Monaro Rail Trail

Trail Development Plans – Stage 1a

Queanbeyan – Michelago
Nimmitabel – Old Bombala Rd
Jincumbilly - Bombala

MONARO RAIL TRAIL
TRAIL DEVELOPMENT PLANS

QUEANBEYAN-MICHELAGO
NIMMITABEL-OLD BOMBALA RD
JINCUMBILLY - BOMBALA

FINAL REPORT

Mike Halliburton Associates
Trail Consultants

TRANSPLAN PTY LTD
Planning and Design

July 2022

CONTENTS

Executive Summary and recommendations	5
Section 1 - Background	17
Section 2 - The Scope of Works for This Project	18
Section 3 - Trail Design and Development Considerations	19
Section 4 - Works Lists and Probable Costs	59
Section 5 - An Implementation Program	156
Section 6 - Construction Management	160
Section 7 - Corridor Management and Operations Plan	168
Appendices	195
Appendix 1 - Trail Concept Design set of drawings	196
Appendix 2 - Road Crossing Drawings	207
Appendix 3 - Road Crossing Chicane Drawings	220
Appendix 4 - Bridge report by WRD	224
Appendix 5 - Trailhead Drawings	327
Appendix 6 - Preliminary Project Cost Estimates: Amalgamated Sections	336
Appendix 7 – Recommendations on assets to be retained	346
Appendix 8 - Trail Maintenance Checklist: An Example	391
Appendix 9 - Trail Maintenance Costs in detail	394
Appendix 10 - Rail Trail Plans 1 – 6	403

EXECUTIVE SUMMARY

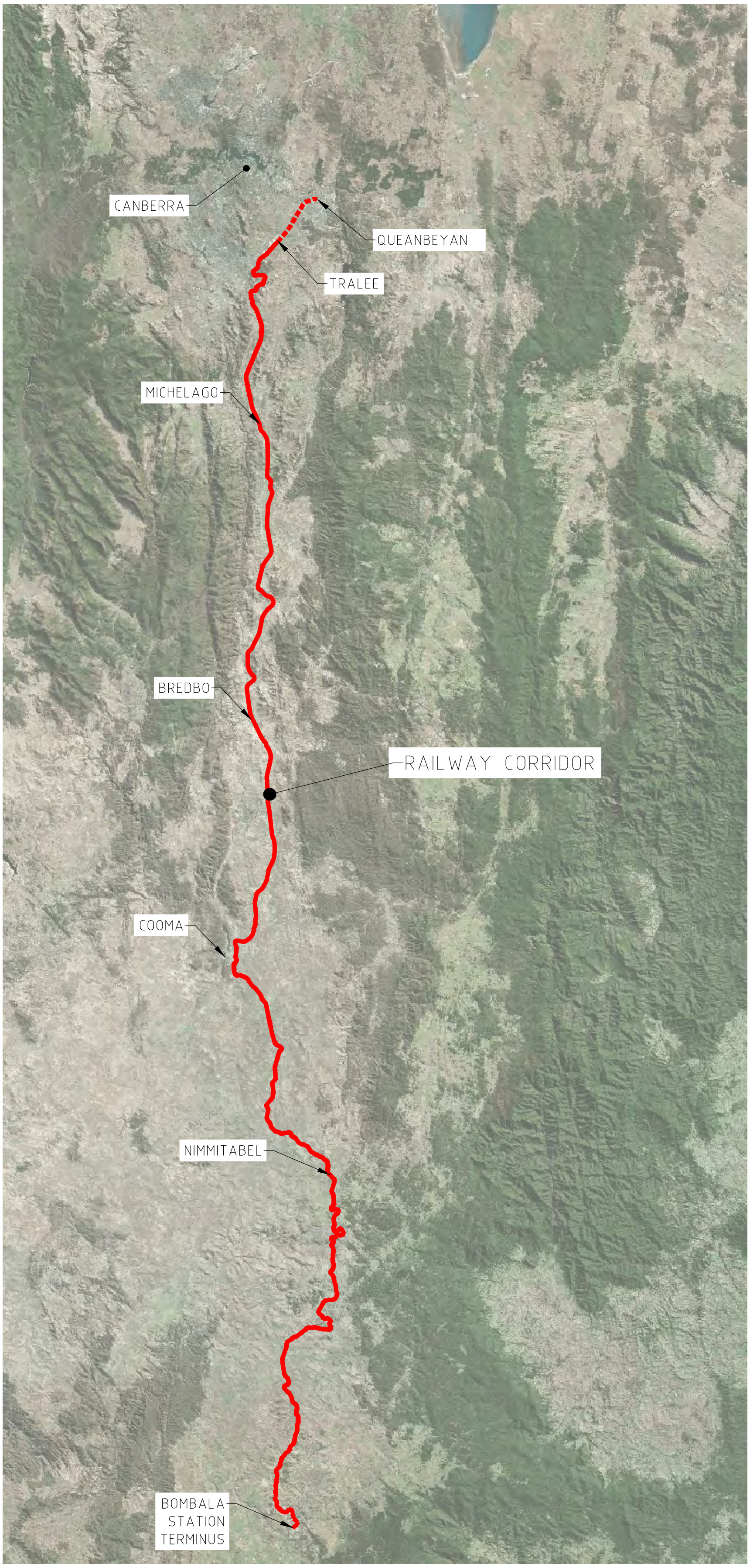
This Trail Development Plan sets out a detailed set of activities for the progressive construction of a trail on the disused railway corridor between Tralee and Michelago, between Nimmitabel and Old Bombala Road, and between Jincumbilly and Bombala. It also provides a strategic overview of a possible link between Queanbeyan and Tralee, given the rail corridor is not available for utilisation as part of the rail trail.

A rail trail is the conversion of a disused railway into a multi-use recreation path, typically for walking, cycling and sometimes horse riding. The characteristics of abandoned railways - flat, long, and frequently running through historical areas - are appealing to numerous potential user groups. Although rail trails are extremely popular with all types of recreational cyclists, they are also very well used by walkers/hikers, horse riders (where permitted), joggers, trail runners, people in wheelchairs, people in mobility scooters (gophers), parents pushing prams, school groups, clubs and families. Rail trails can also be used for events that attract all these users – marathons, duathlons, fun runs, park runs etc.

A study examining the merits of developing a rail trail on the disused railway line was commissioned by Snowy Monaro Regional Council in 2019 – the *Monaro Rail Trail Feasibility Study* was prepared by Transplan Pty Ltd. The Feasibility Study concluded that the rail trail was feasible and, should it be developed, will be a world-class rail trail. It is likely to attract users from not only from all over Australia, but from all around the world – just as the equally spectacular Otago Central Rail Trail (OCRT) on the South Island of New Zealand does. In fact, there is an inevitable comparison between the OCRT and the proposed Monaro Rail Trail. The OCRT is a multi-day adventure in the high country of New Zealand (a 3-day bike ride for most cyclists). It passes through sheep stations and numerous towns and small villages. It provides views of distant snow-capped mountains for most of the year. It has brought prosperity to small towns and businesses (including farms) that were in decline.

The 2019 study looked at the entire railway corridor from Queanbeyan to Bombala. Figure 1 provides an overview of the corridor. The dotted line connecting Tralee to Queanbeyan shows the railway corridor – which may or may not be available for conversion to a rail trail (see below and Section 4 for further explanation).

Figure 1: the Queanbeyan Bombala Railway corridor (showing major station sites)



In preparing the detailed Trail Development Plan, the relevant corridors were traversed by foot in January 2022 and as a result much more is known about the requirements to convert the former railway corridor to a rail trail. These inspections revealed a corridor that has been disused for some time and consequently a number of conditions have developed which will impact on constructability and costs. These are not unexpected given the last train services ran in the 1980s but they are conditions that need to be dealt with. These include:

- There have been land slips within some cuttings which have blocked the efficiency of the drainage systems (side or cess drains) originally constructed to manage drainage in those cuttings;
- Trees and blackberries have grown on the railway formation in certain locations meaning removal will be necessary before construction can begin;
- Small timber bridges and some timber culverts have fallen into disrepair;
- Sections of rail have been removed completely or pulled up and laid loose elsewhere in the corridor particularly in the southern section between Jincumbilly and Bombala (these locations are noted in the works tables in Section 4); and
- Cross fences and other obstructions have been built across the corridor.

Key elements covered in this report are:

- The final trail route;
- Appropriate trail surfacing;
- Bridge refurbishment;
- Location and facilities at trailheads;
- Landholder consultation and associated works items;
- Removal of steel rails;
- Construction costs;
- Maintenance costs; and
- Critical issues identified in the NSW Government *NSW Rail Trails Framework.*

The final trail route

The brief did not request a specific trail development plan element covering the section from Queanbeyan to Tralee due to the current investigations focussing on developing Tralee as an inter-modal site and the possibility of using the rail corridor from Tralee to Queanbeyan for dedicated freight services. The brief requested the evaluation of the potential connections and routes from the trail head at Tralee into the Queanbeyan town centre, whether by utilising existing cycling linkages or the construction of new linkages.

Two alternative routes were investigated and included within this report. The routes were:

- Utilising the existing road and path infrastructure on the Queanbeyan River Walk, Edwin Land Parkway and South Jerrabomberra; and
- Utilising the existing road and path infrastructure parallel to the railway line in Queanbeyan and along Canberra Avenue and traveling along Woods Lane to connect to Lanyon Drive and Tompsitt Drive.

The railway corridor between the western end of the Queanbeyan Railway station (where the disused railway line leaves the active railway line to Canberra) and Tralee cannot be currently used. However, should it become available for use as part of the rail trail, it presents a number of advantages compared with these two options.

Appropriate trail surfacing

A smooth compacted surface is most appropriate for a shared-use rail trail. The surface should be firm enough to provide cyclists (the predominant user group of rail trails) with a relatively smooth ride. There are some good arguments for sealing the surface of some rail trails – users on road bikes are able to use such a trail and the very successful Murray to the Mountains Rail Trail (Victoria) and Amy Gillet Rail Trail and Barossa Rail Trail (both in SA) are sealed trails. The recently opened Tumbarumba Rosewood Rail Trail – the first rail trail in NSW on a government railway line – is a sealed trail (using a chip seal) (see photos below for these and other examples). Historically, the construction costs of putting down a hard surface and the aesthetics of a hard surface have been arguments against a hard surface. It has been argued by some proponents that long-term maintenance costs of sealed trails are cheaper than for natural surfaces.

In accordance with the direction of the client, the construction costs have been prepared on the basis a sealed trail will be built for the 3 sections under consideration (noting that such a decision will create pressure to ensure the rest of the trail from Queanbeyan to Bombala is sealed if and when it is constructed).

The type of seal is not determined in this report. It is not feasible for the trail to be concrete as this would be too expensive; a chip seal or asphalt surface would be the best option. The Tumbarumba Rosewood Rail Trail used a 10mm/5mm 2 coat surface with high bitumen content. This is applied in a 2 coat system with the first coat being 10mm rock (choice of rock depends upon local availability) and the second coat being a 5mm rock.

Partly as a consequence of sealing the trail and partly as a consequence of it being very difficult to provide a parallel bridle trail, no provision has been made to allow for horse riding on the trail (with the support of the Project Committee). Such provision would usually include slashing a parallel bridle trail and various types of gating and signage provisions at road crossing. As a result of horses being excluded, livestock crossing points at certain locations use a livestock grid system on the trail rather than a gating system. In addition, recommended works notably gates and fences are designed to exclude them from likely entry points at the northern end of the trail adjacent to the ACT urban trail riding network and horse facilities such as Hume paddocks.

Bridge reuse, refurbishment and replacement

Bridges are one of the most obvious reminders of the heritage value of disused railways. They are also one of the most significant attractions of trails along disused railways and one of the costliest items in the development of trails on former railways.

There are:

- 15 bridges between Tralee and Michelago ranging in size from 1 metre to 24 metres. Included in this list is the 24m bridge over Guises Creek – just north of old Cooma Rd crossing - and the 32m bridge over Deep Creek.
- 8 bridges between Nimmitabel and Old Bombala Road, ranging in size from 4 metres to 59 metres. Included in this list are two substantial bridges over Maclaughlin River (59 metres) and Old Bombala Road (22 metres).
- 2 bridges between Jincumbilly and Bombala – both under 7 metres.

Wood Research and Development was commissioned by Mike Halliburton Associates to complete a detailed visual inspection and refurbishment options report based on the current condition of the major bridges along the proposed Monaro Rail Trail in the three sections the subject of this study. These bridges are Guises Creek, Lobbs Hole Creek and Deep Creek between Tralee and Michelago and Maclaughlin River and the Old Bombala Road bridge at the southern end of the trail section between Nimmitabel and Old Bombala Road. Two minor bridges - a 10m bridge over Guises Creek Inlet Stream and a 6m bridge immediately north of Williamsdale Road - were also investigated as an indication of other bridges along the corridor.

The costs for bridge repairs have been assessed and range generally from $13,000/lineal metre to $17,000/lineal metre (with one outlying estimate at $23,000/metre). Costs are significantly more than anticipated in the 2019 Feasibility Study for three main reasons:

- The timber ballast topping will be more difficult to remove than if the bridge was simply a timber transom bridge (and consequently more expensive).
- Critically, the price of steel has risen by 50% in the last 6 months. This significantly impacts on the cost of handrails required for bridges.
- Of almost equal importance, the price of timber has increased by 30% in the last 12 months.

Consequently, it is recommended that bridge refurbishment be only undertaken on key bridges along the three trail sections (rather than including a number of smaller timber bridges). Key bridges are those that:

- Offer a “quintessential” rail trail experience; and/or
- Offer the only practical alternative to a creek or road crossing.

The bridges recommended for refurbishing are:

- Guises Creek 24m $16,531/m
- Lobbs Hole Creek 12 m $16,052/m
- Deep Creek 32m $12,937/m

- Maclaughlin River 58m $13,487/m
- Old Bombala Rd 22 m $16,988/m

2 other bridges are recommended for refurbishment. An 8 metre bridge between Williamsdale and Michelago should be refurbished; as a high bridge; it offers a good rail trail experience and presents difficulties with any alternative water crossings. A 7 metre bridge between Jincumbilly and Bombala offers a good rail trail experience and is one of only two rail bridges in this trail section (the other one is very short).

There are disadvantages associated with not using the remaining bridges. Not using the bridges means the loss of an essential part of the rail trail experience. There is a strong case for retention of bridges for their heritage and convenience / utility value. Riding down a steep benched switchback or wheeling a bike down a set of steps to cross a creek then up an equally steep climb on the other side presents at least some trail users with daunting technical and physical challenges and necessitates careful design, construction and maintenance of gully / watercourse approaches to provide for safety and prevent erosion. Retention of the bridges also retains the positive experience of riding along the top of old bridges with panoramic views of the surrounding landscape and the watercourse below. The rail bridges were originally built in their locations primarily because railways need very gentle grades or slopes and the same principle applies to re-use of railway formations as recreation trails. Bridges also provide a safe crossing when water is flowing in gullies, creeks and rivers.

Locations and facilities at trailheads

A trailhead is usually defined by the existence of a car parking area, often with picnic facilities, interpretive signage, a map panel of the trail showing sites of interest and distances to features along the trail and a Code of Conduct. It is a location where a (short or long) trail walk or ride can begin or end.

A number of trailhead locations have been selected for the Monaro Rail Trail. 2 trailhead sites have been recommended for the trail section between Queanbeyan and Tralee:

- Queanbeyan Railway Station; and
- Queen Elizabeth Park.

4 trailhead sites have been recommended for the trail section between Tralee and Royalla:

- Tralee trailhead (at the South Jerrabomberra Town Park);
- Royalla trailhead (at the Royalla siding);
- Williamsdale trailhead (at the Williamsdale siding) – an optional trailhead; and
- Michelago trailhead (at the Michelago station).

The distance between Tralee and Michelago (approximately 39 kms) necessitates the need for trailheads to be developed en-route to enable users to break the journey, to undertake reasonable distance return trips and/or to undertake shorter one way trips. To this end, it is considered that a trailhead at Royalla is essential (Tralee to Royalla is approximately 16.3 kms while a user starting in Queanbeyan would have travelled an additional 11-14 kms). Provision for a toilet has been included in the works for Royalla trailhead.

The recommended trailhead at Williamsdale is optional as Royalla to Williamsdale is only 6.4 kms.

The trailhead at Michelago is also essential. Additional funds have been included within the Michelago trailhead development budget for general works at the station as it is considered a significant attraction for rail trail users.

2 trailhead sites have been recommended for the trail section between Nimmitabel and Old Bombala Road:

- Lake Williams Park (Nimmitabel); and
- Immediately south of the Old Bombala Rd overbridge some 10.5 kms from Nimmitabel.

Lake Williams Park has all the facilities in place and it is understood that funding has been secured for new additional toilets. Minimal work is needed at the site. The site also provides quick and easy access to the village centre. The railway station – while attractive as an historical site – is more remote from the village centre. In addition, developing the trailhead at the station means the expense of refurbishing the bridge north of Clarke St as well as developing the trail surface and associated infrastructure. This refurbishment and trail development will need to be done if and when the whole trail is complete. At this point in the trail's development, Lake Williams Park provides an adequate trailhead for minimum expenditure.

Development of a trailhead at the southern end of this section is problematic. The need to construct a minor trailhead at the end of the section to be developed means a site needed to be found. There is significant landscape and ownership limitations around the end of the trail (at the Old Bombala Road bridge). The site chosen is the most appropriate site given these limitations.

3 trailhead sites have been recommended for the trail section between Jincumbilly and Bombala:

- Jincumbilly siding;
- Bukalong siding; and
- On the station ground at Bombala adjacent to the Visitor Information Centre.

At Bombala, the trailhead is recommended for development at the station adjacent to the Visitor Information Centre. There was debate amongst the Project Steering Committee as to the best site and much of the concern seemed to be around crossing the Monaro Highway adjacent to the station. The main alternative considered was to utilise existing path infrastructure on the south east side of the Bombala River (including a pedestrian bridge) and take users into town to a trailhead near the swimming pool. However, crossing the Monaro Highway is not a major issue as it is within the 60km/hr zone. Taking trail users through the station grounds (past the many historic artefacts and interesting sculptures) and making the most of investment already made in the Visitor Information Centre is a good outcome. Whilst users are not in the centre of town, the centre is easily accessible (by foot, bike, and road) and trail users will make the most of the town centre for refreshments, accommodation etc.

The station grounds include carriages that have been obtained by Friends of Bombala Railway Inc. The group have been working on the station grounds for some years. The works items have been designed to limit the impact on the station grounds in terms of the railway itself. A new trail running along the eastern and southern boundary of the station to the Visitor Information Centre takes users past a range of artefacts, sculptures and buildings while not interfering with any future operations within the station ground. It also avoids using the main “parade ground” for the vintage machinery show held once a year.

Landholder consultation and associated works items

The study brief required formal consultation with adjoining landholders and other groups with an interest in the corridor. Importantly, a number of works items included in the report have been included at the request of the landholder. Many of these works items relate to managing farm operations particularly where the corridor traverses paddocks attached to one property i.e. the landholder uses paddocks on both sides of the corridor. Other items relate to non-farm management concerns such as privacy.

Works items relevant to, and addressing concerns of, landholders take two forms:

- Where they have specifically been requested by the landholder either on-site or via phone/letter conversation. Some works items are tied to specific GPS locations while the location of others should be negotiated at the time of construction. Farming practices change over time and locations of works items may need to change.
- Other works items reflect recommendations by the consultants based on field observations rather than direct requests by landholders. In these cases, landholders have not met with the consultants and the provision is based on experience.

In addition, costings also include a generic allowance for each section of the rail trail for other items that may be requested by landholders in the future.

Removal of steel rails

The construction of the rail trail will require the removal of the steel railway track (noting that some has already been removed in the Jincumbilly-Bombala section). In the 2019 Feasibility Study, the removal of steel track and sleepers was assumed to be a cost-neutral exercise i.e. the costs of removing the rail in particular (by a commercial contractor) were offset by the resale price of the steel track.

During the development of the Tumbarumba Rosewood Rail Trail, the NSW Government granted the trail manager ownership of the track and sleepers as part of the project. The approach taken in this report is to assume the Tumbarumba Rosewood project sets a precedent for asset ownership particularly of the steel railway track.

In this instance there are two options for dealing with the proceeds of the salvage rights to the steel track:

- The construction contractor will use sale of steel rails to off-set capital cost of construction; or

- The construction contractor will be paid to remove steel rails and stockpile at accessible locations for subsequent sale to offset O&M costs.

The track sale price is dependent on the market price for railway track at the time of removal. In the case of the Tumbarumba Rosewood project, the steel price was sufficient that some of the proceeds of the sale of rail were returned to the project i.e. a net positive return was achieved.

Construction Costs

Section 4.0 contains 5 tables where a comprehensive works list for each of the proposed stages of the rail trail development is set out, and an estimate of probable costs for each task. It also contains commentary on possible routes connecting Queanbeyan and Tralee with indicative costings.

This work provides the detail not included in the 2019 Feasibility Study.

The estimated detailed cost of the conversion of the corridor to a rail trail between Tralee and Michelago is **$9,245,805** (excluding GST).

The estimated detailed cost of the conversion of the corridor to a rail trail between Nimmitabel and Old Bombala Road is **$4,470,910** (excluding GST).

The estimated detailed cost of the conversion of the corridor to a rail trail between Jincumbilly and Bombala is **$6,474,505** (excluding GST).

There are unknowns when dealing with the construction of rail trails such as this. The extent of approvals needed prior to development of the trail and the requirement for permits and additional studies is not known but an allowance has been made.

Maintenance Costs

The estimated day to day maintenance costing for a rail trail between Tralee and Michelago is **$107,660/year *(***excluding GST) ($2,760/km/yr).

The estimated day to day maintenance costing for a rail trail between Nimmitabel and Old Bombala Road is **$44,300/year** (excluding GST) ($4,301/km/yr).

The estimated day to day maintenance costing for a rail trail between Jincumbilly and Bombala is **$64,950/year *(***excluding GST) ($2,640/km/yr).

Asset renewal provisions should be provided for separately and cover replacement of surfacing and fencing. Relevant sections costs are:

- Tralee to Michelago - **$170,880/year** (excluding GST);
- Nimmitabel to Old Bombala Rd - **$60,180/year** (excluding GST); and
- Jincumbilly to Bombala - **$145,890/year** (excluding GST).

Bridge replacements are more difficult to assess. Provisions for minor repairs have been included as part of the day to day maintenance calculations, while it is recommended that the major timber bridges are being restored with a 75-100 year design life.

Using volunteers is the key element in reducing the maintenance costs. Volunteers could undertake much of the ongoing maintenance of the trail if a volunteer maintenance programme is arranged. The Bibbulmun Track Foundation provides the best example of the potential contributions of volunteers to trail maintenance. The Bibbulmun Track Volunteer Program relies on the bushwalking community, and Bibbulmun Track walkers in particular, to commit their time to assist in the maintenance and delivery of the Foundation's Programs and services (the Bibbulmun Track is 1,000 kms walking track from Perth to Albany). **It is estimated that around 80% of the Bibbulmun Track in maintained by volunteers in this program.** An enormous amount of money is saved as the volunteers carry out many of the inspections and minor repair work.

Funding trail maintenance is a critical issue. Monaro Rail Trail Inc has prepared quite an extensive paper on maintenance and how it can contribute including some detailed costings. This will be an important factor for consideration by both Councils. In addition, Monaro Rail Trail Inc also prepared a paper entitled *Monaro Rail Trail Business Model: The Case for a Public Private Partnership/Users Pays Model*. Within the paper, a number of income projections were made and possible sources of income identified. Sources identified included commercial operator levies, commissions from billboard advertising, memberships of a Friends group and sales of merchandise. Funds could be used for trail operation and maintenance.

Many of these options are in place on other trails and fund a range of activities by the trail manager and the relevant trail support group (or Friends of the Trail). Importantly, the NSW Government's *NSW Rail Trails* Framework paper recognises the need to allow commercial activity and sets out aa process for corridor transfer and management that ensures minimal constraints on commercial opportunities along the Rail Trail. Key options for funding maintenance are:

- *Sponsorship along the Trail.* There are examples of rail trails around Australia that use a sponsorship program to generate income for upkeep of the rail trail. Sponsorship opportunities include trail signage, events, merchandise, corporate events and promotion through social media and newsletters etc.
- *Friends of a trail group.* Friends of the Trail groups are a resource for many trails across the country. They usually have some form of annual fee offered across a range of membership categories which offers regular users and supporters a way to contribute as well as providing some benefit in terms of specific merchandise or access to events. They also provide a base from which volunteers can be found to assist in the maintenance of the trail. Two of the best models are the Bibbulmun Track Foundation and the Munda Biddi Trail Foundation, both in WA and both centred on long walk and cycle trails (respectively) connecting Perth with Albany. In a similar approach, some trails have donation models operating where users can choose to make cash or online donations towards the Trail Management Committee.
- *Business programs.* Both the Bibbulmun Track Foundation and the Munda Biddi Trail Foundation also offer business support programs. A number of cycle hire, cycle repair and guided cycle tour businesses are accredited businesses under the Munda Biddi Trail Foundation's Cycle Friendly Business program. These businesses offer a range of services along the length of the trail and pay an annual subscription fee to

remain in the accredited program. The Bibbulmun Track Foundation's Walker Friendly Business Program offers a similar opportunity.

- *Merchandising.* Revenue from merchandise sales can contribute to trail funding. Common merchandise includes trail maps, shirts, hats and other apparel, *t*rail guides with historical and cultural interpretation, bike accessories, stubby holders and *w*ater bottles. The Bibbulmun Track Foundation sells a range of branded products including CDs and DVDs, day walk map packs, clothing, gifts and souvenirs, guidebooks and other trail-related books.
- *"Space" renting.* Within the existing railway corridor there are several outdoor advertising signs. They are a potential source of revenue as it is understood that the owners of the billboards pay a fee to the railway corridor owner. It is not known the size of the fee, but it may be a significant amount of money particularly where there are large numbers of signs. Additionally, there may be limited opportunities to use existing railway buildings such as the station at Michelago for commercial purposes and derive a rent from commercial leases. The Murwillumbah Station on the Northern Rivers Rail Trail (under construction) has a bike hire business operating within the building for example.

Critical issues identified in the NSW Government NSW Rail Trails Framework

Rail trails in NSW are being progressed through the development of two pilot projects. The Tumbarumba to Rosewood Rail Trail opened in April 2020 and has been an outstanding success – notwithstanding difficulties imposed on travel by COVID-19. Trail counters in place have registered over 38,000 users since it opened in April 2020. The success has been recognised in the NSW Government's *Rail Trails for NSW Evaluation Summary* released in June 2022. The summary concluded that the rail trail has demonstrated important positive economic and social benefits with outcomes extending beyond the town and into the region. Part of this success may be attributable to the very high sales of e-bikes during the Covid pandemic and users consequently looking for places to ride. The Northern Rivers Rail Trail is the second pilot project. Construction has started on the first section from Murwillumbah to Crabbes Creek, while a section from Casino to Bentley is currently subject to detailed design.

As a result of analysis of these projects, the NSW Government (Department of Regional NSW) released the long awaited *NSW Rail Trails Framework* in June 2022 setting out processes to be followed. This document is a companion to the evaluation summary and has also been accompanied by a new piece of legislation introduced to the NSW Legislative Council in June 2022. *The Transport Administration Amendment (Rail Trails) Bill* is aimed at making the process of conversion of disused railway corridors to rail trails a simpler process. Under the amendment, the Minister for Regional Transport and Roads can authorise the temporary re-purposing of a railway corridor and removal of tracks on a non-operational line. A council or joint organisation could then lease the rail corridor for 30 years. The bill, if passed, will obviate the need to close each individual rail corridor the subject of a trail conversion by a separate act of Parliament.

Existing assets such as buildings will either be retained by the NSW Government or transferred to the applicant (the lead entity). This will be determined on a project by project basis through the identification of an asset register and agreement on items the NSW Government needs to retain, and those assets along the rail corridor that might be utilised or disposed of. The report contains details of existing assets on the rail corridor and recommends:

- Assets seen to be necessary for the rail trail;
- Assets seen to be desirable for the rail trail; and
- Assets not necessary for the rail trail.

The Framework indicates that the councils leasing the land are the lead operational entity. Beyond this stipulation, the Framework allows a project by project determination as to the best governance model for a rail trail recognising that some rail trails will benefit from the active involvement of community volunteers and other stakeholders. A Joint Management model involving community groups in a meaningful way is – in the consultants' opinion – the best way to develop rail trails and the MoU currently in place between the Councils and Monaro Rail Trail Inc. is a good starting point for future governance model.

There are unknowns when dealing with the construction of rail trails such as this. The extent of approvals needed prior to development of the trail and the requirement for permits and additional studies is not known but an allowance has been made.

RECOMMENDATIONS

It is recommended that Snowy Monaro Regional Council and Queanbeyan Palerang Regional Council and the Monaro Rail Trail Inc use this Trail Development Plan and other documentation in future funding applications to the NSW Government and any other potential funding partners.

SECTION 1 – BACKGROUND

The proposed Monaro Rail Trail would be developed on the disused railway corridor between Tralee (5 kms south of Queanbeyan) and Bombala – a distance of some 213 kilometres. In March 1986, the line south of Cooma (to Bombala) closed. Passenger and freight services south of Queanbeyan ceased in May 1989 when a bridge carrying the line over the Numeralla River at Chakola was declared unsafe. The 49 kilometre section between Queanbeyan and Michelago was re-opened in April 1993 for heritage tourist operations conducted by the ACT Division of the Australian Railway Historical Society. The service was finally suspended at the beginning of 2007 following flood damage to a bridge.

The railway corridor between Queanbeyan and Bombala remains in public ownership. Cuttings and embankments are a common feature along the corridor.

Since the closure of the operating railway over 30 years ago, little maintenance has been carried out within the railway reserve – with the notable exception of some of the station grounds. In most locations, the steel railway track and old rotting sleepers remain. Some lengths of the steel railway track have been removed.

A study examining the merit of developing a 'rail trail' on the disused railway line was commissioned by Snowy Monaro Regional Council in 2019. This document was the Monaro Rail Trail Feasibility Study and was prepared by Transplan Pty Ltd. A rail trail is the conversion of a disused railway into a multi-use recreation path, typically for walking, cycling and sometimes horse riding. The characteristics of abandoned railways - flat, long, and frequently running through historical areas - are appealing to numerous potential user groups.

In 2021, Snowy Monaro Regional Council and Queanbeyan Palerang Council, in conjunction with Monaro Rail Trail Inc., determined to proceed to the next stage of work – a detailed Trail Development Plan for three sections – Tralee to Michelago, Nimmitabel to Old Bombala Road (north of the Maclaughlin meatworks), and Jincumbilly to Bombala. The group also requested a strategic overview of a possible link between Queanbeyan and Tralee, given the rail corridor is not available for utilisation as part of the rail trail.

SECTION 2 – THE SCOPE OF WORKS FOR THIS PROJECT

This Trail Development Plan provides sufficient detail for a funding application to be prepared and to guide the actual construction once funding has been obtained. The Trail Development Plan is a construction blueprint. The primary focus is on the works necessary to convert the corridor to a rail trail and the ongoing maintenance and funding.

This Trail Development Plan provides detailed works lists and detailed cost estimates (item by item, location by location) covering all elements needed to convert the rail corridor to a rail trail - informed by a traverse of the corridor by foot. Construction plans with a list of necessary (and optional) construction items, quantity estimates, materials required, and construction schedules have been prepared.

The main elements of this Trail Development Plan are as follows:

- Fieldwork, which involved a traverse of the three corridors (by foot);
- Preparation of detailed works lists and calculation of quantities for construction;
- Preparation of detailed cost estimates for construction;
- Basic design and construction guidelines;
- Preparation of drawings and cross-sections;
- Mapping of corridor (illustrating construction activity); and
- Management and maintenance planning. A list of maintenance tasks that need to be attended to have been provided and innovative ways of addressing these tasks have been suggested.

The study brief included formal on-site landholder consultation. Consultation was also carried out with a number of other parties with interests in the corridor. Outcomes of this consultation are contained in the works items (Section 4) and a separate consultation report.

SECTION 3 – TRAIL DESIGN AND DEVELOPMENT CONSIDERATIONS

3.1 GENERAL CONSIDERATIONS

This section of the Trail Plan addresses a series of matters relating to trail design and development of the Monaro Rail Trail (Stage 1a) – to achieve a rail trail that is constructed with minimal disturbance to the natural environment, is sustainable and that requires minimal maintenance.

The corridor has been disused for some time. Consequently, corridor inspections in January 2022 observed that a number of conditions have developed which will impact on constructability and costs. These are not unexpected given the last train services ran in the 1980s but they are conditions that need to be dealt with. These include:

- There have been land slips within some cuttings which have blocked the efficiency of the drainage systems side or cess drains) originally constructed to manage drainage in those cuttings;
- Trees and blackberries have grown on the railway formation in certain locations meaning removal will be necessary before construction can begin;
- Small timber bridges and some timber culverts have fallen into disrepair;
- Sections of rail have been removed completely or pulled up and laid loose elsewhere in the corridor particularly in the southern section between Jincumbilly and Bombala (these locations are noted in the works tables in Section 4); and
- Cross fences and other obstructions have been built across the corridor.

During construction of the original railway line, effective drainage was important, as it is with all public infrastructure. Locating a trail on the formation of the former railway is important, and reinstatement of bridges where they have fallen into disrepair, is vital for the success of the rail trail.

Along the subject corridor there are several bridges on the three sections of the rail corridor. These range in size from less than 5 metres up to 58 metres (over Maclaughlin River). Many of these appear to be in reasonable condition and present the opportunity to be re-used.

Construction of the railway involved the cutting and filling of the landscape to create a surface that was relatively flat to enable the passage of steam trains. The result was a series of cuttings and embankments along the entire length of the rail corridor. Effective drainage will be required, especially within most cuttings, to ensure stormwater is quickly and effectively removed from the sides of the trail (as it was when the trains were running).

Culverts and other drainage controls should be used to direct run-off away from the trail. Stormwater must drain freely, and where possible, pass beneath the trail without impact on either the base formation or the surface itself. Rail trails, by their very nature, tend to deal with these problems relatively well. Numerous culverts inspected during fieldwork were completely or partially block, thereby inhibiting the free flow of stormwater under and away from the railway embankment. Regular cleaning of blocked culverts is essential to avoid serious soil and water degradation problems.

The old drains of the many cuttings along the proposed rail trail will require attention to ensure they still perform the task of clearing water from the cuttings.

Particular care must be given to reinstating the side (cess) drains through cuttings.

Construction of the rail trail and associated signage should comply with relevant Australian Standards and Austroads guidelines. The works lists outlined in Section 4 delivers a trail to meet these requirements.

At some point in the future, (when the rail trail is funded) contractors will be engaged to remove the steel railway track and sleepers. Care will need to be taken by the contractors to ensure that the formation and bridges are left in as good a condition as possible to minimise rail trail construction difficulties.

A Trail Concept Design set of drawings is included as Appendix 1. This includes:

- Overall layout and key plan;
- General arrangement plans over 5 sheets covering the entire corridor from Tralee to Bombala with major works items noted for the sections included in Stage 1a (these plans present similar information to the maps in Appendix 10 but with a different approach);
- Typical section details;
- Typical signage details; and
- Typical road crossing and access management arrangements.

3.2 PERMITTED USERS – IMPACTS ON DESIGN

Consideration was given to allowing horse riding on this trail particularly in the northern section from Tralee to Old Cooma Road. Part of the positive consideration was a recognition of the number of designated horse paddocks and horse riding trails as part of the ACT urban horse riding network around the Hume/Tralee/Roses Cottage area on the ACT side of the railway corridor. Making the rail trail available to horses from Tralee to Old Cooma Rd would give a distance of around 14 kms (and provide a round trip of around 28 kms though many users may come through on the Monaro Highway Underpass and ride south from there). There is no room to develop float parking facilities at the Old Cooma Rd crossing so any journey would be out and back. A slashed bridle trail alongside the main rail trail is a standard design solution to manage impacts of horse riding.

However, the two Councils and Monaro Rail Trail Inc are firmly of the view that this section in particular (from Tralee to Michelago) should be developed as a sealed rail trail to attract a wider variety of users - particularly road riders. There is also a view amongst landholders in particular that horses provide a significant potential biosecurity and interaction "threat" to livestock adjoining the trail.

There is a major "conflict" between horse riding and sealing. In this 15 km section from Tralee to Old Cooma Rd, there are approximately 6 kms of deep cutting (and some shallow cuttings). Sealing the trail within a cutting to 2.5 m will not practically leave room for a slashed bridle trail alongside the main trail within the cutting. It may be possible at some points to go around or on top of the cutting for horses but this is not always the case. In addition, there are also a number of quite narrow embankments that would not permit a sealed 2.5 m trail and a parallel bridle trail.

There is the potential for both trail damage and significant safety issues if horses are permitted through this section given the frequent occurrence of cuttings and embankments. If horses are allowed, they will be traversing narrow cuttings. In such cases, there will likely be a need for horse riders to perhaps step off the sealed trail surface into the cess drain through the cutting. This is both potentially unsafe and may damage the cess drains.

The more concerning safety situation is the issue of horse riders needing to step off the sealed trail along the numerous, long and narrow embankments, with steep and lengthy drop offs.

Some horses, particularly in the hands of young and inexperienced riders, could get badly spooked with cyclists zooming past in cuttings and embankments if the horses don't have any escape route. Etiquette signs along the rail trail requesting cyclists to slow down when coming on horses may partially address the issue.

The other critical issue is whether horses like travelling on sealed surfaces which they would be doing in cuttings and embankments. It is understood that natural surfaces are preferred for horse riding.

Consequently no provision has been made to allow for horse riding on the trail. Such provision would usually include slashing a parallel bridle trail and various types of gating and signage provisions at road crossing. As a result of horses being excluded, livestock crossing points at certain locations use a livestock grid system on the trail rather than a gating system. In addition, recommended works notably gates and fences are designed to exclude them from likely entry points at the northern end of the trail adjacent to the ACT urban trail riding network and horse facilities such as Hume paddocks.

3.3 TRAIL WIDTH AND HEIGHT

To function effectively as a shared use facility (for cyclists and walkers), the Monaro Rail Trail should have a width of 2.5 metres. Anything wider than that and the trail starts resembling a road, which is not what rail trail users want. The width of the existing embankment/formation of the original railway will ultimately determine the width that the proposed rail trail can be constructed in some locations.

Some sections of the former railway reserve are currently used for farming purposes (grazing etc.), and this access can be retained without seriously diminishing trail user experiences (subject to trail manager approval).

