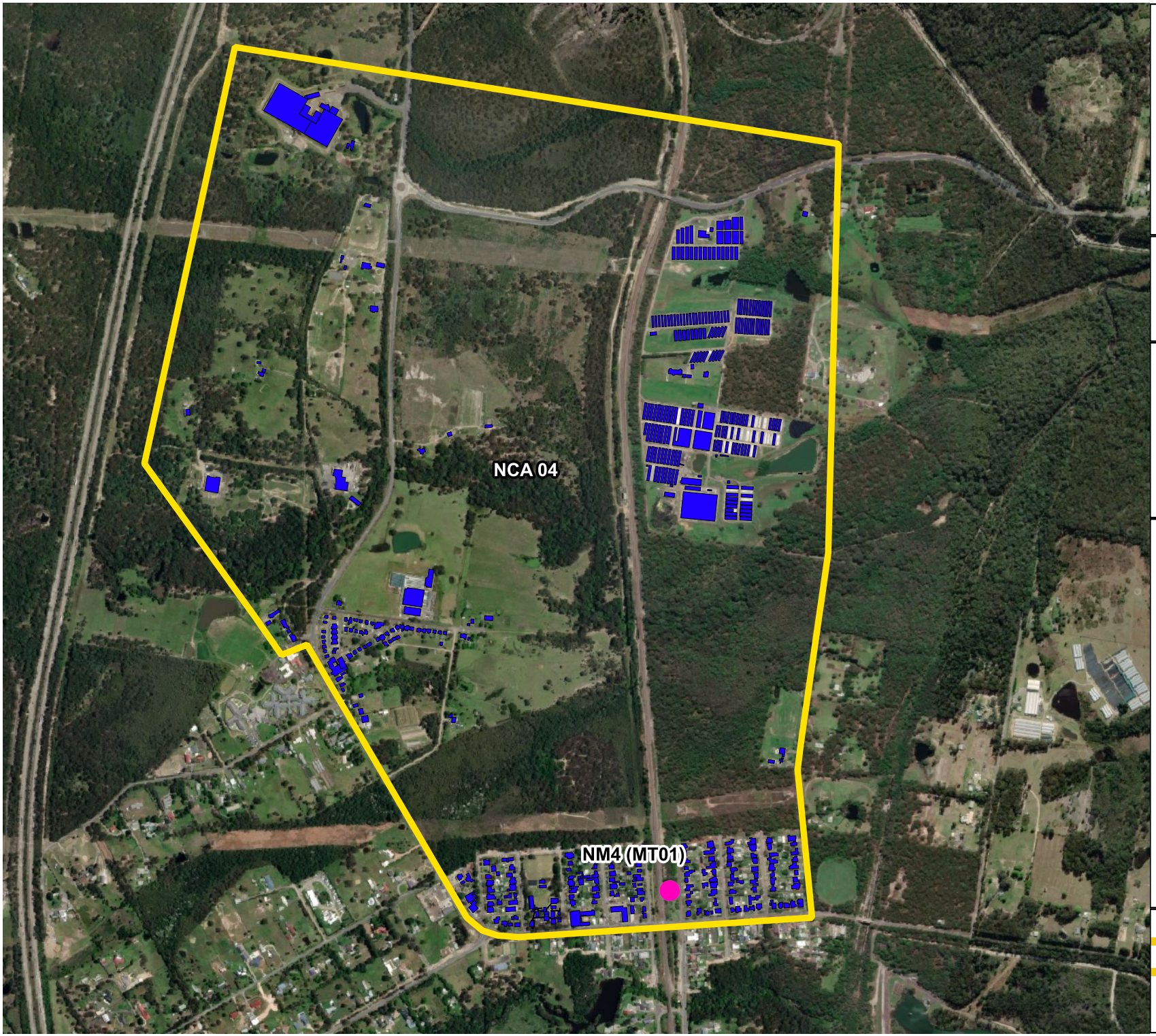

Morisset and Vales Point Resignalling Project

FIGURE 3
Nearest Receivers and Noise Monitoring Locations in Wyee

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- Nearest Wyee receivers
- Noise logger locations
- NCA

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3 Existing noise environment

3.1 Noise catchment areas

The noise environment of the area surrounding the Proposal site is generally mostly rural with pockets of suburban land-uses surrounding Morisset Station and at the southern end of the Proposal in Wyee. The noise environment at nearby noise sensitive receivers is mainly dominated by rail noise, road noise and industrial or commercial sources.

Based on our site observations (during logger placements) and desktop survey (using Google Map), receivers surrounding the Proposal have been divided into four noise catchment areas (NCAs). The four NCAs are presented in Figure 2 and Figure 3.

Discussions of the NCAs are as follows:

- NCA01: This catchment is located at the northern portion of the work alignment and comprises of a mixed of residential and commercial receivers. The Main Northern Line and Main Road run through the middle of the NCA. The noise environment within this NCA would be influenced by road traffic on Main Road and train passbys on the Main Northern Line.
- NCA02: This catchment is located to the north of Morisset station and has a mixed of residential, commercial and school receivers. Dora Street which runs along the south of the NCA is the main street of Morisset. The receivers in NCA are more densely populated than the receivers in NCA01. The existing noise environment in this NCA is mostly influenced by road traffic on Dora Street and train passbys on the Main Northern Line.
- NCA03: This catchment is located to the south of Morisset station and consists of residential receivers. This NCA is setback further from Dora Street compared to NCA02. The existing noise environment is mostly influenced by train passbys from the Main Northern Line.
- NCA04: This catchment is located at Wyee, at the southern portion of the work alignment. This NCA consists of mostly residential receivers and some agricultural industries. The Main Northern Line runs through the middle of the NCA and the existing noise environment is mainly influenced by train passbys.

3.2 Unattended noise monitoring

Unattended noise monitoring was undertaken between the dates of 27 September 2023 and 10 October 2023 at four locations (NM1, NM2, NM3 and NM4 as shown in Figure 2 and Figure 3) to characterise the background noise level of the surrounding nearest sensitive receiver locations. Details of the noise monitors and the monitoring locations are presented in Appendix B.

3.3 Instrumentation

The instrumentation of the unattended noise monitoring comprised of three Rion NL-42 environmental noise loggers (serial number: 00409176, 00709535, 00841630 and 00862918) fitted with wind shields. Field calibration was conducted at the commencement and at the conclusion of the logging period and no significant calibration drift was observed (drift in calibration did not exceed ±0.5 dB(A)). All instrumentation carried appropriate and current NATA (or manufacturer) calibration certificates.

3.4 Weather conditions

It is a requirement that noise data is captured during periods of favourable weather conditions avoiding adverse impacts of wind and rain on background noise levels. To assess weather conditions for the measurement period, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) weather observation station ID 061412 at Lake Macquarie AWS.

Noise data has been excluded from the processed results if:

- rain was observed during a measurement period, and/or
- wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground.

The BOM wind speed data obtained for this report was measured at a height of 10 m above ground level. It is therefore necessary to apply a correction factor in order to estimate the wind speed at the height of the logger (1.5 m).

The methodology to formulate a correction factor has been derived[1]. The correction multiplier for the measured wind speed at 10 m is derived by the following formula:

where:

$W_{1.5}$ = Wind speed at height of 1.5 m
W_{10} = Wind speed at height of 10 m
$M_{1.5,cat}$ = AS 1170 multiplier for receiver height of 1.5 m and terrain category
$W_{10,cat}$ = AS 1170 multiplier for receiver height of 10 m and terrain category

3.5 Unattended noise monitoring results

The noise data obtained from the noise loggers has been processed in accordance with the procedures contained in the NSW EPA's *Noise Policy for Industry* (NPI) to establish representative noise levels at the monitoring locations.