The railway has been mainly disused since 1989. During this time some sections of the corridor have become overgrown and will require clearing for the passage of trail users. However, overgrown sections are very limited in number and where these do occur they are primarily caused by blackberries. Where vegetation has regrown, overhead clearance should be maintained to approximately 2.4 metres from the rail trail surface. All overhanging vegetation – and that which intrudes from the sides into this 'corridor' should be cut back on a regular basis. Care should be taken that sharp and dangerous 'points' are not left in this pruning process.

There are instances where side vegetation can be retained, as the trees are attractive and provide shade. They also provide an attractive vista along the cutting or embankment.

3.4 TRAIL PREPARATION

Given the nature of the existing railway formation along the corridor, where a considerable amount of ballast remains in place in some sections, and in many other parts of the corridor numerous small stones are evident, grading will be required prior to a surface material being applied. No ballast is to be left on the trail formation. It is too rough for bike users in particular and significantly detracts from the user's experience.

Contractors engaged to remove the steel railway track and sleepers should be required to grade the formation to provide a level surface (after removal of the infrastructure). This will be a significant cost saving measure and has been factored into the trail surfacing costs. Side drains must be maintained and not filled in when grading. It is recommended that the contractors engaged to remove the steel railway tracks and sleepers be instructed to undertake their tasks with maximum care so as to leave the formation/embankment in a usable condition. Despite this care, and given the nature of the formation, some grading and re-surfacing will be required. The removal of the sleepers will leave what is often called a 'sleeper shadow' – the indentation that is left once the sleepers have been removed. Simply filling these indentations with fill will in time result in an undulating surface as the newly placed fill material settles in.

After the removal of the sleepers, a light grading of the surface is recommended. Care should be taken not to create berms of ballast on the side of the trail which have the effect of trapping the water in the trail formation i.e. creating a dam effect. Care should also be taken to ensure in cuttings that the ballast is not simply pushed in to the existing drainage measures (cess drains) on the side of the trail or these will have the effect of preventing the drains from performing as they should. Grading should be followed by the spreading and compacting (by vibrating roller) of the new surfacing material. In some locations (notably cuttings), material will need to be dug out of drainage lines in order to clear them and make them work effectively. It may be appropriate that this material be used as part of the trail surface; this approach will make every limited impact on costs but may be a way of reusing material rather than disposing of it off-site.

In the costs estimates that are included within this Trail Plan (Section 4), an allowance has been made for clearing of the trail corridor (vegetation and top soil and ballast), further grading and shaping of the formation to create as smooth a surface as possible, and additional fill material.

3.5 TRAIL SURFACING

A smooth compacted surface is most appropriate for a shared-use rail trail. The surface should be firm enough to provide cyclists (the predominant user group of rail trails) with a relatively smooth ride.

Most rail trails developed in Australia use a locally available earth surface (gravel, decomposed granite, crushed limestone, etc.) to produce a firm surface easily capable of accommodating walkers and cyclists. Use of such material provides a high-quality natural surface without the expense of a hardened (i.e. sealed) surface.

There are some good arguments for sealing the surface of some rail trails – users on road bikes are able to use such a trail and the very successful Murray to the Mountains Rail Trail (Victoria) and Amy Gillet Rail Trail and Barossa Rail Trail (both in SA) are sealed trails. The recently opened Tumbarumba Rosewood Rail Trail – the first rail trail in NSW on a government railway line – is a sealed trail (using a chip seal) (see photos below for these and other examples). Historically, the construction costs of putting down a hard surface and the aesthetics of a hard surface have been arguments against a hard surface. It has been argued by some proponents that long-term maintenance costs of sealed trails are cheaper than for natural surfaces. Unfortunately, evidence of different maintenance costs is hard to find. Representatives of the two Councils and the Monaro Rail Trail Inc. have indicated that the preferred surface for this trail is a sealed surface. Snowy Monaro Regional Council representatives have indicated that conversations with other rail trail managers have indicated strong support for a sealed trail by those managing a sealed trail and a desire by those managing unsealed trails for a sealed trail. Representatives of Monaro Rail Trail Inc. have indicated a strong desire for a sealed trail as a way of making the trail accessible to those who ride road bikes – either for short recreation rides (such as short rides from Canberra) and long touring rides (particularly in the southern sections where cyclists are riding some of the back roads of the Snowy Mountains).

Many bike riders possess a number of bikes and often have the capacity to switch bikes for different types of rides. A recent survey by Rail Trails Australia of users was showing a preference for unsealed trails – with some of the negative comments about sealed trails being about damage by tree roots to sealed surfaces. This is less likely to be an issue on the Monaro Rail Trail.

In accordance with the direction of the client, the works tables in Section 4 have been prepared on the basis a sealed trail will be built for the 3 sections under consideration (noting that such a decision will create pressure to ensure the rest of the trail from Queanbeyan to Bombala is sealed if and when it is constructed).

The type of seal is not determined in this report. It is not feasible for the trail to be concrete as this would be too expensive; a chip seal or asphalt surface would be the best option. The Tumbarumba Rosewood Rail Trail used a 10mm/5mm 2 coat surface with high bitumen content. This is applied in a 2 coat system with the first coat being 10mm rock (choice of rock depends upon local availability) and the second coat being a 5mm rock.

Upon completion of the spray seal process there will be a residue of loose stones on the surface. Conversations with the trail construction manager from Tumbarumba Rosewood Rail Trail indicates this mix was easier to roll. At livestock and machinery crossing points (Section 3.12), the composition was changed to a 14mm/7mm mix. This ensures that the regular passage of stock and machinery across the rail trail does minimal damage to the trail surface and is long-lasting. On the Tumbarumba Rosewood Rail Trail, this surface was applied at a cost of approximately $78/lineal metre. One negative aspect of chip seals is that the small stones can be flicked up into the bike chain and derailleur causing issues.

Dense graded asphalt is a general purpose asphalt which may be used for surfacing and structural layers. According to technical specifications, it is a fine workable mix that is suitable for surface correction and for surfacing very low speed environments such as car parks and bikeways. It has recently been used on the Logan Village Yarrabilba Rail Trail in South East Queensland. It was applied at a cost of $100/lineal metre, which covered topsoil strip, box/trim, shaping, pavement, and sealing. Tinting the asphalt to address the relative unattractiveness of a solid black colour in a natural environment can be done for an additional 10-15% (an example is the Bunbury Tuart Forest which is in the photo group below).

Appendix 1 sets out details for concept design options for the surfacing recommended for this trail.


Above left: The Amy Gillette Rail Trail (SA) – an asphalt trail. Above right: The Tumbarumba Rosewood Rail Trail (NSW) – a chip seal rail trail.


Above left: The Barossa Rail Trail (SA) – an asphalt trail. Above right: The Murray to the Mountains Rail Trail (Vic) – a chip seal rail trail.


Above left: The Logan Village Yarrabilba Rail Trail (Qld) – an asphalt trail. Above right: Bunbury Tuart Forest Trail (WA) – a tinted asphalt trail.

3.6 SAFETY CONSIDERATIONS

The most significant safety issue is that of potential conflict between road users (cars and trucks) and users of the proposed rail trail – especially at road crossings. This is more fully dealt with in 'Road Crossings' (see Section 3.7).

Another major safety issue is that of the bridges over the watercourses. This is dealt with in detail in Section 3.11.

Possible conflicts between different types of trail users are a potential safety issue. Users in conflict can be both legal and illegal – for example, between trail users and trail bikes or 4WD's that have illegally accessed the rail trail. Effective signage and vehicle exclusion barriers (management access gates and self-closing gates for trail user access, or chicanes) will greatly limit this potential problem. Conversations with stakeholders indicate that trail bikes are not a major issue although in certain locations in the northern section, two of the landholders have reported issues with trail bike use of the disused and unattended corridor.

Dogs can be a potential safety consideration on this rail trail, as the corridor passes many farming properties, many of which have dogs, and numerous properties that have stock. Often, dogs can be permitted on a trail in the "town" areas limiting potential interactions with livestock. Dogs should be kept on leads and enforcement should be in accordance with relevant Council regulations.

3.7 ROAD CROSSINGS

Road / trail crossings always present a special hazard which must be addressed carefully. A crossing should have enough space cleared and levelled on both sides of the road to allow cyclists travelling together to gather in a group and cross en masse. One-at-a-time crossing greatly increases the overall time in the roadway and therefore increases the likelihood of encountering a vehicle. The crossing should ideally be at a straight, level area allowing both trail user and vehicle driver good visibility and the driver ample stopping distance (if possible). All trail crossings should be perpendicular to the road.

The 11 road crossing concept drawings that form part of this Trail Plan (see Appendix 2) illustrate the signage that is required at each road crossing and the positioning of gates (for management access vehicles and for trail users). Appendix 1 shows some typical road crossing plans and road crossing types and access management arrangements.

Signs required to create safe road crossing are outlined in Section 3.9. The rail trail should be clearly marked on each side of the road for easy recognition and the crossing be designed to move the trail user away from the road reserve as quickly as possible.

The road crossing drawings contained within Appendix 2 and the cost estimates for required works at these road crossings, have been prepared in recognition of the technical details set out in Austroads *Guide to Road Design Part 6A: Paths for Walking and Cycling* (particularly in relation to path width, signage, path terminal treatments, sight distances and road crossing treatments).

The Guide to Road Design Part 6A: Paths for Walking and Cycling provides guidance on the design of paths for safe and efficient walking and cycling, both within the road corridor and outside the road corridor. Detailed guidance is provided on path location, alignment, width, clearances, operating speeds, horizontal curvature, gradients, crossfall, drainage, road crossing treatments and sight distance requirements.

The location and design of paths is influenced by a range of matters that need to be considered and facilities that need to be accommodated within roadsides. Other Austroads guides are also available, in particular the *Guide to Road Design Part 6: Roadside Design, Safety and Barriers* and *Part 6B: Roadside Environment*.

Of particular importance to the design of the proposed rail trail is that of road crossings and sight distances. Although Austroads Part 6A deals primarily with shared path crossings of roads in urban areas, the concept drawings in this Trail Development Plan reflect best practice associated with rail trails in both rural and urban settings.

The proposed Monaro Rail Trail crosses numerous roads of varying speed limits and width, and traffic volumes, including the Monaro Highway (twice in Bombala). For safe travel pedestrians and cyclists must be able to see other approaching path users as well as approaching vehicles on roads. The available sight distance needs to be such that path and trail users can stop or take evasive action if necessary in order to avoid another cyclist, pedestrian, an obstacle in their path or cars at an intersection.

A complicated formula is set out in Austroads Part 6A, but the commentary on sight distances concludes by stating "Paths should be designed and constructed to provide the greatest sight distance possible at any given location." The general diagram contained within Appendix 2 (entitled "Clearing limits for site distance") provides a simpler depiction of clearing that may be required at locations where the rail trail may cross a road (although in the case of the proposed Monaro Rail Trail, vegetation alongside the roads at the crossing points is not a significant issue). In all cases, the concept plans for the proposed road crossings on the Monaro Rail Trail position the crossing at the best and most appropriate locations. All concept plans provide for a perpendicular crossing to maximise the safety of trail users. The concept plans also take into consideration the need for acceptable sight distances, as well as appropriate signage on the trail and on the road (including "Road Ahead", "Give Way" or "Stop", and "Trail Crossing"). Wayfinding signs (i.e. trail direction markers) would also be installed at road crossings.

"Path terminal treatments" are also described in Austroads Part 6A. A path terminal treatment may be required where a shared path, bicycle path or trail intersects with a road, e.g. when a path crosses a road from a parkland or other public land (including, for example, a disused railway corridor).

Path terminal treatments are provided to restrict illegal access by drivers of motor vehicles to parkland (and railway corridors) to prevent damage to path structures (such as lightweight bridges) that have been designed only for bicycle and pedestrian use.

These devices can be hazardous to cyclists and as such they generally should not be installed unless:

- unauthorised motor vehicle access may result in damage to path structures; and/or
- there is clear evidence of unauthorised and undesirable motor vehicle access; and/or
- the device is effective at excluding such vehicles and not readily circumvented.

Path terminal treatments are usually required on rail trails to keep trail bikes and motor vehicles off the trail. However, should entry by trail bike and other unauthorised users not be expected the path terminal treatment may be removed from the design. Some of the concept plans for road crossings on the Monaro Rail Trail (particularly in more remote locations) have a path terminal treatment in the form of a chicane with an adjoining management access gate. Some crossings have been assessed as not needing any physical barrier.

Generally, the road crossing treatment required includes:

- Gating systems (see 3.8 below);
- Installation of signage on the rail trail (both sides of the road crossing) advising (or warning) of the upcoming crossing of the road. The recommended treatment is the installation of (either or both) “Give Way” (or “Stop” signs if it is a major road) and “Road Ahead” signs on both sides of the crossing;
- “Trail Crossing Warning Signage” on the road (both sides of the trail crossing) alerting road users of the upcoming trail crossing;
- Installation of pipe culverts (where required); and
- Miscellaneous signage (including Rail Trail name and logo; distance signs; Emergency Marker signs; road name signs; “Unauthorised Vehicles Prohibited” signs; “Trail Bikes Prohibited” signs, etc.).

Road crossings often present a challenge. Crossing the Monaro Highway twice at Bombala presents a particular challenge (top left). The suggested solution is to include a large trail name sign at the bottom of the standard trail sign. crossing sign (as shown above on three Victorian rail trails).

The works lists in Section 4 provide for (and have costed) an “at-grade” crossing of the Monaro Highway at Bombala at two locations. Sight lines at this location are good with clear vision for some distance in both directions. In addition (and importantly), both crossings are in the 60km/hr zones (though the northern one is just inside the zone on the outskirts of the town). Trail design and signage are proposed that will see trail users slow as they approach the crossing (see the appropriate drawing in Appendix 2). Across Australia, rail trails cross major roads with varying speed limits (between 50km/hr in urban areas and 100 km/hr in rural areas) with relatively simple crossing systems. One simple way to address the crossings is to include on the “Trail Crossing” ahead sign is a large trail name sign below the yellow diamond. This approach has been successfully used on a number of rail trails in Victoria. This has the added advantage of advertising the trail to passers-by.

3.8 GATING SYSTEMS AT ROAD CROSSINGS

As mentioned above in 3.7, all road crossings include forms of gating systems, permitting access by legitimate trail users and authorised vehicles, such as emergency services vehicles and management vehicles while significantly limiting the possibility of illegal motorised vehicles (notably motorbikes) from entering the trail. Such gates are needed on the trail at:

- Old Cooma Rd (between Tralee and Royalla);
- Williamsdale Rd (between Williamsdale and Michelago);
- Ryrie Street (between Williamsdale and Michelago);
- Springfield Rd (between Nimmitabel and Old Bombala Rd);
- Snowy River Way (between Jincumbilly and Bombala);
- Bukalong Siding Rd (between Jincumbilly and Bombala); and
- Sandy Crossing Rd (between Jincumbilly and Bombala).

In some of these cases, the gating system is included further along the trail rather than at the road crossing due to landform and access at the crossing. The gates included further from the road crossings are at:

- Williamsdale Rd (southern side);
- Ryrie St (northern side);
- Snowy River Way (southern side); and
- Sandy Crossing Rd (north)

Some locations - Kelly Rd, Ryrie Rd (southern side), Mt Cooper, Snowy River Way (northern side), Sandy Crossing Rd (southern side), and both Monaro Highway crossings in Bombala - have no recommended gating systems primarily due to their urban locations or high visibility.

In the majority of cases where gating has been recommended, a management access gate and chicane system are the recommended option (see photos below, typical road crossing types in Appendix 1 and indicative gating drawings in Appendix 3). The two exceptions are the northern side of Old Cooma Rd and the southern side of Bukalong Siding Rd – these are different gates due to landform and access issues.

There are many alternative gating systems which could be used (the photos below show a range of systems). The chicane system is the most effective at significantly reducing the risk of motorbike access. However, it has come under some criticism for rail trail users who are either on recumbent bikes or are towing trailers as they do not have the flexibility to easily negotiate the chicane openings. It may be appropriate to install the chicane system and monitor use; if motorbikes are not an issue, the gating system could then be replaced. Alternatively, the trail could be developed with alternative gating systems and, if motorbike use becomes an issue, chicane gates can then be fitted.

The preferred chicane gating system at road crossings shown on the Kilkivan Kingaroy Rail Trail in Queensland (above left) and the Brisbane Valley Rail Trail in Queensland (above right)

The preferred chicane gating system at road crossings shown on the Lilydale Warburton Rail Trail in Victoria (above left); a similar design is place on the Simpsons Gap Trail in the NT (above right).

Alternative gating systems include angled timber gates on the Otago Central Rail Trail in New Zealand (Above left) and a livestock grid and management gate on Victoria's High Country Rail Trail (above right).

3.9 SIGNAGE

Several kinds of signage are required on the Monaro Rail Trail, including distance, directional, warning, promotional, etiquette and interpretive signs. Each should be standardised along the rail trail and, where appropriate, concordant with relevant local or Australian 'standards or practices. The chosen colours of all signs should be uniform throughout the trail.

Themes and styles already established for other rail trails in Australia, and in keeping with the uniformity in signage sought by Railtrails Australia, may dictate what style of signs and marker posts are used along this rail trail. Trail markers and signage on other rail trails are sometimes affixed to old (recycled) railway sleepers or recycled plastic posts.

In the case of the Monaro Rail Trail, given the large number of railway sleepers to be removed from the line when it is removed, one approach may be to pick the best of the available timber sleepers and re-cycle them as signage.

A design option for trailhead map panels and trail directional markers is included in the design drawings in Appendix 1. It is noted however that Snowy Monaro Regional Council is currently preparing a Regional Trails Masterplan which once complete will include signage specifications for trails in the region. It is important to emphasise that - should the rail trail be constructed – signage along the trail should be consistent regardless of whether it is in Queanbeyan Palerang Regional Council or Snowy Monaro Regional Council. The trail user is "tenure blind" and will only be confused if differing signage design is adopted in the two Council areas for the Monaro Rail Trail.

3.9.1 DISTANCE SIGNAGE

Recognising that users will join a rail trail at any number of points, installing distance and direction signs at road crossings will not only benefit those joining the rail trail at that location, but provide additional information for users already on the rail trail.

Trail distance signage will need to be placed at regular intervals along the route. The obvious location is at each road crossing (and at the trailhead) where trail users are likely to join the trail. It is proposed to implement standard signage addressing distance requirements every 1 km.

The recommended distance sign plates (as with all other signs) should be affixed with at least 4 stainless security screws to prevent them being removed. In addition, the distance signs (as well as the various other sign panels used on the posts) should be affixed with silastic or 'liquid nail' products

3.9.2 WARNING SIGNAGE

There are a number of locations along the proposed Monaro Rail Trail that demand warning signage, primarily at the many road crossings facing trail users. In the case of road crossings, (either or both) a "Road Ahead" yellow diamond warning sign (W6-8A) some 50-70 metres before a crossing is recommended (on a stand-alone post), with a triangular "Give Way" sign (R1-2) on the verge at the road crossing (on a stand-alone post) – or a "Stop" sign where appropriate (R1-1 – 300 x 300). Bicycle/pedestrian (i.e. Trail Crossing) warning signs (W6-9) with arrow (W8-23) (or W6-V105) are recommended for installation on roads, either side of a trail crossing, or use of "Crossing Ahead" signs as indicated above.

The proposed rail trail has 11 road crossings along the route, and some of these provide both challenges and opportunities for trail development. The challenges come in ensuring that these crossings are safe for future trail users, while the opportunities surround the passing road users who can be alerted to the trail's presence. Such 'opportunistic' promotion can only be good for the future of the rail trail in raising awareness and increasing user numbers.

3.9.3 PROMOTIONAL SIGNAGE

Promotional signage has been used to great effect on other rail trails throughout Australia, increasing general awareness of the trail among the broader community. For the proposed Monaro Rail Trail, the recommended 'promotional' sign should be incorporated into the on-road 'Crossing Ahead' warning signs. They are an excellent means of communicating the message to road users that they need to be alert for the presence of trail users.

Though the railway corridor may be quite likely familiar to many local residents, it is recommended that a number of "Trailhead" signs also be erected to give prominence to the trail when constructed. The installation of these signs will enable local people and visitors become more aware of the trail (a good example is the High Country Rail Trail).

Signs pointing in to the "Trailhead", as used on the High Country Rail Trail in Victoria, are an excellent means of directing trail users to a Trailhead and serve to promote the existence of the rail trail to passing motorists, tourists and local people.

3.9.4 EMERGENCY MANAGEMENT SIGNAGE

Distance signage provides good reference points for emergency services. It gives anyone who needs emergency assistance an easy reference point. On other projects, consultation with ambulance officers in particular highlighted this need. When people panic (as they often do in an emergency situation), normal cognitive processes do not work. On-trail signage should be as helpful as possible and minimise likely stress. Consequently, distance signs should be installed at regular intervals, with distances to the next trailhead or major town or road crossing (on either side of the post). This enables people to quickly identify where they are by travelling a very short distance from the emergency situation. All road crossings should also have a GPS reference/identifier on the chicane (or on a separate post) for use in emergencies, again as a location aid for those in stress. There is also a need to include the emergency telephone number at all trailheads (on the trailhead map panel) and clearly identify that one number will contact all three emergency services (police, ambulance, fire). While the emergency number from a landline is 000, the emergency number that works best from a mobile phone is 112. Information on what to do in an emergency, the location of public phones (there may be none on the trail itself), and the capacity for a flip-down sign indicating trail closure (due primarily to fire, flooding or maintenance work) should also be included at each trailhead.

Above left: An Emergency Marker sign on the Lilydale Warburton Rail Trail in Victoria. Above right: An Emergency Marker on the Kilkivan Kingaroy Rail Trail in Queensland.

It is strongly recommended that "Emergency Markers" be installed along the Monaro Rail Trail. The works tables (Section 4) have included these markers within the trail distance signage.

In summary, the emergency signage that should be erected on a trail consists of:

- Distance signs at regular intervals showing distances to next trailhead or town or road crossing (double-sided). It is recommended that these include emergency marker signs (with a series of unique codes or identifiers);
- GPS identifiers at all road crossings (attached to the sign posts or gating systems); and
- Trailhead signage specifying what to do in an emergency, the numbers to call, the location of public phones, and the capacity for a flip-down sign indicating trail closure (due primarily to fire, flooding or maintenance work).

3.9.5 PERMITTED USER SIGNAGE

Signs (in the form of pictograms) indicating user groups that are permitted (or not permitted) on the various sections of the Monaro Rail Trail should be installed at every road crossing and entry point. These small signs can easily be installed on the totem posts near to the proposed trail user access gates (chicanes) or even on the gates/chicanes themselves. Pictogram signage could include "No Motor Vehicles", "No Motor Bikes", "No Smoking", "No Alcohol" and "Dogs on Lead". The installation of "No Motor Vehicles" and "No Motor Bikes" are recommended at the outset, and the trail manager will ultimately determine what other signage may be required.

3.9.6 INTERPRETIVE SIGNAGE

On-trail interpretation is becoming more and more of a feature of trails built in recent times. When well done, it can add significantly to the depth of the user's experience. It can also generate a sizeable cost and can be subject to ongoing vandalism in urban and rural areas.

All rail corridors are inevitably rich with history, not just European settlement history but also indigenous and natural history. The Monaro Rail Trail corridor is no different. People will move along this trail at a leisurely pace. This slower rate of travel, a more relaxed frame of mind and openness to new experiences provide ideal circumstances to educate trail users on all aspects of the country through which they pass. There are many stories that can be told along rail trails. The provision of interpretive material will greatly enrich the experience of visitors to the rail trail.

Effective interpretive material gives a specific "flavour" of the events, landforms, wildlife, and vegetation relevant to a specific site. The intention is for the traveller to develop a deeper understanding of the multitude of stories contained in a region. Conversely, the themes can be designed to spark interest, encouraging people to explore any story that interests them. It may also encourage them to extend their stay in the region to further pursue an interesting story or theme.

Interpretive signage does not need to be in place from the trail opening (though this would be a commendable outcome) but at least some information should be embodied in the trail brochure. Interpretation should be an integral part of any trail's development process.

The works tables (Section 4):

- identify specific locations and subjects for placement of interpretive signage based on conversations with landholders;
- identify specific locations but not subject matter for interpretive signage (based on observations); and
- makes allowance for the placement of a number of panels along the rail trail with locations to be determined after local consultation.

3.10 EROSION CONTROL

Proper drainage is of considerable importance in constructing a lasting, maintenance-free trail. Water should be removed from trail surfaces as fast as possible, wherever possible. Given the flat terrain or gentle slopes involved on much of the proposed rail trail, erosion control should be relatively easy. As the railway has not operated for many years, maintenance of the formation and its drainage structures has been non-existent. Consequently, many of the culverts under the formation and drains along the formation have become overgrown with weeds, grasses and other vegetation. Most require cleaning out.

Those sections of the railway formation which do have blocked culverts or dysfunctional drains should be attended to in the trail construction process, as allowing water to stand on the proposed trail surface or run down even a gentle slope is to invite surface damage followed by costly repairs.

It may be necessary to clear existing drains on a regular basis, or to install additional culverts under the trail in some locations to remove standing water effectively – if this is done, care must be taken to ensure the surface is soundly patched afterwards.

While the cuttings appear to be in good condition, it will be necessary to build up the trail within the cuttings to ensure the cess (or side) drains operate effectively. The works tables (Section 4) allow for two options:

- In shallower cuttings, an allowance for cleaning side drains has been included. While this is a normal part of trail preparation, it has been costed separately to ensure it is done efficiently; and
- In deeper cuttings, an allowance is included to build up the trail within the cuttings to ensure the cess (or side) drains operate effectively. It may be more effective to "build up" the trail formation to 300mm (rather than 150mm) rather than excavating the cess drains in cuttings. In some locations, the need for additional clearing and earthworks has been identified and an allowance has been made.

3.11 BRIDGES

Bridges are one of the most obvious reminders of the heritage value of disused railways. They are also one of the most significant attractions of trails along disused railways and one of the costliest items in the development of trails on former railways.

3.11.1 THE ORIGINAL BRIDGES

There are:

- 15 bridges between Tralee and Michelago ranging in size from 1 metre to 24 metres. Included in this list is the 24m bridge over Guises Creek – just north of old Cooma Rd crossing - and the 32m bridge over Deep Creek.
- 8 bridges between Nimmitabel and Old Bombala Road, ranging in size from 4 metres to 59 metres. Included in this list are two substantial bridges over Maclaughlin River (59 metres) and Old Bombala Road (22 metres).
- 2 bridges between Jincumbilly and Bombala – both under 7 metres.

Whilst all the bridges (except a concrete bridge just south of Williamsdale Rd crossing) have timber "topping" (sleepers, corbels) and a ballast infill on top, the construction of the lower sections varies. The majority of girders (the long single piece structures that span the length of the bridge) are timber though some are steel I-beams. Abutments (the material used in stabilising the edge of the formation) are made either of timber, brick or concrete. The trestles are either directly anchored in the ground or in concrete footings.

It is worth noting that railway bridges were constructed to hold heavy locomotives – and that, provided the bridge structure is sound, weight is not a significant factor when considering the re-use of rail bridges for walkers and cyclists.

There are disadvantages associated with not using the remaining bridges. Not using the bridges means the loss of an essential part of the rail trail experience. There is a strong case for retention of bridges for their heritage and convenience / utility value. Riding down a steep benched switchback or wheeling a bike down a set of steps to cross a creek then up an equally steep climb on the other side presents at least some trail users with daunting technical and physical challenges and necessitates careful design, construction and maintenance of gully / watercourse approaches to provide for safety and prevent erosion. Retention of the bridges also retains the positive experience of riding along the top of old bridges with panoramic views of the surrounding landscape and the watercourse below. The rail bridges were originally built in their locations primarily because railways need very gentle grades or slopes and the same principle applies to re-use of railway formations as recreation trails. Bridges also provide a safe crossing when water is flowing in gullies, creeks and rivers.

Engineering certification of bridge supporting structures and abutments is strongly recommended, to ensure the structural soundness of the bridges to be re-used. The services of a qualified bridge engineer will need to be utilised to assess the bridges recommended for retention for structural soundness (a Level 2 integrity test is sufficient), to provide drawings of, and specifications for, a typical bridge super-structure and re-decking.

3.11.2 BRIDGE DESIGN FOR RAIL TRAIL USE

Reinstatement and refurbishment of the bridges (notably re-decking and installing handrails in compliance with Australian Standards for bridges) will be a major component of the cost of establishing the Monaro Rail Trail.

On the Brisbane Valley Rail Trail, the project manager was able to re-use a significant timber bridge over Jimmy's Gully at Harlin (see photo). The advice from the Project Manager was that the original timber bridge was in very poor condition. The superstructure (girders) was completely decayed with no useable timber. However, once the bad timber was cut away near the headstock connection, the substructure (piles) was in pretty good shape. To get a good engineering and affordable outcome, the bridge was shortened and reduced in height. The refurbished bridge was the cheapest option and a very nice feature on the rail trail as well as keeping the heritage significance with the reuse of the timber piles. The bridge is engineering certified to carry pedestrian loads (including horses) with a 75-year design life.

Renovating original railway bridges adds significantly to the trail user's experience. The bridge on the left is on the Brisbane Valley Rail Trail while the bridge on the right is on Tumbarumba-Rosewood Rail Trail. Both are restored in accordance with designs by WRD and both are good examples of restored railway bridges. Both use a combination of old (existing) and new timbers.

3.11.3 BRIDGE ASSESSMENT

Wood Research and Development was commissioned by Mike Halliburton Associates to complete a detailed visual inspection and refurbishment options report based on the current condition of the major bridges along the proposed Monaro Rail Trail in the 3 sections the subject of this study. These bridges are Guises Creek, Lobbs Hole Creek and Deep Creek between Tralee and Michelago and Maclaughlin River and the Old Bombala Road bridge at the southern end of the trail section between Nimmitabel and Old Bombala Road. Two minor bridges - a 10m bridge over Guises Creek Inlet Stream and a 6m bridge immediately north of Williamsdale Road - were also investigated as an indication of other bridges along the corridor. In addition, the bridge over Bobundara Creek between Nimmitabel station and Lake Williams was also the subject of an inspection as there was originally some though that the Nimmitabel to Old Bombala Road section would start at the station. It has been agreed that this trail section will start at Lake Williams; the assessment of Bobundara Creek bridge is provided for future reference should the trail be extended north from Lake Williams.

The 2019 Feasibility Study did not include any of these bridges in the bridge assessments which focussed on bridges between Michelago and Cooma.

The main objective of the investigation was to establish the general condition of the primary structural elements, and to assess what techniques could be utilised to safely repurpose the structure into a rail trail bridge for pedestrian and cyclist use.

Appendix 4 contains the report of this investigation.

The detailed visual condition inspection of the bridges along the proposed trail was completed by a Wood Research and Development (WRD) Level II Certified Inspection Engineer in February 2022. A detailed visual inspection was commissioned and used in this investigation along with a brief, low density cavity test of several elements using non-destructive tests, including EPHOD® Stress Wave Technology.

The majority of the bridges assessed have ballast top deck that consist of a full timber decking that supports the 300mm thick rock ballast that the timber transoms (sleepers/rail ties) bear on.

The Condition State Rating (CSR) system has been developed by Wood Research and Development, through timber inspection experience, to clearly describe the condition of the elements inspected. Elements inspected were the substructure, the superstructure, and the deck, with an overall rating also included. The elements of the bridges inspected have all been classified as having a 3, 4 or 5 rating (note that 1 and 2 are also included in the rating system but apply to bridges in good and fair condition). Characteristics of the system are described below (for ratings 3,4 and 5 noting that ratings 1 and 2 are also included in the rating system but apply to bridges in good and fair condition).

- Rating 3 – Poor. Estimated remaining lifespan is 30% or 24 years (based on an 80 year lifespan). Defects affecting the durability/serviceability which may require monitoring and/or remedial action or inspection by a structural engineer are present. The component or element shows marked and advancing deterioration including loss of protective coating. Minor loss of section from the parent material is evident. Intervention is normally required.

- Rating 4 – Very Poor. Estimated remaining lifespan is 5% or 4 years (based on an 80 year lifespan). Defects affecting the performance and structural integrity of the structure which require urgent action as determined by a detailed structural engineering inspection are present. The component or element shows advanced deterioration, loss of section from the parent material, signs of overstressing or evidence that it is acting differently to its intended design mode or function.
- Rating 5 – Unsafe. Estimated remaining lifespan is 1% or less than 2 years (based on an 80 year lifespan). The bridge should be closed. Structural integrity is severely compromised, and the structure must be taken out of service until a structural engineer has inspected the structure and recommended the required remedial action.

The following is a summary of the Condition State Rating (CSR) for each bridge:

Guises Creek bridge (major)

- Substructure: CSR 3-4
- Superstructure: CSR 3-4
- Deck: CSR 5
- Overall: CSR 4

Guises Creek Inlet stream bridge (10m) (minor)

- Substructure: CSR 4
- Superstructure: CSR 3
- Deck CSR: 3
- Overall CSR: 3

Lobbs Hole Creek Bridge (major)

- Substructure: CSR 3
- Superstructure: CSR 4
- Deck: CSR 4
- Overall: CSR 4

6m bridge north of Williamsdale Rd (minor)

- Substructure: CSR 3
- Superstructure: CSR 4
- Deck: CSR 4
- Overall: CSR 4

Deep Creek Bridge (major)

- Substructure: CSR 3-4
- Superstructure: CSR 3-4
- Deck: CSR 4
- Overall: CSR 4

Bobundara Creek Bridge (major)

- Substructure: CSR 3-4
- Superstructure: CSR 3-4
- Overall: CSR 4

Maclaughlin River Bridge (major)

- Substructure: CSR 4
- Superstructure: CSR 3-4
- Overall: CSR 4

Old Bombala Road Bridge (major)

- Substructure: CSR 3-4
- Superstructure: CSR 3-4
- Overall: CSR 4

The WRD report sets out costs and options for re-using the bridges included within its report. Based on the information compiled from both the visual inspection and the brief SWT (NDT) testing conducted by the WRD technicians, several repairs/replacements will be required to repurpose the railway bridges as rail trail bridges for pedestrian, equestrian and cycle use. Two (2) options have been developed to refurbish the structures for use as rail trail bridges.

Option 1 involves removing the existing railway line, transoms and deck whilst repairing/replacing substructure and superstructure elements where required with kind-for-kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25 - 50 year design life along with a 5kPa load rating. A 5 kPa load rating also has the advantage over a 3 kPa loading in that it allows light duty service vehicles to cross the bridges for maintenance purposes on the trail.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure.

Another option was explored for repurposing these rail trail bridges that utilises the entire existing structure (minus the ballast, transom and railway line) in its 'current' condition with the existing poor (missing) deck planks being replaced and a new code-compliant handrail system installed to the exterior girders. Given the very poor condition of most of the elements in all the bridges, this option is not viable due to it being structurally unsafe and having a very limited life span with major maintenance costs.

Both options include diffusing the remaining hardwood elements with Borate salt rods to increase the life of the structure by preventing decay**.** It is also highly recommended that all exposed bright wood be treated with Copper Naphthenate and end-grains should be sealed with a paraffin wax sealant.

Option 2, which is the more expensive repair option in all cases but gives the longest lifespan, is the recommended option for refurbishment of all the bridges.

The costs for bridge repairs have been assessed and range generally from $13,000/lineal metre to $17,000/lineal metre (with one outlying estimate at $23,000/metre). This cost is significantly more than the allowances included in the 2019 report and anticipated in conversations with the Steering Committee. The engineer from WRD has advised that the costs are significantly more than anticipated for three main reasons:

- The timber ballast topping will be more difficult to remove than if the bridge was simply a timber transom bridge (and consequently more expensive).
- Critically, the price of steel has risen by 50% in the last 6 months. This significantly impacts on the cost of handrails required for bridges.
- Of almost equal importance, the price of timber has increased by 30% in the last 12 months.

Consequently, it is recommended (and costed accordingly) that bridge refurbishment be only undertaken on key bridges along the three trail sections (rather than including a number of smaller timber bridges). Key bridges are those that either:

- Offer a "quintessential" rail trail experience; and/or
- Offer the only practical alternative to a creek or road crossing.

Existing smaller bridges will be removed and replaced by prefabricated bridges or culverts of a similar size. Two minor bridges were included in the bridge assessment process to provide an indicator of the likely condition of other smaller bridges. One of these bridges (a 10m bridge over Guises Creek Inlet stream) was also included in the assessment as it was quite close to, and therefore visible from, the highway and could provide an "advertisement" for the highway (rather than providing any essential rail trail bridge experience). Repairs for both were quite expensive and so it is recommended that both these bridges be replaced by prefabricated bridges. Funds for bridge repairs will provide a better return if spent on the 5 major bridges.

The bridges recommended for refurbishing are:

- Guises Creek 24m $16,531/m
- Lobbs Hole Creek 12 m $16,052/m
- Deep Creek 32m $12,937/m
- Maclaughlin River 58m $13,487/m
- Old Bombala Rd 22 m $16,988/m

(All costs shown above include a 15% contingency and assume piles below ground and the concrete foundations will support a 5kpa pedestrian load. Costs exclude GST).

2 other bridges are recommended for refurbishment. An 8 metre bridge between Williamsdale and Michelago should be refurbished; as a high bridge; it offers a good rail trail experience and presents difficulties with any alternative water crossings. A 7 metre bridge between Jincumbilly and Bombala offers a good rail trail experience and is one of only two rail bridges in this trail section (the other one is very short).

In both cases, these bridges have not been inspected but it is assumed conditions will be similar to other bridges tested.

In considering bridge re-use, the use by emergency vehicles and maintenance vehicles also needs to be considered. The bridge designs costed in the WRD report provide for a 5kPa loading which will allow light duty service vehicles to cross the bridges for maintenance purposes on the trail. This rating may not allow heavier emergency vehicles to use the bridges. However, the bridges do not need to carry emergency vehicles given that the sections are not “isolated” i.e. road access is relatively simple. Emergency vehicles can get onto the trail very easily either side of any of the bridges. If it is determined bridges need to carry vehicles (maintenance and emergency), bridges should sound enough to carry the weight of a 4WD emergency services vehicle (up to 4 tonnes) or a rural fire appliance (13 tonne). They would need to be rated to carry 44kPa which would add significant cost.

Notes for all bridges

Handrails will be required where the fall from the bridge decking to the ground is greater than 1 metre. This is a Standards Australia requirement. Handrails will help ensure the safety of users of the bridges, preventing people from falling over the sides and giving a sense of safety, uniformity and consistency along the trail. Timber handrails are best, providing a more aesthetic finish and are more in keeping with rail trail heritage values (although pre-fabricated bridges are unlikely to have timber handrails). One design option is to use galvanised chain link mesh (50mm diamond mesh) with support bracing to prevent children climbing through.

There are designated standards for handrails for pedestrians and cyclists (1.0 – 1.1m high for walkers and 1.4m for cyclists with a number of detailed specifications regarding design).

3.11.5 PREFABRICATED BRIDGES

There are several locations along the three corridors where small timber bridges are in place but have fallen into significant disrepair and are not worth repairing given the high price of materials needed for bridge repair. A simple option (and the one included in the works lists) where bridges are in poor condition is to install pre-fabricated bridges. Landmark is one company that specialises in supplying such bridges but there are other suppliers.

In considering replacing timber bridges, an alternative is to recycle some of the salvaged timber and utilising appropriately skilled community members to construct some replacement bridges out of the recycled timber, thus reducing the requirement for pre-fabricated bridges. This may save some costs, though this approach will not be cost-free. The recycled timber could also be used elsewhere on the rail trail for seating, shelters, gates, fencing, etc.

In a limited number of locations between Tralee and Michelago, it is suggested that very small bridges (1-3 metres) be replaced by equivalent-size concrete culverts at level. This can be done where the bridges do not sit very high off the ground and may provide a cheaper alternative than pre-fabricated bridges.

3.12 TRAIL FURNITURE

There are a number of scenic locations along the corridor well suited to the placement of seats that would benefit all trail users. Some of these sites have been specifically identified in the works tables (Section 4). In addition, an allowance has been made for the eventual installation of seats – at sites selected by the trail manager. Sites should have views over the adjoining countryside. Care should be taken in the selection of styles of seating and tables. Many styles commonly used on trails are more suited to backyard gardens, or city parks. Few look 'right' in the natural environment. Placement of simply constructed seats at intervals along the trail will benefit all trail users.

There are also provisions for "comfort stops" – one in each of the three sections. These involve a little more site development than a seat and include a picnic table, bike stand (for parking), and interpretive signage (and a directional marker if they are some distance from the trail). These have been included at particularly attractive locations.

The choice of seating is important. It can really add to the trail user's experience and highlight local material and craftsmanship (above left on Cape Raoul in Tasmania). By way of contrast, the wrong seat in the wrong place facing the wrong way (above right in the John Oxley Reserve in Brisbane) can significantly detract from the user's experience.

3.13 TRAILHEADS AND PARKING

A trailhead is usually defined by the existence of a car parking area, often with picnic facilities, interpretive signage, a map panel of the trail showing sites of interest and distances to features along the trail and a Code of Conduct. It is a location where a (short or long) trail walk or ride can begin or end. Given that much of the usage of the Monaro Rail Trail is likely to come from users from other areas, formal 'trailheads' are important.

A number of trailhead locations have been selected for the Monaro Rail Trail. The relevant works tables (Section 4) show the items for inclusion at each trailhead and relevant costings. Facilities such as parking, and a picnic table or seats in the shade, interpretive information (on a map panel) showing distances to features and towns along the rail trail is important and will prove useful to all rail trail users.

Concept plans for 8 trailheads are included in Appendix 5 of this Trail Plan (no trailhead plans have been done for the two sites in Queanbeyan, nor at Tralee where the town park has already been designed by the developer in conjunction with QPRC). These are concept plans subject to more detailed design.

2 trailhead sites have been recommended for the trail section between Queanbeyan and Tralee:

- Queanbeyan Railway Station; and
- Queen Elizabeth Park.

4 trailhead sites have been recommended for the trail section between Tralee and Royalla:

- Tralee trailhead (at the South Jerrabomberra Town Park);
- Royalla trailhead (at the Royalla siding);
- Williamsdale trailhead (at the Williamsdale siding) – an optional trailhead; and
- Michelago trailhead (at the Michelago station).

A typical trailhead interpretive shelter. Usually these shelters may contain two information panels (front and back, with general information, a map with the trail route and key features and important safety information for trail users.

The Tralee trailhead would be located in the yet-to-be developed South Jerrabomberra Town Park. The location of various works items should be determined between QPRC and The Village Building Company. The Village Building Company has indicated a desire to have the Town Park act as a trailhead and it is the most obvious location.

The distance between Tralee and Michelago (approximately 39 kms) necessitates the need for trailheads to be developed en-route to enable users to break the journey, to undertake reasonable distance return trips and/or to undertake shorter one way trips. To this end, it is considered that a trailhead at Royalla is essential (Tralee to Royalla is approximately 16.3 kms while a user starting in Queanbeyan would have travelled an additional 11-14 kms). Provision for a toilet has been included in the works for Royalla trailhead – this is discussed further in Section 3.24.

The recommended trailhead at Williamsdale is optional as Royalla to Williamsdale is only 6.4 kms.

The trailhead at Michelago is also essential. Additional funds have been included within the Michelago trailhead development budget for general works at the station as it is considered a significant attraction for rail trail users.

2 trailhead sites have been recommended for the trail section between Nimmitabel and Old Bombala Road:

- Lake Williams Park (Nimmitabel); and
- Immediately south of the Old Bombala Rd overbridge some 10.5 kms from Nimmitabel.

Lake Williams Park has all the facilities in place and it is understood that funding has been secured for new additional toilets. Minimal work is needed at the site other than some signage and the construction of a connecting trail from the park to the rail corridor. This would involve formalising an existing path which runs around the Lake. The site also provides quick and easy access to the village centre. The railway station – while attractive as an historical site – is more remote from the village centre. In addition, developing the trailhead at the station means the expense of refurbishing the bridge north of Clarke St as well as developing the trail surface and associated infrastructure. This refurbishment and trail development will need to be done if and when the whole trail is complete (the bridge assessments done as part of this work include a condition assessment of that bridge) and there may be a need to re-examine whether the trailhead could be moved to the railway station. At this point in the trail's development, Lake Williams Park provides an adequate trailhead for minimum expenditure.

Development of a trailhead at the southern end of this section is problematic. If the trail was to be completed through to Jincumbilly, a minor trailhead along the route could be developed at the Holts Flat siding which would be approximately half way between Nimmitabel and Jincumbilly. However, the need to construct a minor trailhead at the end of the section to be developed means a site needed to be found. There is significant landscape and ownership limitations around the end of the trail (at the Old Bombala Road bridge). The site chosen is the most appropriate site given these limitations.

3 trailhead sites have been recommended for the trail section between Jincumbilly and Bombala:

- Jincumbilly siding;
- Bukalong siding; and
- On the station ground at Bombala adjacent to the Visitor Information Centre.

At Jincumbilly siding, the works tables (Section 4) provide the option of utilising the existing siding building (on the north western side of Mt Cooper Rd) to house a toilet. It is appropriate to have a toilet at the start of the trail though it is a costly item. If the option is taken not to include a toilet, the trail can start on the south western side of Mt Cooper Rd – eliminating a road crossing.

At Bukalong siding, the works tables (Section 4) also provide the option of utilising the existing siding building to house a toilet. The tables also include a $10,000 allowance to re-furbish the existing stockyards as a historic artefact. This could be undertaken by the local Men's Shed or similar organisation – it is not a commercial project.

At Bombala, the trailhead is recommended for development at the station adjacent to the Visitor Information Centre. There was debate amongst the Project Steering Committee as to the best site and much of the concern seemed to be around crossing the Monaro Highway adjacent to the station. The main alternative considered was to utilise existing path infrastructure on the south east side of the Bombala River (including a pedestrian bridge) and take users into town to a trailhead near the swimming pool. However, crossing the Monaro Highway is not a major issue as it is within the 60km/hr zone. Taking trail users through the station grounds (past the many historic artefacts and interesting sculptures) and making the most of investment already made in the Visitor Information Centre is a good outcome. Whilst users are not in the centre of town, the centre is easily accessible (by foot, bike, and road) and trail users will make the most of the town centre for refreshments, accommodation etc.

The station grounds include carriages that have been obtained by Friends of Bombala Railway Inc. The group have been working on the station grounds for some years. The works items have been designed to limit the impact on the station grounds in terms of the railway itself. A new trail running along the eastern and southern boundary of the station to the Visitor Information Centre takes users past a range of artefacts, sculptures and buildings while not interfering with any future operations within the station ground. It also avoids using the main "parade ground" for the vintage machinery show held once a year.

3.14 FENCING

Fencing along a rail trail is required for several reasons:

- To prevent unauthorised access onto the rail trail;
- To prevent authorised trail users (cyclists, walkers, horse riders) from attaining access onto adjoining properties, and to prevent unauthorised trail users (trail bikes, etc.) from illegally trespassing onto private property;
- To minimise disturbance of stock by trail users;
- To prevent encroachments by adjoining landowners;
- To delineate freehold (private property) from Crown land and to minimise encroachments and trespassing, unintended or otherwise;
- To prevent stock from straying (recognising that it is the land owner's responsibility to ensure stock does not stray); and
- To keep stock off the rail trail and away from trail users.

It is critical that the rail trail corridor be fenced on both sides of the trail where it passes through farms – for public liability insurance and risk reasons. The rail trail corridor cannot remain unfenced.

In the northern section (Tralee to Michelago), the existing boundary fencing is sufficient to address these concerns. There are however locations in this section where new fencing for a narrower corridor is recommended. The works tables (section 4) include provision for surveying the fence alignment along the entire 38 kms. This allowance is best used to record the location of new fencing where relevant and surveying the existing boundary fencing (to ensure it is on the right alignment) where new fencing is not proposed.

New fencing is recommended for most of the two southern sections (Nimmitabel to Old Bombala Rd and Jincumbilly to Bombala). The works tables (Section 4) include provision for surveying the fence alignment. This allowance is best used to record the location of new fencing.

There are three options for corridor maintenance that will impact significantly on fencing requirements:

- **Option 1** requires the erection of new fences along the entire corridor so that there is a 7 metre trail corridor along the entire route. Adjoining landholders are offered the opportunity to graze the "excess" corridor. As the original railway corridor is mostly 20-30 metres wide, the excess corridor can be leased to adjoining landowners. This approach will minimise the reduction in land that they currently farm and enable stock to 'maintain' the corridor outside of the fenced trail corridor

Interest needs to be sought before this major cost exercise is undertaken and interest may not be as great given that adjoining landholders will need to move stock onto the corridor in many places where trail is bounded by roads on both sides. Use of permanent fencing to facilitate grazing the “remnant” corridor will involve installing new fencing closer in to the trail (rather than at the property boundary). This ensures ongoing grazing access to the “remnant” corridor, even if land ownership changes.

The works tables in Section 4 have been prepared utilising this as the preferred option in the 2 southern sections (noting some issues around adjoining landholders between Nimmitabel an Old Bombala Rd). This option provides for low maintenance costs in terms of reduced slashing requirements (though human resources will be required to manage this process within Council).

If this option is pursued, the installation of the fencing should be undertaken in close consultation with the adjoining landowners who wish to graze the corridor.

- **Option 2** would allow stock to graze the “remnant” parts of the corridor at given times of the year to manage vegetation growth. The best approach to temporary seasonal grazing may be to allow grazing by the use of temporary electric fencing delineating the grazing areas. This is a low-cost solution and the payment for electric fencing can be negotiated between the landowner and the relevant council. Livestock could be permitted on the corridor at certain times of the year for a limited period of time. Under this management scenario, stock should be moved off the corridor on weekends (this is anticipated to be the highest use time). This approach reduces the opportunities for negative interactions between stock and trail users (though none are anticipated). The grazing opportunity is offered to adjoining/nearby landholders as needed. This approach needs the trail manager to actively seek and manage temporary licences. This option offers a low capital cost, and relatively low maintenance cost (falling between Option 1 and Option 3). This option has not been included in any cost calculations. This may be an appropriate solution particularly in the northern corridor between Tralee and Michelago.
- **Option 3** is basically a ‘do nothing’ option. No new fencing would be erected (none is needed). The trail manager would manage the entire corridor width, slashing up to 5 - 6 times/year depending on growing seasons. This has effectively no capital cost but a potentially high maintenance cost. However, in examining the area around the corridor in January 2022, it appears as if the approach taken by the road manager is that slashing in road reserves beyond the road envelope is limited – perhaps due to previous drought years though grass is currently very high. It may be that this option is taken in the northern section of the rail trail. The “excess” corridor is simply left with minimal slashing beyond the 7 metre trail corridor - 3.5 metres either side of the trail centreline (while noting that new fencing narrowing the trail corridor is proposed between Tralee and Old Tuggeranong siding).


An option for managing the corridor beyond the trail is to fence a narrower trail corridor and allow adjoining landholders to graze the "excess" corridor. In both examples above, the original railway corridor boundary fence has also been retained (on the left hand side) on the Amy Gillett Rail Trail (above left) and on the right side on the Port Fairy Rail Trail (above right).

It should be noted that, whichever fencing option is chosen, the original boundary fence (generally 10 metres from the formation centreline on either side) should remain where it exists (noting that the two southern sections have less original boundary fencing as the railway was generally built as an unfenced corridor).

Fencing requirements

Where new fencing is to be built, it should be similar to what is already in place. From general observations of the corridor, fencing would appear to be a choice of six-strand wire (2 strands of barb wire with 4 strands of plain wire) where cattle are present and hinge joint mesh fencing (or ring lock fencing) where sheep are present. In at least two instances, landholders have requested specific fencing configurations and these should be provided. It is possible that fencing costs can be reduced given the size of the contracted job (particularly in the southern sections); this saving may be offset by some of the difficulties encountered (such as extra assemblies for line deviations). One landholder has suggested that ideally the fencing contractor is a reputable local contractor using quality Australian made materials in order not to compromise the standard of fence. While this report is no position to make these types of recommendations, using local contractors remains a good approach to both satisfy landholders and keep construction funding within the local economy thus magnifying the economic benefits of the rail trail.

The recommended fencing alignment will follow the bottom of any embankments and along the top of any cuttings. Whilst placing the fencing on the bottom of embankments can create a slashing challenge, experience on the Tumbarumba Rosewood Rail Trail is showing that this approach will reduce ongoing maintenance costings. In a number of locations along the rail trail where fencing is on the top of the embankment, cattle have wandered to the top of the embankment and have damaged the embankment edge quite close to where the trail has been constructed (as these embankments are quite narrow). This creates an avoidable maintenance cost. Embankments can be slashed with a hydraulic arm reach mower, commonly used to manage sloping road verges.

3.15 STOCK CROSSINGS

There are a number of crossings along the corridor that allow adjoining landowners to move their stock or machinery from one side of the rail trail corridor to the other. This is particularly common in the two southern sections. Some of these were pointed out by landholders traversing the corridor with consultants while others were noted based on field observations. All current locations of stock and/or machinery crossings (based on on-site consultation with landholders and on field observations) have been included within the works tables (Section 4) with either a gating system or an underpass in place to minimise biosecurity risks and to assist with ongoing farm management.

Any such crossings should be retained, and the development of any trail will need to make allowance for their retention. These facilities are only required where landholders own parcels on both sides of the corridor. They may also be needed where an adjoining landholder expresses an interest in grazing the "remnant" corridor as discussed in 3.14 above.

On the Lilydale Warburton Rail Trail (Vic), gates are open to the trail user (above left) and are only closed to the trail when stock are moved across in a mob. Other trails (Otago Central Rail Trail (NZ) – bottom left and Port Fairy Warrnambool Rail Trail (Vic) – bottom right) use similar systems.

There are several options for stock crossings. In the examples above from the Lilydale Warburton, Otago Central and Port Fairy Warrnambool Rail Trails, crossings are gated either side of the corridor meaning that the adjoining landowners would be responsible for opening the gates when needed. The limitation is that this system does not allow stock to move easily between paddocks potentially shutting off access to water. An alternative design means the crossing is open and stock are able to cross the rail trail to the other side of the corridor at all times, unhindered by gates – with trail users having to open gates to get across the stock crossing (not shown in the photos).

To address the limitations of the gating systems shown above, the preferred solution is a relatively open system on both sides (the trail and the paddocks). This means that the issue of stock being cut off from water supplies in particular on the other side of the fenced corridor is negated. A livestock grid (with attached pedestrian gate) or an underpass are the preferred solutions for livestock and machinery crossing points. The grid system can be used as there are no horses on the trail.

The underpasses are made using large 3000mm x 2700mm concrete box culverts. This completely removes interactions between stock and machinery, and trail users. These are placed where there are cuttings to minimise earthworks. Underpasses are only used where stock are involved; if the crossing is for machinery only, the at-grade grid system is the better option as it is cheaper.

The preferred solution ensures both trail and paddock are generally open. The livestock grid as used on the Wadandi Rail Trail (WA) (above left) was designed specifically for the rail trail as part of trail planning by Transplan Pty Ltd. What needs to be added to it is a spring-loaded pedestrian access gate on one side to ensure comfortable transit by walkers (included in the works tables in Section 4). The underpasses as used on the Tumbarumba Rosewood Rail Trail and designed by the Rail Trail Committee (above right) work in certain locations (in significant cuttings) and can double as temporary emergency shelters – they are more expensive than the grid system but have proved very popular with landholders on the trail.

By allowing stock from adjoining farms to cross from one side of the corridor to the other at all times, the interruption to current farming practices is minimised and adjoining landowners are much more favourably disposed to the prospect of the rail trail.

Individual discussions with landholders at the time of construction would work out the most appropriate system. The preferred option is to use stock grids either side of the crossing that trail users must pass over. This does away with the need for gates to be opened (and closed) by cyclists. Walkers will generally need to open a gate; a spring loaded gate significantly reduces the risk of wandering stock. Care must be taken in the design and fabrication of the grids to ensure they are safe for trail users, particularly cyclists. A non-slip finish needs to be applied to the grid railings given the climatic conditions in the Monaro region.

The experience from the Tumbarumba Rosewood Rail Trail is that the surface on the at-grade crossing points needs to be slightly "stronger" to ensure the regular passage of stock across the rail trail does minimal damage to the trail surface and is long-lasting. As noted in Section 3.5, a 14mm/7mm 2 coat surface was used at these points.

3.16 EMERGENCY SHELTERS

The 2019 Feasibility Study identified that the Monaro region climate is characterised by extremes of weather (compared to other places in Australia). Temperatures can soar above 40 degrees in summer and fall well below freezing in winter. Sudden changes in weather can occur and potentially can impact on the safety and well-being of trail users (and others engaging in outdoor activities) though outdoor recreational activities are common in the region across the seasons. The report identified that it would be prudent to plan for hazardous conditions by the building of trail shelters at key locations, notably in the southern sections of the trail. There is provision in the works items for a number of stock underpasses between Jincumbilly and Bombala (as noted in 3.15). These underpasses are 3 metres high. Whilst not specifically designed as emergency shelters – in the same way as a mountain hut for example – it is felt that they can provide an adequate substitute for purpose-built emergency shelters. They would not provide full emergency shelters but should be sufficient to provide some relief to trail users in the event of rapidly occurring extreme cold weather events (noting that the trail literature including websites would carry warnings of extreme weather).

3.17 ENCROACHMENTS IN THE TRAIL CORRIDOR

Between the closure of the railway in 1989 and the present, several encroachments on to the former railway corridor have been made. Grazing of livestock occurs in several locations. Cross fences abound – their purpose is no longer clear though they may have been boundary fences at some point and presently form part of a paddock rotation system. These are not major issues.

3.18 USE OF THE RAIL CORRIDOR BY COMMUNITY GROUPS

The rail trail corridor has been subject to a number of other uses over the years since it closed as an operating commercial railway, notably as a heritage rail line in certain locations. More recently, the NSW Government commissioned a study to determine the feasibility of reinstating a commercial train connecting Canberra airport to Eden. This study found such a trail was not feasible. The Cooma Monaro Progress Association – the proponents of the train proposal – has indicated in comments to the consultant that it is not satisfied with this outcome and will continue to pressure the Government to re-visit the economic analysis contained in the Feasibility Study. In conversations with the association's representative, it was indicated that sections of the current alignment are totally inappropriate for modern train movements (being too windy and unstable in places) and a new route would be needed in these sections. At least two of the sections mentioned were in the vicinity of Old Tuggeranong siding and between Nimmitabel and Jincumbilly – two of the sections covered by this study. This may also be an issue for any heritage train proposals. Whilst the Association will continue to pursue its agenda, it appears unlikely that a train will be reinstated on the corridor.

Cooma Monaro Railway Inc has publicly indicated, as recently as February 2022, that it aims to recommence heritage railway operations within the Snowy Monaro region and link the three towns of Cooma, Nimmitabel and Bombala. The group has declared that it is fully supportive of the rail trail and it believes both projects can coexist. It believes a rail trail can be installed beside the existing track alignment. Rail with trail has its adherents but there are very few (if any) examples in Australia where a rail trail successfully exists alongside a railway line (major cities do have bike paths alongside electrified railway lines but this is a slightly different model). For a heritage train service, there may be engineering issues with crossing bridges and negotiating cuttings where landslips and rockfalls have occurred. It is not clear whether any heritage rail group will receive permission to cross major roads (which they would need to do at Bombala for example). Importantly, there has not been any significant business cases put forward outlining how any proposals would be funded and would operate. It is important to note that a heritage train service did run after commercial services stopped, but they also stopped running due to a number of critical factors.

The Bombala History Society indicated support for the rail trail. As discussed in Section 3.13, it is acknowledged that the Friends of Bombala Railway have restored a number of carriages within the station grounds. The group have been working on the station grounds for some years. The works items have been designed to limit the impact on the station grounds and the line running through the grounds should the group want to utilise the existing track within the grounds. Any proposal to travel on any form of railway carriage beyond the station grounds would need to cross the Monaro Highway (the same problem faced by the Cooma Monaro Railway Inc).

3.19 OTHER USERS AND TRAIL ETIQUETTE

Managing interaction between user groups is a primary prerequisite on all trails, and standard signage and protocols already exist. Providing adequate signage is installed and users are well aware of the likelihood of meeting other user groups, such interactions should generally be non-threatening and relatively safe.

Every attempt must be made to ensure the rail trail is not used by either four-wheel drives or trail bikes, though this is likely to be difficult to manage and hard to police. The proposed management access gates and chicanes at road crossings will go part way to addressing this issue.

Education through signage and use of gates or other vehicle exclusion barriers will help, as will encouraging bona-fide users – and local residents – to report registration numbers of illegal users.

The Murray to the Mountains Rail Trail has a Code of Conduct sign board at regular intervals along the trail ensuring that all trail users are aware of their rights and responsibilities.

3.20 CODES OF CONDUCT

A Code of Conduct for each user group provides all trail users with guidelines to minimise their impact on the environment, and on other trail users.

Codes of Conduct help to:

- Prevent trespass;
- Prevent soil erosion;
- Minimise trampling;
- Prevent the introduction and spread of noxious and exotic plants;
- Protect waterways;
- Reduce the risk of fire;
- Protect significant and environmentally sensitive sites;
- Minimise potential conflict with other users of the trail; and
- Ensure the safety of all trail users.

Trailhead signage is the best place to provide Code of Conduct signage.

3.21 HERITAGE ISSUES

A number of structures along the trail corridor have historical or heritage value. These include station buildings, station signs, bridges, culverts, cuttings and embankments, and distance posts. A rail trail will enhance the appreciation of these historic assets.

It is strongly recommended that the trail manager seek to ensure all artefacts and relics of the railway remain in place during the construction of the trail. The existing stations and other buildings in all the station grounds are outstanding examples of preserved railway heritage.

Above: Glenroy Siding on the Tumbarumba Rosewood Rail Trail. Siding platform rebuilt by the Tumbarumba Men's Shed.

All existing signs, signals and switches have been identified in the works tables (Section 4) and an allowance made for the retention and upgrading. Many of the items included in the works tables are railway infrastructure items that should be preserved and restored as appropriate. Not just major items like stations and bridges but minor items such as switches, levers, siding platforms, and signs of all descriptions are identified and a cost attached to works needed to restore them. In addition, new signs can be reproduced where the original signs have been removed. Good examples are missing distance markers (showing the distance from Sydney's Central Station) and original station signs. The Tumbarumba Rosewood Rail Trail has reaped great benefits from involving the local men's shed in re-creating original siding names (such as Glenroy siding) and distance markers adding to the trail user's experience.

3.22 ENVIRONMENTAL ISSUES

A number of key environmental issues have been identified. These include:

- Clearing of regrowth vegetation along the corridor, and the need for clearing permits and the possible future need for offset re-vegetation. This may not be a major issue given the current state of the corridor.
- The potential for the spread of weeds (and pathogens) during the construction phase and, potentially, through usage of the trail.
- Contamination of soils as a result of the operations of the railway and the manner in which former bridges were constructed and maintained.
- The potential for sedimentation of watercourses as a result of trail construction and bridge works.

In addition, care will need to be taken in the ongoing maintenance of the proposed rail trail to ensure weeds and pathogens are not unwittingly spread by maintenance machinery. Ongoing clearing at the sides of the rail trail will be required to keep the trail corridor at acceptable widths.

Weed control will be an ongoing issue, particularly as farmers expressed concerns about the spread of weeds via the corridor. More discussion on ongoing weed management is included in Section 7. In terms of works items, provision for boot and tyre cleaning stations has been made at the northern and southern ends of the Jincumbilly-Old Bombala Rd section, and the Jincumbilly-Bombala section. Spread of particular weeds seems more of an issue (based on comments by landholders) in these two sections than further north. The biosecurity assessment being prepared separately may identify concerns with weeds at in the northern section; if this occurs, cleaning stations should be put in adjacent to road crossings to ensure users coming onto the trail clean their equipment.

Boot (and tyre) washing stations are one way of managing the spread of weeds. This one pictured here (for walkers only) is on the South Coast Trail in Tasmania.

Potential contamination may be an issue at various sites along the corridor primarily associated with historical weed management practices and residual contaminants at sidings, station grounds and within remnant building. Although no contamination investigations are known to have been undertaken, it is possible that there are contaminants in the soil from years of maintenance of the railway track, railway corridor and associated infrastructure.

Historically across many railway lines in Australia, arsenic was used to suppress weed growth (and prevent termites eating the sleepers) along railway formations until the 1950s, when organic herbicides began to be used. The presence of contaminants in any railway soils would appear to be remote, given that the arsenic was last used some 50 years ago. It is likely that the contamination has dissipated over the years, having been leached down through the soils under the formation.

Advice from previous rail trail projects (In Victoria) is that the presence of mature trees growing from within any formation is a sure sign that the level of contamination remaining within the soil is negligible. This is certainly the case along much of the corridor investigated for this Trail Development Plan.

In 1997, a health risk assessment was undertaken for the SA Department of Recreation and Sport of a rail corridor that was proposed for a rail trail. The work was undertaken to address risks to future trail users and construction workers and was carried out in accordance with the approach suggested in relevant guidelines at the time (*Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*). Notable conclusions were that the indicative level of risk posed to future trail users by soil contamination along the former single track was anticipated to be negligible, that a precautionary approach was suggested for trail construction at former railway sidings due to a potential higher risk, arsenic was unlikely to pose a risk of severe effect from a single exposure to the highest level of contamination anticipated on the site, and construction activities were also unlikely to pose an occupational risk. Whilst this study was site-specific, its findings may be generalised for many railway corridors.

The Bio-security assessment carried out by North Coast Local Land Services for the Northern Rivers Rail Trail investigated contamination risks as part of the work. It looked at some critical questions with regards to the risk to stock from previous chemical treatments on the railway corridor and these are detailed below:

Specific risk: Poisoning of livestock by chemicals

Risk of Rail Trail compared with existing risk: Risk is increased with Trail, through risks associated with construction. However, likelihood is unlikely.

Rationale: Ash from burnt Arsenic treated timber is a source of Arsenic poisoning. Cases of poisoning of livestock from burnt railway sleepers and bridge timbers have been documented on the north coast. Arsenic poisoning has also been recorded in cattle on the north coast from access to dip sites and old banana chemical storage sheds.

Consequences: Minor. Limited animal deaths on single enterprise.

Risk treatment options and activities to reduce risk:

- Reduce the risk livestock contact with Arsenic; timber removal and not burnt on site. Remediation for any sites identified as having potential for soil contamination with Arsenic.

Residues and Antimicrobial Resistance

Specific risk: Chemical residues in livestock

Risk of Rail Trail compared with existing risk: Risk is increased with Trail, through risk associated with construction. However, the likelihood is unlikely.

Rationale: Soil contaminated with persistent chemicals such as OC's (organochlorines) may be unearthed during construction and potentially pose a risk of residue contamination in livestock. OC residues caused disruption of trade for a significant number of cattle holdings on the north coast in the late 1980's and early 1990's.

Consequences: Minor. Few or single businesses affected economically.

Risk treatment options and activities to reduce risk:
- Reduce risk of cattle access to possible soil residues.
- Obtain track treatment history from state Rail.
- Design Trail to minimise soil disturbance.
- Soil excavated or exposed during construction is tested and is removed or treated to make safe.

The other key issue remains the potential for asbestos within disused railway buildings that are recommended for re-purposing, notably buildings at Bukalong and Jincumbilly sidings (where it is recommended that composting toilets be constructed within the existing waiting sheds). An allowance of $50,000 has been included at each site for rehabilitating the buildings and installing toilets. Should the sheds have significant asbestos issues (and this would need to be tested as part of the pre-construction process), it may be more appropriate not to re-purpose but rather to install separate stand-alone composting toilets as proposed at Royalla siding. This will add $30,000 to the costs at each site (for a total of an additional $60,000).

It is interesting to note that advice from The Peron Group for this project was that project sampling and testing was carried out on the Tumbarumba Rosewood Rail Trail and that this testing returned negative results for preservative chemicals and asbestos.

The Construction Management Plan (see Section 6) should specify how potential contamination is to be dealt with.

3.23 CLEARING FOR THE RAIL TRAIL

In the years since the railway last operated, vegetation (in various forms) has regrown along parts of the corridor that formerly was kept clear of vegetation. The amount of regrowth vegetation varies along the corridor.

Clearing will be required at a number of locations along the former railway corridor.

The estimates of probable costs reflect these various types of clearing of vegetation.

Generally speaking, a cleared 'trail corridor' of 3.5 - 4.0 metres will be required to enable a trail of 2.5 metres to be developed in the centre of the cleared corridor. Either side of this trail will be further clearing of vegetation up to 1.0m for drainage.

Ongoing maintenance will be required, on an 'as and when required' basis, to prune the vegetation alongside the trail to keep the trail corridor clear of overhanging vegetation. The regularity of the clearing of side growth vegetation will depend on numerous factors, particularly the type of vegetation growing alongside the trail over its length.

3.24 TOILETS

There is no standard accepted distance between toilets on a trail. One of the challenges is providing for the needs of both walkers and cyclists. Walkers cannot cover the same distances as bike riders in the same time and may therefore require toilets at closer intervals. Toilets at trail heads are a good idea given people start and finish a ride or walk at a trailhead.

The following trailheads have or will have functioning toilets:

- South Jerrabomberra Town Park;
- Michelago (though it needs an upgrade to allow it to function for a large number of people);
- Nimmitabel at Lake Williams Park; and
- Bombala Visitor Information Centre.

This leaves the need for toilets at Royalla (as a trailhead roughly halfway along the corridor from Tralee to Michelago) and Jincumbilly as trailheads. An additional toilet is also provided for at Bukalong siding as it is half way along a 24 km trail from Jincumbilly to Bombala.

Provision for a new toilet has been included in the works for Royalla trailhead. This is a high profile site (very visible to passing traffic); it should be relatively protected from vandalism

The composting toilet at Glenroy siding on the Tumbarumba Rosewood Rail Trail cost $80,000 to install.

by its visibility (a risk with more remote yet visible toilets). In this it is similar to the existing toilets at the Colinton Rest Area.

There is provision in the works tables (Section 4) for renovating the existing toilets at Michelago station. This is not as critical as other trailheads given the proximity of toilets across the road in the park but would help in the station upgrade.

At Jincumbilly siding, the works tables (Section 4) provide the option of utilising the existing siding building (on the north-western side of Mt Cooper Rd) to house a toilet. At Bukalong siding, the works tables also provide the option of utilising the existing siding building to house a toilet. At both these sites, works will be required to restore or renovate the buildings as well as install toilets (note comments in Section 3.22 regarding the risk of asbestos contamination).

3.25 CONNECTING TRAILS

There are likely to be opportunities to establish connecting trails between the rail trail and adjacent attractions (both community and commercial facilities). Should these opportunities arise, the trail manager should pursue those opportunities with interested parties. A simple connection would most likely require a connecting trail, a self-closing pedestrian gate in the rail trail fence, and appropriate signage. In some instances, agreements to traverse the “trail envelope” in instances where there is excess land between the rail trail corridor and the facility may be required, though, if these opportunities are identified during the construction process, an “trail envelope” can be left in place. The costs of these provisions can be negotiated between the trail manager and the provider.

Connecting trails allow users to take easy advantage of trailside businesses whether it is accommodation (above left on the Otago Central Rail Trail in New Zealand) or cafes and wineries (above right on the appropriately named Riesling Trail).

SECTION 4 - WORKS LIST AND PROBABLE COSTS

4.1 INTRODUCTION

Investigations undertaken during the fieldwork associated with this project enable a reasonably accurate picture of the work required to bring about the development of a rail trail within the relevant sections of the disused railway corridor.

4.2 LANDHOLDER CONSULTATION

As part of the study brief, formal on-site landholder consultation was required. Consultation was also carried out with a number of other parties with interests in the corridor. It should be noted that this was supplementary to, and separate from, community consultation carried out for the 2019 study which consisted of 5 open house events along the corridor (Michelago, Bredbo, Cooma, Nimmitabel and Bombala) as well as an extensive on-line survey conducted by Snowy Monaro Regional Council.

Letters were sent from Snowy Monaro and Queanbeyan Palerang Regional Councils in early December 2021 to all adjoining landholders notifying them of the project. The letters invited interested landholders to meet on-site with the consultants in January 2022 to discuss any particular issue(s) they may have. The letters also offered an alternative option to discuss issues with the consultants over the phone prior to the corridor inspections. This enabled the consultants to examine the issue and determine potential solutions as they passed the location/s. Letters were also sent to other stakeholders with an interest in the corridor.

In summary:

- The consultants met on-site with 8 adjoining landholders. 2 of these were in the Tralee-Michelago section, 3 were in the Nimmitabel-Old Bombala Rd section, and 3 were in the Jincumbilly-Bombala section.
- The consultants spoke with 4 landholders over the phone to discuss concerns and possible solutions. 3of these were in the Tralee-Michelago section and 1 was in the Nimmitabel-Old Bombala Rd section.
- The consultants spoke with a range of other parties with an interest in the corridor. On-site meetings were held with 3 community groups (1 in each section). Meetings or phone conversations were held with 1 nominated representative of the ACT Government, 2 land developers in the Tralee-Michelago section, representatives of the NSW Government Crown Lands and NSW Local Land Services, and one community group with an interest in the corridor.

Table 1 provides an overview of issues discussed with landholders and other interested parties during consultation and outlines recommended solutions. In dealing with adjoining landholders, the approach taken was of trying to get outcomes that worked within a reasonable cost limit particularly relating to minimising disruption to farm operations whilst still delivering the rail trail and high quality user experiences. This approach is designed to ensure construction costs are not understated (while acknowledging there are likely to be additional landholder requests hence the line item allowance in each table). These solutions have been reflected and included within the relevant works tables.

Table 1: Landowner concerns and solutions – consultation 2022

IMPACT / ISSUE / PROBLEM	SOLUTIONS PROPOSED FOR MONARO RAIL TRAIL
Impacts on adjoining land owners' lifestyles	
Crime - Trespassing, vandalism and theft. Some landholders expressed a range of concerns in regard to the issue of trespassing on to farmland and site security. One had quite valuable horses on site.	○ Installation of fencing and planting are included in the works tables recommended for this project. ○ Keeping trail corridors clean and well-maintained increases sense of community ownership and 'passive surveillance' reducing minor crime such as litter, graffiti and vandalism. Two landholders in the northern section reported in conversations that illegal access for motorbikes, walkers and campers was constantly causing them issues. This occurred because the corridor is not being presently used and maintained. ○ Code of Conduct signposting is recommended as works items at all trailheads. ○ Prohibiting motor vehicle use (by regulation and design) reduces property crime. Locked management access gates are a proven method of restricting access on to a trail. These have been included at all road crossings (or similar gating systems).
Loss of privacy for adjoining landowners Several landholders noted this as an issue along the northern section and the Nimmitabel-Old Bombala Rd section. In one particular instance, the railway line ran adjacent to a landholder's house. In other instances, houses were relatively close to the corridor (and could be seen from the corridor).	○ Fencing and vegetation screening are included as works items in both specific and general locations. ○ Re-routing the trail off the formation away from the affected residence to elsewhere in the rail corridor has been recommended in one instance in the northern section. ○ Substantial additional vegetation planting to provide a visual barrier between the trail and the residence (while minimising 'hiding' places) has been included in a number of locations (based both on landholder requests and field observations). ○ One landholder requested monitored security camera at house driveway gates. This has not been included or costed but is a matter for consideration by the relevant Council (Snowy Monaro Regional Council).
Land value devaluation	○ Two landholders questioned whether probable negative land value impact (for a working farm) had been considered and whether any compensation ramifications including ability to operate the farm satisfactorily have been costed.