A summary of background L_{A90} results from the unattended noise survey during proposed operational hours of the playground is presented in Table 1.

The background noise levels were determined by taking the arithmetic mean noise level that was exceeded for 90% of the time during the relevant assessment periods for each day and then taking the median of all the days where monitoring took place for each assessment period as identified in the NPI. This process provides a single figure rating background noise level (RBL) for the day, evening and night periods. These RBLs were used to establish the relevant noise criteria in accordance with Sydney Trains *Environment Protection Licence* (EPL) 12208 for the following assessment periods:

- standard daytime hours[2]
- out-of-hours daytime
- out-of-hours evening
- out-of-hours night-time.

Detailed graphs presenting measured noise levels versus time overlaid with weather data for the monitoring period are presented in Appendix C.

[1] Gowen, T., Karantonis, P. & Rofail, T. (2004), *Converting Bureau of Meteorology wind speed data to local wind speeds at 1.5m above ground level*, Proceedings of ACOUSTICS 2004

[2] Condition O13.1 Standard railway maintenance hours: a) between the hours of 7:00am and 6:00pm Monday to Friday; b) between the hours of 8:00am and 1:00pm Saturday; and c) not on Sunday or public holidays.

Table 1: Unattended noise monitoring results summary

Monitoring location	Baseline noise levels – dB(A)					
	Daytime 7:00 am – 6:00 pm		Evening 6:00 pm – 10:00 pm		Night 10:00 pm – 7:00 am	
	RBL	$L_{eq, period}$	RBL	$L_{eq, period}$	RBL	$L_{eq, period}$
NM1 (MT29)	44	72	38	71	31	74
NM2 (MTRR)	44	60	41	59	34	60
NM3 (MT11)	42	65	41	66	34	64
NM4 (MT01)	38	63	37	61	33	62

3.6 Attended noise measurement results

Operator attended noise measurements were conducted on 10 October 2023, prior to the retrieval of the noise loggers, in order to verify logger data and observe background noise levels. The measurements were conducted between 8:00 am and 10:30 am at the logger locations.
Attended noise measurements were conducted using a Rion NL-42 (Serial no. 946983). Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. The results of operator attended noise measurements are presented in Table 2 below.

Table 2: Operator attended 15-minute noise measurements

Location	Date	Start time	Measured Existing Noise Levels, dB(A) (Operator Attended Measurements)	
			L_{eq}	L_{90}
NM1 (MT29)	10/10/2023	09:51 am	59	39
NM2 (MTRR)	10/10/2023	09:28 am	60	42
NM3 (MT11)	10/10/2023	08:58 am	57	47
NM4 (MT01)	10/10/2023	08:22 am	59	44

The operator attended noise measurement results at the logger locations showed good correlation to the unattended noise monitoring results.

During the attended noise measurements, the existing noise environment in the area were observed to be the following:

- Background noise levels at all locations were influenced by local fauna and distant road traffic.
- Ambient noise levels at all locations were influenced by local road traffic noise and train pass-bys.

Based on the observations during the attended measurements, we have determined the following:

- Noise logging at NM1 is representative of the background noise levels in NCA01
- Noise logging at NM2 is representative of the background noise levels in NCA02
- Noise logging at NM3 is representative of the background noise levels in NCA03
- Noise logging at NM4 is representative of the background noise levels in NCA04.

4 Construction noise and vibration criteria

4.1 Construction noise criteria

4.1.1 Environment Protection Licence 12208

The construction noise criteria for Sydney Trains resignalling works have been specified in Conditions O13.1, O13.2 and O13.3 of NSW EPA issued EPL 12208. The three EPL conditions have been extracted and presented below:

Standard railway maintenance hours

O13.1 Maintenance activities must be undertaken:

a) between the hours of 7:00am and 6:00pm Monday to Friday

b) between the hours of 8:00am and 1:00pm Saturday; and

c) not on Sunday or public holidays,

unless an exception in condition O13.2 or condition O13.3 applies.

Exception to standard railway maintenance hours

O13.2 The licensee may undertake maintenance activities outside of the hours specific in Condition O13.1:

a) to provide safe and reliable train services or a safe working environment; or

b) for emergency works; or

c) for the delivery of oversized plant or structures that require special arrangements or authorisation to be lawfully transported along public roads.

Exception to standard railway maintenance hours for low noise impact generating works

O13.3 (a) The licensee may undertake maintenance activities outside of the hours specified in Condition O13.1, if the activities do not exceed:

i. 5dBA (LAeq, 15min) above the relevant rating background levels at day, evening and night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation, and

ii. 15dBA (LA1, 1min or LAmax) above the relevant rating background level at night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation.

b) The results of any acoustic investigation undertaken in relation to Conditions O13.3(a)(i) and O13.3(a)(ii) must be provided by the licensee when requested by an authorised officer of the EPA.

c) An acoustic investigation referred to in Conditions O13.3(a)(i) and O13.3(a)(ii) is not required if there are no noise sensitive receivers impacted by the activities.

4.1.2 Project specific noise criteria

In accordance with Conditions O13.1 to O13.3 of EPL 12208, construction noise assessment is only required for the following:

- resignalling works conducted outside of the standard hours, i.e. possession weekends day, evening and night periods

- impacts to noise sensitive receivers[3].

Based on Condition O13.3 and measured background noise levels, the Project specific OOH construction noise limits have been presented in Table 3.

Table 3: Project specific construction noise limits at surrounding receivers

NCA	OOH daytime noise limit dB(A) $L_{eq,15min}$	OOH evening noise limit dB(A) $L_{eq,15min}$	OOH night-time noise limit dB(A)	
			$L_{eq,15min}$	$L_{1,1min}$ or L_{max}
NCA01	49	43	36	46
NCA02	49	46	39	49
NCA03	47	46	39	49
NCA04	43	42	38	48

4.2 Ground-borne noise criteria

Ground-borne noise will not be a controlling factor with respect to construction noise impacts. No underground works will occur and therefore air-borne noise levels will exceed the ground-borne noise levels and control noise management requirements. As such, a detailed ground-borne noise assessment is not required for the resignalling works.

4.3 Construction vibration criteria

Ground vibration generated by construction can have a range of effects on buildings and building occupants, with the main effects generally classified as:

- Human disturbance – disturbance to building occupants: vibration which inconveniences or interferes with the activities of the occupants or users of the building
- Effects on building structures – vibration that may compromise the condition of the building structure itself.

In general, vibration criteria for human disturbance are more stringent than vibration criteria for effects on building contents and structural damage. Building occupants will normally feel vibration readily at levels well below those that may cause a risk of cosmetic or structural damage to a structure. However, it may not always be practical to achieve the human comfort criteria. Furthermore, unnecessary restriction of construction activities can prolong construction works longer than necessary, potentially resulting in other undesirable effects for the local community.

Construction vibration criteria have been adopted from the following sources:

- Cosmetic and structural damage to buildings: German Standard DIN 4150-3[4]
- NSW EPA's *Human comfort: Assessing Vibration – a technical guideline*.

[3] NSW EPA's *Rail Infrastructure Noise Guideline* identifies noise sensitive receivers to be residential land uses, schools, educational institutions, childcare centre, places of worship and hospitals.

[4] German Standard DIN 4150-3, 1999, *Structural Vibration – Part 3: Effects of vibration on structures*.

4.3.1 Cosmetic and structural damage

The DIN 4150-3 structural and cosmetic damage assessment criteria for different types of buildings are presented in Table 4. The criteria are specified as Peak Particle Velocity (PPV) levels measured in any direction at or adjacent to the building foundation.

DIN 4150-3 states that exposing buildings to vibration levels higher than that recommended in Table 4 would not necessarily result in damage. Rather it recommends these values as maximum levels of short-term construction vibration at which experience has shown that damage that reduces the serviceability of structures will not occur due to vibration effects.

DIN 4150-3 is considered to be suitable for the assessment of both structural and cosmetic damage as the standard considers a reduction in serviceability of the structure is deemed to have occurred if:

- Cracks form in plastered surfaces of walls.
- Existing cracks in the building are enlarged.
- Partitions become detached from loadbearing walls or floors.

Table 4: DIN 4150-3 vibration cosmetic and structural damage criteria

Structure type	Peak Particle Velocity (PPV), mm/s			
	Foundation of structure			Vibration at horizontal plane of highest floor at all frequencies
	<10 Hz	10-50 Hz	50-100 Hz	
Buildings used for commercial, industrial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwelling and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in rows 1 and 2, and are of great intrinsic value (e.g. heritage-listed buildings)	3	3 to 8	8 to 10	8

DIN4150 states that exceedances of the guidance values do not necessarily mean that damage will occur, but that more detailed analysis may be required in order to quantify the site specific relationship between vibration levels, strain and the potential for damage. If required, the additional analysis may include more detailed vibration, strain or displacement measurements combined with engineering analysis.

4.3.2 Human comfort

The ICNG recommends that vibration from construction works be assessed under the EPA's *Assessing Vibration – a technical guideline* (Vibration Guideline). The vibration assessment criteria defined in this Vibration Guideline are for human comfort and represent goals that, where predicted or measured to be exceeded, require the application of all feasible and reasonable mitigation measures. Where the maximum value cannot be feasibly and reasonably achieved, the operator would need to negotiate directly with the affected community.

The Vibration Guideline defines vibration assessment criteria for continuous, impulsive and intermittent vibration. Vibration can be classified according to the following definitions:

- Continuous vibration: continues uninterrupted for a defined period. Applies to continuous construction activity such as tunnel boring machinery.
- Impulsive vibration: rapid build-up to a vibration peak followed by a damped decay or the sudden application of several cycles of vibration at approximately the same magnitude providing that the duration is short. Applies to very occasional construction activities that create distinct events such as the occasional dropping of heavy equipment.
- Intermittent vibration: interrupted periods of continuous vibration (such as a drill) or repeated periods of impulsive vibration (such as a pile driver).
- The majority of construction works as part of the proposal would be expected to be intermittent in nature with the potential for some impulsive activities (e.g. demolition works).

Table 5 presents the management levels for continuous and impulsive vibration at different land uses. The management levels specified are as overall unweighted root-mean-square (rms) vibration velocity levels (V_{rms}). The Guideline specifies the management levels as suitable for vibration sources predominantly in the frequency range 8-80 Hz as would be expected for construction vibration.

Table 5: Daytime V_{rms} management levels for continuous and impulsive vibration

Receiver	Continuous vibration V_{rms}, mm/s		Impulsive vibration V_{rms}, mm/s	
	Preferred	Maximum	Preferred	Maximum
Residences – daytime	0.2	0.4	6	12
Residences – night-time	0.14	0.28	2	4
Offices, schools, place of worship	0.4	0.8	13	26
Workshops	0.8	1.6	13	26

For intermittent vibration, the Vibration Dose Value (VDV) is used as the metric for assessment as it accounts for the duration of the source, which will occur intermittently over the assessment period. The VDV management levels at different land uses for intermittent vibration sources are presented in Table 6.

Table 6: VDV management levels for intermittent vibration

Receiver	VDV – Intermittent vibration, $m/s^{1.75}$	
	Preferred	Maximum
Residences – daytime	0.2	0.4
Residences – night-time	0.13	0.26
Offices, schools, places of worship	0.4	0.8
Workshops	0.8	1.6

5 Construction noise and vibration assessment

This section details the assessment of the construction noise and vibration impacts from the Proposal. Construction noise impacts predicted at the nearest residential receivers have been assessed against the adopted construction noise and vibration limits presented in Section 4.

5.1 Construction noise assessment

5.1.1 Methodology

In order to quantify noise emissions from the proposed resignalling works, noise modelling software (SoundPLAN v9.0, ISO 9613 prediction algorithm) has been used to predict the $L_{Aeq(15\text{-}minute)}$ and L_{Amax} noise levels at nearby noise sensitive receivers. The calculations include the source noise levels of the anticipated equipment, the location of selection of nearby sensitive receivers, the number of plant items likely to be operating at any given time and the distance between the equipment and the receivers.

The typical noise levels used for the purposes of this assessment have been based on the following references:

- Transport for NSW (TfNSW) *Construction Noise and Vibration Strategy* (TfNSW CNVS) (2018)
- TfNSW *Construction Noise and Vibration Guideline (Roads)* (TfNSW CNVG) (2023)
- TfNSW *Construction Noise Estimation Tool* (TfNSW CNET)
- Sydney Metro *Appendix F Construction Noise and Vibration Standard* (Metro CNVS) (2020)
- Equipment manufacturer datasheet such as Volvo, Hydrema and Geismar.

In practice, the noise levels would vary due to the fact that plant would move around the worksites and would not all be operating concurrently. As such, noise levels are likely to be lower than the worst-case noise levels presented for notable periods of time during the works.

5.1.2 Construction activities, duration and equipment sound power

A summary of the construction activities and the relevant equipment sound power levels used for the construction noise assessment is provided in Table 7 below. All activities described are anticipated to occur during OOH, i.e. possession weekends. It is understood that these construction activities will need to be carried out during OOH to provide safe and reliable train services, and a safe working environment.

Table 7: Assumed construction sound power levels

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
Track alignment	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107
	14t Hydrema	Hydrema 912 series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	6	1	106
	Tamper Consists	Metro CNVS	113	1	1	113
	PEM-LEMs	Geismar Pum	93	10	1	103
	Test locomotive	Resonate database	100	1	1	100
	Total $L_{Aeq(15minute)}$					**117**
Buildings works	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Telehandler EWP	TfNSW CNET	95	1	0.5	92
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Concrete truck	TfNSW CNET	109	1	0.5	106
	Concrete pump	TfNSW CNET	109	1	0.5	106
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
	14t Hydrema	Hydrema 912 series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	2	1	101
	Total $L_{Aeq(15minute)}$					**116**
Drainage/drain pipes	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Concrete truck	TfNSW CNET	109	1	0.5	106
	Concrete pump	TfNSW CNET	109	1	0.5	106
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107
	14t Hydrema	Hydrema 912 series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	4	1	104
	Total $L_{Aeq(15minute)}$					**116**