	○ No costings have been included. Whilst this has been raised with other rail trails in Australia, the consultants are unaware of any successful legal actions on other rail trails.
Stress and concerns about the impacts of trails on farmers lifestyles and incomes An element of uncertainty in both the short-term (until a decision is made) or the long-term (from rail trail operations). The short-term impacts were a major issue for one landholder.	○ Two landholders raised the uncertainty aspect. One noted that the confidence to undertake and invest in on farm improvements is completely eroded whilst the Monaro Rail Trail project is "hanging over landholders' heads". Landholders are looking to make decisions on farming practices notably around reconfiguring paddocks which will involve capital investment primarily for fencing but also for other items of farm infrastructure. It was argued that any decisions they make on fencing locations in particular may be redundant if the trail is built and the corridor fenced which would have the effect of possibly reconfiguring paddocks. Given the life of fencing at 20-40 years, this is a reasonable concern over capital investment. However, there is simply no solution to this uncertainty at this time. The landholders can fence land that is theirs to the edge of the railway corridor but cannot legally fence within the corridor until permission is granted by the corridor manager; to do so means taking the risk of fencing being removed or reconfigured if the trail is built as the land remains publicly owned.
Impacts on farming practices	
Weeds There are weeds on the corridor at present and throughout the region – who will remove them and who will keep them under control is a major issue for a number of adjoining landholders met with. There was general consensus that the weed management regime currently in place (by John Holland) was grossly inadequate and weeds were a major issue.	**Possible solutions** ○ Weed management will be the responsibility of whichever entity is responsible for the corridor should it be converted to a rail trail (as John Holland was and UGL is presently). ○ The draft report includes preparation of a regularly reviewed Trail Management Plan covering all maintenance issues prepared in advance of construction. One of the focusses of the maintenance program will be weed control. ○ The works items have made provision for boot and tyre cleaning stations at the northern and southern ends of the Jincumbilly-Old Bombala Rd section, and the Jincumbilly-Bombala section. Spread of particular weeds seems more of an issue (based on comments by landholders) in these two sections than further north. The biosecurity assessment being prepared separately

	may identify concerns with weeds at in the northern section; if this occurs, cleaning stations should be put in adjacent to road crossings to ensure users coming onto the trail clean their equipment.
Interactions between nervous livestock and trail users on horseback Farmers whose properties adjoin the corridor are often concerned at horses being allowed along the proposed rail trail, potentially bringing in weeds via faecal matter and a range of bacterial diseases and causing difficulties for their livestock. This was a concern for some of the landholders spoken to.	○ This Trail Development Plan has been prepared on the basis that horses will not be allowed on the rail trail.
General biosecurity Some of the landholders consulted were concerned with biosecurity. The key question was how will the biosecurity obligations be met to satisfy the statutory requirements of affected farms? These landholders believe there will be a high risk of introduction/contamination of weeds and disease.	○ Biosecurity of the corridor is being addressed as a separate study. It is worth noting that there have been two biosecurity assessments done for the two new NSW rail trails – the Tumbarumba Rosewood Rail Trail (opened in April 2020) and the Northern Rivers Rail Trail (under construction). It is expected that these assessments will form the template of future consideration.
Fencing of the corridor - who pays and what might be needed. A number of landholders consulted had a range of questions about fencing. In summary, the questions were about what the fencing arrangements would be and who would pay for them. One landholder stated that if corridor is fenced, this would	○ Based on conversations with existing landholders, new fencing has been included in the works tables in a number of locations. There are selected locations in the northern trail sections, while the two southern sections have included almost 100% new fencing. ○ Provision for repairs to existing boundary fencing have also been included in costings for the northern sections where the boundary fence will be the primary fence. ○ The cost of fencing, where required, should be a project cost. Adjoining landowners may wish to be receive remuneration should they wish to erect the fencing to their standards (rather than contractors).

interfere with farm operations regarding movements across the corridor. He indicated that - assuming a fenced corridor is proposed - there is a highly likely adverse effect on paddock configurations and stock water access. He contends that this extends to potential redundancy of existing infrastructure by virtue of its location in relation to historical working paddock/farm layout including fencing, yards, roads, watering points and even buildings. The same landholder stated that - if the corridor is unfenced - what will stop users wandering off the trail onto adjoining paddocks.	This issue was not discussed with any of the landholders. ○ The corridor cannot be unfenced.
Splitting of farm paddocks Splitting properties and the resultant impact on farm practices (particularly getting stock to watering points). This was a common point raised by landholders in the southern two sections. (The corridor in the northern section tends to have either ACT Government land or road reserves as one neighbour).	○ Based on conversations with landholders and field observations, several options have been included within the works tables for dealing with "paddock splitting". They involve providing either at-level fenced and gated crossing points for stock and machinery or underpasses at appropriate locations. Some of these locations have been specifically determined between the landholder and the consultants as part of field investigations while others have been provided for in the works tables but not specifically located. Locations can be determined by the landholder and trail manager as construction proceeds. ○ In some locations, watering points (new water tanks or similar) have been provided on both sides of the corridor for stock. ○ An associated issue is the risk of stray stock moving from one land holding to the next via the fenced corridor. Stock grids have been provided in the works tables at appropriate locations to address this issue. Again, these have been provided at locations that appear to be property boundaries based on field

	observations (in some instances, these locations were confirmed with the landholder.
Impacts of trail users	
Management of litter and toilet waste One landholder raised these two issues.	○ Rubbish bins have been included at trailheads. ○ The works tables include placement of composting toilets at three locations between towns (1 in the northern section and two in the southern section – Jincumbilly to Bombala).
Farm/user safety Two landholders raised issues of how is health and safety risks to the public addressed when essentially wandering through the middle of a working farm? Potential exposure to operating farm machinery, chemical spraying (land and aerial), livestock movement, and vermin control (Firearms and poison).	**Possible solutions** ○ Good design and appropriate information will discourage people from going off the trail onto farm property and thus placing themselves in dangerous work environments or in close proximity to unpredictable livestock. Fencing is the key solution proposed in the works tables; appropriate warnings on trail literature (websites, trailhead panels, codes of conduct) is the right place to deliver these messages in written form and need to be included when such material is designed. ○ Shooting remains problematic; it has not been raised elsewhere on rail trails so no easy solutions are apparent.

A number of site-specific and non site-specific issues were raised by one or a few landholders. These were:

- Some landholders spoken to have existing water pipes across the corridor. This is not seen as a major issue; where they currently exist and were pointed out, preservation of the "easement" and care in trail construction have been recommended.
- Time used (limitations day/night). One landholder quite close to a potential trailhead questioned whether there were limitations (day/night) on the trail's use. There are no limitations; however, the vast majority of use will be during daylight hours. This landholder was also concerned about facilities such as pop-up coffee vans being established at this trailhead as it would potentially create a high level of noise in the early waking hours.
- There is no power at the Royalla siding. This is not an issue as power is not really needed to service any trailhead developed in accordance with the Trail Development Plan.
- One landholder in the northern section had what appeared to be a very complicated set of leases/licences over the corridor for various uses. These can be maintained by the new trail managing entity; the difficulty will be untangling what undoubtedly will be very messy paperwork.
- The future of existing railway bridges on the corridor was raised as an issue. One particular landholder believed that work done to a bridge to allow it to be

converted to a rail trail bridge will detract from its heritage vale (or his views of its heritage value). Refurbished bridge designs will be sympathetic to the original bridge architecture; there is no doubt however that adding handrails to all bridges may be seen to detract from their aesthetic value.

As noted in Table 1, a number of works items included in the works tables have been included at the request of the landholder. Within the works tables, works items relevant to, and addressing concerns of, landholders take two forms:

- Where they have specifically been requested by the landholder either on-site or via phone/letter conversation. These are noted as such in the tables. Some works items are tied to specific GPS locations while the location of others should be negotiated at the time of construction. Farming practices change over time and locations of works items may need to change.
- Other works items reflect recommendations by the consultants based on field observations rather than direct requests by landholders. In these cases, landholders have not met with the consultants and the provision is based on experience.

There is also a generic allowance at the end of each table for each section of the rail trail for other items that may be requested by landholders in the future.

There are also some items (in Table 6 - Nimmitabel to Old Bombala Road) that have not been costed. These items are:

- Access to riparian right to stock and domestic water. Explore options including tapping into town water and dedicated pump station and pipeline (Works Item 36).
- Monitored security camera at house driveway gates (Works Item 84).

These items are included but have not been costed either because other options may provide the solutions, they are too difficult to cost and/or they seem an unreasonable demand on the project. The Council may choose to negotiate over these items at the time of construction.

4.3 SECTION COSTS

For the purposes of determining costs, the per unit construction rates for key items set out below have been used:

- Trail construction. Construction includes stripping of top soil, boxing out, cleaning side drains, compacting subgrade (to 150mm), filling with road base, levelling, trimming, shaping and compacting, and sealing: $100/lineal metre (for 2.5m trail width). Assumes formation is clean and reasonably level (subsequent to steel track and sleeper removal). Surfacing costs are based on recent experience with the Tumbarumba Rosewood Rail Trail developed as a chip seal trail (in 2019 and 2020) and the Logan Village Yarrabilba Rail Trail (in South East Queensland) developed as an asphalt trail (in late 2021).
- Clearing. Clearing costs (prior to earthworks) vary:
    - Slashing or side pruning (no heavier clearing will be required along some of the corridor). The cost varies from $1,000/km for slashing of cleared trail route (prior to earthworks), to side pruning at $2,000/km (i.e. track may exist but needs to be widened). An average cost of $1,500/km has been included. (The

slashing costs for construction purposes are much higher than ongoing slashing covered in Section 7 as the initial slashing for construction will be a much more complicated operation).

- Minor clearing is $3,000/km;
- Moderate clearing (most notably the removal of small trees in the formation) is $6,800/km; and
- Heavy clearing (large trees and/or significant undergrowth in the formation) is $14,000/km.

- Removal of steel track and sleepers. In the 2019 Feasibility Study, the removal of steel track and sleepers was assumed to be a cost-neutral exercise i.e. the costs of removing the rail in particular (by a commercial contractor) were offset by the resale price of the steel track. The ownership of the track and responsibility for removal (and any sale proceeds) is part of the Tumbarumba-Rosewood Rail Trail pilot project. On the Tumbarumba project, the NSW Government granted the trail manager ownership of the track and sleepers as part of the project. A removal contract was organised and proceeds of the sale of the track went to the demolition contractor (with the trail manager taking a percentage of the sale value as the price for steel track was high). The track sale price was dependent on the market price for railway track at the time of removal. It is difficult to know what market conditions will be like at the time of track removal should the Monaro Rail Trail proceed. For a zero cost to be realised, the price of used steel in particular is such that a commercial demolition company will remove the track free of charge recovering their costs by selling it to an appropriate market. This partially depends on how much steel is available and the price of used railway steel at the time the contract for removal is let. For the purposes of estimating construction costs, the approach taken in this report is to assume the Tumbarumba Rosewood project sets a precedent for asset ownership. It may be that the price of steel railway at the time of removal allows some proceeds of sale to be returned to the asset owner (as it did in the case of the Tumbarumba Rosewood Rail Trail). It is worth noting (as discussed in Section 3.11) that the general price of steel has increased by 50% in the last 6 months (this report is prepared in March 2022). Whilst this has had a significant negative impact on the cost of refurbishing existing bridges due to the need for steel handrails, it also has the potential for a positive impact on the recovery price of steel railway track. These high prices may be unique to this time but it is worth remembering that a high steel price will have both positive and negative cost implications for this project. **However, a prudent approach is required, and the removal or track and sleepers has been considered a cost-neutral exercise. No provision of funds has been included in the works tables for track removal.**
- Sealing. $100/lineal metre. This allows for a 10mm/5mm 2 coat surface with high bitumen content (as used in Tumbarumba Rosewood Rail Trail) with “extra” allowance for development of 14mm/7mm 2 coast surface at machinery/livestock crossing points. It also allows for extra work on “cleaning” the formation if needed. This price also allows for an alternative surfacing of asphalt if Councils decide this a preferred surface.

- Bridge Costs
  - Installing pre-fabricated bridges (Landmark or similar) - $6,000/lineal metre. Handrails will be required as fall to ground exceeds 1m in all cases.
  - The bridge costings and rationale for refurbishing the major bridges and replacing other bridges has been explained in some detail in Section 3.11. Unit costings vary between the 5 bridges recommended for refurbishment – Guises Creek, Lobbs Hole Creek, Deep Creek, Maclaughlin River and Old Bombala Rd. Two other bridges – one between Williamsdale and Michelago (8m) and one between Jincumbilly and Bombala (7m) - have also been recommended for refurbishment. As these were not inspected by Wood Research and Development, an indicative cost based on the other 5 inspections of $14,500/m has been allowed. It is to be noted that the bridge costings included in the tables below have an in-built 15% contingency allowance – this is in addition to the 15% contingency allowance included overall for each section at the end of Tables 2 to 7.
- Purchase and installation of "Trailhead" sign pointing into the trailhead from road(s) - $1,600/unit.
- Research, writing, manufacturing and installation of "Trailhead" map panels at trailhead - $5,500/unit.
- Purchase and installation of "Trail crossing" signs on roads - $600/sign.
- Purchase and installation of Trail Directional Markers (incorporating emergency markers) - $1,000/unit installed.
- Research, writing, manufacturing and installation of interpretive panels - $3,000/panel.
- Chicane gate and management access gate (primarily at road crossings) - $4,000/set.
- Livestock/machinery crossing gate systems - $20,000/unit based on the gating systems used on the Tumbarumba Rosewood Rail Trail. The gating systems used on the Wadandi Rail Trail (see discussion in Section 3.15) are likely to be a cheaper option but an allowance for the type in common use and working from all reports on the Tumbarumba Rosewood Rail Trail seems a more conservative approach. The Project Manager at the time of construction will need to decide on a gating system to use based primarily on what outcomes are being sought.
- Fencing - $15/metre installed.

4.4 ADDITIONAL NOTES

Map references shown in the tables refer to works items shown on Plans in Appendix 10:

- Plan 1 covers the section from Queanbeyan to Tralee (overview only).
- Plan 2 covers the section from Tralee to Royalla.
- Plan 3 covers the section from Royalla to Williamsdale.

- Plan 4 covers the section from Williamsdale to Michelago.
- Plan 5 covers the section from Nimmitabel to Old Bombala Road
- Plan 6 covers the section from Jincumbilly to Bombala.

Only major and significant works items are shown on the maps. These are generally in the precise location (though measurements may vary slightly on the ground).

The works tables for Tralee-Michelago, Nimmitabel-Old Bombala Rd, and Jincumbilly-Bombala sections have also been prepared as excel spreadsheets – PDFs of these are included in Appendix 6 (please note that amounts differ slightly between the totals in the works tables and the excel spreadsheets due to rounding discrepancies).

The works tables also show mobile phone coverage at randomly selected locations in order to give an indication of mobile phone coverage. This is discussed in more detail in Section 7.

4.5 QUEANBEYAN TO TRALEE: ROUTE OVERVIEW

(Refer Plan 1 in Appendix 10)

The brief did not request a specific trail development plan element covering the section from Queanbeyan to Tralee due to the current investigations focussing on developing Tralee as an inter-modal site and the possibility of using the rail corridor from Tralee to Queanbeyan for dedicated freight services. The brief requested the evaluation of the potential connections and routes from the trail head at Tralee into the Queanbeyan town centre, whether by utilising existing cycling linkages or the construction of new linkages.

Two alternative routes were investigated and included within this report. The routes are shown on Plan 1 in Appendix 10. During fieldwork, time was spent looking at other options to get from Queanbeyan to Tralee. The alternative option looked at closely involved using the existing path network within the urban section of Queanbeyan (utilising north-south roads such as Donald Road and east-west roads such as Southbar Road and parks such as Bicentennial Park) to get to Mt Jerrabomberra Nature Reserve, utilise the existing tracks within this reserve, then travelling to Edwin Land Parkway and using the network. However, the network required to do this had two significant disadvantages:

- It would involve a very convoluted route with minimum legibility - traversing a range of quiet urban streets particularly south of the Nature Reserve; and
- Cycling through the Nature Reserve offered significant “up and down” riding on tracks designed for mountain biking – not something which users on a rail trail might expect.

Option 1: Utilising the existing road and path infrastructure on the Queanbeyan River Walk, Edwin Land Parkway and South Jerrabomberra

This route utilises existing and proposed path/trail networks in the Queanbeyan, Jerrabomberra and South Jerrabomberra areas. Trailheads can be developed at Queanbeyan Railway Station and Queen Elizabeth Park in Queanbeyan CBD. Whilst the parking adjacent to Queen Elizabeth Park is both time and space limited, ample parking exists at Collett Carpark and the vacant block diagonally opposite Queen Elizabeth Park to accommodate trail users. Trail users may also choose to park at the railway station.

The existing Queanbeyan River Walk provides an attractive route for trail users. Queanbeyan Palerang Regional Council has advised that sections of the River Walk are being upgraded (where it does not meet shared use standard), and formalised where it is currently an informal path (e.g. between Dane Street and Hayes Street) as funds become available. No funding provision has been included within this Plan for these upgrades. However, QPRC may wish to consider funding upgrades through the rail trail project if it determines to proceed.

The trail would proceed along the river until it reaches Barracks Creek. Whilst route options have not been explored in detail, there appears to be an option to use Kenny Place, River Drive and Fairlane Flora and Fauna Reserve (or adjacent green space) to reach Barracks Flat Neighbourhood Park where path infrastructure has been built linking to Ellerton Drive and Cooma Street. This route has been recommended as other routes in this vicinity (despite having shared use paths in place) require users to climb steep grades from the Queanbeyan River to Ellerton Drive and are consequently inappropriate as a rail trail “substitute” given one of a rail trail’s significant appeals is its gentle gradient.

Users would then utilise existing off-road paths along the southern and northern sides of Edwin Land Parkway before turning south onto Environa Drive and using existing path and bike lane infrastructure to access the South Jerrabomberra Town Park – the proposed Tralee trailhead.

This route would be a distance of some 13.5 kms from the railway station and 11.7 kms from Queen Elizabeth Park. Principal works items required would be:

- Trailhead map panels at Queanbeyan Railway Station and Queen Elizabeth Park ($11,000);
- Trailhead signs (double-sided brown chevron) at major decision points on the adjoining road network (allow 3 at a total cost of $4,800);
- Trail directional markers at every kilometre and at key decision points (21 in all at a total cost of $21,000); and
- New concrete path through Fairlane Flora and Fauna Reserve (400m at $240/metre for a total cost of $96,000). A concrete surface ensures consistency with surrounding infrastructure. As noted above, upgrades to the existing Queanbeyan River Walk are not covered by this project’s costings.

Option 2: Utilising the existing road and path infrastructure parallel to the railway line in Queanbeyan and along Canberra Avenue and traveling along Woods Lane to connect to Lanyon Drive and Tompsitt Drive.

This route runs parallel to the existing railway corridor utilising existing path/trail networks parallel to the railway line between Queanbeyan Railway Station and Uriarra Road. It crosses over on the dedicated pedestrian bridge and connects to the shared path along Canberra Avenue. Users would then cross Canberra Avenue opposite HMAS Harman and head south on Woods Lane – a formed gravel road. Opposite the Queanbeyan Racecourse (on the ACT side of the railway line), there is currently a locked gate preventing vehicular access to Jerrabomberra East Grasslands Nature Reserve. Woods Lane is still a constructed road on the southern side of the gate. Users would then proceed along the constructed gravel road for 950 metres. At this point (GPS location S 35^{o} 23.234’ E 149^{o} 11.375), users would head under the railway corridor (utilising an existing underpass) and enter the Queanbeyan Nature Reserve. It is proposed to construct a new trail immediately adjacent to the railway corridor which would travel south before exiting the reserve adjacent to the constructed footpath close to the intersection of Lanyon Drive and Tompsitt Drive. Users would utilise existing off-road paths along Tompsitt Drive before turning south onto Environa Drive (and merging with Option 1) and using existing path and bike lane infrastructure to access the South Jerrabomberra Town Park – the proposed Tralee trailhead.

This route would be a distance of some 11.5 kms from the railway station and 13.3 kms from Queen Elizabeth Park to the Tralee trailhead. Principal works items required (to develop the trail from the railway station to where it joins Option 1 at Environa Drive) would be:

- Trailhead map panels would be required at Queanbeyan Station and Queen Elizabeth Park (costing for these is covered under Option 1);
- Trailhead signs (double-sided brown chevron) at major decision points on the adjoining road network (allow 3 at a total cost of $4,800);
- Trail directional markers at every kilometre and at key decision points (17 in all at a total cost of $17,000); and
- New trail through Queanbeyan Nature Reserve (1,000m at $90/metre for a total cost of $90,000). Given the two different surfaces on this route (concrete on the urban path network and gravel road on Woods Lane), a high quality natural surface would suffice. However, any decision on surfacing will depend on negotiations with NSW NPWS to construct the trail in the Queanbeyan Nature Reserve. The cost allows for new trail construction and includes a 20% allowance for unstable surface work. A rail formation has a level of soil stability. Breaking new ground – as would be done if a trail was put through the reserve – brings a risk of less soil stability; this allowance covers any such issues with new ground.
- Drainage works and a sealed trail in the railway underpass at Woods Lane (allow $8,000).

There are issues with this route:

1. There are reportedly concerns from the naval base (HMAS Harman) about people travelling in close proximity to the naval base – as they would be on Woods Lane (or indeed on the rail corridor itself should this become available).
2. Traversing the Jerrabomberra East Grasslands Nature Reserve will require consultation and probable approval from the ACT Government. The ACT Government representative has advised that the existing access track south of the locked gate i.e. Woods Lane is not a road reserve but rather is an access track for the reserve. Access may not be guaranteed in the same way as if it was a road reserve.
3. Constructing a new trail through the Queanbeyan Nature Reserve will require consultation and probable approval from the NSW National Parks and Wildlife Service. The intention is for the track to be constructed as close to the railway corridor as possible thus minimising disturbances to the grasslands.

4. Travelling along a gravel road (Woods Lane) is not ideal – particularly as the access from Queanbeyan station, the access to Tralee trailhead and the rail trail to Michelago will offer a sealed surface. It is important – if the trail proceeds along this route – that users are aware of the differences in surface.

However, this route represents the closest route to the original railway corridor and the shortest distance from Queanbeyan to the trailhead at Tralee (in the absence of the railway corridor).

As noted above, the railway corridor between the western end of the Queanbeyan Railway station (where the disused railway line leaves the active railway line to Canberra) and Tralee cannot be currently used. However, should it become available for use as part of the rail trail, it presents a number of advantages compared with the other two options discussed above. These are:

- It would remove Issues 2, 3 and 4 associated with Option 2 above (issues with grasslands and varying trail surfaces);
- It represents the shortest distance between Queanbeyan CBD and Tralee;
- It maximises the ”railway experience” for rail trail users – a critical element;
- It would likely lead to more users starting the rail trail within Queanbeyan (either from the CBD or the railway station) with flow-on economic and other benefits; and
- It would provide easy safe off-road access to the new regional sportsgrounds at South Jerrabomberra

This option has not been investigated in any detail as part of this study. There has been no detailed investigation of this corridor section to enable the listing of specific works items. There are three bridges that would need to be dealt with – two small bridges north of Lanyon Drive (a 3m bridge and a 2 m bridge) and a 32m bridge over Jerrabomberra Creek. The road crossing at Arnott Place was originally an overbridge but this has been demolished and an at-grade crossing could be developed (similar to what has been proposed for Ryrie Street in Michelago – see Appendix 2). Other than those works items, the corridor appears to present relatively simple construction processes.

4.6 WORKS TABLES: TRALEE TO MICHELAGO

Table 2: Tralee (South Jerrabomberra Town Park) to Royalla siding/trailhead (16,320 metres)

(Refer Plan 2 in Appendix 10)

Ref #	GPS Reference	Works Item	$
1		Construct new sealed trail between Tralee (South Jerrabomberra Town Park) and Royalla siding (16,320m). Construction includes stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing.	1,632,000
2		Moderate Clearing required. Tralee (South Jerrabomberra Town Park) to WI 10 (1,175m).	7,990
3	S 35° 24.100' E 149° 09.781'	Trailhead: Tralee (South Jerrabomberra Town Park). Prepare and install trailhead map panel ($5,500). Install trail directional markers (x3) ($3,000). Install trailhead signs (double-sided brown chevron) at major decision points on the adjoining road network (x3) ($4,800). (Locations to be determined between QPRC and The Village Building Company).	13,300
4	S 35° 24.168' E 149° 09.706'	Retain/renovate/repaint distance peg (331 km).	200
5	S 35° 24.236' E 149° 09.643'	Retain/renovate/repaint railway sign ($200). Rectangular concrete culvert. Clean out and maintain ($500).	700
6	S 35° 24.299' E 149° 09.584'	Adjoining landholder (south east side) has requested new gating system across rail corridor. Difficult to precisely locate this until trail is being built and new trailhead at Tralee activated. Allowance included – precise location to be negotiated with landholder ($4,000). Adjoining landholder has expressed interest in grazing excess corridor. Build new fence on south east side 3.5 m from trail centreline to WI 43 (4,300 m). Fence to be on top of cuttings and at bottom of embankments (which may be more than 3.5 m from trail centreline) ($64,500).	68,500

7	S 35° 24.470' E 149° 09.414'	Existing timber underbridge with ballast top. Replace with culvert (3m x 3m x 3m)	15,000
8	S 35° 24.507' E 149° 09.376'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 9 (165 m).	3,300
9	S 35° 24.530' E 149° 09.325'	South western end of shallow cutting. End – clear side drains.	0
10	S 35° 24.572' E 149° 09.281'	End moderate clearing. Start minor clearing to WI 17 (975m).	2,925
11	S 35° 24.589' E 149° 09.250'	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 12 (405m) ($12,150). Build new fence on north east side WI 43 (3,530 m). Fence to be on top of cuttings and at bottom of embankments. Fencing designed to prevent horses entering onto trail from adjoining horse paddocks on ACT side of corridor ($52,950).	65,100
12	S 35° 24.713' E 149° 09.046'	South western end of deep cutting. End – raised trail.	0
13	S 35° 24.735' E 149° 09.009'	Retain/renovate/repaint railway sign ($200). Rectangular concrete culvert. Clean out and maintain ($500).	700
14	S 35° 24.749' E 149° 08.986'	Large Rectangular concrete culvert. Clean out and maintain.	700
15	S 35° 24.798' E 149° 08.909'	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 18 (500 m)	15,000
16	S 35° 24.871' E 149° 08.832'	Additional allowance for blackberry clearing (10 m)	100
17	S 35° 24.933' E 149° 08.788'	Retain/renovate/repaint distance peg (distance plate missing – likely 332 km) ($400). End Minor clearing. Start Moderate clearing to WI 18 (85m). ($580)	980
18	S 35° 24.975' E 149° 08.770'	End moderate clearing.	29,765

		Start minor clearing to WI 133 (9,355 m). ($28,065) Southern end of deep cutting. End – raised trail. Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) for 85m (to WI 19) ($1,700).	
19	S 35° 25.004' E 149° 08.759'	Southern end of shallow cutting. End – clear side drains. Existing bridge (3m) with steel I-beam. Remove existing decking and re-deck. Retain brick abutments (assumption is that bridge structure is sound).	18,000
20	S 35° 25.027' E 149° 08.752'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 22 (490 m)	14,700
21	S 35° 25.194' E 149° 08.721'	Retain/renovate/repaint railway sign.	200
22	S 35° 25.284' E 149° 08.704'	Southern end of deep cutting. End – raised trail.	0
23	S 35° 25.290' E 149° 08.702'	Rectangular concrete culvert. Clean out and maintain.	500
24	S 35° 25.296' E 149° 08.703'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 26 (175m).	3,500
25	S 35° 25.344' E 149° 08.694'	Retain/renovate/repaint railway sign (x2).	400
26	S 35° 25.379' E 149° 08.686'	Southern end of shallow cutting. End – clear side drains. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 27 (240 m).	7,200
27	S 35° 25.475' E 149° 08.648'	Southern end of deep cutting. End – raised trail.	0
28	S 35° 25.475' E 149° 08.648'	Side trail to Gilmore. *Note: works listed below – with the exception of gate and grid and "horses prohibited sign" – are within the ACT and will require separate approvals and may be funded separately.*	53,000

		Construct 300m sealed trail connecting rail trail to underpass on existing informal dirt track ($36,000 – priced to allow a contingency for trail construction on new ground rather than rail formation). Steep climb at connecting point. Clear, stabilise and widen (30 m) ($3,000). Existing footpath (160 m) from underpass to Henry Melville Crescent (may be appropriate to widen to shared use standard but not costed). Prepare and install trailhead map panel adjacent to Henry Melville Crescent and near existing footpath ($5,500). Install 5 trail directional markers (confirmational): North western side of underpass; south eastern side of underpass; any cross track intersections (x2); on rail trail at top of steep climb ($5,000). At junction of side trail and rail trail, install bicycle safe stock grid and pedestrian gate on north western side of rail trail ($3,000). Install sign prohibiting horses ($500).	
29	S 35° 25.499' E 149° 08.630'	Rectangular concrete culvert. Clean out and maintain.	500
30	S 35° 25.535' E 149° 08.589'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 31 (100 m).	3,000
31	S 35° 25.568' E 149° 08.539'	Southern end of deep cutting. End – raised trail.	0
32	S 35° 25.577' E 149° 08.526'	Rectangular concrete culvert (2 openings). Clean out and maintain.	700
33	S 35° 25.619' E 149° 08.462'	Rectangular concrete culvert. Clean out and maintain.	500
34	S 35° 25.642' E 149° 08.417'	Retain/renovate/repaint railway sign (x2).	400
35	S 35° 25.683' E 149° 08.354'	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 36 (180 m).	5,400

36	S 35° 25.769' E 149° 08.309'	Southern end of deep cutting. End – raised trail.	0
37	S 35° 25.782' E 149° 08.310'	Rectangular concrete culvert. Clean out and maintain.	500
38	S 35° 25.788' E 149° 08.310'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 39 (95 m).	2,850
39	S 35° 25.832' E 149° 08.325'	Southern end of deep cutting. End – raised trail.	0
40	S 35° 25.857' E 149° 08.331'	Install seat to take advantage of views (GPS point is off-trail on suggested precise location of seat)	3,000
41	S 35° 25.900' E 149° 08.345'	Rectangular concrete culvert. Clean out and maintain.	500
42	S 35° 25.906' E 149° 08.349'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 43 (500 m).	15,000
43	S 35° 26.023' E 149° 08.569'	Southern end of deep cutting. End – raised trail. Existing interpretive sign (by ACT Government) End new fencing both sides of corridor. Install new gate in new fence on northern side to allow for landholder exit (existing gate in existing boundary fence).	1,000
44	S 35° 26.019' E 149° 08.577'	Retain/renovate/repaint railway sign.	200
45	S 35° 26.019' E 149° 08.577'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
46	S 35° 26.015' E 149° 08.585'	Retain and renovate existing railway switch.	500
47	S 35° 25.982' E 149° 08.650'	Old Tuggeranong siding. Double track runs for 150 metres – retain. Manufacture and install siding sign (new one needed) ($3,000). Install interpretive sign ($3,000)	6,000

48	S 35° 25.968’ E 149° 08.696’	Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 49 (60 m).	1,800
49	S 35° 25.967’ E 149° 08.736’	Eastern end of deep cutting. End – raised trail. Install pipe and fill (3m x 2.5m x 1m deep)	1,500
50	S 35° 25.967’ E 149° 08.737’	Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 52 (65 m)	1,950
51	S 35° 25.975’ E 149° 08.776’	Retain/renovate/repaint railway sign (x2).	400
52	S 35° 25.980’ E 149° 08.789’	Eastern end of deep cutting. End – raised trail.	0
53	S 35° 25.993’ E 149° 08.853’	Rectangular concrete culvert. Clean out and maintain.	500
54	S 35° 25.993’ E 149° 08.860’	Retain/renovate/repaint distance peg (336 km). 3 large pines in close proximity to railway formation. Preserve if possible during construction.	200
55	S 35° 25.998’ E 149° 08.890’	Western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 57 (155m).	3,100
56	S 35° 26.002’ E 149° 08.977’	Install seat to take advantage of views. Seat to be installed to take advantage of views on top of the low cutting looking west and south west.	3,000
57	S 35° 25.998’ E 149° 08.990’	Eastern end of shallow cutting. End – clear side drains. Install pipe and fill (3m x 2.5m x 1m deep)	1,500
58	S 35° 25.998’ E 149° 08.992’	Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 59 (115 m).	3,450
59	S 35° 25.992’ E 149° 09.069’	Eastern end of deep cutting. End – raised trail	0
60	S 35° 26.003’ E 149° 09.185’	Rectangular concrete culvert (major). Clean out and maintain *(large diameter).*	1,000

61	S 35° 26.087' E 149° 09.299'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 62 (170 m).	5,100
62	S 35° 26.172' E 149° 09.321'	Southern end of deep cutting. End – raised trail.	0
63	S 35° 26.228' E 149° 09.306'	Retain/renovate/repaint distance peg (337 km).	200
64	S 35° 26.245' E 149° 09.296'	Rectangular concrete culvert. Clean out and maintain.	500
65	S 35° 26.327' E 149° 09.221'	Rectangular concrete culvert. Clean out and maintain.	500
66	S 35° 26.367' E 149° 09.196'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 68 (245 m)	7,350
67	S 35° 26.469' E 149° 09.193'	Retain/renovate/repaint railway sign.	200
68	S 35° 26.491' E 149° 09.197'	Southern end of deep cutting. End – raised trail. Retain/renovate/repaint railway sign (x2).	400
69	S 35° 26.558' E 149° 09.196'	Rectangular concrete culvert (major) – Monks Gully. Clean out and maintain.	1,000
70	S 35° 26.638' E 149° 09.113'	Rectangular concrete culvert (major). Clean out and maintain.	1,000
71	S 35° 26.649' E 149° 09.066'	Eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 73 (195 m).	5,850
72	S 35° 26.651' E 149° 09.026'	Retain/renovate/repaint distance peg (distance plate missing – likely 338 km).	400
73	S 35° 26.645' E 149° 08.936'	Western end of deep cutting. End – raised trail. Eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI T74 (55m).	1,100
74	S 35° 26.649' E 149° 08.905'	Western end of shallow cutting. End – clear side drains.	0

75	S 35º 26.651' E 149º 08.897'	Rectangular concrete culvert. Clean out and maintain.	500
76	S 35º 26.662' E 149º 08.871'	Install seat to take advantage of views. Seat to be installed to east of GPS point under trees to take advantage of views primarily to the south west.	3,000
77	S 35º 26.678' E 149º 08.845'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
78	S 35º 26.687' E 149º 08.828'	Shallow cutting. Clear east side drain only (40m).	400
79	S 35º 26.708' E 149º 08.795'	Rectangular concrete culvert. Clean out and maintain.	500
80	S 35º 26.710' E 149º 08.790'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 81 (100m).	2,000
81	S 35º 26.741' E 149º 08.741'	South western end of shallow cutting. End – clear side drains. Retain/renovate/repaint railway sign.	200
82	S 35º 26.651' E 149º 08.897'	Rectangular concrete culvert. Clean out and maintain.	500
83	S 35º 26.786' E 149º 08.668'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 85 (175m).	3,500
84	S 35º 26.819' E 149º 08.627'	Construct rock battering (20m) in cutting to address landslip/erosion issue.	6,000
85	S 35º 26.873' E 149º 08.600'	Southern end of shallow cutting. End – clear side drains. Install pipe and fill (3m x 2.5m x 1m).	1,500
86	S 35º 26.875' E 149º 08.600'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 88 (125m).	2,500
87	S 35º 26.934' E 149º 08.603'	Southern end of shallow cutting. End – clear side drains.	0
88	S 35º 26.967' E 149º 08.612'	Retain/renovate/repaint distance peg (339 km).	200
89	S 35º 26.977' E 149º 08.612'	Rectangular concrete culvert. Clean out and maintain.	500

90	S 35° 27.009’ E 149° 08.607’	Rectangular concrete culvert. Clean out and maintain.	500
91	S 35° 27.022’ E 149° 08.601’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 92 (205m).	6,150
92	S 35° 27.097’ E 149° 08.516’	Western end of deep cutting. End – raised trail.	0
93	S 35° 27.101’ E 149° 08.496’	Rocky Gully. Rectangular concrete culvert. Check and maintain (water flowing regularly through – no need for initial clean out at January 2022).	100
94	S 35° 27.103’ E 149° 08.441’	Rectangular concrete culvert. Clean out and maintain ($500). Retain/renovate/repaint railway sign (x2) ($400)	900
95	S 35° 27.104’ E 149° 08.419’	Eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 97 (215m).	6,450
96	S 35° 27.106’ E 149° 08.363’	Retain/renovate/repaint railway sign.	200
97	S 35° 27.109’ E 149° 08.283’	Western end of deep cutting. End – raised trail.	0
98	S 35° 27.119’ E 149° 08.253’	Rectangular concrete culvert. Clean out and maintain.	500
99	S 35° 27.130’ E 149° 08.222’	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 100 (95m).	1,900
100	S 35° 27.164’ E 149° 08.173’	South western end of shallow cutting. End – clear side drains.	0
101	S 35° 27.217’ E 149° 08.136’	Rectangular concrete culvert. Clean out and maintain.	500
102	S 35° 27.237’ E 149° 08.130’	Retain/renovate/repaint distance peg (340 km).	200
103	S 35° 27.283’ E 149° 08.127’	Rectangular concrete culvert. Clean out and maintain.	500

104	S 35º 27.307’ E 149º 08.132’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 107 (175m).	5,250
105	S 35º 27.315’ E 149º 08.134’	Retain/renovate/repaint railway sign.	200
106	S 35º 27.351’ E 149º 08.152’	Retain/renovate/repaint railway sign.	200
107	S 35º 27.397’ E 149º 08.173’	Southern end of deep cutting. End – raised trail.	0
108	S 35º 27.421’ E 149º 08.177’	Rectangular concrete culvert. Clean out and maintain.	500
109	S 35º 27.443’ E 149º 08.182’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 111 (350m).	10,500
110	S 35º 27.497’ E 149º 08.180’	Retain/renovate/repaint railway sign.	200
111	S 35º 27.635’ E 149º 08.185’	Southern end of deep cutting. End – raised trail.	0
112	S 35º 27.664’ E 149º 08.198’	Rectangular concrete culvert. Clean out and maintain.	500
113	S 35º 27.702’ E 149º 08.223’	Construct comfort stop. Include picnic table, bike stand (for parking), sign on trail, interpretive signage.	13,000
114	S 35º 27.724’ E 149º 08.249’	Rectangular concrete culvert. Clean out and maintain.	500
115	S 35º 27.749’ E 149º 08.267’	Retain/renovate/repaint railway sign.	200
116	S 35º 27.755’ E 149º 08.272’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) (to WI 118 (130m) ($3,900). Install “Caution: Falling Rocks” sign ($500). Additional allowance for blackberry clearing (20m - $200)	4,600

117	S 35° 27.820’ E 149° 08.296	Install interpretive sign – railway cutting information.	3,000
118	S 35° 27.848’ E 149° 08.297’	Southern end of deep cutting. End – raised trail. Install “Caution: Falling Rocks” sign	500
119	S 35° 27.855’ E 149° 08.297’	Retain/renovate/repaint railway sign.	200
120	S 35° 27.882’ E 149° 08.296’	Rectangular concrete culvert. Clean out and maintain.	500
121	S 35° 27.924’ E 149° 08.299’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 122 (140 m).	4,200
122	S 35° 27.998’ E 149° 08.306’	Southern end of deep cutting. End – raised trail.	0
123	S 35° 28.014’ E 149° 08.308’	Retain/renovate/repaint railway sign.	200
124	S 35° 28.057’ E 149° 08.321’	Rectangular concrete culvert. Clean out and maintain.	500
125	S 35° 28.138’ E 149° 08.361’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 126 (240 m).	7,200
126	S 35° 28.243’ E 149° 08.452’	Southern end of deep cutting. End – raised trail. Install pipe and fill (5m x 3m x 1m)	1,500
127	S 35° 28.246’ E 149° 08.454’	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 129 (100 m).	3,000
128	S 35° 28.248’ E 149° 08.457’	Retain/renovate/repaint distance peg (distance plate missing – likely 342 km).	400
129	S 35° 28.287’ E 149° 08.495’	South eastern end of deep cutting. End – raised trail.	0
130	S 35° 28.290’ E 149° 08.499’	Rock culvert. Clean out and maintain.	600

131	S 35° 28.298' E 149° 08.507'	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 132 (300 m).	9,000
132	S 35° 28.431' E 149° 08.621'	Southern end of deep cutting. End – raised trail	0
133	S 35° 28.431' E 149° 08.621'	North western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 134 (135 m) ($2,700). Finish minor clearing. Start slashing to WI 144 (1,860 m) ($2,790). *Mobile phone coverage 4 bars*	5,490
134	S 35° 28.496' E 149° 08.664'	South eastern end of shallow cutting. End – clear side drains.	0
135	S 35° 28.519' E 149° 08.677'	Retain/renovate/repaint railway sign.	200
136	S 35° 28.593' E 149° 08.714'	Driveway crossing: Install Give Way sign on both sides of trail.	1,000
137	S 35° 28.658' E 149° 08.742'	Rectangular concrete culvert. Clean out and maintain.	500
138	S 35° 28.682' E 149° 08.752'	North western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 139 (95 m).	1,900
139	S 35° 28.725' E 149° 08.772'	South eastern end of shallow cutting. End – clear side drains. Retain/renovate/repaint distance peg (343 km).	200
140	S 35° 28.978' E 149° 08.878'	Retain/renovate/repaint railway sign.	200
141	S 35° 29.046' E 149° 08.911'	North western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 142 (95 m).	1,900
142	S 35° 29.096' E 149° 08.930'	South eastern end of shallow cutting. End – clear side drains.	0
143	S 35° 29.175' E 149° 08.959'	Driveway crossing: Install Give Way sign on both sides of trail	1,000
144	S 35° 29.310' E 149° 09.021'	Start heavy clearing (blackberries and trees in formation) to WI 148 (790 m).	11,060

145	S 35° 29.310' E 149° 09.021'	Guises Creek bridge. Preferred option is to repair and re-deck and add handrails in accordance with report by Wood Research and Development (note that cost in Column 4 includes a 15% contingency allowance).	396,750
146	S 35° 29.488' E 149° 09.094'	Retain/renovate/repaint railway sign.	200
147	S 35° 29.553' E 149° 09.108'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 150 (560 m).	16,800
148	S 35° 29.733' E 149° 09.109'	End heavy clearing. Start minor clearing to WI 180 (2,080 m)	6,240
149	S 35° 29.759' E 149° 09.109'	Retain/renovate/repaint distance peg (distance plate missing – likely 344 km).	400
150	S 35° 29.846' E 149° 09.109'	Southern end of deep cutting. End – raised trail.	0
151	S 35° 29.851' E 149° 09.109'	Rectangular concrete culvert. Clean out and maintain.	500
152	S 35° 29.914' E 149° 09.10'	Rectangular concrete culvert. Clean out and maintain.	500
153	S 35° 29.988' E 149° 09.104'	Road crossing – Old Cooma Road. (See road crossing drawing - Appendix 2). • Install "Road Ahead" sign on trail on both sides of road ($1,000). • Install "Stop" signs on trail on both sides of road ($1,000). • Install "Trail Crossing" signs on both sides of Road ($1,200). • Install bicycle safe stock grid and pedestrian gate on northern side of road ($3,000). • Install trail user chicane and management access gate on southern side of Old Cooma road ($4,000). • Install fill on trail on northern side of road and batter to enable installation of gating system ($900). • Install new fences parallel to road on both sides of crossing (allow 60m total) ($900).	12,000

154	S 35° 30.009’ E 149° 09.103’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 156 (155 m).	3,100
155	S 35° 30.030’ E 149° 09.103’	Retain/renovate/repaint railway sign.	200
156	S 35° 30.093 E 149° 09.101’	Southern end of shallow cutting. End – clear side drains.	0
157	S 35° 30.111’ E 149° 09.101’	Rectangular concrete culvert. Clean out and maintain.	500
158	S 35° 30.128’ E 149° 09.102’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 159 (205 m).	4,100
159	S 35° 30.238 E 149° 09.099’	Southern end of shallow cutting. End – clear side drains.	0
160	S 35° 30.239 E 149° 09.099’	Railway power/electrical box – very dilapidated. No value in renovation.	0
161	S 35° 30.248’ E 149° 09.098’	Rectangular concrete culvert. Clean out and maintain.	500
162	S 35° 30.286’ E 149° 09.099’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 164 (150 m).	4,500
163	S 35° 30.298’ E 149° 09.099’	Retain/renovate/repaint distance peg (distance plate missing – likely 346 km).	400
164	S 35° 30.366’ E 149° 09.096’	Southern end of deep cutting. End – raised trail.	0
165	S 35° 30.420’ E 149° 09.091’	Rectangular concrete culvert. Clean out and maintain. Clean out side drain off eastern embankment leading to culvert.	1,000
166	S 35° 30.508’ E 149° 09.078’	Trail to leave formation due to proximity of house on western boundary. New trail to be constructed on eastern edge of railway corridor to WI 172 (distance of 405m) ($48,600 – priced to allow a contingency for trail construction on new ground rather than rail formation). Leave existing railway track in place to WI 172. Develop screen planting (230m x 5m) on western side of rail corridor including along existing formation to WI 169 (230m) ($6,900).	63,325

		Allow for establishment and maintenance watering ($1,000). Erect new fencing on western side of new trail to WI 174 (455 m). Landholder requests 7 strand plain wire with bottom strand higher than normal to allow horses to graze by sticking heads underneath. ($6,825). Possible lease swap to be negotiated as landholder advises he presently has licence over eastern side of railway corridor in this location. New trail to be constructed on eastern side – licence swap to land on western side of corridor not needed for trail.	
167	S 35° 30.542' E 149° 09.070'	Retain intact railway signals (noting these artefacts will be off the trail as they are on western side of corridor)	0
168	S 35° 30.563' E 149° 09.071'	Existing single water pipe across drain line – to be retained under new trail. Trail needs to be built up (15 m) as ground is lower than surrounding proposed trail location.	1,000
169	S 35° 30.618' E 149° 09.044'	End screen planting at start of existing cutting (railway is in cutting south of this location; trail will be east of existing cutting). Fencing to be built on top of cutting through this section.	0
170	S 35° 30.665' E 149° 09.024'	Retain and renovate existing railway switch (noting this artefact will be off the trail as it is on western side of corridor)	500
171	S 35° 30.678' E 149° 09.018'	Drainage rehabilitation needed as part of new trail alignment	2,000
172	S 35° 30.711' E 149° 09.003'	End trail realignment. Trail to be constructed on formation going south.	0
173	S 35° 30.723' E 149° 08.997'	Rectangular concrete culvert. Clean out and maintain.	500
174	S 35° 30.739' E 149° 08.990'	Existing public right of way (according to asset register). End new fencing. Install trail user chicane and management access gate ($4,000). Retain one set of tracks (triple track in place to Royalla Estate Rd overbridge).	17,300

		Develop screen planting (410 m x 5m) on eastern side of rail corridor to WI 180 (410m) ($12,300). Work with existing trees planted on eastern side to complement screening. Allow for establishment and maintenance watering ($1,000).	
175	S 35º 30.742’ E 149º 08.985’	Old loading platform – northern end. Optional works item - Local men’s shed may be interested in restoring (allowance included)	10,000
176	S 35º 30.760’ E 149º 08.979’	Existing shed. Unclear if a railway asset.	0
177	S 35º 30.780’ E 149º 08.971’	Old loading platform – southern end. End existing triple railway track. Start double railway track.	0
178	S 35º 30.816’ E 149º 08.956’	Rectangular concrete culvert. Clean out and maintain.	500
179	S 35º 30.823’ E 149º 09.953’	Retain/renovate/repaint distance peg (347 km).	200
180	S 35º 30.883’ E 149º 08.903’	Trailhead: Royalla Station. (See Trailhead plan – Appendix 5). • Install trailhead sign (double-sided brown chevron) on Monaro Highway ($1,600). • Prepare and install trailhead map panel ($5,500). • Install 2 trail directional markers ($2,000) • Construct (clear, grade and gravel) gravel carpark 32 m x 5 m) ($4,000). • Construct connecting trail from carpark to rail trail ($1,800). • Install pipe culvert under connecting trail ($1,500) • Install 2 bollards ($260) • Install composting toilet ($80,000). End screen planting at southern side of trailhead (not shown on drawing)	96,660
		Allowance for additional landowner requests (e.g. fencing and vegetation screening).	15,000
		Allowance for surveying of property boundaries/fencing alignment as relevant ($3,000/km) (approximately 5 km surveying needed for new fencing and trail realignment;	51,000

		the remaining allowance should be used for surveying the balance 11.5kms where the existing boundary fence is to be retained)	
		Allowance for repairs of proportion (10%) of existing boundary fence where new fence is not being built (2,420m)	12,100
		Allowance for weed spraying before/during construction	5,000
		Allowance for preparation and installation of interpretive signage (in addition to those specifically identified above at locations to be determined by trail manager and local historians) (2 signs).	6,000
		Allowance for Trail Directional Markers (incorporating emergency markers) to be placed along trail every 1 km.	17,000
		Allowance for installation of trailside furniture (e.g. seats) in addition to those specifically identified above at locations to be determined by trail manager (1 seat).	3,000
		Allowance for leaving in place all historic telegraph poles (away from formation but within corridor)	1,000
		Allowance for steep embankment signs and delineators as determined by Project Manager at time of construction (allow 1,500 m).	52,500
		Allowance for marking trees to be cleared, pruned or left untouched.	3,200
		Allowance for marking centreline of trail with flagging tape prior to clearing and construction.	4,500
		Allowance for purchase and installation of: • Regulatory signage (Shared Path; “No Trail Bikes”; “Authorised Users Only”); • Road name signs; • Trail name signs; • “No Trespassing” signs; • Local attractions sign; and • Miscellaneous signs (Keep Out etc.).	3,600
		Allowance for traffic management (1 road crossing).	2,000

		Allowance for cable locators at road crossings (1 road crossing).	1,000
		Allowance for construction access – management access gates in fence alongside road and access track onto rail corridor (allow 1 access point in addition to existing road crossings).	2,200
		Sub-total	*2,984,885*
		Allowance for additional construction costs. The limited number of road crossings (Alderson Street and Old Cooma Road) and other access points (via Tuggeranong Pines and immediately off the Monaro Highway in the vicinity of the Royalla Solar Farm) means more time will be spent hauling material from stockpile sites created where the railway corridor crosses a publicly accessible road. One way to reduce this cost is negotiate access agreements with landholders who adjoin the corridor. Some may be willing to provide access (material can be stockpiled on the railway corridor). An allowance of 5% of construction costs has been included to allow for this additional time (this can be reduced if agreements can be reached with adjoining landholders).	149,245
		Approvals, permits, applications, designs, specifications, assessments (2.5%).	74,620
		Contingency amount (20%).	596,975
		Project management (5%).	149,245
		TOTAL (NOT INCLUDING GST)	***3,954,970***

Table 3: Royalla siding/trailhead to Williamsdale trailhead (6,469 metres)

(Refer Plan 3 in Appendix 10)

Ref #	GPS Reference	Works Item	$
1		Construct new sealed trail between Royalla trailhead and Williamsdale trailhead (6,469 m). Construction includes stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing.	646,900
2		Minor Clearing required. Royalla trailhead to Williamsdale trailhead (6,469 m).	19,410
3	S 35° 30.883’ E 149° 08.903’	Trailhead: Royalla Station. (detailed in Table 2 above).	0
4	S 35° 30.909’ E 149° 08.912’	Existing 7 span concrete drains on a concrete base (spans 4.2 m). Fill and place pipe within each gap (6 in all).	6,000
5	S 35° 30.936’ E 149° 08.901’	End existing double railway track. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI to WI 7 (90 m).	2,700
6	S 35° 30.945’ E 149° 08.896’	Retain and renovate existing railway switch.	500
7	S 35° 30.975’ E 149° 08.882’	Southern end of deep cutting. End – raised trail. Trail passes under Royalla Estate Road (overbridge).	0
8	S 35° 30.999 E 149° 08.873’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 12 (165 m).	4,950
9	S 35° 31.000’ E 149° 08.871’	Retain and renovate existing railway signal.	500
10	S 35° 31.046’ E 149° 08.850’	Retain and renovate existing railway post and box. *Mobile phone coverage 2 bars*	1,000
11	S 35° 30.076’ E 149° 08.837’	Retain/renovate/repaint railway sign.	200

12	S 35° 31.087' E 149° 08.833'	Southern end of deep cutting. End – raised trail.	0
13	S 35° 31.095' E 149° 08.829'	Install trail user chicane and management access gate ($4,000). Landholder with licence over this part of corridor has expressed interest in grazing excess corridor. Erect new ring lock fencing on east side 3.5 m from trail centreline to WI 18 (1,800 m). Fence to be on top of cuttings and at bottom of embankments (which may be more than 3.5 m from trail centreline) ($27,000).	31,000
14	S 35° 31.242' E 149° 08.761'	Existing 3 m timber bridge. Remove and replace with box culvert.	15,000
15	S 35° 31.259' E 149° 08.752'	Retain and renovate existing railway post and box.	1,000
16	S 35° 31.313' E 149° 08.728'	Existing 3 m timber bridge. Remove and replace with box culvert.	15,000
17	S 35° 31.444' E 149° 08.668'	Existing 10 m bridge (Guises Creek Inlet). Included in assessment by Wood Research and Development; recommendation is that costs of repairs too significant for the experience offered. Replacement with Landmark (or similar) prefabricated bridge a better option.	60,000
18	S 35° 31.690' E 149° 08.556'	Driveway crossing: Install Give Way sign on both sides of trail. End new fencing.	1,000
19	S 35° 31.739' E 149° 08.532'	Existing 3 m timber bridge with steel pipe under. Redeck and install handrails.	18,000
20	S 35° 31.830 E 149° 08.489'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 21 (500 m) ($15,000) Retain/renovate/repaint distance peg (349 km) ($200).	15,200
21	S 35° 32.056' E 149° 08.386'	Southern end of deep cutting. End – raised trail.	0
22	S 35° 32.061' E 149° 08.383'	Rectangular concrete culvert. Clean out and maintain.	500
23	S 35° 32.111' E 149° 08.360'	Rectangular concrete culvert. Clean out and maintain.	500

24	S 35º 31.119’ E 149º 08.357’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 25 (500 m).	15,000
25	S 35º 32.197’ E 149º 08.320’	Southern end of deep cutting. End – raised trail.	0
26	S 35º 32.214’ E 149º 08.312’	Rectangular concrete culvert. Clean out and maintain.	500
27	S 35º 32.218’ E 149º 08.311’	Rectangular concrete culvert. Clean out and maintain.	500
28	S 35º 32.231’ E 149º 08.305’	Rectangular concrete culvert. Clean out and maintain.	500
29	S 35º 32.284’ E 149º 08.280’	Rectangular concrete culvert. Clean out and maintain.	500
30	S 35º 32.321’ E 149º 08.263’	Rectangular concrete culvert. Clean out and maintain.	500
31	S 35º 32.342’ E 149º 08.255’	Retain/renovate/repaint distance peg (350 km).	200
32	S 35º 32.420’ E 149º 08.217’	Rectangular concrete culvert. Clean out and maintain.	500
33	S 35º 32.485’ E 149º 08.187’	Rectangular concrete culvert. Clean out and maintain.	500
34	S 35º 32.539’ E 149º 08.162’	Rectangular concrete culvert. Clean out and maintain.	500
35	S 35º 32.636’ E 149º 08.118’	Rectangular concrete culvert. Clean out and maintain.	500
36	S 35º 32.641’ E 149º 08.115’	Rectangular concrete culvert. Clean out and maintain.	500
37	S 35º 32.659’ E 149º 08.107’	Driveway crossing: Install Give Way sign on both sides of trail ($1,000) Landholder has requested new fence on eastern side though no interest expressed in grazing excess corridor. Negotiate at time of construction whether new fence is on the existing boundary or 3.5 m from trail centreline (recommended). Erect new ring lock fencing on east side 3.5 m from trail centreline to WI 48 (1,280 m) ($19,200).	20,200

38	S 35° 32.700’ E 149° 08.088’	Rectangular concrete culvert. Clean out and maintain.	500
39	S 35° 32.757’ E 149° 08.061’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 41 (220 m).	6,600
40	S 35° 32.847’ E 149° 08.022’	Retain/renovate/repaint distance peg (351 km).	200
41	S 35° 32.868’ E 149° 08.011’	Southern end of deep cutting. End – raised trail.	0
42	S 35° 32.878’ E 149° 08.006’	Rectangular concrete culvert with steel pipes in place. Clean out and maintain. (Note 2 culverts in this location).	1,200
43	S 35° 32.898’ E 149° 07.996’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 44 (160 m).	4,800
44	S 35° 32.981’ E 149° 07.960’	Southern end of deep cutting. End – raised trail.	0
45	S 35° 33.033’ E 149° 07.941’	Timber culvert. Replace with small box culvert.	6,000
46	S 35° 33.097’ E 149° 07.926’	Retain/renovate/repaint railway sign.	200
47	S 35° 33.250’ E 149° 07.909’	Large single steel pipe culvert. Clean out and maintain.	600
48	S 35 ° 33.322’ E 149 ° 07.912	End new boundary fence on eastern side.	0
49	S 35° 33.324’ E 149° 07.913’	Driveway crossing: Install Give Way sign on both sides of trail.	1,000
50	S 35° 33.376’ E 149° 07.922’	Retain/renovate/repaint distance peg (352 km).	200
51	S 35° 33.519’ E 149° 07.957’	Large single steel pipe culvert. Clean out and maintain.	600
52	S 35° 33.617’ E 149° 07.984’	Large single steel pipe culvert. Clean out and maintain.	600
53	S 35° 33.646’ E 149° 07.994’	Retain/renovate/repaint railway sign.	200

54	S 35° 33.660’ E 149° 07.996’	Large single steel pipe culvert. Clean out and maintain.	600
55	S 35° 33.725’ E 149° 08.014’	Trail to run behind (eastern) side of existing house. Significant stand of trees exists to provide screening at time of report preparation. No work needed.	0
56	S 35° 33.840’ E 149° 08.046’	Rectangular concrete culvert. Clean out and maintain.	500
57	S 35° 33.902’ E 149° 08.064’	Retain/renovate/repaint distance peg (353 km).	200
58	S 35° 33.910’ E 149° 08.066’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
59	S 35° 33.958’ E 149° 08.085’	Driveway crossing: Install Give Way sign on both sides of trail.	1,000
60	S 35° 33.992’ E 149° 08.089’	Lobbs Hole Creek bridge. Preferred option is to repair and re-deck and add handrails in accordance with report by Wood Research and Development (note that cost in Column 4 includes a 15% contingency allowance).	192,625
61	S 35° 34.127’ E 149° 08.126’	Existing 6 m bridge. Wood Research and Development have assessed this bridge and provided a refurbishment cost of $140,875. It is recommended that this bridge not be refurbished but be replaced by a Landmark or similar prefabricated bridge.	36,000
62	S 35° 34.164’ E 149° 08.137’	Retain/renovate/repaint railway sign.	200
63	S 35° 34.184’ E 149° 08.144’	Road crossing – Williamsdale Road. (See road crossing drawing - Appendix 2). • Install “Road Ahead” sign on trail on both sides of road ($1,000). • Install “Give Way” signs on trail on both sides of road ($1,000). • Install “Trail Crossing” signs on both sides of Road ($1,200). • Install trail user chicane and management access gate on north side of road ($4,000). • Remove existing cattle stops and install pipe culverts under trail at junction with road (both sides) ($10,000).	17,200

64	S 35° 34.196’ E 149° 08.157’	Trailhead: Williamsdale siding. (See Trailhead plan – Appendix 5). *Please note this is an optional minor trailhead. It need not be built.* • Remove existing gate ($200). • Clear around culvert under existing driveway ($500). • Install trailhead sign (double-sided brown chevron) on Williamsdale Rd ($1,600). • Prepare and install trailhead map panel ($5,500). • Install bicycle parking rails ($2,000). • Install 1 trail directional marker facing carpark ($1,000) • Install picnic table ($8,000). • Construct (clear, grade and gravel carpark (25m x 20m) ($12,500). • Construct connecting trail from carpark to rail trail ($300). • Install bollards (1.4 m spacing) ($1,040).	32,640
		Allowance for additional landowner requests (e.g. fencing and vegetation screening).	5,000
		Allowance for for surveying of property boundaries/fencing alignment as relevant ($3,000/km) (approximately 3 km surveying needed for new fencing; the remaining allowance should be used for surveying the balance 3.5 kms where the existing boundary fence is to be retained).	21,000
		Allowance for repairs of proportion (10%) of existing boundary fence where new fence is not being built (1,000 m)	5,000
		Allowance for weed spraying before/during construction	2,000
		Allowance for preparation and installation of interpretive signage (at locations to be determined by trail manager and local historians) (2 signs).	6,000
		Allowance for Trail Directional Markers (incorporating emergency markers) to be placed along trail every 1 km.	7,000

		Allowance for installation of trailside furniture (e.g. seats) in addition to those specifically identified above at locations to be determined by trail manager (2 seats).	6,000
		Allowance for leaving in place all historic telegraph poles (away from formation but within corridor)	500
		Allowance for steep embankment signs and delineators as determined by Project Manager at time of construction (allow 0 m).	0
		Allowance for marking trees to be cleared, pruned or left untouched.	1,200
		Allowance for marking centreline of trail with flagging tape prior to clearing and construction.	1,800
		Allowance for purchase and installation of: • Regulatory signage (Shared Path; "No Trail Bikes"; "Authorised Users Only"); • Road name signs; • Trail name signs; • "No Trespassing" signs; • Local attractions sign; and • Miscellaneous signs (Keep Out etc.).	1,200
		Allowance for traffic management (1 road crossing).	2,000
		Allowance for cable locators at road crossings (1 road crossing).	1,000
		Allowance for construction access – management access gates in fence alongside road and access track onto rail corridor (allow 2 access points in addition to existing road crossings).	4,400
		Sub-total	*1,248,125*
		Allowance for additional construction costs. This section of corridor is easily accessible from nearby roads compared to other sections. No additional allowance is needed.	0
		Approvals, permits, applications, designs, specifications, assessments (2.5%).	31,205
		Contingency amount (20%).	249,625
		Project management (5%).	62,405
		TOTAL (NOT INCLUDING GST)	1,591,360

Table 4: Williamsdale to Michelago (16,545 metres)

(Refer Plan 4 in Appendix 10)

Ref #	GPS Reference	Works Item	$
1		Construct new sealed trail between Williamsdale trailhead and Michelago trailhead (16,545 m). Construction includes stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing.	1,654,500
2		Minor Clearing required. Williamsdale trailhead to WI 78 (10,115 m)	30,345
3	S 35° 34.196' E 149° 08.157'	Trailhead: Williamsdale. (detailed in Table 3 above).	0
4	S 35° 34.245' E 149° 08.159'	Existing trike shed. No work needed. Install trail user chicane and management access gate.	4,000
5	S 35° 34.263' E 149° 08.163'	Existing 12 m concrete bridge. Install handrails.	24,000
6	S 35° 34.429' E 149° 08.210'	Retain/renovate/repaint distance peg (354 km). *Mobile phone coverage 1 bars*	200
7	S 35° 34.484' E 149° 08.225'	Rectangular concrete culvert. Clean out and maintain.	500
8	S 35° 34.521' E 149° 08.235'	Rectangular concrete culvert. Clean out and maintain.	500
9	S 35° 34.653' E 149° 08.272'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
		QMRC/SMRC boundary between WI 9 and WI 10	0
10	S 35° 34.805' E 149° 08.314'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
11	S 35° 34.856' E 149° 08.328'	Driveway crossing: Install Give Way sign on both sides of trail.	1,000
12	S 35° 34.893' E 149° 08.338'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600

13	S 35° 34.954’ E 149° 08.355’	Rectangular concrete culvert. Clean out and maintain.	500
14	S 35° 34.956’ E 149° 08.356’	Retain/renovate/repaint distance peg (355 km). *Mobile phone coverage 2 bars*	200
15	S 35° 34.998’ E 149° 08.368’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
16	S 35° 35.056’ E 149° 08.384’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
17	S 35° 35.134’ E 149° 08.405’	Existing 3 m timber bridge (relatively high). Remove and replace with Landmark or similar pre-fabricated bridge.	18,000
18	S 35° 35.231’ E 149° 08.433’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 20 (635 m).	19,050
19	S 35° 35.477’ E 149° 08.528’	Retain/renovate/repaint distance peg (356 km). *Mobile phone coverage 1 bar*	200
20	S 35° 35.559’ E 149° 08.574’	Southern end of deep cutting. End – raised trail.	0
21	S 35° 35.707’ E 149° 08.655’	Deep Creek bridge. Preferred option is to repair and re-deck and add handrails in accordance with report by Wood Research and Development (note that cost in Column 4 includes a 15% contingency allowance).	414,000
22	S 35° 35.722’ E 149° 08.665’	Retain/renovate/repaint railway sign.	200
23	S 35° 35.763’ E 149° 08.692’	Existing water pipe under railway corridor. Reinstate when rail trail built. Notify landholder prior to construction to allow him to disable and take back from edge of formation.	0
24	S 35° 35.763’ E 149° 08.692’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 25 (320 m).	9,600
25	S 35° 35.936’ E 149° 08.785’	Southern end of deep cutting. End – raised trail.	0

26	S 35° 35.970’ E 149° 08.805’	Retain/renovate/repaint distance peg (357 km).	200
27	S 35° 36.008’ E 149° 08.826’	Rectangular concrete culvert. Clean out and maintain.	500
28	S 35° 36.143’ E 149° 08.901’	Waterhole Creek. 6m diameter rectangular concrete culvert. Clean out and maintain ($3,000). Landholder has requested new fence on eastern side though no interest expressed in grazing excess corridor. Negotiate at time of construction whether new fence is on the existing boundary or 3.5 m from trail centreline (recommended). Erect new ring lock fencing on east side 3.5 m from trail centreline to WI 33 (850 m) ($12,750).	15,750
29	S 35° 36.196’ E 149° 08.931’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 31 (545 m).	16,350
30	S 35° 36.220’ E 149° 08.944’	Retain/renovate/repaint railway sign.	200
31	S 35° 36.464’ E 149° 09.082’	Southern end of deep cutting. End – raised trail. Retain/renovate/repaint distance peg (358 km).	200
32	S 35° 36.473’ E 149° 09.087’	Rectangular concrete culvert. Clean out and maintain.	500
33	S 35° 36.569’ E 149° 09.143’	End new fencing. Road crossing – Kelly Road North. (See road crossing drawing - Appendix 2). • Install “Road Ahead” sign on trail on both sides of road ($1,000). • Install “Give Way” signs on trail on both sides of road ($1,000). • Install “Trail Crossing” signs on both sides of Road ($1,200). • install pipe culverts under trail at junction with road (both sides) ($10,000).	13,200

34	S 35° 36.593' E 149° 09.148'	Rectangular concrete culvert. Clean out and maintain.	500
35	S 35° 36.603' E 149° 09.151'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 36 (160 m).	3,200
36	S 35° 36.689' E 149° 09.162'	Southern end of shallow cutting. End – clear side drains.	0
37	S 35° 36.697 E 149° 09.162'	Rectangular concrete culvert. Clean out and maintain.	500
38	S 35° 36.714' E 149° 09.163'	Retain and renovate existing railway switch.	500
39	S 35° 36.796' E 149° 09.172'	Rectangular concrete culvert. Clean out and maintain.	500
40	S 35° 36.900' E 149° 09.212'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 41 (140 m).	2,800
41	S 35° 36.963' E 149° 09.255'	Southern end of shallow cutting. End – clear side drains. Retain/renovate/repaint distance peg (distance plate missing – likely 359 km).	400
42	S 35° 37.073' E 149° 09.364'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
43	S 35° 37.158' E 149° 09.455'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
44	S 35° 37.164' E 149° 09.463'	Retain/renovate/repaint railway sign.	200
45	S 35° 37.176' E 149° 09.474'	Rectangular concrete culvert. Clean out and maintain.	500
46	S 35° 37.216' E 149° 09.515'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
47	S 35° 37.357' E 149° 09.640'	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
48	S 35° 37.362' E 149° 09.645'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 49 (240 m).	4,800
49	S 35° 37.479' E 149° 09.719'	Southern end of shallow cutting. End – clear side drains.	0

50	S 35° 37.493’ E 149° 09.726’	Rectangular concrete culvert. Clean out and maintain.	500
51	S 35° 37.547’ E 149° 09.753’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
52	S 35° 37.568’ E 149° 09.760’	Driveway crossing: Install Give Way sign on both sides of trail. (an easement off Kelly Road – formed but not significant track/road)	1,000
53	S 35° 37.660’ E 149° 09.794’	Rectangular concrete culvert. Clean out and maintain.	500
54	S 35° 37.729’ E 149° 09.811’	Rectangular concrete culvert. Clean out and maintain.	500
55	S 35° 37.926’ E 149° 09.833’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
56	S 35° 38.025’ E 149° 09.835’	Rectangular concrete culvert. Clean out and maintain.	500
57	S 35° 38.065’ E 149° 09.837’	Rectangular concrete culvert. Clean out and maintain.	500
58	S 35° 38.160’ E 149° 09.839’	Rectangular concrete culvert. Clean out and maintain.	500
59	S 35° 38.165’ E 149° 09.840’	Retain/renovate/repaint railway sign.	200
60	S 35° 38.199’ E 149° 09.840’	Rectangular concrete culvert. Clean out and maintain.	500
61	S 35° 38.240’ E 149° 09.843’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
62	S 35° 38.288’ E 149° 09.843’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
63	S 35° 38.363’ E 149° 09.846’	Rectangular concrete culvert. Clean out and maintain.	500
64	S 35° 38.449’ E 149° 09.848’	Rectangular concrete culvert. Clean out and maintain.	500
65	S 35° 38.550’ E 149° 09.851’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600

66	S 35° 38.645’ E 149° 09.853’	Rectangular concrete culvert. Clean out and maintain ($500). Develop screen planting (225m x 5m) on western side of rail corridor to WI 69 (225m) ($6,750). Allow for establishment and maintenance watering ($1,000).	8,250
67	S 35° 38.714’ E 149° 09.854’	Retain/renovate/repaint distance peg (distance plate missing – likely 360 km).	400
68	S 35° 38.738’ E 149° 09.855’	Rectangular concrete culvert. Clean out and maintain.	500
69	S 35° 38.773’ E 149° 09.860’	End screen planting	0
70	S 35° 38.776’ E 149° 09.856’	Rectangular concrete culvert. Clean out and maintain.	500
71	S 35° 38.919’ E 149° 09.860’	Rectangular concrete culvert. Clean out and maintain.	500
72	S 35° 39.025’ E 149° 09.864’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
73	S 35° 39.253’ E 149° 09.868’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 77 (545 m).	16,350
74	S 35° 39.267’ E 149° 09.869’	Retain/renovate/repaint railway sign.	200
75	S 35° 39.286’ E 149° 09.870’	Kelly Rd overbridge	0
76	S 35° 39.362’ E 149° 09.869’	Remove cross fence	200
77	S 35° 39.478’ E 149° 09.868’	Southern end of deep cutting. End – raised trail.	0
78	S 35° 39.501’ E 149° 09.868’	End minor clearing Start moderate clearing to WI 80 (90m)	615
79	S 35° 39.510’ E 149° 09.868’	Rectangular concrete culvert. Clean out and maintain.	500
80	S 35° 39.540’ E 149° 09.866’	Existing 3m timber bridge with brick abutments and steel I-beam. Re-deck and install handrails ($18,000). End moderate clearing.	36,420

		Start minor clearing to WI 140 (6,140 m) ($18,420)	
81	S 35° 39.575’ E 149° 09.863’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 82 (170 m).	3,400
82	S 35° 39.666’ E 149° 09.863’	Southern end of shallow cutting. End – clear side drains.	0
83	S 35° 39.806’ E 149° 09.857’	Retain/renovate/repaint railway sign.	200
84	S 35° 39.830’ E 149° 09.856’	Rectangular concrete culvert. Clean out and maintain.	500
85	S 35° 39.904’ E 149° 09.854’	Rectangular concrete culvert. Clean out and maintain.	500
86	S 35° 39.988’ E 149° 09.850’	Existing timber bridge (3m). Replace with box culvert.	15,000
87	S 35° 40.020’ E 149° 09.851’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 91 (380 m).	11,400
88	S 35° 40.187’ E 149° 09.848’	Additional blackberry clearing (155m) to WI 92	1,550
89	S 35° 40.075’ E 149° 09.848’	Retain/renovate/repaint railway sign (x2) ($400). Retain/renovate/repaint distance peg (365 km) ($200).	600
90	S 35° 40.086’ E 149° 09.846’	Replace collapsed timber culvert with pipe and fill (3m x 3m x1.5m)	1,500
91	S 35° 40.223’ E 149° 09.858’	Southern end of deep cutting. End – raised trail.	0
92	S 35° 40.267’ E 149° 09.879’	End additional blackberry clearing	0
93	S 35° 40.282’ E 149° 09.890’	Rectangular concrete culvert. Clean out and maintain.	500
94	S 35° 40.328’ E 149° 09.931’	Retain/renovate/repaint railway sign.	200
95	S 35° 40.373’ E 149° 09.998’	Rectangular concrete culvert. Clean out and maintain.	500

96	S 35º 40.’392 E 149º 10.031’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 97 (145 m).	4,350
97	S 35º 40.444’ E 149º 10.107’	Southern end of deep cutting. End – raised trail. Install seat on top of cutting to take advantage of views ($3,000). Install interpretive panel ($3,000).	6,000
98	S 35º 40.448’ E 149º 10.111’	Rectangular concrete culvert. Clean out and maintain.	500
99	S 35º 40.453’ E 149º 09.115’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 100 (75 m).	1,500
100	S 35º 40.490’ E 149º 10.146’	Southern end of shallow cutting. End – clear side drains.	0
101	S 35º 40.496’ E 149º 10.148’	Rectangular concrete culvert. Clean out and maintain.	500
102	S 35º 40.516’ E 149º 10.161’	Retain/renovate/repaint distance peg (366 km).	200
103	S 35º 40.520’ E 149º 10.162’	Rectangular concrete culvert. Clean out and maintain.	500
104	S 35º 40.579’ E 149º 10.181’	Rectangular concrete culvert. Clean out and maintain.	500
105	S 35º 40.638’ E 149º 10.181’	Rectangular concrete culvert. Clean out and maintain.	500
106	S 35º 40.687’ E 149º 10.173’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 112 (400 m).	12,000
107	S 35º 40.725’ E 149º 10.167’	Construct rock battering (30m) in cutting (eastern side) to address landslip/erosion issue.	9,000
108	S 35º 40.771’ E 149º 10.159’	Existing overbridge (farm access). Retain. No work needed.	0
109	S 35º 40.781’ E 149º 10.156’	Retain/renovate/repaint railway sign.	200
110	S 35º 40.796’ E 149º 10.153’	Construct rock battering (20m) in cutting (eastern side) to address landslip/erosion issue.	6,000

111	S 35° 40.834’ E 149° 10.147’	Construct rock battering (10m) in cutting (eastern side) to address landslip/erosion issue.	3,000
112	S 35° 40.904’ E 149° 10.134’	Southern end of deep cutting. End – raised trail.	0
113	S 35° 41.028’ E 149° 10.133’	Rectangular concrete culvert. Clean out and maintain.	500
114	S 35° 41.051’ E 149° 10.138’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 115 (140 m) ($4,200). Retain/renovate/repaint distance peg (367 km) ($200).	4,400
115	S 35° 41.120’ E 149° 10.161’	Southern end of deep cutting. End – raised trail.	0
116	S 35° 41.122 E 149° 10.162’	Install pipe and fill (2m x 2.5m x 1m deep)	1,500
117	S 35° 41.125’ E 149° 10.163’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 118 (300 m).	9,000
118	S 35° 41.267’ E 149° 10.265’	Southern end of deep cutting. End – raised trail.	0
119	S 35° 41.282’ E 149° 10.278’	Rectangular concrete culvert. Clean out and maintain.	500
120	S 35° 41.291’ E 149° 10.284’	Retain/renovate/repaint railway sign.	200
121	S 35° 41.361’ E 149° 10.314’	Existing 8m timber bridge. Not assessed by Wood Research and Development. Recommendation is to retain and refurbish bridge due to its height offering good rail trail experience and difficulties of alternatives. Condition is assumed to be similar to other bridges tested. Allowance of $14,500/metre is provided (in keeping with approach to other bridges for refurbishment, the cost in Column 4 includes a 15% contingency allowance).	133,400
122	S 35° 41.476’ E 149° 10.310’	Rectangular concrete culvert. Clean out and maintain.	500

123	S 35° 41.551’ E 149° 10.280’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 124 (395 m). Retain/renovate/repaint distance peg (368 km) ($200).	11,850
124	S 35° 41.747’ E 149° 10.197’	South western end of deep cutting. End – raised trail.	0
125	S 35° 41.788’ E 149° 10.175’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
126	S 35° 41.806’ E 149° 10.170’	Retain/renovate/repaint railway sign.	200
127	S 35° 41.903’ E 149° 10.175’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
128	S 35° 42.037’ E 149° 10.074’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
129	S 35° 42.064’ E 149° 10.063’	Retain/renovate/repaint distance peg (369 km).	200
130	S 35° 42.119’ E 149° 10.040’	Existing bridge (1m) with concrete walls. Replace with box culvert.	6,000
131	S 35° 42.214’ E 149° 10.004’	Rectangular concrete culvert. Clean out and maintain ($500). Install trail user chicane and management access gate ($4,000).	4,500
132	S 35° 42.233’ E 149° 09.998’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 133 (125 m) ($3,750). Retain/renovate/repaint railway sign (large “Give Way” with ladder) ($400).	4,150
133	S 35° 42.296’ E 149° 09.983’	South western end of deep cutting. End – raised trail.	0
134	S 35° 42.299’ E 149° 09.983’	Rectangular concrete culvert with steel pipe in place. Clean out and maintain.	600
135	S 35° 42.306’ E 149° 09.982’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 137 (160 m) ($3,200).	8,700