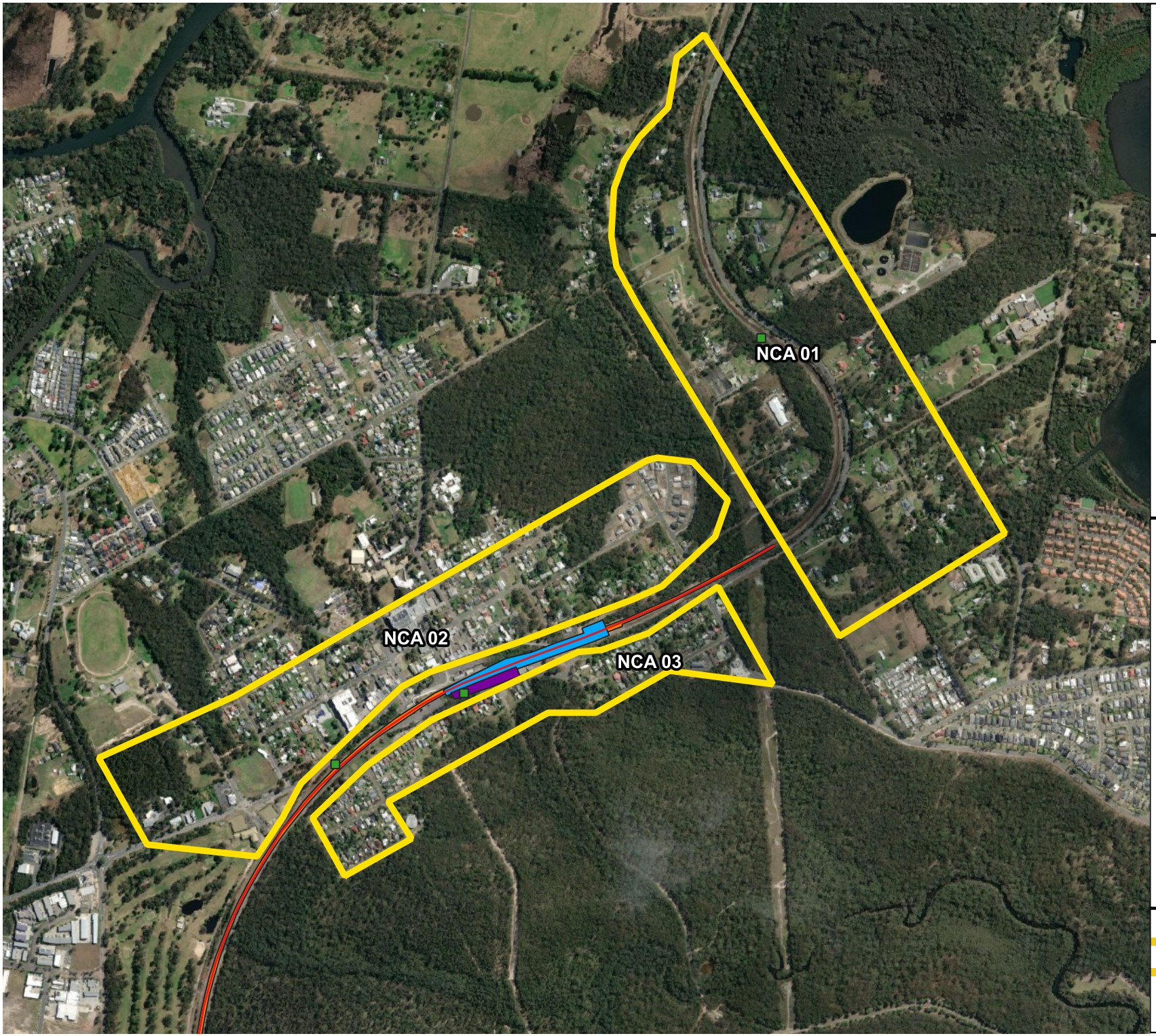
Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
LV cables	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Telehandler EWP	TfNSW CNET	95	1	0.5	92
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	4	1	104
	Total $L_{Aeq(15minute)}$					**113**
Overhead wiring	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Telehandler EWP	TfNSW CNET	95	1	0.5	92
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Concrete truck	TfNSW CNET	109	1	0.5	106
	Concrete pump	TfNSW CNET	109	1	0.5	106
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107
	14t Hydrema	Hydrema 912 Series	102	1	0.5	99

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	6	1	106
	Total $L_{Aeq(15minute)}$					**116**
Pits	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Concrete truck	TfNSW CNET	109	1	0.5	106
	Concrete pump	TfNSW CNET	109	1	0.5	106
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107
	14t Hydrema	Hydrema 912 Series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	4	1	104
	Total $L_{Aeq(15minute)}$					**116**
Ancillary	L90 FEL	Volvo L90E	105	1	0.5	102

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Hydro jet/vac truck	TfNSW CNET	109	1	0.5	106
	Telehandler EWP	TfNSW CNET	95	1	0.5	92
	Franna crane	TfNSW CNVG	98	1	0.75	97
	Concrete truck	TfNSW CNET	109	1	0.5	106
	Concrete pump	TfNSW CNET	109	1	0.5	106
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107
	14t Hydrema	Hydrema 912 series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	2	1	101
	Total $L_{Aeq(15minute)}$					**116**
Stockpile	L90 FEL	Volvo L90E	105	1	0.5	102
	L120 FEL	Volvo L120E	106	1	0.5	103
	5-8t rubber tracked excavator	TfNSW CNVS	95	1	0.5	92
	16t rubber tracked excavator	TfNSW CNVS	105	1	0.5	102
	16t rubber tired excavator	TfNSW CNVS	105	1	0.5	102
	Bogie tipper truck	TfNSW CNVS	110	1	0.5	107

Construction activity	Plant item	Reference	Typical Sound Power Level dB(A)	Number off	Operating time (% of typical 15-minute assessment period)	Estimated Sound Power Level dB(A)
	14t Hydrema	Hydrema 912 Series	102	1	0.5	99
	6t tipper truck	TfNSW CNVS	107	1	0.5	104
	Street sweeper	TfNSW CNET	109	1	0.5	106
	Watercart	TfNSW CNVG	107	1	0.5	104
	Generator (25-50kVa)	TfNSW CNVG	103	1	1	103
	Daymakers/lighting towers	TfNSW CNVG	98	2	1	101
	Total $L_{Aeq(15minute)}$					**114**

The locations of the construction activities are presented in Figure 4 and Figure 5, and have incorporated in the noise model for the noise predictions.