		Develop screen planting (150 m x 5 m) on western side of rail corridor to WI 137 (150 m) ($4,500). Allow for establishment and maintenance watering ($1,000).	
136	S 35° 42.325' E 149° 09.979'	Retain/renovate/repaint railway sign.	200
137	S 35° 42.379' E 149° 09.975'	Southern end of shallow cutting. End – clear side drains. End screen planting.	0
138	S 35° 42.440' E 149° 09.973'	Rectangular concrete culvert. Clean out and maintain.	500
139	S 35° 42.479' E 149° 09.971'	Remove existing embankment and "ramp down" trail to road crossing on north side of road to WI 140 (165 m). Users to cross Ryrie Street at road level. Battering may be needed.	16,500
140	S 35° 42.568' E 149° 09.169'	Road crossing – Ryrie Street. (See road crossing drawing - Appendix 2). • Install "Road Ahead" sign on trail on north side of road ($500). • Install "Give Way" sign on trail on north side of road ($500). • Install "Trail Crossing" signs on both sides of Road ($1,200). • Install pipe culvert under new trail at junction with road (north side) ($5,000). • Trail to use existing constructed access gravel road on south side of crossing/east side of railway line to access rail trail south of existing embankment (south side of Ryrie Street) • Install trail directional markers (x3) on southern side of road ($3,000).	10,200
141	S 35° 42.669' E 149° 09.952'	Trailhead: Michelago station. (See Trailhead plan – Appendix 5). • Prepare and install trailhead map panel ($5,500). • Install bicycle parking rails ($3,000). • Replace 2 existing picnic tables with 2 new picnic tables ($16,000). • Construct (clear, grade and gravel) 3 carparking areas ($9,375).	88,515

		• Tidy up site – gravel between access road and station buildings. Remove old seat ($1,000). • Resurface driveway ($2,500). • Construct gravel connecting trail to rail trail on southern side of railway buildings ($2,100). • Construct connecting trail between carpark and gate between main buildings ($600) • Install 2 sets of bollards (1.4 m spacing) ($8,840). • Construct trail on eastern track and retain western track (adjacent to platform). • Install trailhead sign (double-sided brown chevron) on Ryrie Rd ($1,600) (not shown on drawing) • Minor repairs and painting to buildings especially station (allowance $10,000) • Renovation of toilets (2 female; 1 male) ($20,000) • Landscaping between station and carpark (allowance $5,000). • Repaint station name sign ($1,000). • Refurbish signal box (allowance $2,000)	
		Allowance for additional landowner requests (e.g. fencing and vegetation screening).	15,000
		Allowance for surveying of property boundaries/fencing alignment as relevant ($3,000/km) (approximately 0.85 km surveying needed for new fencing and trail realignment; the remaining allowance should be used for surveying the balance 16 kms where the existing boundary fence is to be retained).	51,000
		Allowance for repairs of proportion (10%) of existing boundary fence where new fence is not being built (3,220m)	16,100
		Allowance for weed spraying before/during construction	5,000
		Allowance for preparation and installation of interpretive signage (in addition to those specifically identified above at locations to be determined by trail manager and local historians) (4 signs).	12,000

		Allowance for Trail Directional Markers (incorporating emergency markers) to be placed along trail every 1 km.	17,000
		Allowance for installation of trailside furniture (e.g. seats) in addition to those specifically identified above at locations to be determined by trail manager (3 seats).	9,000
		Allowance for leaving in place all historic telegraph poles (away from formation but within corridor)	1,000
		Allowance for steep embankment signs and delineators as determined by Project Manager at time of construction (allow 1,500 m).	52,500
		Allowance for marking trees to be cleared, pruned or left untouched.	3,200
		Allowance for marking centreline of trail with flagging tape prior to clearing and construction.	4,500
		Allowance for purchase and installation of: • Regulatory signage (Shared Path; “No Trail Bikes”; “Authorised Users Only”); • Road name signs; • Trail name signs; • “No Trespassing” signs; • Local attractions sign; and • Miscellaneous signs (Keep Out etc.).	3,600
		Allowance for traffic management (2 road crossings).	4,000
		Allowance for cable locators at road crossings (2 road crossings).	2,000
		Allowance for construction access – management access gates in fence alongside road and access track onto rail corridor (allow 2 access points in addition to existing road crossings).	4,400
		Sub-total	*2,901,545*
		Allowance for additional construction costs. There are a significant number of multiple access driveways, road crossings and “trail alongside road” through this section to manage the construction process. Once the trail heads south of Kelly Rd south bridge, it becomes more	0

		remote for 7kms to Michelago. This is not likely to create significant additional time hauling material from stockpile sites created where the railway corridor crosses a publicly accessible road. No additional allowance is needed.	
		Approvals, permits, applications, designs, specifications, assessments (2.5%).	72,540
		Contingency amount (20%).	580,310
		Project management (5%).	145.080
		TOTAL (NOT INCLUDING GST)	***3,699,475***

Table 5: Total Costs: Tralee to Michelago (39,334 metres)

Section	Cost
Section 1: Tralee (South Jerrabomberra Town Park) to Royalla	***$ 3,954,970***
Section 2: Royalla to Williamsdale	***$ 1,591,360***
Section 3: Williamsdale to Michelago	***$ 3,699,475***
Total (excluding GST)	***$ 9,245,805***

4.7 WORKS TABLES: NIMMITABEL TO OLD BOMBALA ROAD

Table 6: Nimmitabel (Lake Williams) to Old Bombala Rd trailhead (10,298 metres)

(Refer Plan 5 in Appendix 10)

Ref #	GPS Reference	Works Item	$
1		Construct new sealed trail between Nimmitabel and Old Bombala Rd trailhead (10,298 m). Construction includes stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing.	1,029,800
2		Minor clearing required – Lake Williams trailhead to Old Bombala Rd (10,298 m).	30,895
3	S 36º 30.089' E 149º 16.924'	Trailhead: Nimmitabel (Lake Williams Park) (See Trailhead plan – Appendix 5). • Install trailhead sign (double-sided brown chevron) on Monaro Highway (above existing sign to Lake Williams Rest Area) ($1,600). • Prepare and install trailhead map panel ($5,500). • Install trail directional marker ($1,000). • Construct connecting trail (150m) from carpark to rail trail (in 2 sections) ($9,000).	17,100
4	S 36º 30.938' E 149º 16.828'	Connecting trail to Lake Williams. Existing water pipe – retain during and after construction. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 5 (100 m).	3,000
5	S 36º 30.990' E 149º 16.846'	Southern end of deep cutting. End – raised trail. Install pipe and fill (3m x 2.5m x 1m deep)	1,500
6	S 36º 31.034' E 149º 16.852'	Remove cross fence ($200) Tree clearing to WI 7 (150m) ($2,100)	2,300
7	S 36º 31.113' E 149º 16.864'	Road crossing – Springfield Road. (See road crossing drawing - Appendix 2). • Install "Road Ahead" sign on trail on both sides of road ($1,000).	12,000

		• Install "Give Way" signs on trail on both sides of road ($1,000). • Install "Trail Crossing" signs on both sides of road (on existing post where "Rough Surface" is signed ($800). • Install trail user chicane and management access gate on southern side of Springfield road ($4,000). • Remove existing cross fence ($200). • Install pipe culverts under trail at junction with road (south side) ($5,000).	
8	S 36° 31.118' E 149° 16.862'	Erect fencing along the corridor (western side) to WI 24 (1,385 m) ($20,775) Install boot and bike tyre cleaning station ($3,000).	23,775
9	S 36° 31.154' E 149° 16.871'	Rectangular concrete culvert. Clean out and maintain.	500
10	S 36° 31.170' E 149° 16.873'	Cattle stop: Remove and fill (no pipe needed as it on top of an embankment) 2m x 2.5m x 1m deep.	500
11	S 36° 30.938' E 149° 16.828'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 12 (105 m).	3,150
12	S 36° 30.990' E 149° 16.846'	Southern end of deep cutting. End – raised trail. Install pipe and fill (3m x 2.5m x 1m deep)	1,500
13	S 36° 31.412' E 149° 16.897'	Install 5m Landmark (or similar) pre-fabricated bridge.	30,000
14	S 36° 31.414' E 149° 16.892'	Retain/renovate/repaint railway sign.	200
15	S 36° 31.531' E 149° 16.881'	Rectangular concrete culvert. Clean out and maintain.	500
16	S 36° 31.565' E 149° 16.880'	Cattle stop. Replace with concrete culvert (1 m)	6,000
17	S 36° 31.567' E 149° 16.881'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 19 (155 m).	4,650
18	S 36° 31.614' E 149° 16.877'	Remove cross fence	200

19	S 36° 31.647’ E 149° 16.875’	Southern end of deep cutting. End – raised trail.	0
20	S 36° 31.675’ E 149° 16.875’	Rectangular concrete culvert. Clean out and maintain.	500
21	S 36° 31.744’ E 149° 16.855’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 23 (215 m).	6,450
22	S 36° 31.792’ E 149° 16.794’	Site of former overhead road bridge. Only post and abutment remains. May be old Monaro Highway. Install interpretive sign ($3,000).	3,000
23	S 36° 31.817’ E 149° 16.749’	South western end of deep cutting. End – raised trail. Install seat off trail on top of cutting with views over waterhole.	3,000
24	S 36° 31.820’ E 149° 16.743’	Remove cross fence ($200). End new fencing on western side. Install 4m Landmark (or similar) pre-fabricated bridge ($24,000). Install livestock grid (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gate to prevent stock wandering onto adjoining property (precise location to be determined – adjacent to property boundary) ($3,000).	27,200
25	S 36° 31.888’ E 149° 16.685’	Remove cross fence ($200). Erect fencing (both sides of trail) to create a 7 metre trail corridor to WI 104 (7,830 m). Fencing requirements requested by adjoining landholder are 7-line plain wire fence (2 barb) with stayed box end assemblies and corner assemblies, steel fence posts at 3m spacing ($234,900). Note: this works item takes the double fencing provision through two properties south of WI 25. The more southern of the two landholders is strongly opposed to the rail trail. He may not have an interest in grazing the excess corridor created by new side fencing south of	235,100

		Maclaughlin River bridge. If this is the case, new fencing need not be installed from Maclaughlin River bridge to Old Bombala Rd trailhead (a distance of approximately 2,510 m). Boundary fencing may need some repairs in this instance at a minor cost; the survey allowance for new fencing in this location should be applied to the existing boundary fencing if the landholder has no interest in grazing the excess corridor.	
26	S 36º 31.895’ E 149º 16.682’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 28 (415 m) ($12,450). Retain/renovate/repaint railway sign ($200). Additional drainage and earthworks needed in cutting (allowance $5,000).	17,650
27	S 36º 32.035’ E 149º 16.752’	Overhead road bridge – Old Bombala Road	0
28	S 36º 32.055’ E 149º 16.835’	Eastern end of deep cutting. End – raised trail. Existing cattle stop: Remove and replace with livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Grids also serves purpose to prevent stock wandering onto adjoining property. Adjoining landholder requested stock crossing points through this area. Similar system provided at WI 32 and 35. Negotiate precise location with landowner.	20,000
29	S 36º 32.046’ E 149º 16.895	Retain/renovate/repaint distance peg (distance plate missing – likely 477 km).	400

30	S 36° 32.038' E 149° 16.927'	Rectangular concrete culvert. Clean out and maintain. *Mobile phone coverage 3 bars*	500
31	S 36° 31.997' E 149° 17.052'	Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 32 (185m) ($5,550). Additional drainage and earthworks needed in cutting (allowance $2,000).	7,550
32	S 36° 31.979' E 149° 17.173'	Eastern end of deep cutting. End – raised trail. Existing cattle stop: Remove and replace with livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Adjoining landholder requested stock crossing points through this area. Similar system provided at WI 27 and 35. Negotiate precise location with landowner	20,000
33	S 36° 31.985' E 149° 17.199'	Retain/renovate/repaint railway sign.	200
34	S 36° 32.050' E 149° 17.289'	Rectangular concrete culvert. Clean out and maintain.	500
35	S 36° 32.103' E 149° 17.311'	Existing cattle stop: Remove and replace with livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and farm access gates in fence on either side of trail. Grids also serve purpose to prevent stock wandering onto adjoining property. Install appropriate warning signs about agricultural activity on both sides of crossing point.	20,000

		Adjoining landholder requested stock crossing points through this area. Similar system provided at WI 28 and 32. Negotiate precise location with landowner	
36	S 36° 32.116' E 149° 17.305'	Boundary between "Clydebank" and adjoining property is in this area. "Clydebank" runs to Maclaughlin River bridge (WI 74). "Clydebank" owner has requested a number of items. These are not geolocated in this table but location is to be negotiated at time of construction. • 4 livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. ($80,000). • 4 stock watering points (Tank, trough supplied by pressurized water line) ($20,000). • Access to riparian right to stock and domestic water. Explore options including tapping into town water and dedicated pump station and pipeline. Cannot be costed but need to be explored if other solutions don't provide access to water.	100,000
37	S 36° 32.116' E 149° 17.305'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 39 (275m) ($8,250). Additional drainage and earthworks needed in cutting (allowance $3,500).	11,750
38	S 36° 32.214' E 149° 17.281'	Retain/renovate/repaint distance peg (478 km). *Mobile phone coverage 2 bars*	200
39	S 36° 32.247' E 149° 17.262'	Southern end of deep cutting. End – raised trail.	0

40	S 36° 32.308’ E 149° 17.170’	Rectangular concrete culvert. Clean out and maintain.	500
41	S 36° 32.322’ E 149° 17.139’	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 42 (145 m)	2,900
42	S 36° 32.363’ E 149° 17.061’	South western end of shallow cutting. End – clear side drains.	0
43	S 36° 32.388’ E 149° 17.032’	Retain/renovate/repaint railway sign.	200
44	S 36° 32.453’ E 149° 16.997’	Rectangular concrete culvert. Clean out and maintain.	500
45	S 36° 32.468’ E 149° 16.989’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 46 (170m)	5,100
46	S 36° 32.558’ E 149° 16.954’	Southern end of deep cutting. End – raised trail.	0
47	S 36° 32.589’ E 149° 16.941’	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep.	1,500
48	S 36° 32.624’ E 149° 16.927’	Rectangular concrete culvert. Clean out and maintain.	500
49	S 36° 32.641’ E 149° 16.920’	Retain/renovate/repaint distance peg (479 km).	200
50	S 36° 32.682’ E 149° 16.907’	Collapsed timber abutment. Install pipe and fill (3m x 3m x 0.5m deep.)	1,500
51	S 36° 32.691’ E 149° 16.906’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 53 (150m)	4,500
52	S 36° 32.732’ E 149° 16.906’	Disused road bridge and built up ramp in cutting (Jenkins Rd). Install underpass.	50,000
53	S 36° 32.771’ E 149° 16.931’	South eastern end of deep cutting. End – raised trail.	0
54	S 36° 32.799’ E 149° 16.944’	Rectangular concrete culvert. Clean out and maintain.	500
55	S 36° 32.904’ E 149° 16.964’	Rectangular concrete culvert. Clean out and maintain ($500). Retain/renovate/repaint railway sign ($200).	700

56	S 36° 32.917' E 149° 16.964'	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1m deep ($1,500). Remove cross fence ($200).	1,700
57	S 36° 32.960' E 149° 16.970'	Rectangular concrete culvert. Clean out and maintain.	500
58	S 36° 33.152' E 149° 16.975'	Rectangular concrete culvert. Clean out and maintain.	500
59	S 36° 33.173' E 149° 16.962'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 61 (365m)	7,300
60	S 36° 33.298' E 149° 16.903'	Major break in cutting on eastern bank. Possible borrow pit. Overgrown with blackberries – clearing needed ($500). Additional drainage works may be needed ($2,000 allowance only).	2,500
61	S 36° 33.337' E 149° 16.913'	Southern end of shallow cutting. End – clear side drains.	0
62	S 36° 33.375' E 149° 16.922'	Rectangular concrete culvert. Clean out and maintain. *(480.381 stamped on culvert)*	500
63	S 36° 33.426' E 149° 16.934'	Retain/renovate/repaint railway sign.	200
64	S 36° 33.555' E 149° 17.048'	Rectangular concrete culvert. Clean out and maintain.	500
65	S 36° 33.565' E 149° 17.149'	Rectangular concrete culvert. Clean out and maintain.	500
66	S 36° 33.561' E 149° 17.173'	Retain/renovate/repaint distance peg (distance plate missing – likely 481 km) ($400). Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 67 (100m) ($3,000).	3,400
67	S 36° 33.540' E 149° 17.229'	North eastern end of deep cutting. End – raised trail.	0
68	S 36° 33.470' E 149° 17.303'	Existing (probable) town water valve. Leave in place and take care.	0
69	S 36° 33.433' E 149° 17.331'	Rectangular concrete culvert. Clean out and maintain.	500

70	S 36° 33.380' E 149° 17.380'	Rectangular concrete culvert. Clean out and maintain ($500). South western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 72 (140m) ($4,200).	4,700
71	S 36° 33.361' E 149° 17.408'	Install seat to take advantage of views primarily to the south and south east	3,000
72	S 36° 33.343' E 149° 17.453'	Eastern end of deep cutting. End – raised trail.	0
73	S 36° 33.344' E 149° 17.552'	Rectangular concrete culvert. Clean out and maintain ($500). Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. At this location, this allows landholder to access and exercise Riparian right to stock water. Grid also serve purpose to prevent stock wandering onto adjoining property ($7,000).	20,500
74	S 36° 33.391' E 149° 17.628'	Maclaughlin River bridge. Preferred option is to repair and re-deck and add handrails in accordance with report by Wood Research and Development (note that cost in Column 4 includes a 15% contingency allowance).	782,000
75	S 36° 33.423 E 149° 17.649'	Assumed boundary between "Clydebank" and adjoining southern property. Owner is strongly opposed to rail trail but has requested a number of items in consultation. These are not geolocated in this table but location is to be negotiated at time of construction. • 6 livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about	141,000

		agricultural activity on both sides of crossing point. ($120,000). • 3 stock watering points on southern side of corridor (Tank, trough, pipes supplied by pressurized water line) ($15,000). • Grids at north and south property boundaries to prevent stock wandering onto adjoining property ($6,000). • Landholder also requested monitored security camera at house driveway gates (WI 84) and a range of other measures that are not works items but are covered in consultation report.	
76	S 36° 33.423 E 149° 17.649’	Construct comfort stop on western side of trail. Include picnic table, bike stand (for parking), interpretive signage.	13,000
77	S 36° 33.470’ E 149° 17.676’	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 78 (305m).	9,150
78	S 36° 33.644’ E 149° 17.775’	Southern end of deep cutting. End – raised trail. Heavy clearing (trees) for 100 m through cuttings. ($1,400) Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (east side only) to WI 79 (70m) ($700). *Mobile phone coverage 2 bars*	2,100
79	S 36° 33.682’ E 149° 17.770’	Southern end of shallow cutting. End – clear side drains.	0
80	S 36° 33.691’ E 149° 17.769’	Install 3m Landmark or similar pre-fabricated bridge (concrete abutments in place).	18,000
81	S 36° 33.727’ E 149° 17.743’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 82 (115m).	3,450
82	S 36° 33.766’ E 149° 17.691’	Western end of deep cutting. End – raised trail.	0
83	S 36° 33.775’ E 149° 17.668’	Install pipe and fill (4m x 3m x 1.5m deep) ($1,500).	4,500

		Remove cross fence ($200). Eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 84 (70m) ($2,800).	
84	S 36° 33.785’ E 149° 17.631’	Western end of shallow cutting. End – clear side drains. Driveway crossing: Install Give Way sign on both sides of trail ($1,000). Install lockable gates (2 each side) in boundary fences to prevent unauthorised access. Place “No Trespassing” signs on each side ($5,000). Retain large tree adjacent to formation.	6,000
85	S 36° 33.805’ E 149° 17.558’	Rectangular concrete culvert. Clean out and maintain.	500
86	S 36° 33.807’ E 149° 17.487’	Retain/renovate/repaint distance peg (483 km).	200
87	S 36° 33.801’ E 149° 17.444’	Rectangular concrete culvert. Clean out and maintain *(483.041 stamped on culvert).*	500
88	S 36° 33.790’ E 149° 17.375’	Install 4m Landmark or similar pre-fabricated bridge (concrete abutments in place).	24,000
89	S 36° 33.790’ E 149° 17.362’	Eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 90 (215m).	6,450
90	S 36° 33.829’ E 149° 17.227’	Western end of deep cutting. End – raised trail.	0
91	S 36° 33.850’ E 149° 17.206’	Retain large tree adjacent to formation (lopping required).	400
92	S 36° 33.858’ E 149° 17.200’	Rectangular concrete culvert. Clean out and maintain.	500
93	S 36° 33.869’ E 149° 17.192’	Existing 4m timber bridge with concrete abutments. Replace with pipe and fill (4m x 3m x 1.5m deep) ($2,500). Clear surrounding debris ($500).	3,000
94	S 36° 33.876’ E 149° 17.188’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 98 (600m) ($18,000).	24,000

		Additional drainage and earthworks needed in cutting (allowance $6,000). Retain trees in cutting where possible.	
95	S 36° 33.942' E 149° 17.125'	Install seat to take advantage of views (break in cutting with views to north and south)	3,000
96	S 36° 33.959' E 149° 17.079'	Install small pipe under formation to take water onto northern side of trail from cut in rock face on southern side. *(Listed in asset register as concrete culvert but no evidence on-ground).*	1,000
97	S 36° 33.962' E 149° 17.050'	Install small pipe under formation to take water onto northern side of trail. *(Listed in asset register as timber culvert but no evidence on-ground).*	1,000
98	S 36° 33.939' E 149° 16.919'	Retain/renovate/repaint distance peg (distance plate missing – likely 484 km).	400
99	S 36° 33.945' E 149° 16.840'	Western end of deep cutting. End – raised trail.	0
100	S 36° 33.952' E 149° 16.830'	Retain large tree adjacent to formation – lop side branches	400
101	S 36° 33.963' E 149° 16.799'	Rectangular concrete culvert. Clean out and maintain ($500). Install trail user chicane and management access gate road ($4,000).	4,500
102	S 36° 33.978' E 149° 16.776'	Rectangular concrete culvert. Clean out and maintain ($500). North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 103 (145m) ($4,350). Installation of wire mesh on rock face of cutting (allowance for 500m^2) ($20,000).	24,850
103	S 36° 34.051' E 149° 16.743'	Western end of deep cutting. End – raised trail. Install boot and bike tyre cleaning station.	3,000
104	S 36° 34.106' E 149° 16.761'	Old Bombala Road bridge. Preferred option is to repair and re-deck and add handrails in accordance with report by Wood Research and Development (note that cost in Column 4 includes a 15% contingency allowance).	373,750
105	S 36° 34.112' E 149° 16.768'	Retain/renovate/repaint railway sign.	200

106	S 36° 34.140’ E 149° 16.802’	Rectangular concrete culvert. Clean out and maintain.	500
107	S 36° 34.231’ E 149° 16.953’	Trailhead: Old Bombala Rd. (See Trailhead plan – Appendix 5). • Remove pile of old timber and existing steel post. ($2,000) • Earthworks to level parking site (allowance $10,000). • Construct (clear, grade and gravel) carpark (30m x 10 m) ($7,500). • Install trailhead sign (double-sided brown chevron) on Old Bombala Rd ($1,600). • Prepare and install trailhead map panel ($5,500). • Install 2 trail directional markers ($2,000). • Install barrier to re-direct users ($1,000). • Grade and construct connecting trail from carpark to rail trail ($2,400).	32,000
		Allowance for additional landowner requests (e.g. fencing and vegetation screening).	15,000
		Allowance for for surveying of property boundaries/fencing alignment where relevant ($3,000/km) (approximately 8.5 km surveying needed for new fencing and trail realignment; the remaining allowance should be used for surveying the balance 1.7 kms where the existing boundary fence is to be retained).	30,000
		Allowance for repairs of proportion (10%) of existing boundary fence where new fence is not being built (360m)	1,800
		Allowance for weed spraying before/during construction	4,000
		Allowance for preparation and installation of interpretive signage (in addition to those specifically identified above at locations to be determined by trail manager and local historians) (2 signs).	6,000
		Allowance for Trail Directional Markers (incorporating emergency markers) to be placed along trail every 1 km.	11,000

		Allowance for installation of trailside furniture (e.g. seats) in addition to those specifically identified above at locations to be determined by trail manager (1 seat).	3,000
		Allowance for leaving in place all historic telegraph poles (away from formation but within corridor)	750
		Allowance for steep embankment signs and delineators as determined by Project Manager at time of construction (allow 1,500 m).	52,500
		Allowance for marking trees to be cleared, pruned or left untouched.	2,000
		Allowance for marking centreline of trail with flagging tape prior to clearing and construction.	3,000
		Allowance for purchase and installation of: • Regulatory signage (Shared Path; "No Trail Bikes"; "Authorised Users Only"); • Road name signs; • Trail name signs; • "No Trespassing" signs; • Local attractions sign; and • Miscellaneous signs (Keep Out etc.).	2,400
		Allowance for traffic management (1 road crossing).	2,000
		Allowance for cable locators at road crossings (1 road crossing).	1,000
		Allowance for construction access – management access gates in fence alongside road and access track onto rail corridor (allow 0 access points in addition to existing road crossings).	0
		Sub-total	*3,374,270*
		Allowance for additional construction costs. This section of corridor is not accessible from nearby roads. There are only road crossings at either end (Springfield Rd and Old Bombala Road). More time will be spent hauling material from stockpile sites created where the railway corridor crosses a publicly accessible road. Both major landholders in this section have indicated their opposition to the project so it is unlikely that access agreements can be negotiated. An	168,715

		allowance of 5% of construction costs has been included to allow for this additional time.	
		Approvals, permits, applications, designs, specifications, assessments (2.5%).	84,355
		Contingency amount (20%).	674,855
		Project management (5%).	168,715
		TOTAL (NOT INCLUDING GST)	4,470,910

4.8 WORKS TABLES: JINCUMBILLY TO BOMBALA

Table 7: Jincumbilly to Bombala (24,580 metres)

(Refer Plan 6 in Appendix 10)

Ref #	GPS Reference	Works Item	$
1		Construct new sealed trail between Jincumbilly and Bombala (24,580 m). Construction includes stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing.	2,458,000
2		Start minor clearing to WI 162 (16,390m).	49,170
3		Erect fencing along the corridor (both sides of trail) to create a 7 metre trail corridor to WI 170 (17,095 m).	512,850
4	S 36° 43.889’ E 149° 13.239’	Road crossing – Mt Cooper Road. (See road crossing drawing - Appendix 2). • Install “Road Ahead” sign on trail on both sides of road ($1,000). • Install “Give Way” signs on trail on both sides of road ($1,000). • Install “Trail Crossing” signs on both sides of Road ($1,200). *Note: If works are not to be undertaken on north western side of Mt Cooper Rd (see WI 4), none of these signs need to be installed at this stage as users will not cross Mt Cooper Rd. For costing purposes, these are included.*	2,600
5	S 36° 43.916’ E 149° 13.252’	Trailhead: Jincumbilly. (See Trailhead plan – Appendix 5). *Items in the following list need to be developed regardless of whether any works items are built on the north west side of Mt Cooper Rd* • Remove existing cross fencing ($200). • Install double sided “Trailhead” sign (brown chevron) on Snowy River Way ($1,600). • Prepare and install trailhead map panel ($5,500). • Install bicycle parking rails ($3,000). • Construct (clear, grade and gravel) carparking area (35 m x 30m) ($26,250).	91,050

		• Install 2 trail directional markers ($2,000). • Construct gravel connecting trail between carpark and rail trail ($1,500). *Options on north west side of Mt Cooper Rd.* • Rehabilitate Jincumbilly Station building and install toilet (allowance $50,000). • Install barrier ($1,000). • New trail to be constructed on formation linking parking area with toilet block (Included in WI 1). *Options on south east side of Mt Cooper Rd* • Install grid. This grid is to be installed only if works at the trailhead do not include restoration of the station building and installation of a toilet, and the installation of a barrier (all works on the north west side of Mt Cooper Rd) ($1,000). *For costing purposes, this grid is not included.* *The total cost in the right hand column ($91,050) assumes that the works on the north western side of Mt Cooper Rd are included.*	
6	S 36° 43.967' E 149° 13.341'	Formation removed from this point to Snowy River Way crossing (WI 8). Rebuild trail on original alignment and new alignment to WI 8. 435 m of new trail required.	52,200
7	S 36° 44.065' E 149° 13.402'	Site of small timber bridge now removed. Install cross pipe under new trail at this location to allow drainage.	500
8	S 36° 44.174' E 149° 01.440'	Road crossing – Snowy River Way. (See road crossing drawing - Appendix 2). • Install 2 barriers on existing alignment to re-direct users. 1 is to be on the new trail on eastern side of crossing (WI6); one is on the western side of crossing ($2,000) • Install "Road Ahead" sign on trail on both sides of road ($1,000). • Install "Stop" signs on trail on both sides of road ($1,000) • Install "Trail Crossing" signs on both sides of road ($1,200).	16,400

		• Install pipe culverts on trail on both sides of road crossing ($10,000). • Remove existing gate on western side of crossing ($200). • Install trail directional marker on western side of road crossing ($1,000).	
9	S 36º 44.260’ E 149º 13.454’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 10 (100m) ($2,000). At start of cutting, install boot and bike tyre cleaning station ($3,000)	5,000
10	S 36º 44.306’ E 149º 13.454’	Southern end of shallow cutting. End – clear side drains. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 11 (105m).	3,150
11	S 36º 44.356’ E 149º 13.453’	South western end of deep cutting. End – raised trail.	0
12	S 36º 44.368’ E 149º 13.448’	Rectangular concrete culvert. Clean out and maintain ($500). Install trail user chicane and management access gate ($4,000).	4,500
13	S 36º 44.452’ E 149º 13.401’	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (north west side only) to WI 14 (90m).	1,800
14	S 36º 44.483’ E 149º 13.358’	South western end of shallow cutting. End – clear side drains. North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 15 (250m).	7,500
15	S 36º 44.507’ E 149º 13.196’	Western end of deep cutting. End – raised trail.	0
16	S 36º 44.510’ E 149º 13.180’	Remove cross fence (wombat holes through embankment).	200
17	S 36º 44.522’ E 149º 13.138’	Rectangular concrete culvert. Water pipe running through culvert. Clean out and maintain.	700

18	S 36° 44.681’ E 149° 13.076’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 20 (150m) ($4,500). Retain/renovate/repaint distance peg (distance plate missing – likely 512 km) ($400). Install interpretive panel – “train stuck in snow” ($3,000).	7,900
19	S 36° 44.702’ E 149° 13.084’	Possible location for stock underpass/emergency shelter. Negotiate precise location with landholder.	50,000
20	S 36° 44.740’ E 149° 13.129’	South eastern end of deep cutting. End – raised trail. Rectangular concrete culvert. Clean out and maintain.	500
21	S 36° 44.761’ E 149° 13.159’	North western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 22(100m).	2,000
22	S 36° 44.794’ E 149° 13.204’	South eastern end of shallow cutting. End – clear side drains.	0
23	S 36° 44.807’ E 149° 13.217’	Rectangular concrete culvert. Clean out and maintain.	500
24	S 36° 44.828’ E 149° 13.243’	North western end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 25 (195m).	3,900
25	S 36° 44.868’ E 149° 13.282’	South eastern end of shallow cutting. End – clear side drains. Install pipe and fill (4m x 3m x 1.5m deep) ($1,500). Install interpretive panel – “shepherd’s stone wall” ($3,000).	4,500
26	S 36° 44.883’ E 149° 13.285’	Retain/renovate/repaint railway sign.	200
27	S 36° 44.919’ E 149° 13.333’	Rectangular concrete culvert. Clean out and maintain.	500
28	S 36° 44.935’ E 149° 13.353’	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 29 (255m).	7,650
29	S 36° 45.032’ E 149° 13.482’	South eastern end of deep cutting. End – raised trail.	0

30	S 36° 45.164' E 149° 13.620'	Rectangular concrete culvert. Clean out and maintain.	500
31	S 36° 45.233' E 149° 13.661'	Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner.	20,000
32	S 36° 45.276' E 149° 13.683'	Rectangular concrete culvert. Clean out and maintain.	500
33	S 36° 45.303' E 149° 13.703'	Retain/renovate/repaint railway sign.	200
34	S 36° 45.344' E 149° 13.725'	Rectangular concrete culvert. Clean out and maintain.	500
35	S 36° 45.371' E 149° 13.741'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 36 (160m).	3,200
36	S 36° 45.449' E 149° 13.775'	Southern end of shallow cutting. End – clear side drains.	0
37	S 36° 45.552' E 149° 13.770'	7m existing bridge. Not assessed by Wood Research and Development. Recommendation is to retain and refurbish bridge due to offering good rail trail experience and lack of rail bridges in this trail section. Condition is assumed to be similar to other bridges tested. Allowance of $14,500/metre is provided (in keeping with approach to other bridges for refurbishment, the cost in Column 4 includes a 15% contingency allowance).	103,675
38	S 36° 45.591' E 149° 13.769'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 39 (120m).	2,400
39	S 36° 45.648' E 149° 13.782'	Southern end of shallow cutting. End – clear side drains.	0
40	S 36° 45.688' E 149° 13.813'	Existing 4m bridge. Replace and install 4m Landmark or similar pre-fabricated bridge (concrete abutments in place).	24,000

41	S 36° 45.785’ E 149° 13.977’	Rectangular concrete culvert. Clean out and maintain.	500
42	S 36° 45.862’ E 149° 14.119’	Existing cattle stop – probable property boundary. Remove stop, fill and install livestock grid (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gate to prevent stock wandering onto adjoining property.	3,000
43	S 36° 45.878’ E 149° 14.140’	Rectangular concrete culvert. Clean out and maintain.	500
44	S 36° 45.944’ E 149° 14.188’	Retain/renovate/repaint railway crossing sign ($200). Retain/renovate/repaint distance peg (515 km) ($200). Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner ($20,000). Northern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 45 (90m) ($1,800).	22,200
45	S 36° 45.990’ E 149° 14.199’	Southern end of shallow cutting. End – clear side drains. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 47 (140m).	4,200
46	S 36° 46.042 E 149° 14.219’	Possible location for stock underpass/emergency shelter. Negotiate precise location with landholder.	50,000
47	S 36° 46.060’ E 149° 14.223’	Southern end of deep cutting. End – raised trail.	0

48	S 36º 46.062’ E 149º 14.219’	Existing single water pipe across drain line. Ensure no damage during construction and replacement underneath new trail surface.	200
49	S 36º 46.087’ E 149º 14.225’	Rectangular concrete culvert. Clean out and maintain.	500
50	S 36º 46.135’ E 149º 14.224’	Rectangular concrete culvert. Clean out and maintain.	500
51	S 36º 46.160’ E 149º 14.214’	Deep existing cattle stop. Replace with culvert	5,000
52	S 36º 46.171’ E 149º 14.208’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 54 (195m).	5,850
53	S 36º 46.221’ E 149º 14.180’	Remove cross fence ($200) Probable property boundary. Install livestock grid (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gate to prevent stock wandering onto adjoining property ($3,000).	3,200
54	S 36º 46.273’ E 149º 14.160’	Southern end of deep cutting. End – raised trail. Rectangular concrete culvert. Clean out and maintain beyond southern edge ($500). Remove cross fence ($200).	700
55	S 36º 46.281 E 149º 14.160’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 57 (110m).	3,300
56	S 36º 46.305 E 149º 14.156’	Possible location for stock underpass/emergency shelter. Negotiate precise location with landholder. Landholder discussion held on-site (suggested rather than final site).	50,000
57	S 36º 46.391’ E 149º 14.169’	Southern end of deep cutting. End – raised trail	0
58	S 36º 46.441’ E 149º 14.156’	Rectangular concrete culvert. Clean out and maintain.	500
59	S 36º 46.339’ E 149º 14.167’	Rectangular concrete culvert. Clean out and maintain. *Mobile phone coverage 1 bar*	500

60	S 36° 46.458’ E 149° 14.151’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 61 (105m).	3,150
61	S 36° 46.517’ E 149° 14.149’	Southern end of deep cutting. End – raised trail	0
62	S 36° 46.525’ E 149° 14.156’	Rectangular concrete culvert. Clean out and maintain.	500
63	S 36° 46.538’ E 149° 14.163’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 64 (155m) ($4,650). Remove cross fence ($200).	4,850
64	S 36° 46.604’ E 149° 14.237’	South eastern end of deep cutting. End – raised trail	0
65	S 36° 46.617’ E 149° 14.265’	Rectangular concrete culvert. Clean out and maintain.	500
66	S 36° 46.642’ E 149° 14.305’	Construct comfort stop on eastern side of trail. Include picnic table, bike stand (for parking), interpretive signage ($13,000) Remove cross fence ($200).	13,200
67	S 36° 46.712’ E 149° 14.348’	Rectangular concrete culvert. Clean out and maintain.	500
68	S 36° 46.782’ E 149° 14.340’	Remove cross fence	200
69	S 36° 46.793’ E 149° 14.335’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 70 (220 m).	6,600
70	S 36° 46.901’ E 149° 14.318’	Southern end of deep cutting. End – raised trail	0
71	S 36° 46.942’ E 149° 14.331’	Rectangular concrete culvert. Clean out and maintain.	500
72	S 36° 46.960’ E 149° 14.336’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 73 (65 m).	1,950
73	S 36° 46.994’ E 149° 14.352’	Southern end of deep cutting. End – raised trail	0

74	S 36° 47.072' E 149° 14.375'	Rectangular concrete culvert. Clean out and maintain.	500
75	S 36° 47.133' E 149° 14.354'	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 76 (195 m).	5,850
76	S 36° 47.203' E 149° 14.297'	South eastern end of deep cutting. End – raised trail.	0
77	S 36° 47.205' E 149° 14.292'	Rectangular concrete culvert. Clean out and maintain.	500
78	S 36° 47.213' E 149° 14.290'	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 79 (120 m).	3,600
79	S 36° 47.272' E 149° 14.268'	Southern end of deep cutting. End – raised trail.	0
80	S 36° 47.321' E 149° 14.272'	Rectangular concrete culvert. Clean out and maintain.	500
81	S 36° 47.336' E 149° 14.273'	Cattle stop: Remove, install pipe and fill over 3m x 3m x 1.5m deep.	1,500
82	S 36° 47.396' E 149° 14.242'	Rectangular concrete culvert. Clean out and maintain.	500
83	S 36° 47.471' E 149° 14.273'	Existing single water pipe across drain line. Ensure no damage during construction and replacement underneath new trail surface ($200). Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 84 (170 m) ($5,100).	5,300
84	S 36° 47.563' E 149° 14.273'	Southern end of deep cutting. End – raised trail.	0
85	S 36° 47.609' E 149° 14.272'	Rectangular concrete culvert. Clean out and maintain.	500
86	S 36° 47.640' E 149° 14.273'	Road crossing – Bukalong Siding Road. (See road crossing drawing - Appendix 2). • Install "Road Ahead" sign on trail on both sides of road ($1,000). • Install "Give Way" signs on trail on both sides of road ($1,000).	12,300