Morisset and Vales Point Resignalling Project

FIGURE 4
Resignalling Works Locations in Morisset

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

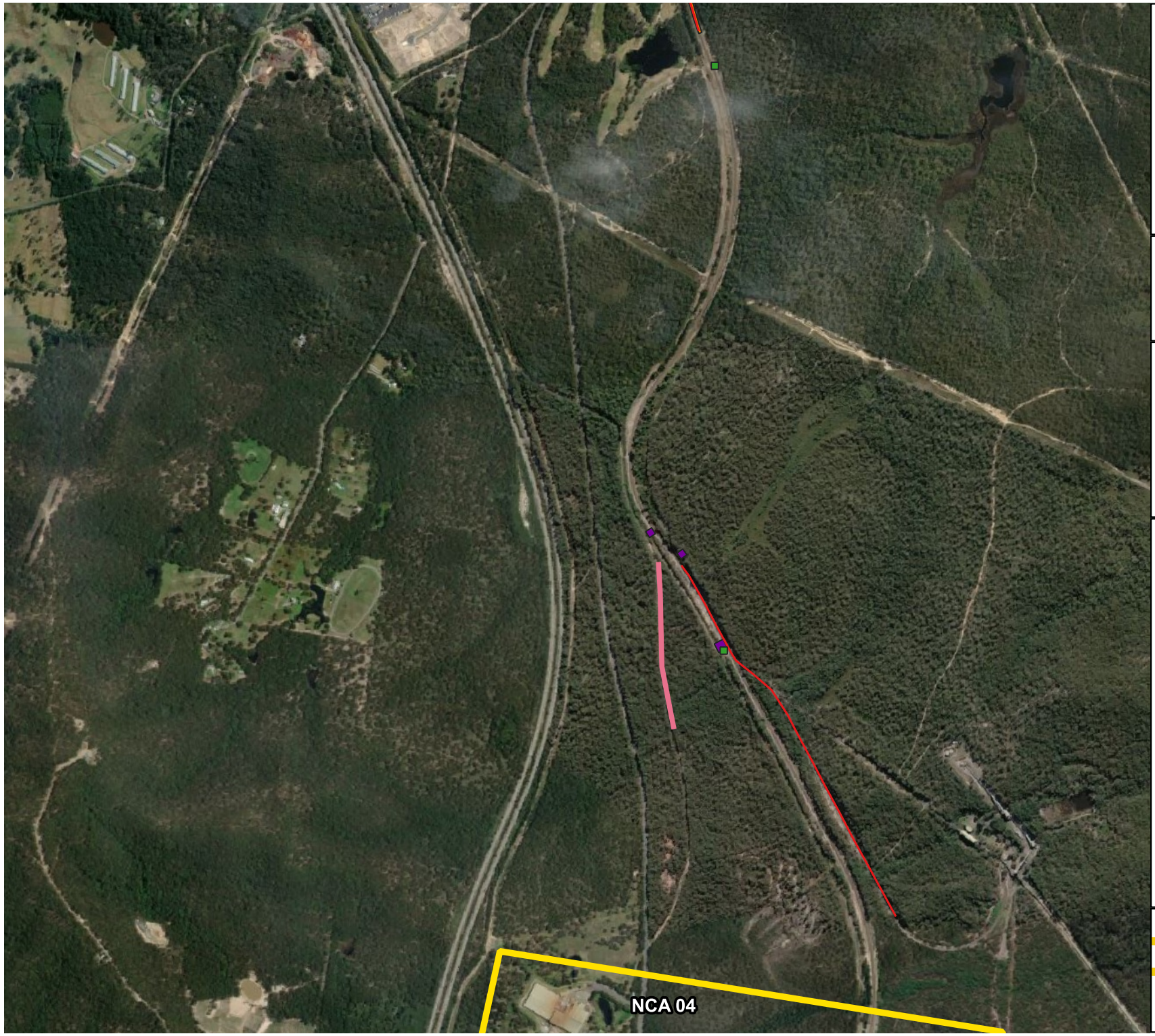
Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- NCA
- Buildings works
- Drainage drain pipe works
- Overhead wiring works
- Pits
- Track alignment works

Resonate



Morisset and Vales Point Resignalling Project

FIGURE 5
Resignalling Works Locations in Wyee

Date: November 2023
Client: SMEC/Sydney Trains
Prepared by: RS

N

Datum GDA 2020, Projection MGA ZONE 56

0 0.25 0.5 0.75 km

Legend

- NCA
- Buildings works
- LV cable works
- Overhead wiring works
- Pits

Resonate

5.2 Assessment of predicted noise levels

The detailed predicted L_{eq} and L_{max} noise levels of the resignalling works are presented in Appendices D and E respectively. Discussions of the predicted noise levels of each resignalling works within each NCA are presented in the following sections below.

5.2.1 NCA01

- Track alignment
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 66 dB(A) and 62 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 25, 41 and 48 noise sensitive receivers respectively within NCA01.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 23 noise sensitive receivers within NCA01.
- Buildings
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 68 dB(A) and 62 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 15, 23 and 46 noise sensitive receivers respectively within NCA01.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 10 noise sensitive receivers within NCA01.
- Drainage/drain pipes
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 48 dB(A) and 42 dB(A) respectively.
  - This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 16 and 47 noise sensitive receivers respectively within NCA01.
  - This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01.
- LV cables
  - There are no predicted L_{eq} and L_{max} impacts within NCA01 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA01.
- Overhead wiring
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 64 dB(A) and 58 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 22, 40 and 47 noise sensitive receivers respectively within NCA01.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 17 noise sensitive receivers within NCA01.
- Pits
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 46 dB(A) and 40 dB(A) respectively.
  - This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 3 and 40 noise sensitive receivers respectively within NCA01.
  - This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01.
- Ancillary
  - Highest predicted L_{eq} and L_{max} noise levels within NCA01 are 48 dB(A) and 42 dB(A) respectively.
  - This activity is predicted to comply with the daytime L_{eq} noise criteria at all receivers but predicted to exceed the evening and night-time L_{eq} noise criteria at up to 18 and 47 noise sensitive receivers respectively within NCA01.

  - This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA01.
- Stockpiles
  - There are no predicted L_{eq} and L_{max} impacts within NCA01 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA01.

5.2.2 NCA02

- Track alignment
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 71 dB(A) and 67 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 187, 203 and 205 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 161 noise sensitive receivers within NCA02.
- Buildings
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 73 dB(A) and 67 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 48, 65 and 188 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 17 noise sensitive receivers within NCA02.
- Drainage/drain pipes
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 72 dB(A) and 66 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 94, 123 and 192 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 48 noise sensitive receivers within NCA02.
- LV cables
  - There are no predicted L_{eq} and L_{max} impacts within NCA02 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA02.
- Overhead wiring
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 69 dB(A) and 63 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 181, 195 and 205 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 93 noise sensitive receivers within NCA02.
- Pits
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 58 dB(A) and 52 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 22, 47 and 155 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 3 noise sensitive receivers within NCA02.
- Ancillary
  - Highest predicted L_{eq} and L_{max} noise levels within NCA02 are 67 dB(A) and 61 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 105, 143 and 202 noise sensitive receivers respectively within NCA02.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 45 noise sensitive receivers within NCA02.

- Stockpiles
  - There are no significant predicted L_{eq} and L_{max} impacts within NCA02 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA02.

5.2.3 NCA03

- Track alignment
  - Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 74 dB(A) and 70 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 137, noise sensitive receivers for all periods within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 135 noise sensitive receivers within NCA03.
- Buildings
  - Highest predicted Leq and Lmax noise levels within NCA03 are 79 dB(A) and 73 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 88, 90 and 122 noise sensitive receivers respectively within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 61 noise sensitive receivers within NCA03.
- Drainage/drain pipes
  - Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 73 dB(A) and 67 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 98, 105 and 134 noise sensitive receivers respectively within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 47 noise sensitive receivers within NCA03.
- LV cables
  - There are no predicted L_{eq} and L_{max} impacts within NCA03 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA03.
- Overhead wiring
  - Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 71 dB(A) and 65 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 136, 137 and 137 noise sensitive receivers respectively within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 127 noise sensitive receivers within NCA03.
- Pits
  - Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 82 dB(A) and 76 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 68, 74 and 116 noise sensitive receivers respectively within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 31 noise sensitive receivers within NCA03.
- Ancillary
  - Highest predicted L_{eq} and L_{max} noise levels within NCA03 are 79 dB(A) and 73 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 128, 130 and 135 noise sensitive receivers respectively within NCA03.
  - This activity is also predicted to exceed the L_{max} noise criteria at up to 84 noise sensitive receivers within NCA03.
- Stockpiles
  - There are no significant predicted L_{eq} and L_{max} impacts within NCA03 for this activity.

- This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA03.

5.2.4 NCA04

- Track alignment
  - There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- Buildings
  - Highest predicted L_{eq} and L_{max} noise levels within NCA04 are 50 dB(A) and 44 dB(A) respectively.
  - This activity is predicted to exceed the daytime, evening and night-time L_{eq} noise criteria at up to 112, 160 and 230 noise sensitive receivers respectively within NCA04.
  - This activity is predicted to comply with the L_{max} noise criteria at all noise sensitive receivers within NCA04.
- Drainage/drain pipes
  - There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- LV cables
  - There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- Overhead wiring
  - There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- Pits
  - There are no significant predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- Ancillary
  - There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.
- Stockpiles
  - There are no predicted L_{eq} and L_{max} impacts within NCA04 for this activity.
  - This activity is predicted to comply with the daytime, evening and night-time L_{eq} noise criteria and the L_{max} noise criteria within NCA04.

5.3 Construction vibration assessment

5.3.1 Safe working distances

Safe working distances for typical vibration intensive construction equipment are provided in the Sydney Trains' EMS-10-PR-0048 *Construction and Maintenance Noise and Vibration Management* (CMNVM) and are shown in Table 8. The safe working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from the NSW EPA Assessing Vibration: a technical guideline). They are calculated from empirical data which suggests that where work is further from receivers than the quoted safe distances then impacts are not considered likely. The

safe working distances apply to addressing the risk of cosmetic (minor – easily reparable) damage of typical buildings under typical geotechnical conditions.

Where vibration intensive works are required to be undertaken within the specified safe working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied.

In relation to human comfort, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions would be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed.

Table 8 presents the recommended safe working distances for vibration intensive plant.

Table 8: Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Minimum Working Distance – Cosmetic Damage[1] (BS7385)	Minimum Working Distance – Human Response (OH&E Guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Handheld	1 m (nominal)	2 m

5.3.2 Vibration intensive activities

The currently anticipated schedule of plant to be used for the resignalling works does not include any vibration intensive plant. That said, if a vibration intensive plant, as listed in Table 8, would subsequently be used, the safe working distances should be adhered to.

6 Construction noise and vibration management measures

6.1 EPL Noise management measures

Based on the predicted exceedances during track alignment, buildings, drainage/drain pipes, overhead wiring, pits and ancillary works in NCAs 01, 02 and 03, the management measures detailed in Conditions O13.4 and O13.5 in the EPL will need to be implemented. The management measures will need to be implemented and adhered when track alignment, buildings, drainage/drain pipes, overhead wiring, pits and ancillary works are being carried out in NCAs 01, 02 and 03. The management measures specified in Conditions O13.4 and O13.5 of the EPL have been extracted and presented below.

O13.4 *Where maintenance activities are undertaken, including outside of the hours specified in Condition O13.1, noise impacts must be managed in accordance with the recommendations in the Interim Construction Noise Guideline (DECCW, 2009), as updated from time to time. The licensee is required to:*

a) identify noise sensitive receivers that may be affected;

b) identify hours of work for the proposed activities;

c) identify noise impacts at noise sensitive receivers;

d) select and apply reasonable and feasible work practices to minimise noise impacts; and

e) notify the identified noise sensitive receivers at least 5 days prior to the commencement of maintenance activities undertaken outside of the hours specified in Condition O13.1, except where the licensee first becomes aware of the need to undertake those maintenance activities less than 5 days prior to the proposed commencement date, in which case the notification must be provided as soon as practicable after becoming aware of the need to undertake the maintenance activities.

O13.5 *When requested by an authorised officer of the EPA, the licensee must provide the following information regarding any proposed maintenance activities on the Sydney Trains Network:*

a) dates and times of the proposed maintenance activity;

b) location of the proposed maintenance activity;

c) type(s) of work to be performed in conducting the proposed maintenance activity;

d) plant and equipment to be used; and

e) contact name and telephone number of a person who will be on site during the activity and who is authorised by the licensee to take action, including the cessation of the activity or any part of it, if so directed by the EPA. A contact person must be contactable 24 hours a day via the supplied telephone number(s) during the whole of the period that the activity takes place outside the hours specified in Condition O13.1.

6.2 Standard mitigation measures

Construction noise criteria exceedances are predicted at several identified noise sensitive receivers for various construction activities associated with the Proposal. Efforts should be made to implement all feasible and reasonable mitigation measures in order to minimise the impacts of construction noise and vibration.

It is recommended that standard best practice management measured in addition the those specified in the EPL should be implemented. Table 9 below present a detailed table of standard noise mitigation measures which have been developed from the standard noise and vibration mitigation measures specified in the CMNVMå . The CMNVM

states that the standard mitigation measures should be implemented on all construction projects. The standard mitigation measures include items such as:

- Community consultation or notification
- Site inductions and staff training
- Preparation of work specific construction noise and vibration management plans
- Validation noise and vibration measurements
- Selection of the quietest available plant and equipment
- Scheduling of noise and vibration intensive work
- Use of temporary noise barrier / enclosure and/or planning work to use natural topographical shielding
- Dilapidation surveys and vibration monitoring.

Table 9: Standard noise mitigation measures applicable to the proposal

Action required	Applies to:	Details
Management measures		
Implement community consultation or notification measures	Airborne noise. Ground-borne noise & vibration.	• Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. • Website (If required). • Contact telephone number for community. • Email distribution list (if required). • Community drop-in session (if required by approval conditions).
Site inductions	Airborne noise. Ground-borne noise & vibration.	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise.	• No swearing or unnecessary shouting or loud stereos/radios on site. • No dropping of materials from height, throwing of metal items and slamming of doors.
Attended vibration measurements	Ground-borne vibration	Where required, attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage.
Update Construction Environmental Management Plans	Airborne noise. Ground-borne noise and vibration.	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.

Action required	Applies to:	Details
Building condition surveys	Vibration	If vibration intensive plant are to be used near or at sensitive structures/buildings, undertake dilapidation surveys on all structures/buildings located within the buffer zone prior to commencement of activities with the potential to cause property damage.
Source controls		
Construction hours and scheduling	Airborne noise. Ground-borne noise and vibration.	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.
Equipment selection	Airborne noise. Ground-borne noise and vibration.	Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. Ensure plant including the silencer is well maintained.
Plant noise levels	Airborne noise.	The noise levels of plants and equipment must have operating Sound Power or Sound Pressure Levels compliant with the levels presented in Table 7 of this report.
Rental plant and equipment	Airborne noise.	The noise levels of plant and equipment items are to be considered in rental decisions and, in any case, cannot be used on site unless compliant with the levels presented in Table 7 of this report.
Use and siting of plant	Airborne noise.	• The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. • Plant used intermittently to be throttled down or shut down. • Noise-emitting plant to be directed away from sensitive receivers. • Only have necessary equipment on site.
Plan worksites and activities to minimise noise and vibration	Airborne noise. Ground-borne vibration.	• Locate compounds away from sensitive receivers and discourage access from local roads. • Plan traffic flows, parking and loading/unloading areas to minimise reversing movements within the site. • Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible. • Very noisy activities should be scheduled for normal working hours. If the work cannot be undertaken during the day, it should be completed before 11.00 pm where possible. • Where practicable, work should be scheduled to avoid major student examination periods when students are studying for examinations, whether at an institution or within a residence, such as before or during Higher School Certificate and at the end of higher education semesters.