		• Install “Trail Crossing” signs on both sides of road ($1,200). • Deposit fill and compact to allow gate system to be installed on northern side of road ($4,500) • Install trail user chicane and management access gate on northern side of road. ($4,000). • Install spring loaded non-motorised access gate on southern side of road ($600).	
87	S 36° 47.7695 E 149° 14.129’	Install trailhead sign (double-sided brown chevron) on Bukalong Siding Rd 230 m west of road crossing *(Note – not on rail corridor or shown on road and trailhead drawings)*	1,600
88	S 36° 47.736’ E 149° 14.268’	Large rectangular concrete culvert. Clean out and maintain.	700
89	S 36° 47.829’ E 149° 14.226’	Rectangular concrete culvert. Clean out and maintain.	500
90	S 36° 47.839’ E 149° 14.217’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 91 (85 m).	2,550
91	S 36° 47.877’ E 149° 14.186’	South western end of deep cutting. End – raised trail.	0
92	S 36° 47.892’ E 149° 14.180’	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep.	1,500
93	S 36° 47.940’ E 149° 14.153’	Rectangular concrete culvert. Clean out and maintain.	500
94	S 36° 48.004’ E 149° 14.135’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 95 (45 m).	1,350
95	S 36° 48.030’ E 149° 14.130’	Southern end of deep cutting. End – raised trail.	0
96	S 36° 48.043’ E 149° 14.127’	Rectangular concrete culvert. Clean out and maintain.	500
97	S 36° 48.050’ E 149° 14.124’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 98 (185 m).	5,550

98	S 36° 48.148’ E 149° 14.102’	Southern end of deep cutting. End – raised trail.	0
99	S 36° 48.181’ E 149° 14.101’	Rectangular concrete culvert. Clean out and maintain.	500
100	S 36° 48.193’ E 149° 14.103’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 102 (95 m). End new double fencing.	2,850
101	S 36° 48.209’ E 149° 14.088’	Old stockyards adjacent to railway line/trail. Restoration project allowance.	10,000
102	S 36° 48.241’ E 149° 14.096’	Southern end of deep cutting. End – raised trail. Start siding platform.	0
103	S 36° 48.235’ E 149° 14.075’	Trailhead: Bukalong siding. (See Trailhead plan – Appendix 5). • Prepare and install trailhead map panel ($5,500). • Install 1 trail directional marker ($1,000) • Install bicycle parking rails ($2,000). • Install picnic table ($8,000). • Construct (clear, grade and gravel) gravel carpark ($15,375). • Construct connecting trail from carpark to rail trail ($1,500). • Clear, level and gravel platform area (east of rail trail) ($5,625). • Construct connecting trail from rail trail to platform (east of trail) ($900). • Install bollards (1.4 m spacing) ($7,800). • Rehabilitate waiting room and install composting toilet ($50,000).	97,700
104	S 36° 48.300’ E 149° 14.068’	Vehicle access across corridor from west to east required by landholder (currently in place). Designate crossing point with landholder and install signage on trail (“Give Way”) ($1,000). Start new double fencing (covered in general fence costing at WI 3). Install trail user chicane and management access gate – south of crossing point ($4,000).	5,000
105	S 36° 48.387’ E 149° 14.055’	Rectangular concrete culvert. Clean out and maintain.	500

106	S 36° 48.430’ E 149° 14.043’	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep.	1,500
107	S 36° 48.435’ E 149° 14.060’	Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner (landholder request).	20,000
108	S 36° 48.550’ E 149° 14.013’	Rectangular concrete culvert. Clean out and maintain.	500
109	S 36° 48.630’ E 149° 13.982’	Remove cross fence ($200). North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 110 (140 m) ($4,200).	4,400
110	S 36° 48.685’ E 149° 13.915’	South western end of deep cutting. End – raised trail.	0
111	S 36° 48.688’ E 149° 13.897’	Rectangular concrete culvert. Clean out and maintain.	500
112	S 36° 48.698’ E 149° 13.875’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 113 (100 m).	3,000
113	S 36° 48.710’ E 149° 13.823’	South western end of deep cutting. End – raised trail.	0
114	S 36° 48.727’ E 149° 13.807’	Rectangular concrete culvert. Clean out and maintain.	500
115	S 36° 48.6742 E 149° 13.790’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 117 (90 m).	2,700
116	S 36° 48.757’ E 149° 13.775’	Possible location for stock underpass/emergency shelter. Location and need identified with landholder on-site.	50,000
117	S 36° 48.783’ E 149° 13.754’	South western end of deep cutting. End – raised trail.	0

118	S 36° 48.785’ E 149° 13.752’	Rectangular concrete culvert. Clean out and maintain.	500
119	S 36° 48.802’ E 149° 13.745’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 120 (60 m).	1,800
120	S 36° 48.827’ E 149° 13.727’	South western end of deep cutting. End – raised trail.	0
121	S 36° 48.845’ E 149° 13.717’	Rectangular concrete culvert. Clean out and maintain.	500
122	S 36° 48.918’ E 149° 14.677’	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep ($1,500). Remove cross fence ($200).	1,700
123	S 36° 48.927’ E 149° 13.673’	Rectangular concrete culvert. Clean out and maintain.	500
124	S 36° 48.937’ E 149° 13.668’	Retain/renovate/repaint railway sign.	200
125	S 36° 48.973’ E 149° 13.658’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 126 (165 m).	4,950
126	S 36° 49.063’ E 149° 13.670’	Southern end of deep cutting. End – raised trail. At end of cutting, livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner.	20,000
127	S 36° 49.117’ E 149° 13.657’	Rectangular concrete culvert. Clean out and maintain.	500
128	S 36° 49.137’ E 149° 13.645’	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 129 (105 m).	3,150
129	S 36° 49.168’ E 149° 13.602’	South western end of deep cutting. End – raised trail.	0

130	S 36° 49.182’ E 149° 13.573’	Rectangular concrete culvert. Clean out and maintain.	500
131	S 36° 49.240’ E 149° 13.460’	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 132 (255 m).	5,100
132	S 36° 49.312’ E 149° 13.328’	South western end of shallow cutting. End – clear side drains.	0
133	S 36° 49.382’ E 149° 13.275’	Rectangular concrete culvert. Clean out and maintain.	500
134	S 36° 49.405’ E 149° 13.262’	Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep ($1,500). At start of cutting, livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner ($20,000). North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 136 (150 m) ($4,500).	26,000
135	S 36° 49.430’ E 149° 13.248’	Remove cross fence	200
136	S 36° 49.482’ E 149° 13.227’	South western end of deep cutting. End – raised trail	0
137	S 36° 49.527’ E 149° 13.198’	Rectangular concrete culvert. Clean out and maintain.	500
138	S 36° 49.587’ E 149° 13.098’	Rectangular concrete culvert. Clean out and maintain.	500
139	S 36° 49.607’ E 149° 13.053’	Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install	20,000

		appropriate warning signs about agricultural activity on both sides of crossing point. Landholder request on-site.	
140	S 36° 49.612' E 149° 13.045'	North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 141 (345m).	10,350
141	S 36° 49.780' E 149° 13.000'	Southern end of deep cutting. End – raised trail	0
142	S 36° 49.892' E 149° 12.988'	Rectangular concrete culvert. Clean out and maintain.	500
143	S 36° 49.943' E 149° 12.945'	Cattle stop: Remove and fill over 4m x 3m x 1.5m deep (no pipe needed) ($500). Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Landholder request on-site ($7,000).	20,500
144	S 36° 49.953' E 149° 12.930'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 145 (315 m).	6,300
145	S 36° 50.012' E 149° 12.892'	South western end of shallow cutting. End – clear side drains.	0
146	S 36° 50.128' E 149° 12.902'	Rectangular concrete culvert. Clean out and maintain.	500
147	S 36° 50.235' E 149° 12.902'	Rectangular concrete culvert. Clean out and maintain.	500
148	S 36° 50.272' E 149° 12.862'	North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drains (both sides) to WI 149 (105m).	2,100
149	S 36° 50.307' E 149° 12.817'	South western end of shallow cutting. End – clear side drains. At end of cutting, livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either	20,000

		side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Landholder request on-site.	
150	S 36º 50.388' E 149º 12.700'	Rectangular concrete culvert. Clean out and maintain.	500
151	S 36º 50.492' E 149º 12.603'	Rectangular concrete culvert. Clean out and maintain.	500
152	S 36º 50.501' E 149º 12.592'	Trail to leave formation due to need to manage farming activity – shearing shed in close proximity to railway corridor on western side. New trail to be constructed on eastern edge of railway corridor to WI 153 (distance of 340m) ($40,800). Erect new fencing on both sides of new trail (for 7m trail corridor) to WI 153 (cost covered in general fencing costs at WI 3). Install livestock grid (set in concrete footing to allow vehicle access as needed) and spring loaded pedestrian gate in 4 locations: either side of livestock cross-over point and at northern and south end of new trail ($12,000). Install double farm access gates in new fence on both sides of new trail at livestock cross-over point opposite shearing shed ($4,000). Licence arrangement to be put in place with landholder to allow him to utilise the 340m x 13m "excess corridor". Works items derived from discussions on-site with landholder.	56,800
153	S 36º 50.675' E 149º 12.557'	Trail back on original railway line alignment. Cattle stop: Remove, install pipe and fill over 4m x 3m x 1.5m deep ($1,500). Existing landholder water pipe crosses railway corridor. Reinstate when rail trail built ($500).	2,000
154	S 36º 50.680' E 149º 12.555'	Existing access track crosses railway corridor. Retain. Livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow	21,500

		vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point ($20,000). Install alternative watering site with pipe and trough in adjoining paddock. ($1,500) Landholder requests on-site.	
155	S 36º 50.762’ E 149º 12.650’	Rectangular concrete culvert. Clean out and maintain.	500
156	S 36º 50.865’ E 149º 12.682’	Rectangular concrete culvert. Clean out and maintain.	500
157	S 36º 50.945’ E 149º 12.660’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 158 (360 m).	10,800
158	S 36º 51.115’ E 149º 12.617’	Southern end of deep cutting. End – raised trail	0
159	S 36º 51.148 E 149º 12.618’	Livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner. Landholder request on-site.	20,000
160	S 36º 51.205’ E 149º 12.630’	Rectangular concrete culvert. Clean out and maintain.	500
161	S 36º 51.233’ E 149º 12.637’	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drain (west side only) to WI 162 (115 m).	2,300
162	S 36º 51.298’ E 149º 12.623’	Southern end of shallow cutting. End – clear side drain. Probable property boundary – existing cattle stop. If boundary, remove existing cattle stop and install livestock grid (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gate to prevent stock wandering onto adjoining property ($3,000).	8,860

		Install interpretive panel "soldier settlements" ($3,000). End minor clearing. Start moderate clearing to WI 167 (420m) ($2,860).	
163	S 36° 51.351' E 149° 12.614'	Rectangular concrete culvert. Clean out and maintain.	500
164	S 36° 51.428' E 149° 12.620'	Rectangular concrete culvert. Clean out and maintain.	500
165	S 36° 51.448' E 149° 12.614'	Northern end of shallow cutting. Attend to drainage in cutting: Clear side drain (west side only) to WI 166 (90m).	1,800
166	S 36° 51.487' E 149° 12.601'	Southern end of shallow cutting. End – clear side drain. Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 167 (65 m) ($1,950). Retain/renovate/repaint railway sign ($200).	2,150
167	S 36° 51.515' E 149° 12.568'	Southern end of deep cutting. End – raised trail. End moderate clearing. Start heavy clearing to WI 169 (215m)	3,010
168	S 36° 51.606' E 149° 12.523'	Rectangular concrete culvert. Clean out and maintain.	500
169	S 36° 51.626' E 149° 12.527'	End heavy clearing. Start minor clearing to WI 170 (85m)	255
170	S 36° 51.664' E 149° 12.540'	End new double fencing. Remove cross fence ($200). North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 171 (280m) ($8,400). Corridor is currently fenced close to the top of cutting. Leave in place. End minor clearing.	10,505

		Start moderate clearing (small – medium trees) through cutting to WI 171 (280m) ($1,905). *Note: 10 metres of rail track missing.*	
171	S 36° 51.806' E 149° 12.632'	Southern end of deep cutting. End – raised trail. Develop screen planting (280m x 5m) on western side of rail corridor to WI 174 (280m) ($8,400). Allow for establishment and maintenance watering ($1,000). End moderate clearing. Start minor clearing to WI 179 (835m) ($2,505).	11,905
172	S 36° 51.900' E 149° 12.606'	Existing rock armouring on embankment (60 m). There is a constructed access track on eastern side of embankment within corridor – retain for landholder use.	0
173	S 36° 51.915' E 149° 12.603'	Rectangular concrete culvert. Clean out and maintain.	500
174	S 36° 51.958' E 149° 12.572'	End screen planting. At start of cutting, livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner ($20,000). Remove cross fence ($200). North eastern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 176 (220m) ($6,600). Additional earthworks needed in cutting (allowance $2,500).	29,300
175	S 36° 52.076' E 149° 12.542'	Southern end of deep cutting. End – raised trail. At end of cutting, develop screen planting (100m x 5m) on western side of rail corridor (to WI 176 (100m) ($3,000). Allow for establishment and maintenance watering ($1,000).	4,000

176	S 36° 52.135’ E 149° 12.562’	End screen planting. Erect fencing along the corridor (both sides of trail) to create a 7 metre trail corridor to WI 218 (4,120m)	123,600
177	S 36° 52.146’ E 149° 12.570’	Rectangular concrete culvert. Clean out and maintain.	500
178	S 36° 52.213’ E 149° 12.630’	Remove cross fence ($200). Northern end of shallow cutting. Attend to drainage in cutting: Clear side drain (both sides) to WI 179 (30 m) ($600).	800
179	S 36° 52.226’ E 149° 12.639’	Southern end of shallow cutting. End – clear side drains. Install seat on eastern side of trail ($3,000). Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 180 (425 m) ($12,750). End minor clearing. Start moderate clearing (small – medium trees) through cutting to WI 180 (425m) ($2,890).	18,640
180	S 36° 52.424’ E 149° 12.534’	Southern end of deep cutting. End – raised trail. Trail onto embankment. Retain as many trees on either side of trail as possible. End moderate clearing. Start minor clearing to WI 192 (1,245m) *Note: 300 metres rail track and sleepers missing*.	0
181	S 36° 52.513’ E 149° 12.504’	Rectangular concrete culvert. Clean out and maintain.	500
182	S 36° 52.571’ E 149° 12.536’	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 183 (230 m).	6,900
183	S 36° 52.676’ E 149° 12.633’	South eastern end of deep cutting. End – raised trail. *Note: 10 metres of rail track and sleepers missing.*	0
184	S 36° 52.712’ E 149° 12.654’	Rectangular concrete culvert. Clean out and maintain.	500

185	S 36° 52.744’ E 149° 12.673’	*Note: 280 metres of rail track and sleepers missing.*	0
186	S 36° 52.781’ E 149° 12.684’	Livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landholder.	20,000
187	S 36° 52.787’ E 149° 12.697’	Remove cross fence ($200). North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 188 (195 m).	5,850
188	S 36° 52.891’ E 149° 12.704’	South western end of deep cutting. End – raised trail.	0
189	S 36° 52.909’ E 149° 12.697’	Rectangular concrete culvert with stone topping. Clean out and maintain ($500). North eastern end of shallow cutting. Attend to drainage in cutting: Clear side drain (west side only) to WI 190 (80 m) ($1,600).	2,100
190	S 36° 52.943’ E 149° 12.682’	Southwestern end of shallow cutting. End – clear side drain. North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 191 (60 m).	1,800
191	S 36° 52.971’ E 149° 12.673’	South western end of deep cutting. End – raised trail.	0
192	S 36° 53.007’ E 149° 12.664’	Rectangular concrete culvert. Clean out and maintain ($500). End minor clearing. Start heavy clearing to WI 194 (215m) ($3,010) *Note: rail track relocated away from original alignment or missing (1,300 m)* *Mobile phone coverage 2 bars*	3,510

193	S 36º 53.096' E 149º 12.721'	Livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner ($20,000). North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 194 (220 m) ($6,600).	26,600
194	S 36º 53.175' E 149º 12.840'	South eastern end of deep cutting. End – raised trail. North western end of shallow cutting. Attend to drainage in cutting: Clear side drain (southern side only) to WI 195 (95 m) ($1,900). End heavy clearing. Start minor clearing to WI 232 (2,650m) ($7,950)	9,850
195	S 36º 53.214' E 149º 12.875'	South eastern end of shallow cutting. End – clear side drain.	0
196	S 36º 53.229' E 149º 12.895'	Rectangular concrete culvert. Clean out and maintain.	500
197	S 36º 53.235' E 149º 12.905'	At start of cutting, livestock/machinery crossing point and existing cattle stop. Remove existing cattle stop and install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner ($20,000). North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 198 (130 m) ($3,900).	23,900

198	S 36° 53.275' E 149° 12.981'	South eastern end of deep cutting. End – raised trail.	0
199	S 36° 53.359' E 149° 13.048'	Remove cross fence ($200). Possible property boundary. If boundary, install livestock grid (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gate to prevent stock wandering onto adjoining property ($3,000). Retain/renovate/repaint railway sign ($200).	3,400
200	S 36° 53.407' E 149° 13.092'	Rectangular concrete culvert. Clean out and maintain.	500
201	S 36° 53.418' E 149° 13.121'	North western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 202 (130m).	3,900
202	S 36° 53.439' E 149° 13.193'	Eastern end of deep cutting. End – raised trail.	0
203	S 36° 53.446' E 149° 13.210'	Rectangular concrete culvert. Clean out and maintain.	500
204	S 36° 53.449' E 149° 13.227'	Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 205 (170 m).	5,100
205	S 36° 53.476' E 149° 13.332'	Eastern end of deep cutting. End – raised trail. At end of cutting, livestock/machinery crossing point: Install livestock/machinery crossing point system using livestock grids (set in concrete footing to allow vehicle access as needed) and spring-loaded pedestrian gates on trail either side of crossing point and double farm access gates in fence on either side of trail. Install appropriate warning signs about agricultural activity on both sides of crossing point. Negotiate precise location with landowner. *Mobile phone coverage 2 bars*	20,000
206	S 36° 53.480' E 149° 13.343'	Retain/renovate/repaint railway sign.	200
207	S 36° 53.494' E 149° 13.398'	Rectangular concrete culvert. Clean out and maintain.	500

208	S 36° 53.498’ E 149° 13.418’	Retain/renovate/repaint railway sign. Former Old Cooma Rd crossing location and sign.	400
209	S 36° 53.494’ E 149° 13.481’	Rectangular concrete culvert. Clean out and maintain.	500
210	S 36° 53.478’ E 149° 13.531’	South western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 211 (185 m).	5,550
211	S 36° 53.407’ E 149° 13.619’	North eastern end of deep cutting. End – raised trail.	0
212	S 36° 53.389’ E 149° 13.641’	Rectangular concrete culvert. Clean out and maintain.	500
213	S 36° 53.366’ E 149° 13.666’	South western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 214 (95 m).	2,850
214	S 36° 53.330’ E 149° 13.713’	North eastern end of deep cutting. End – raised trail. Rectangular concrete culvert. Clean out and maintain.	500
215	S 36° 53.311’ E 149° 13.742’	South western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 216 (70 m).	2,100
216	S 36° 53.293’ E 149° 13.786’	North eastern end of deep cutting. End – raised trail.	0
217	S 36° 53.290’ E 149° 13.822’	Rectangular concrete culvert. Clean out and maintain.	500
218	S 36° 53.285’ E 149° 13.851’	End new double fencing. Western end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 219 (105 m). Buried gas pipeline passes under this cutting (based on presence of marker signs on either side of rail corridor).	3,150
219	S 36° 53.298’ E 149° 13.924’	Eastern end of deep cutting. End – raised trail.	0
220	S 36° 53.305’ E 149° 13.938’	Machinery crossing point. Track appears to be maintenance access track for gas pipeline	5,000

		rather than farming access track. Install double access gates in fence either side of trail. Reinforce trail surface at crossing point.	
221	S 36º 53.332’ E 149º 13.985’	Rectangular concrete culvert. Clean out and maintain.	500
222	S 36º 53.359’ E 149º 14.010’	Rectangular concrete culvert. Clean out and maintain ($500). Install trail user chicane and management access gate ($4,000).	4,500
223	S 36º 53.374’ E 149º 14.020’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 224 (110 m).	3,300
224	S 36º 53.429’ E 149º 14.031’	Southern end of deep cutting. End – raised trail.	0
225	S 36º 53.448’ E 149º 14.027’	Remove cross fence ($200). Cattle stop: Remove and fill (no pipe needed as it on top of an embankment) 4m x 3m x 1.5 m deep ($500).	700
226	S 36º 53.485’ E 149º 14.016’	Rectangular concrete culvert. Clean out and maintain.	500
227	S 36º 53.524’ E 149º 14.005’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 229 (80 m).	2,400
228	S 36º 53.527’ E 149º 14.009’	Retain/renovate/repaint railway sign.	200
229	S 36º 53.562’ E 149º 14.019’	Southern end of deep cutting. End – raised trail. Install boot and bike tyre cleaning station.	3,000
230	S 36º 53.567’ E 149º 14.023’	Road crossing – Sandy Crossing Rd (See road crossing drawing - Appendix 2). • Install “Road Ahead” sign on trail on both sides of road ($1,000). • Install “Give Way” signs on trail on both sides of road ($1,000) • Install “Trail Crossing” signs on both sides of Road ($1,200).	3,200
231	S 36º 53.583’ E 149º 14.032’	Rectangular concrete culvert. Clean out and maintain.	500

232	S 36° 53.612’ E 149° 14.047’	End minor clearing. Start heavy clearing to WI 236 (370m).	3,320
233	S 36° 53.694’ E 149° 14.099’	Rectangular concrete culvert. Maintain (clean at time of report).	500
234	S 36° 53.712’ E 149° 14.104’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 236 (160 m).	4,800
235	S 36° 53.782’ E 149° 14.147’	Southern end of deep cutting. End – raised trail.	0
236	S 36° 53.810’ E 149° 14.162’	Road crossing – Monaro Highway 1 (north). (See road crossing drawing - Appendix 2). • Clear overgrown and overhanging vegetation at foot of slope on southern side of cutting ($560). • Install “Road Ahead” sign on trail on both sides of road ($1,000). • Install “Stop” signs on trail on both sides of road ($1,000). • Install “Trail Crossing” signs on both sides of Road on Monaro Highway – large style (see note in report) ($5,000). • Install “Trail Crossing” sign on Rifle Range Rd ($600). • Install line of bollards (1.4 m spacing) to prevent encroachment ($5,590). • Fill and level at roadside crossing point on western side of road ($1,000) • Relocate “Rifle Range” sign ($500). End heavy clearing. Start minor clearing to WI 241 (840m) ($2,520)	17,770
237	S 36° 53.931’ E 149° 14.172’	Large rectangular concrete culvert (2m diameter). Clean out and maintain.	700
238	S 36° 53.962’ E 149° 14.205’	Northern end of deep cutting. Attend to drainage in cutting: Construct trail to a depth of 300mm (rather than a standard 150mm) to WI 239 (100 m).	3,000
239	S 36° 53.998’ E 149° 14.259’	Southern end of deep cutting. End – raised trail.	0
240	S 36° 54.005’ E 149° 14.280’	Retain/renovate/repaint railway sign.	200

241	S 36° 54.169' E 149° 14.462'	End minor clearing. Start heavy clearing to WI 244 (140m).	1,960
242	S 36° 54.197' E 149° 14.485'	Rectangular concrete culvert. Clean out and maintain.	500
243	S 36° 54.212' E 149° 14.495'	Retain/renovate/repaint railway sign.	200
244	S 36° 54.234' E 149° 14.495'	End heavy clearing.	0
245	S 36° 54.237' E 149° 14.489'	Road crossing – Monaro Highway 2 (south). (See road crossing drawing - Appendix 2). • Cut back overhanging branches on north side of road crossing ($200). • Install roadside delineators (2) on north side of road crossing to delineate edge of embankment ($100). • Install "Road Ahead" sign on trail on both sides of road ($1,000). • Install "Stop" signs on trail on both sides of road ($1,000). • Install "Trail Crossing" signs on both sides of Road on Monaro Highway – large style (see note in report) ($5,000). • Install pipe culvert under new trail at junction with road (west side) ($5,000). • Install trail directional markers (2) ($2,000). • Construct new trail off railway formation on western side of road crossing (see WI 246).	14,300
246	S 36° 54.247' E 149° 14.490'	Construct 310m of new trail connecting Monaro Highway 2 (south) crossing to car parking area at Bombala trailhead to run along eastern and southern boundary of railway station grounds (GPS point is approximately northern start of new trail).	37,200
247	S 36° 54.290' E 149° 14.519'	Install pipe culvert under new trail. Extra fill and battering needed.	5,000
248	S 36° 54.385' E 149° 14.434'	Trailhead: Bombala. (See Trailhead plan – Appendix 5). • Remove log retaining walls to allow trail construction ($500).	25,100

		• Prepare and install trailhead map panel ($5,500). • Install bicycle parking rails ($3,000). • Construct (clear, grade and gravel) carparking area (25m x 20m) ($12,500). • Install trail directional marker ($1,000). • Install trailhead sign (double-sided brown chevron) on Monaro Highway ($1,600) • Install trailhead sign (single-sided brown chevron) on access road to carpark adjacent to V.I.C. ($1,000).	
		Allowance for additional landowner requests (e.g. fencing, crossing systems - gates or underpasses - and vegetation screening).	60,000
		Allowance for for surveying of property boundaries/fencing alignment where relevant ($3,000/km) (approximately 21.3 km surveying needed for new fencing and trail realignment; the remaining allowance should be used for surveying the balance 3.3 kms where the existing boundary fence is to be retained).	72,000
		Allowance for repairs of proportion (10%) of existing boundary fence where new fence is not being built (330m).	1,650
		Allowance for weed spraying before/during construction.	10,000
		Allowance for preparation and installation of interpretive signage (in addition to those specifically identified above at locations to be determined by trail manager and local historians) (2 signs).	12,000
		Allowance for Trail Directional Markers (incorporating emergency markers) to be placed along trail every 1 km.	25,000
		Allowance for installation of trailside furniture (e.g. seats) in addition to those specifically identified above at locations to be determined by trail manager (5 seats).	15,000
		Allowance for leaving in place all historic telegraph poles (away from formation but within corridor).	1,000

		Allowance for steep embankment signs and delineators as determined by Project Manager at time of construction (allow 500 m).	17,500
		Allowance for marking trees to be cleared, pruned or left untouched.	4,800
		Allowance for marking centreline of trail with flagging tape prior to clearing and construction.	7,200
		Allowance for purchase and installation of: • Regulatory signage (Shared Path; "No Trail Bikes"; "Authorised Users Only"); • Road name signs; • Trail name signs; • "No Trespassing" signs; • Local attractions sign; and • Miscellaneous signs (Keep Out etc.).	4,800
		Allowance for traffic management (6 road crossings).	12,000
		Allowance for cable locators at road crossings (6 road crossings).	6,000
		Allowance for construction access – management access gates in fence alongside road and access track onto rail corridor (allow 0 access points in addition to existing road crossings).	0
		Sub-total	*4,886,420*
		Allowance for additional construction costs. There are 6 road crossings along this 24.58 km section of corridor. However, 4 of them are very close to each end (Mt Cooper Rd and Snowy Valley Highway in the north and 2 crossings of the Monaro Highway in the south). The limited number of road crossings in the middle section means more time will be spent hauling material from stockpile sites created where the railway corridor crosses a publicly accessible road. One way to reduce this cost is negotiate access agreements with landholders who adjoin the corridor. Some may be willing to provide access (material can be stockpiled on the railway corridor). At least 3 landholders in the middle	244,320

		section have indicated support for the rail trail and may be willing to provide stockpile sites. However, this situation may change before the trail is constructed; it is therefore prudent to include an allowance of 5% of construction costs to allow for this additional time (this can be reduced if agreements can be reached with adjoining landholders).	
		Approvals, permits, applications, designs, specifications, assessments (2.5%)	122,160
		Contingency amount (20%)	977,285
		Project management (5%).	244,320
		TOTAL (NOT INCLUDING GST)	6,474,505

SECTION 5 – AN IMPLEMENTATION PROGRAM

5.1 NSW GOVERNMENT PROCESSES

In June 2022, the NSW Government (Department of Regional NSW) released its long awaited *NSW Rail Trails Framework* and the *Rail Trails for NSW Evaluation Summary*. Both documents are outcomes of the review of the two pilot projects (Tumbarumba Rosewood Rail Trail and the Northern Rivers Rail Trail). The evaluation report found that the operational impact of the Tumbarumba Rosewood Rail Trail was socially and economically 'excellent'. The rail trail (opened in April 2020) has increased discretionary spending by 55 per cent, leading to nine new or expanding businesses.

The Framework states that the NSW Government supports the development of rail trails where there is demonstrated community support, where environmental impacts have been considered and where a viable business model is in place. The Framework aims to:

- Provide guidance for rail trail proponents seeking NSW Government support;
- Outline how the NSW Government determines whether a rail trail project is viable;
- Supports the planning and delivery of additional rail trails;
- Provides a clear and transparent approach for the Government to consider rail trail proposals during the funding application assessment, legislative amendment, and/or lease intent processes;
- Identify best practice approaches to the development of rail trails; and
- Support improved timeframes and efficiency of the legislative process required to open a rail trail.

Importantly, the Framework sets out processes for proceeding with future rail trails. The processes as set out have four stages:

- Stage 1: Proposal;
- Stage 2: Legislation change;
- Stage 3: Construction; and
- Stage 4: Operation and maintenance

While there still some elements of Stage 1 that need to be addressed by this proposal, notably around environmental and biosecurity issues, the critical elements with respect to the Monaro Rail Trail Stage 1A at this time are the elements contained in Stage 2. Repurposing a non-operational rail corridor to a Rail Trail can only occur once the project has met NSW Government requirements (as set out in Stage 1) and funding has been secured. Critically (in respect to work already done), The Framework indicates that rail trail proposals will only be considered if the application is led and endorsed by a local council or multiple councils. The council (or councils) will be the lead operational entity for the governance of any rail trail.

In terms of the legislative processes, the NSW Government recently introduced to the Legislative Council the *Transport Administration Amendment (Rail Trails) Bill* which will give effect to the steps outlined in the Framework paper and will remove what has been a significant obstacle to rail trail development in NSW – that is, the need to close an individual railway line by a specific act of Parliament (as has been used to facilitate the Tumbarumba Rosewood Rail Trail (opened in 2020) and the Northern Rivers rail trail (two sections currently under design and construction). Under the proposed Bill, the Minister for Regional Transport and Roads can authorise the temporary re-purposing of a railway corridor and removal of tracks on a non-operational line. A council could then lease the rail corridor for 30 years.

Under the Framework, Transport Asset Holding Entity of NSW (TAHE) will continue to own the land and will lease the land to the local council for construction, operation ownership and maintenance of the rail trail asset for a nominal fee with a lease length of up to 30 years.

Existing assets such as buildings will either be retained by the NSW Government or transferred to the applicant (the lead entity0. This will be determined on a project by project basis through the identification of an asset register and agreement on items the NSW Government needs to retain, and those assets along the rail corridor that might be utilised or disposed of. Appendix 7 contains details of existing assets on the rail corridor between Tralee and Michelago, between Nimmitabel and Old Bombala Rd, and between Jincumbilly and Bombala. Detailed asset identifiers are drawn from the Monaro Rail Trail Assets 20210823 spreadsheet supplied for this project). The tables in Appendix 7 recommend:

- Assets seen to be necessary for the rail trail;
- Assets seen to be desirable for the rail trail; and
- Assets not necessary for the rail trail.

This list of recommendations should be treated as a starting point for negotiation between the Councils and the NSW Government.

The Framework identifies necessary planning pathways for trail development associated with NSW planning and infrastructure legislation.

The other relevant section of the Framework relates to governance models. The Framework indicates that the councils leasing the land are the lead operational entity. Beyond this stipulation, the Framework allows a project by project determination as to the best governance model for a rail trail recognising that some rail trails will benefit from the active involvement of community volunteers and other stakeholders. A Joint Management model involving community groups in a meaningful way is – in the consultants' opinion – the best way to develop rail trails and the MoU currently in place between the Councils and Monaro Rail Trail Inc. is a good starting point for future governance model.

5.2 TRAIL CONSTRUCTION STAGES

Development of trails can often be staged so that parts of trails are developed in line with available funding sources. It is often not possible to open the full length of a trail simultaneously as significant physical, financial, community and institutional work needs to be undertaken. This is the case in many rail trails (and indeed many recreational trails) around Australia. Opening a new trail in stages also allows those who are opposed or undecided about a project to see a clear demonstration of its use and lack of issues (almost inevitably, problems identified by concerned people do not arise).

A staged approach to planning and development is often the best approach as it better suits the capacity of the entity charged with delivering the project.

A staged approach to planning and development is often the best approach as it better suits the capacity of the entity charged with delivering the project. Trails can take up to 10 years to develop from initial planning stages. The “new” Bibbulmun Track in WA was some 4 years in the detailed planning and construction. This was a significant trail project with backing by the State Government – it stands out as a track planned and built relatively quickly. Other rail trail projects provide better illustrations of a realistic timeframe. A Feasibility Study for the Great Victorian Rail Trail was prepared in 2004; the trail opened in 2012. Interestingly, this trail was completely developed in one stage as the result of a large Commonwealth Government grant after the tragic Black Saturday bushfires in 2009. The Port Fairy Warrnambool Rail Trail (a 37km trail) was subject to various studies and plans from 2002; it was opened in 2010 – again all in one stage.

The 2019 Feasibility Study recommended that the trail be constructed north to south based on a number of criteria. These were:

- Trail sections anchored in trailheads (preferably near to major population centres).
- Trail sections enabling local people to use the facility for local walks and rides and for commuting purposes.
- Construct cheaper sections earlier than expensive ones (affordability).
- Construct most attractive sections first.
- Probable economic impacts.
- Finished product logic.
- Ease of access for users.
- Ease of trailhead development.
- Numbers of rural properties through which the rail trail would pass.

However, the two Councils have determined three priority sections (from the longer 213 km trail opportunity). The northern (Queanbeyan to Michelago) and southern (Jincumbilly to Nimmitabel) are the two longer sections and possibly represent a better return on investment in the short term (given proximity to markets, length of trail, ease of construction, attitudes of adjoining landholders). It is recognised that the northern section crosses Local Government boundaries – it may be that one Council is more able or willing to begin construction sooner – this will be another key criterion.

If funding is available and the trail manager believes they have the capacity to construct the entire trail in one stage, this can be done. Under this scenario, project management will be a significant and major task. Care needs to be taken if this is the approach – short cuts in construction will manifest themselves in expensive repairs and refurbishment very quickly as has been the experiences on other trails.

5.3 IMPACTS ON NATIVE VEGETATION

Trail construction will require the removal of vegetation along the length of the former railway corridor. Clearing will be required. Generally speaking, much of the corridor has been kept free of vegetation – in some sections, there has been regrowth though this is not extensive.

The Office of Environment and Heritage (OEH), in partnership with Local Land Services (LLS), manages the implementation of the *Native Vegetation Act 2003* and *Native Vegetation Regulation 2013.*

The *Native Vegetation Regulation 2013* makes provision for and with respect to the following:

- development consent for clearing of native vegetation;
- the form and content of property vegetation plans (PVPs), the variation and termination of PVPs and a register of PVPs;
- the assessment of broad scale clearing, including the adoption of an Assessment Methodology for determining whether proposed broad scale clearing will improve or maintain environmental outcomes;
- clearing for private native forestry;
- routine agricultural management activities;
- special provisions for vulnerable land; and
- miscellaneous and savings and transitional matters.

It is unclear whether the clearing of regrowth vegetation for the purposes of constructing the trail will be required. The Councils will need to liaise with the OEH to determine whether permits will be required and/or whether offset revegetation will be required.

SECTION 6 – CONSTRUCTION MANAGEMENT

Should the trail proceed, prior to the construction of the rail trail between Queanbeyan and Michelago, between Nimmitabel and Old Bombala Rd, and between Jincumbilly and Bombala, a number of matters need to be considered.

This Trail Development Plan includes an extensive commentary on a series of matters relating to construction management.

6.1 BROAD STAGES OF TRAIL CONSTRUCTION

The general process for the development of the Monaro Rail Trail will involve the following tasks:

Stage 1: Pre-construction

- Obtaining all necessary approvals, permits, designs, specifications and environmental assessments.
- Environmental and other surveys (e.g. flora if required, site pegging and on ground delineation).
- Notifying key stakeholders and adjoining landowners (government departments, quarry operators etc) well in advance of construction commencing.
- Ongoing consultation with adjoining landowners to clarify/confirm need for, and precise location of, requested items.

Stage 2: Field identification works

- Clearing landslides before removal of track; stabilising cuttings as necessary (in limited locations).
- Walking the actual route and marking the actual trail route.
- Marking trees to be cleared, pruned or left untouched.
- Removal of cross fences (enables access for machinery to clear vegetation)
- Clearing regrowth vegetation, and removal of weeds.
- Identifying and establishing stockpile locations and machinery wash down facilities.
- Identifying/relocating utilities (if required).
- Geotechnical/engineering investigations for drainage crossings.

Stage 3: Clearing corridor

- Removal of steel track and sleepers.
- Marking the position of new fences to be installed.
- Installation of new side fencing and gates (as required).

Stage 4: Drainage measures

- Replacement/reinstatement (or removal in some instances) of culverts, bridges and cattle stops.
- Installing erosion and sediment controls such as silt fences at waterway crossings.
- Batter treatment (as required).
- Drainage reinstatement in cuttings and installation of barrier fencing where land slips, rock falls and erosion has occurred.

Stage 5: Trail surfacing

- Hauling/stockpiling of trail surfacing (and other) material.
- Constructing trail (i.e. trail surfacing) and trailheads.