Action required	Applies to:	Details
Reduced equipment power	Airborne noise. Ground-borne vibration.	Use only the necessary size and power.
Non-tonal and ambient sensitive reversing alarms	Airborne noise.	• Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. • Consider the use of ambient sensitive alarms that adjust output to the ambient noise level.
Minimise disturbance arising from delivery of goods to construction sites	Airborne noise.	• Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. • Select site access points and roads as far as possible from sensitive receivers. • Dedicated loading/unloading areas to be shielded if close to sensitive receivers. • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. • Avoid or minimise these out of hours movements where possible.
Engine compression brakes	Construction vehicles.	• Limit the use of engine compression brakes at night and in residential areas. • Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Path controls		
Shield stationary noise sources such as pumps, compressors, fans, etc.	Airborne noise.	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.
Shield sensitive receivers form noisy activities	Airborne noise.	Use of structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.

7 Conclusion

Resonate Consultants has conducted a construction noise and vibration assessment of the activities associated with the Morisset and Vales Point resignalling project.

Unattended and attended background noise monitoring was completed to characterise the prevailing environmental noise within the Proposal boundary. Project specific construction noise and vibration assessment criteria have been established based on the measured background noise levels as per the requirements set out in Condition O13.3 of Sydney Trains EPL 12208.

Predicted construction noise levels have been assessed against the established criteria and the proposed construction methodology. Exceedance of the construction noise criteria have been predicted at a number of nearby noise sensitive receivers located within NCA01, NCA02 and NCA03. The criteria exceedances may be considered noticeable to highly intrusive depending on the relative location of sensitive receivers to the works and whether the works are occurring during daytime, evening or night-time period of the OOH possession weekend.

Analysis of the predicted noise levels found that the exceedances at noise sensitive receivers within NCA01, NCA02 and NCA03 are due to track alignment, buildings, drainage/drain pipes, overhead wiring, pits and ancillary works. Based on this understanding, the management measures detailed in Conditions O13.4 and O13.5 in the EPL will need to be implemented. The management measures will need to be implemented and adhered when track alignment, buildings, drainage/drain pipes, overhead wiring, pits and ancillary works are being carried out in NCAs 01, 02 and 03.

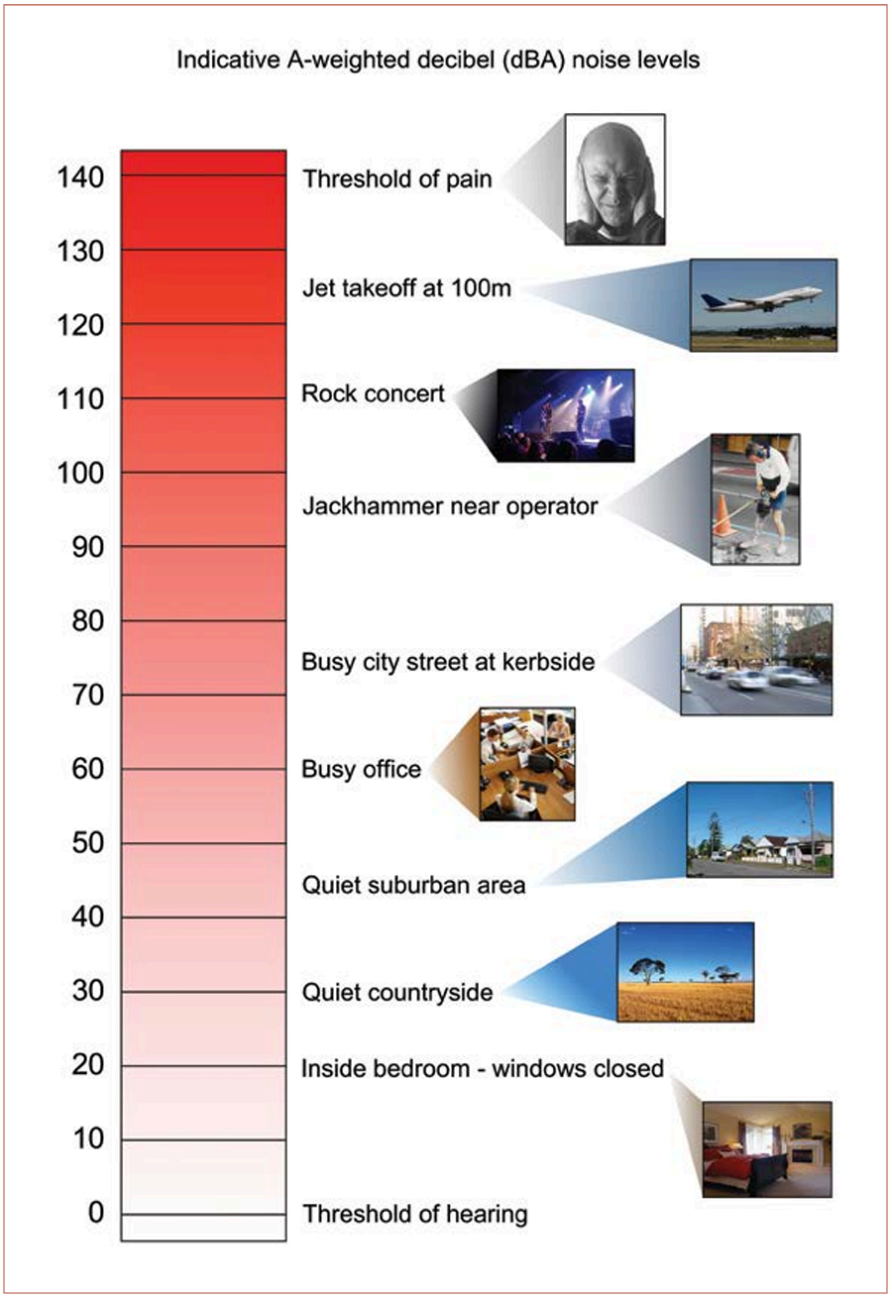
In addition to the EPL noise management measures, standard best practice noise management measures developed from Sydney Trains' CMNVM have also been recommended for the Proposal. These standard measures are presented in Table 9 of this report.

From a review of the currently proposed plant items for the resignalling works, it was established that there is no vibration plant intended for used. Therefore, vibration impact of human comfort or structural damage to surrounding sensitive receivers is unlikely. That said, should a vibration intensive plant, as listed in Table 8, be subsequently used on the Proposal, the minimum working distances should be adhered to.

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: • character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) • character of the environment (e.g. very quiet suburban, suburban, urban, near industry) • miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) • human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: • Noise mitigation benefits (amount of noise reduction provided, number of people protected). • Cost of mitigation (cost of mitigation versus benefit provided). • Community views (aesthetic impacts and community wishes). • Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night-time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night-time monitoring periods.
Receiver	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	**Sound** (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



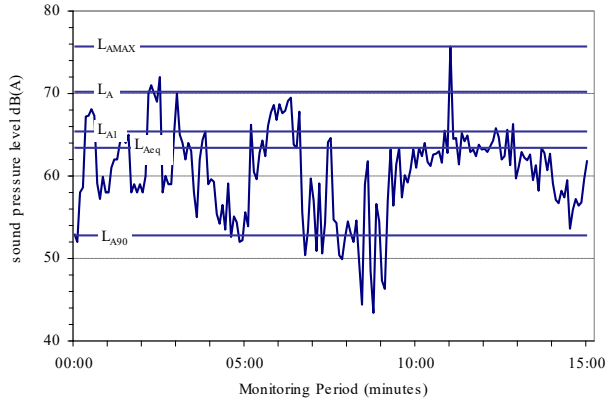
dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.
Sound Pressure Level (SPL)	The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

- L_{Amax}: Maximum recorded noise level.
- L_{A1}: The noise level exceeded for 1% of the 15 minute interval.
- L_{A10}: Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.
- L_{Aeq}: Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.
- L_{A90}: Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Threshold

The lowest sound pressure level that produces a detectable response (in an instrument/person).

Tonality

Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Noise monitoring details

Project: Morrisset and Vales resignalling project	**Project number:** S230683
Noise logging location: Morisset rail corridor, east of 139 Moira Park Road – Noise logger was located inside the rail corridor chained to a switchboard. The logger was located east of 139 Moira Park Road in free field.	
Location ID: NM1 (MT29)	**Installation:** free field (>5m from vertical reflective surface)
Latitude: -33.100994	**Longitude:** 151.501020
Equipment installed: Rion NL-22 (841630)	**Calibration valid until:** 2024-01-16
Deployment date: 2023-09-27	**Collection date:** 2023-10-10
Deployed by: [redacted]	**Collected by:** [redacted]

Location Map:

Installation Photos:

Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
94.0	94.0	0.0

Project: Morrisset and Vales resignalling project	**Project number:** S230683
Noise logging location: Morisset rail corridor, east of Morisset Station's southern commuter carpark – Noise logger was located inside the rail corridor chained to a timber pole. The logger was located east of Morisset Station's southern commuter carpark in free field.	
Location ID: NM2 (MTRR)	**Installation:** free field (>5m from vertical reflective surface)
Latitude: -33.108613	**Longitude:** 151.489362
Equipment installed: Rion NL-22 (862918)	**Calibration valid until:** 2023-11-08
Deployment date: 2023-10-27	**Collection date:** 2023-10-10
Deployed by: [redacted]	**Collected by:** [redacted]

Location Map:

Installation Photos:

Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
94.0	94.2	-0.2

Project: Morrisset and Vales resignalling project	**Project number:** S230683
Noise logging location: Morisset rail corridor, north-west of 162 Macquarie Street – Noise logger was located inside the rail corridor chained to a timber pole. The logger was located north-west of 162 Macquarie Street in free field.	
Location ID: NM3 (MT11)	**Installation:** free field (>5m from vertical reflective surface)
Latitude: -33.111733	**Longitude:** 151.484477
Equipment installed: Rion NL-21 (409176)	**Calibration valid until:** 2023-11-08
Deployment date: 2023-09-27	**Collection date:** 2024-01-16
Deployed by: [redacted]	**Collected by:** [redacted]

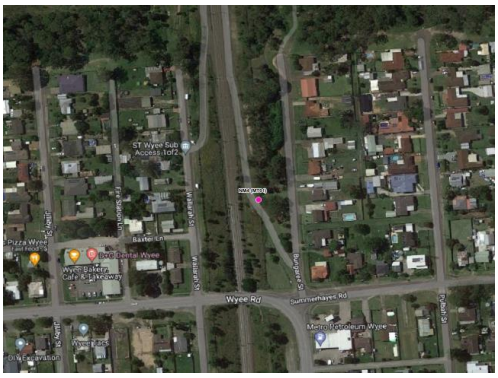
Location Map:

Installation Photos:

Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
94.0	93.9	0.1

Project: Morrisset and Vales resignalling project	**Project number:** S230683
Noise logging location: Wyee rail corridor, west of 29 Bungaree Street – Noise logger was located inside the rail corridor chained to the rail corridor's wired fence. The logger was located west of 29 Bungaree Street in free field. Photo of noise logger was corrupted and is therefore not available.	
Location ID: NM4 (MT01)	**Installation:** free field (>5m from vertical reflective surface)
Latitude: -33.174800	**Longitude:** 151.486897
Equipment installed: Rion NL-21 (709535)	**Calibration valid until:** 2025-05-07
Deployment date: 2023-09-27	**Collection date:** 2023-10-10
Deployed by: [redacted]	**Collected by:** [redacted]

Location Map:



Calibration level at deployment, dB	Calibration level at collection, dB	Drift, dB
94.0	94.0	0.0

A11. Detailed Design Drawings

A12. Formal Notification to Lake Macquarie City Council and Application to AusGrid.

Member of the Surbana Jurong Group

SMEC Ref No:30013326 / Ausgrid Ref No: 1900123749_0

24 October 2023

Lake Macquarie Council
Planning Department
Box 1906, Hunter Regional Mail Centre
NSW 2310 Australia

Dear Council officer, Sir or Madam,

Re: Proposed project at Morisset Vales Point – consultation under the Electricity Supply Act 1995 and State Environmental Planning Policy (Transport and Infrastructure) 2021

I am writing to provide formal notification to Council with the opportunity to review and make a submission in relation to a proposal to remove one pole top substation and establish one new pole top substation at the existing Sydney Trains signal location Morisset Vales Point, as required by the Electricity Supply Act 1995 and the State Environmental Planning Policy (Transport and Infrastructure) 2021.

Attached are the following for your information:

1. One (1) copy, 1900123749_0 20231023

The attached concept plan illustrates the proposed Decommission PT and Establish new PT works.

The proposal is to:

- Decommission existing Pole Top substation HP27140 on existing pole MG-60003
- Establish a new Pole Top substation (size TBC) replacing existing pole MG-60133 concurrently
- The project is required to facilitate Morisset Vales Point / Sydney Trains V8 signal room supply upgrade works
- Proposed estimated timing to commence and finish work is Q2-Q3 2024

An environmental assessment will be undertaken or this project to meet the requirements of the Environmental Planning and Assessment Act 1979. Therefore, in addition to any submission, can you please advise of any information that Council has which will assist us in considering all relevant issues and adequately assessing the environmental impacts. Such information could include:

- specific zoning and consent requirements
- approved surrounding land uses
- any known environmental restrictions (eg environmental protection area etc)
- threatened or endangered flora or fauna species
- fire prone land

SMEC
74 Hunter Street
Newcastle 2230 NSW
T 02 4925 9679 **E** asp3@smec.com

Member of the Surbana Jurong Group

- stormwater
- Council's infrastructure
- locally rare or protected flora or fauna or areas of critical habitat
- wetlands or flood prone areas
- land contamination, potential or actual acid sulphate soils, soil instability or subsidence
- heritage items or relics, including Aboriginal heritage and sites
- site access, traffic or parking restrictions
- adjacent sensitive sites
- potential community concerns of which Council may be aware
- other nearby development proposals likely to impact upon the proposal
- any other items that Council considers relevant.

The proposed activities will have environmental management safeguards to a suitable standard implemented in accordance with the assessment.

Submissions and information for this project will be considered if received within 40 days of the date of this letter. Submissions and information may be sent via e-mail (asp3@smec.com).

If no written correspondence is received by 03/12/2023 we will consider that Council does not wish to lodge a submission and we will proceed to schedule work after this date.

Please contact me if you would like to discuss this matter.

Yours sincerely,

[redacted]

A13. Interface Agreement between Sydney Trains and Sunset Power International