Stage 6: Signage and road crossings

- Installing signage (including warning, advisory, trailhead, distance/directional, emergency and interpretive signage) on trail and at trailheads.
- Installing management access gates, trail user gates and chicanes, stock crossings, cattle grids, bollards and fencing.

Stage 7: Final steps

- Determining locations for (and installing) trailside furniture.
- Landscaping/revegetation.
- Cleaning up site.
- Opening of trail

Initial works

When the contractors are removing the track and sleepers, the project manager should ensure that the embankments and cuttings of the former railway are left in an acceptable condition. Furthermore, the contract should ensure that when the track is being removed the contractors should be required to grade and level the embankment/formation following removal of the track.

Retention of all old distance pegs, and other signage, is strongly recommended.

Care when removing track from the remaining bridges is also critical. Experience from other rail trails indicates that substantial and at times irretrievable damage to bridges can occur if removal of the track is not done with care and strict supervision.

Similarly, within cuttings care should be taken to ensure drainage is not unduly impacted by careless depositing of ballast to the side of the formation (and thereby filling the side drains).

The project manager should ensure that contractors do not remove any remaining railway signs and signals and switches etc. when moving the steel track and sleepers. These artefacts are one of the reasons that people love rail trails and retention of all these items has been included in the works lists.

When using the works tables (Section 4), construction crews should rely on the GPS coordinates.

6.2 DEALING WITH ADJOINING LANDHOLDERS

To allay the concerns of adjoining landholders during construction the following actions should be taken:

- Adjoining landowners are to be advised well in advance of construction activity taking place.
- Construction machinery and contractors' vehicles are not to use private property or private roads to access the former railway corridor (except where permission has been granted). Access should either be along the corridor or adjacent gazetted roads.
- Fencing needs to be maintained at all times during construction to prevent stock straying.
- Contractors and Council employees are not to trespass on private property during construction (unless prior written agreement is obtained from the landowner).
- Spread of weeds along the corridor by construction machinery is to be controlled and minimised. Vehicle and machinery wash down facilities will be needed.
- Leaving of rubbish within the corridor during/after construction of the trail should not occur.
- Construction crews should work closely with adjoining landowners over various issues, such as water pipes that cross the corridor, location of stock crossings, new fencing etc.

6.3 CONSTRUCTION MANAGEMENT PLAN

Prior to the construction of the rail trail (any or all sections), the project manager should prepare a Construction Management Plan (CMP).

The purpose of a Construction Management Plan is to provide a framework reference document detailing how the Councils and any contractors will manage and control aspects of the trail construction. The CMP will be used as a working document to ensure that obligations and commitments provided in the relevant licences, permits and approvals are made known to all site personnel and implemented effectively as an integral part of trail construction.

It also aims to detail processes to minimise impacts associated with the construction of the rail trail on adjacent areas. Given sufficient thought and consideration prior to construction, risks can be mitigated, and impacts can be minimised.

Consideration will need to be given to the following matters in the preparation of the CMP:

Landholder Communication Plan

The Councils should prepare a Landholder Communication Plan before work commences to ensure that all adjacent landowners are aware of the construction program well in advance and are individually consulted regarding exact placement of recommended works items. This includes the early removal of cross fences (across the railway corridor), replacement of old cattle stops with fences and grids and the installation of new (or repairs to old) side fences.

Safe Work Statement Method (SWMS)

A Safe Work Method Statement (SWMS) documents a process for identifying and controlling health and safety hazards and risks. Under Occupational Health and Safety Regulations, a SWMS must be prepared before high risk construction work begins, if anyone’s health and safety is at risk because of the work, but SWMS can be used for any other work activities. A SWMS is designed to help contractors and their employees think through the hazards and risks involved in the work, and to choose effective control measures. As a matter of course, a SWMS will be required and the CMP must address all risks and address how they will be controlled. Matters to be addressed include construction activity at road crossings.

Preparation of Other Works Method Statements

The appropriate environmental authorities (prior to work commencing) may require several other ‘Works Method Statements’ such as Clearing Work Method Statement, Minor Earth Works Method Statement and Drainage Works Method Statement. These statements will address a range of potential concerns such as the spread of weeds during vegetation clearing (on and offsite), water pollution or sedimentation due to working near to watercourses, and the discovery or impact to any new sites of Aboriginal or non-Aboriginal heritage or archaeological sites.

Environmental and Other Surveys (e.g. flora if required, site pegging and on ground delineation)

Prior to selection of stockpile sites and construction activity, it may be necessary to carry out a variety of environmental and other surveys. The CMP will need to schedule the activity to occur at appropriate times of the year, and prior to construction.

Geotechnical/engineering Investigations for Drainage Crossings and cuttings and embankments

Various investigations may be required at and around watercourses prior to refurbishment / adaptation of the bridges and culverts. The CMP will need to schedule in this activity prior to construction occurring at these sensitive locations. Some base line assessments may also be required at existing rockfall and landslip sites.

Utility Identification/Relocation (if required)

Fieldwork did not reveal the existence of utilities (telecom cabling etc) within the corridor (apart from at the major road crossings). However, the CMP should allow for a cable locator to establish the precise locations of utilities and services prior to construction activity (including removal of steel track and sleepers) occurring.

Installation of New Gates and Fences and Stock Crossings

In order to ensure stock are kept out of the rail trail corridor, fencing will need to be repaired or relocated or new fencing erected along parts of the corridor. This activity should be undertaken early in the construction process. Cooperation and consultation with adjoining landowners will be required to ensure any new fencing is installed in the appropriate location and that stock crossings are located in the optimum locations. The fieldwork has included detailed consultation with some adjoining landholders who have identified precise locations for stock and machinery crossing points (either at-grade or via underpasses). Other locations for such crossings are indicated as general locations either after consultation with landholders or based on field observations.

Fencing and Stock Control During Construction

Construction of the rail trail will mean numerous (existing) fences erected across the corridor (particularly at property boundaries and road crossings) will need to be removed. One of the first steps in construction will be to erect new fences and gates (where appropriate) to ensure stock are contained to their paddocks and to ensure construction machinery have unlimited access along the corridor. The CMP will need to program this activity, including the necessary consultation with adjoining landowners and contractors.

Selection of Material Stockpile Sites

Construction of the rail trail will involve the removal of material from the corridor (discarded timber sleepers, steel, old fencing material, miscellaneous waste/rubbish material) and the delivery of materials to be used in the construction of the trail (gravel, fencing materials, bridge components, etc). Numerous stockpile sites will be required along the alignment to enable the management of surfacing material, culvert materials, fill and potentially topsoil and vegetation. Care will need to be taken to ensure the selected sites are safely located, secure, and minimise the invasion of the privacy of neighbours of the proposed rail trail. The stockpile sites should also be located on already cleared sites (minimising the vegetation clearing requirements) and with little or no impact on watercourses or other environmentally sensitive sites. It is imperative that access to the corridor be via public land unless agreement has been obtained from neighbouring landowners (as noted in the works tables in Section 4). Preparation of the CMP should address these issues.

Construction of Access Points to Corridor

The works tables (Section 4) have noted where gates can be put in fences to allow ease of access. These new access points will be sited off existing public roads and they will consist of a management access gate in the boundary fence and formed access track (built to 5m wide). The precise locations have not been included within the Plan; precise locations will depend upon having direct access to the railway corridor off an adjoining public road (rather than via an adjoining private property). Upon completion of the trail these additional gates can be used for access by emergency vehicles and maintenance vehicles. They will require identical locking mechanisms to the gates at each road crossing.

The works tables (Section 4) have also noted where access will not be so easy and will need to be done from road crossings (and an allowance for extra time involved has been included). The tables identify that negotiations with adjoining landholders may provide alternative access opportunities but this should not be relied upon. At this point in time with the existing landholders in place at March 2022, additional access points will be unable to be negotiated between Nimmitabel and Old Bombala Rd trailhead due to the steadfast opposition of landholders to the proposal. Landholders in other sections were not directly asked this question during fieldwork so their attitude is unknown; however, at least one landholder is very positively inclined to the rail trail so may be open to negotiation over construction access.

Remediation of Contaminants in Sleepers and Along Formation

Although no contamination investigations are known to have been undertaken, it is possible that there are contaminants in the soil and sleepers from years of maintenance of the railway track, railway corridor and associated infrastructure. The CMP should specify how potential contamination is to be dealt with. The original risk assessment for the Tumbarumba Rosewood Rail Trail (prepared by Riverina Local Land Services in 2017 recommended that, as a precautionary measure, soil samples should be taken on any areas deemed to be high risk for residue contamination, especially where earth works occur. The Peron Group have advised that sampling and testing were carried out for the project and returned negative results for preservative chemicals and asbestos. In keeping with this approach, sampling and testing of the railway sleepers should be undertaken at various section along the site to determine whether they contain any contaminants. Specifically, confirming whether there are any residual preservative chemicals or asbestos (from the train brakes) will enable the disposal method and costs to be determined.

De-contamination of Construction Equipment

As good practice, it is imperative that any construction equipment be kept clean. The CMP should specify the process by which construction equipment will be kept clean of potential diseases, weeds and contaminants.

Management of Fire Risk (incl. Spark Control)

There is a risk of accidental fires being caused by sparks from machinery and (in the case of the removal of the steel railway track) the cutting of steel. The CMP will need to address ways of ensuring fires are not inadvertently caused by the construction activity, and consideration given to the time of the year that different construction activities are undertaken. The CMP will identify the general requirements regarding fire prevention and management during construction, especially at times of total fire ban.

Weed Management – Control and Eradication

There is a legal obligation to control noxious weeds. The control/eradication of weeds within the former railway corridor is of particular importance and the CMP will need to ensure that construction of the rail trail does not cause weeds to spread. This is of particular concern to landholders in the southern two sections under consideration.

Marking Trees for Retention or Removal

In some locations, vegetation has re-grown within the former railway corridor and even between the sleepers of the railway. Clearing of (some of) the regrowth vegetation will be required. However, some of the regrowth should be retained to provide shade for trail users, as it is sufficiently clear of the proposed trail corridor so as to not be of concern. Prior to construction commencing trees that are to be retained (for their shade and aesthetic values) should be marked with flagging tape. The CMP should specify the process for marking trees for retention.

Clearing, Mulching and Disposal of Waste Vegetative Material

Some regrowth vegetation will need to be removed from the rail trail corridor. The CMP will address the process for clearing, and the manner in which vegetative material will be removed from the corridor (such as by mulching and spreading in the immediate area or by other methods).

Disposal, Re-use or Recycling of Sleepers

There may be good quality sleepers available for re-use should they be needed for signage or battering of slopes etc. The remainder can be used for erosion control, or chipped if they are in very poor condition. The CMP should specify where poor sleepers can be used and where the good ones will be used and other methods of disposal.

Erosion Control and Drainage Along Corridor

The railway (when operating) had functional erosion control techniques in place. The construction of the rail trail must ensure that no damage is done to existing drainage channels and erosion control devices and that erosion is mitigated rather than exacerbated. This is particularly important when working in and around the numerous watercourses, along embankments and through cuttings. The CMP will need to address how erosion will be controlled, both during the construction of the rail trail and afterwards.

Pollution Control at Watercourses/Bridges

There will be considerable construction activity in the vicinity of watercourses at the time when bridges and culverts are being replaced and/or refurbished. The CMP will need to specify the installation of erosion and sediment controls, such as silt fences, to be deployed at sensitive locations such as bridges and other watercourses. Utmost care needs to be taken to avoid damage to banks of creeks.

The Perron Group has noted that works around the waterways on the project will likely require approval from Department of Planning, Industry and Environment and recommended that early engagement is recommended to ensure that this will not form a delay to the project.

Access Considerations

The CMP will need to determine the most efficient means of access to all parts of the corridor (and to stockpile sites), with minimal noise, dust and inconvenience to nearby residents.

Traffic Control

There are 11 road crossings along the proposed rail trail. Each road crossing will require various improvements, such as the construction of the trail, the installation of gates and fencing, and the installation of signage. The CMP will need to address the issue of traffic management and control to ensure the safety of contractors involved in construction activity in the vicinity of each road crossing – particularly at major roads such as the two crossings of the Monaro Highway in Bombala and the crossing of the Snowy River Way at Jincumbilly. RMS approvals will be required to cross some of the roads. The CMP will need to reflect any conditions for traffic control put on RMS approvals.

SECTION 7 – CORRIDOR MANAGEMENT AND OPERATIONS PLAN

7.1 INTRODUCTION: A CORRIDOR MANAGEMENT PLAN

As the trail development planning moves towards completion, a number of decisions need to be made about the ongoing management, operation and maintenance of the rail trail.

The best approach to deal with these issues is through a Corridor Management Plan, which forms the basis for ongoing trail management, operation and maintenance. A well-prepared and comprehensive corridor management plan serves to ensure the rail trail functions and operates as a high-quality experience.

The following information is provided for information so that the two Councils (and any Committee of Management set up to progress the project) can consider a range of factors in managing the trail.

What is in a Corridor Management Plan?

There are four major components to a Corridor Management Plan:

- A 'Trail Policy' or a set of Guiding Principles which incorporates a set of decisions made about how the rail trail will operate;
- A Trail Management Plan;
- An Emergency Response Plan (incorporating a Fire Management Plan); and
- A Trail Maintenance Plan.

Bringing all four elements together in one framework (a Corridor Management Plan) makes ongoing trail development and management an efficient process and ensures ongoing seamless transitions as personnel involved with the trail change over time.

7.2 GUIDING PRINCIPLES/TRAIL POLICY

7.2.1 GUIDING PRINCIPLES

The preparation of a set of overarching principles is a useful exercise. Adherence to these principles will serve as a guide to the use, upgrading, maintenance, promotion and management of the Monaro Rail Trail. The following principles provide guidance for both Councils (and have been adopted from several other rail trail projects). The scope of principles indicates the scope of issues considered in the development of the Rail Trail.

- **Access for all** - where practical and appropriate, the Monaro Rail Trail will be developed/upgraded to enable access by as wide a range of potential users as possible including people in wheelchairs, people with disabilities, family groups and the elderly.
- **Providing enhanced outdoor recreational opportunities** - the Monaro Rail Trail will be promoted as an additional component to the range of low cost outdoor recreational opportunities within the region.

- **Minimal conflict between trail users** – the Monaro Rail Trail will cater for walkers and cyclists with minimal conflict.
- **Providing access to and an enhanced understanding of the history of the Monaro region** - the many physical reminders of past land uses and activities can be a major component of interpretive information available on the Monaro Rail Trail, and a greater inducement for visitors to use the trail.
- **Quality promotion** - the trail manager will give significant emphasis to promoting the Monaro Rail Trail as part of a broader visitor experience of the region.
- **Effective and ongoing maintenance** - the Monaro Rail Trail will be the subject of a regular maintenance regime, and a detailed audit every 2–3 years, ensuring that all defects along the trail receive quick attention, thereby keeping the trail up to the requisite standard and quality.
- **Quality construction** – the Monaro Rail Trail will be built to appropriate standards, and to a high quality, thereby minimising the need for maintenance, and giving users a quality experience.
- **Quality information**, including brochures and mapping - the Monaro Rail Trail will have quality on-trail information, as well as a professionally produced and widely available trail brochure and map. All means of distribution of trail information need to be utilised, including a web site and social media.
- **Outstanding interpretive material** - the Monaro Rail Trail will have on-trail interpretive material and will be included within other trail and publicity brochures, providing trail users with a greater appreciation of the more interesting features to be found along the trail.
- **Consistency and uniformity of signage** - signage is recognised as an essential element of a quality trail, and all signage erected at trailheads, along nearby and adjoining roads and along the Monaro Rail Trail will conform to accepted standards and will maintain a consistent theme along the entire trail.
- **Adherence to recognised standards** - trail construction, signage and trail markers, and trail classification will comply with recognised Australian Standards, thereby ensuring a high quality and safe experience for all trail users.
- **Community involvement** – the management and maintenance of Monaro Rail Trail will consistently seek to involve the local communities along the corridor on an on-going basis and in the formulation of critical decisions. The on-going involvement with the community will ensure that the trail is meeting their expectations.
- **Trail user survey** – trail users will be surveyed on a bi-annual basis to ensure the trail is meeting their needs and expectations, and a survey of adjoining landowners and businesses will be undertaken to ensure the trail is meeting their expectations. Whilst this could be considered an optional principle, it provides a useful feedback tool for the trail manager.

Due to the nature of a rail trail (a corridor surrounded by a range of activities), it can be vulnerable to the negative impacts of surrounding development. The Rails-to-Trails Conservancy (USA) suggests that trail planning include the development of a trail protection policy to prevent damage to the trail corridor. The policy sets out primary uses of the corridor – recreation, transportation, and historic preservation. Any use deemed incompatible with this primary use will be denied; those uses compatible with the primary use will be considered and carefully regulated.

A comprehensive **trail protection policy** provides the trail manager with the authority to do the following:

- Regulate all secondary uses of the trail corridor in a fair and consistent manner;
- Minimise inconvenience to trail users, and assure protection of wildlife habitat and natural and historic resources within the trail corridor;
- Minimise damage to the trail corridor at all times;
- Establish uniform standards for construction and restoration of the trail corridor if it is damaged by a secondary use;
- Ensure that the managing agency recovers all its administrative costs and receives appropriate compensation for use of, and damage to, the trail corridor by secondary uses;
- Inform all public and private interests of the expectations and intentions of the trail managing agency with respect to secondary uses;
- Issue permits and licences for secondary uses; and
- Prohibit the transfer of ownership rights through the use of easements or other mechanisms.

7.2.2 THE INITIAL DECISIONS

Some basic initial questions need to be answered, and some crucial decisions made. These inform the management decisions about the ongoing management of the rail trail. The following discussion covers the range of issues generally addressed in trail management. Questions are posed and some possible answers are included. These answers will need to be considered and more fully answered by the two Councils. Trailhead Code of Conduct signage should reflect the Councils' position on the following matters.

Enforcement procedures

What enforcement procedures will be in place? The two councils will have existing local laws covering a range of matters such as riding motorbikes in parks (a common issue). These local laws should form the basis for enforcement – the enforcement infrastructure is the key issue.

Dogs on the trail

Will dogs be allowed? If they are allowed, in what sections should they be allowed? Will they be permitted to be off-leash, or will they be required to be on-leash? The proximity of dogs to other dogs on rural properties can cause an unacceptable conflict or public safety problem.

It is recommended that dogs be allowed on the "town and near town" sections of the trail, where they could be permitted on leash and managed in accordance with relevant local laws. The two councils can refine the boundaries but as a starting point the dog "boundaries" should be:

- Tralee trailhead south to the Gilmore side trail, thus allowing people from both Tralee/South Jerrabomberra and the proximate Canberra suburbs to walk their dogs.
- Michelago to a point north of Michelago where the trail enters more rural settings (boundary to be determined by possible future extent of suburban/rural residential development).
- Nimmitabel to the site of a former overhead road bridge which may be the old Monaro Highway (approximately 1.6kms from Lake Williams).
- Bombala trailhead to Sandy Crossing Road crossing.

Horses on the trail

As noted in Section 3, no provision has been made to allow for horse riding on the trail.

Weed eradication and control

What will be the weed eradication and/or long-term control program? The options are grazing, slashing or using poisons. The two Councils (and/or the trail manager if not the Councils) will have an obligation to deal with weeds. On other rail trail proposals, trialing native grass plantings as part of a weed removal program has been suggested. This potentially reduces weed growth opportunities and potentially reduces slashing requirements as native grasses need slashing far less regularly. This may be an appropriate course to pursue if the trail proceeds.

Additionally, some landholders may currently manage the weeds within the corridor as they are a "threat" to sustainable farming – this is a positive action and their ongoing involvement with weed control should be negotiated if the trail proceeds. Procedures for ensuring their continued involvement need to be negotiated at an early stage if the two Councils (or the trail manager if not the Councils) is to rely on a contribution.

Open fires and barbecues

Any lighting of open fires or barbecues at any time of the year should not be permitted along the rail trail.

Trail construction and infrastructure standards

Decisions need to be made as to whether a high or low standard of infrastructure will feature on the trail. This may also include timetables for ongoing enhancements or embellishment of infrastructure. A decision on standards to be adopted on a permanent basis has implications for ongoing trail maintenance.

Strategies for the protection of native vegetation

Together with road reserves, railway reserves played an important role as wildlife corridors and habitats for native birds and animals. In many instances they hold important remnants of the indigenous vegetation that has been all but lost. It is important to manage railway reserves in a manner that maintains and enhances their nature conservation values.

In order to improve aesthetic and nature conservation values, the removal of introduced weeds and grasses and revegetation with native species is desirable. Revegetation is also important in some areas for visitor comfort. Any revegetation areas planted with native trees, shrubs, herbaceous plants and grasses. Where screen planning is used (at the request of any landholder primarily for privacy purposes), appropriate native species should be used.

Once the rail trail is developed, the two Councils (and/or the trail manager if not the Councils) will be responsible for management of revegetation and the control of weeds within the corridor.

Complaints/communications – procedures and responsibilities

It is critically important for the rail trail users, adjoining landholders and the public to have contact with authorities to ensure that the rail trail is managed properly, that maintenance matters are attended to readily, that any regulations are enforced and that general feedback can be given. It is important that this person or agency is easily contactable. Contact details need to be on all trail literature and maps, on trailhead signage, and on relevant websites.

It is important that the public and users know who to contact about the trail and about management issues. Responsibility rests with an accountable person or group. The two Councils (and/or the trail manager if not the Councils) needs to take responsibility for organising maintenance and for any necessary trail closures and for being the first point of contact for most matters.

It is strongly recommended that one person be allocated within each of the two Councils (and/or the trail manager if not the Councils) to be the primary contact point for trail matters.

On-trail events and group use policy

One form of group usage is the on-trail special event and how these are to be managed. Examples from other rail trails include the annual Somerset Rail Trail Fun Run on the Brisbane Valley Rail Trail, and the South Burnett Rail Trail Express Relay both in South East Queensland. The two Councils (and/or the trail manager if not the Councils) should notify, and seek input from, local police and other emergency service personnel when any sizeable event is planned. It builds good community relationships. Major events not involving alcohol may also require assistance from police; for example, police are often involved with events, providing some traffic control services. It is good practice to involve local service personnel in the early stages of event planning.

On-trail advertising

Will on-trail advertising be allowed? The two Councils (and/or the trail manager if not the Councils) need to be aware that advertising can be an advantage to users and commercial operators as it can be a source of funding for ongoing maintenance/upgrades. For example, there are a number of quite large roadside advertising signs within the railway reserve between Royalla and Michelago. It is assumed that some revenue from these signs is being paid to the corridor manager and this should continue when the corridor management regime changes. Such signage should be controlled, and it should be to a standard (though existing contracts may be hard to alter). On-trail advertising is one avenue of revenue generation. The main impacts of such advertising would be visual impacts and safety impacts. Any permitted advertising signs should not impede trail users nor create a safety hazard (for example, by obscuring a road crossing warning sign). Visual impacts are much more difficult to judge. Local governments have a range of signage policies that are likely to address visual amenity. Policies that regulate road-side advertising would be the most relevant. Where these are not compatible the two Councils (and/or the trail manager if not the Councils) should determine the criteria.

Commercial establishments, such as accommodation providers, alongside the Otago Central Rail Trail in New Zealand are obliged to comply with advertising design guidelines and pay for the advertising.

On-trail advertising is likely to be directly connected to trail-side businesses or (more likely) businesses of interest to trail users such as bakeries and cafes (this could be one of the criteria) but the two Councils (and/or the trail manager if not the Councils) would not be endorsing the service nor directing trail users to that facility under any agreement.

Use of the trail corridor by utilities

A linear corridor such as a rail trail does lend itself to a range of potential future uses – many of which are not excluded by the possibility of the corridor being converted into a recreation trail. This former railway corridor, like so many others around the world, is also ideally suited for the placement of utilities, such as wires, cables and pipes. Data, telephony and energy can and are all carried in pipes alongside or underneath rail trails. Running underneath sections of the Brisbane Valley Rail Trail are pipes for the South East Queensland Recycled Water Scheme. These uses can be complementary to the corridor's use as a recreation trail.

Provided the intended co-use does not disturb the natural, scenic and historical qualities of the trail, it can be permitted in accordance with the Trail Protection Policy (discussed in Section 7.1.2). In other jurisdictions, utilities are charged an annual fee for corridor use.

Consideration and amelioration of impacts on adjoining landholders

Consideration of the impacts on the landholders needs consideration. This covers issues such as fencing, privacy issues, and trespassing. The Corridor Management Plan needs to set a basis for how these are dealt with on an on-going basis. One of the guiding principles for the Monaro Rail Trail should be that the management and maintenance of the trail will consistently seek to involve the local community on an on-going basis and in the formulation of critical decisions. This on-going involvement with adjoining landowners and the community will ensure that the use of the rail trail does not impinge on private operations and that disputes are resolved wherever possible to the satisfaction of both the trail manager and the landowner.

A spirit of cooperation with adjoining landholders needs to be continued throughout the life of the rail trail. Building community support is critical – adjoining landholders can provide a significant boost for wider community support. There are no rules for on-going engagement with adjoining landholders – a willingness to sit down and listen and discuss openly is required. Having a single contact point for the trail would be a significant advantage to ensure ongoing good relationships with landholders. Inviting landowners to 'adopt-the-trail-section' adjacent to their property may be warranted.

During preparation of this Trail Development Plan, a number of adjoining landholders were spoken to. Some were very supportive of the rail trail, others were neutral, while others were steadfastly opposed. Those who are supportive should continue to be encouraged to be involved with the rail trail's development (acknowledging that one landholder has been very supportive and instrumental in work to date on progressing the rail trail proposal).

Management structures and management planning

Decisions about management structures, timetables for change and the reasons for decisions should also be included in the Corridor Management Plan. Ongoing community involvement which will be driven through the management structures needs to be also included in the Corridor Management Plan – the why, the how and the who need to be clearly articulated in an accessible document.

7.3 A TRAIL MANAGEMENT PLAN

A Trail Management Plan is essential to setting both the long-term and day-to-day management objectives for the trail and provides a framework against which a range of decisions can be made. Such a document - as with all management plans - should be both flexible and responsive to change yet set a clear management framework for future directions and priorities. Trails that do not have a Management Plan suffer from decisions taken on the run, out of context or as knee-jerk responses to critical situations.

Many of the initial decisions mentioned in Section 7.2.2 flow into a trail management plan and should be included.

A timetable for reviewing and updating this Plan should be set, with annual reviews and three (or five) year updates recommended. The Plan must outline a professional program of management, designed to ensure that there is no lapse into a belief that trails, once built, will manage themselves.

Further, this plan must clearly define who is responsible for what – it is crucial that everyone knows what their role and responsibility is. Without this, it is all too easy for everyone to sit back expecting someone else to do the work. Trail management plans need to be specific about roles in management and maintenance.

7.4 AN EMERGENCY RESPONSE PLAN

Major fire events in particular throughout Australia in recent years have put the need for emergency planning and management into sharp focus. Trail managers need to be very conscious of the need to prepare emergency response plans and work out how to deal with emergencies on trails. This is not limited to fires. Flooding can be just as serious an issue.

The key elements of an emergency response plan for a rail trail such as this are:

- General risk management;
- Fire risk and fire management;
- Flood risk and evacuation procedures;
- The provision of appropriate signage;
- Trail access for emergency service vehicles;
- Emergency responses – how and who;
- The provision of adequate information and mapping to the services' communications centres;
- The need for special agreements between emergency service providers and the trail manager; and
- The provision of on-trail communication systems.

7.4.1 GENERAL RISK MANAGEMENT

A risk is the chance of something happening as a result of a hazard or threat that will impact on an activity or planned event. Risk arises out of uncertainty. It is measured in terms of the likelihood of it happening and the consequences if it does happen. Risk, therefore, even on trails, needs to be managed. Ignoring the risks that apply to a recreation trail or events planned along a trail could impact on:

- The health and safety of trail users, staff, volunteers and event participants;
- The reputation, credibility and status of the trail and its manager (or trail association);
- Public and customer confidence in the trail manager;
- The trail manager's financial position; and
- Plant, equipment and the environment.

A systematic approach to managing risk is now regarded as good management practice. Risk management is a process consisting of well-defined steps which, when taken in sequence, support better decision making by contributing to a greater insight into risks and their impacts. It is as much about identifying opportunities as it is about avoiding losses. By adopting effective risk management techniques, the trail manager can help to improve the safety of trail users, the quality of experience for trail users and business performance of the trail organisation. Sound risk management can prevent injuries from occurring and help to reduce insurance claims and costs. Risk management is of particular importance to nature based and adventure tourism operations and requires careful consideration in how it is planned for and dealt with. The courts expect that a business (including local governments) will exercise due diligence in carrying out hazard assessment, risk management planning and emergency response planning. There are many benefits in implementing risk management procedures. Some of these include:

- More effective strategic planning;
- Better cost control;
- Increased knowledge and understanding of exposure to risk;
- A systematic, well-informed and thorough method of decision making;
- Increased preparedness for outside review;
- Minimised disruptions;
- Better utilisation of resources;
- Strengthening culture for continued improvement; and
- Creating a best practice and quality organisation.

Though the rail trail would be located on a reasonably flat grade, and is wide enough to accommodate several user groups, there will be risks associated with use of the trail.

Some of the risks involved are:

- Encountering motor vehicles at road crossings;
- Conflict between user groups;
- Encountering illegal trail users such as cars/4WD and trail bikes;
- Being caught in a grass fire;
- Being caught in a sudden change of weather (snow; blizzard etc);
- Being caught in a flood; and
- Being bitten by a snake.

Good design and construction address some of these risk elements. Many trail projects have in place a maintenance plan which sets out clearly the items which require regular inspection, the frequency of that inspection and assessment, the actions to take in response to degraded surface conditions or infrastructure, and remedial action to rectify a problem or fault.

The threat of fires is always present. Though snakes are rarely encountered, it may be prudent for trail promotional material to carry a warning about possible encounters and to provide information about dealing with a snakebite.

7.4.2 FIRE RISK AND MANAGEMENT

The trail manager will be responsible for implementing fire protection and management along the rail trail corridor to protect life, property, public assets and natural and cultural values from fire, reduce the incidence of fire, reduce the severity and restrict the spread of fire. The aim of fire management is to ensure trail users and adjoining landholders are protected from fire commencing on or travelling along the rail trail corridor. To reduce the incidence of fire starting from the rail trail all open or solid fuel fires should be prohibited. At visitor facilities, such as trailheads, picnic shelters and rest areas, slashing should be used to reduce fuel loads. Where the corridor has tree cover or where revegetation is to occur, there will be a need to provide a buffer zone along the boundary or alternatively seasonal grazing of the vegetated area to reduce fuel loads will be permitted. Relevant signage at trailheads needs to include fire warnings.

Fire management issues include:

- Fire risk factors in the area – risk profile is influenced by a number of factors including slope of the land, response time for emergency vehicles (the closer to a town a trail location, the less time for emergency vehicles to get there), proximity of roads and how heavily trafficked they are (highways and major arterials increase risk due to higher numbers of passing motorists), and closeness of refuges including fire-proof buildings and roads.
- Fire management responses for the trail. These included closure on days of total fire ban (and consequent policing). This is now done regularly in National Parks throughout Australia and on recreational trails.
- The banning of smoking on the rail trail under legislation governing smoking in outdoor areas. It is acknowledged that this is difficult to enforce except by having a constant presence; it is however a possible ‘tool in the toolbox’ for managing fire risk.

It is of major importance to develop a Bush Fire Risk Management Plan early in the planning process in consultation with the NSW Rural Fire Service. This is an issue with many rail trails (and in fact with any activity that takes people out into the bush in significant numbers). It has been successfully tackled elsewhere. For example, the Lilydale to Warburton Rail Trail (in Victoria) has developed a Wildfire Risk Management Plan. The Plan includes a number of objectives and relevant actions. The objectives are:

- Providing a safe recreation trail for walkers, cyclists and horse riding;
- Providing a safe access onto and along the trail for all emergency vehicles;
- Minimising the risks of fires spreading from or onto the rail trail; and
- Developing annual maintenance works and maintenance programs (with an accent on fire hazard reduction).

7.4.3 FLOOD RISK

Flood issues include:

- Need for safe crossing of all waterways.

- Closing the trail at times of flooding (or immediately after heavy rains when the trail surface may be impacted by trail users).
- Evacuation procedures when trail users are inadvertently caught on the trail during a sudden flood event.

7.4.4 APPROPRIATE SIGNAGE

Trailhead signage should specify what to do in an emergency, the numbers to call, the location of public phones, and the capacity for a flip-down sign indicating trail closure (due primarily to fire, flooding or maintenance work).

Many trails, including rail trails, are now using Emergency Marker signage placed at regular intervals along the trail and at road crossings.

The Emergency Marker system generally uses a unique alpha-numeric code for each location. The trail would have a series of consecutively numbered sign posts. The signs contain not just the unique alpha-numeric identifier, but also the Emergency telephone number to call for help. Emergency Service operators are aware of the location of each uniquely identified sign and can send help to that specific location in an emergency.

7.4.5 TRAIL ACCESS FOR EMERGENCY SERVICES

The main design element is that emergency vehicles will need to have access to the rail trail. The simplest option is to ensure that all locked gates or bollards along the trail have the same locking system. Combination locks have been recommended on other projects, simply to manage the human problem of misplaced keys.

7.4.6 EMERGENCY RESPONSES – WHO AND HOW

In an emergency situation, one of the key issues that arise is how an emergency is communicated. The emergency number from a landline is 000, while the emergency number that works best from a mobile phone is 112. Once a call is made by a trail user, the communications centre for the appropriate service dispatches the required personnel and vehicles. The trail manager would only be likely to be involved after the emergency situation is resolved, to review and record the incident, and to review the response.

It is a different situation when the emergency is a slowly emerging situation, such as a period of total fire ban (or very high fire risk) or the likelihood of flooding. The trail manager needs the vested authority to close the trail under such circumstances (under relevant state government legislation). Once the trail manager advises police that the trail (or part of the trail) is closed, police have the powers to ensure that people do not go onto the trail or can be removed from the trail if they are on it (an administrative trespass) though most people accept the advice of police. In an emergency such as a fire or flood (as opposed to trail closure because of a fire risk for example), emergency services have ‘command and control’ powers that allow them to remove people from a situation considered to be dangerous. In such circumstances, emergency service personnel are ‘out and about’ and see people and move them to an appropriate place.

At times when the trail needs to be closed (such as a very high fire risk or when flooding of watercourses is present), police or other authorities would be able to travel to trailheads in their area and ‘flip down’ the Trail Closed sign.

7.4.7 PROVISION OF ADEQUATE INFORMATION FOR COMMUNICATIONS CENTRES

As the trail develops, mapping data should be provided to the communications centres for each of the emergency services. The data that should be entered into their system covers maps with the location of Emergency Markers, trail distance markers (and their reference points), and road crossings (and their GPS coordinates) marked on the maps. One set of data should be developed and given to all the communications centres.

7.4.8 SPECIAL AGREEMENTS

There is usually no need for special formal arrangements between the trail manager and the emergency services for a trail. It is a resource and an activity that the emergency services need to deal with as part of their everyday activities. Any major events on the trail should trigger early involvement by police and ambulance in particular – this is good practice and ensures good relationships.

7.4.9 ON-TRAIL COMMUNICATIONS SYSTEMS

The placement of emergency phones on the trail as a way of ensuring that emergencies could be managed could be considered. However, this is a significant cost item to install, replace and maintain. In addition, most trail users would have some form of mobile phone. The works tables (Section 4) have included notes on mobile phone coverage along the three trail sections. It is reasonable to say that coverage is relatively patchy along the corridor, varying between 1 and 4 bars of strength (on the Telstra network). Even sites relatively close to the Monaro Highway (for example just south of Williamsdale Road) have weak signal strength. The most isolated of the trail sections would be the section between Jincumbilly and Bombala and mobile coverage varies (at the random locations selected) between 1 and 2 bars.

Publicly available maps from Telstra show 3G coverage along the entire corridor between Tralee and Michelago and less coverage along the other two corridors with sections of the Nimmitabel to Old Bombala Rd and Jincumbilly to Bombala trails not covered. Optus maps show similar coverage while Vodafone provides almost no coverage over the corridor from Jincumbilly to Bombala but is similar to the other major providers for the other two corridors (good coverage over the Tralee to Michelago and patchy coverage over the corridor between Nimmitabel and Old Bombala Road).

People heading into the “bush” need to be prepared for emergencies. The use of personal locator beacons has been of great assistance to emergency management personnel even in the absence of mobile phone coverage.

Placing phones on the trail possibly increases the trail manager’s liability – if a phone does not work (for instance it is broken), an aggrieved person may look for recompense from the trail manager. Public phones are often quite accessible from trailheads and their locations should be shown on all trail mapping (brochures, trailheads, Web sites etc.).

7.5 A TRAIL MAINTENANCE PLAN

Ongoing trail maintenance is a crucial component of an effective management program – yet it is often neglected until too late. Countless quality trails have literally disappeared because no one planned a maintenance program and no one wanted to fund even essential ongoing repairs. It is therefore essential that funds be set aside in yearly budgets for maintenance of these trails - to ensure user safety and enjoyment, and to minimise liability risks for land managers.

7.5.1 THE MAINTENANCE TASK

Ongoing maintenance can be minimised by building a trail well in the first place. A well-constructed trail surface will last considerably longer than a poorly built trail. Signs, gates, and posts installed in substantial footings stand less risk of being stolen or damaged. Well designed, well-built and well installed management access gates and trail user gates (as proposed) will keep motor vehicles and motorised trail bikes off the trail with a consequent lessened need for surface repairs. Trail furniture (such as bench seats, trail directional marker posts and interpretation) should be installed in substantial footings sufficient to withstand high winds and theft. These should require minimal ongoing maintenance. Care needs to be taken by maintenance vehicles when travelling along the trail so as not to damage the surface.

Trail managers and "Friends of …" groups often arrange 'Adopt-a-Trail' programs to ensure the rail trail is well maintained – by volunteers. The majority of some trails, such as the Bibbulmun Track, are maintained by volunteers.

The presence of trees along some of the trail means that time will be spent removing damaged and fallen trees and branches in the aftermath of a storm.

The most frequent maintenance task will be attending to fallen branches and limbs, repairing trail surfaces, replacing stolen or damaged signs (including road signs), clearing culverts and under bridges and ensuring gates and fences are functioning as intended.

As noted above, building good trails in the first place is the very best way of minimising future problems and costs. As a second line of defence, a clear and concise Management Plan with a regular maintenance program written into it will aid significantly in managing ongoing resource demands.

The goals of a Trail Maintenance Plan are to:

- Ensure that trail users continue to experience safe and enjoyable conditions;
- Guard against the deterioration of trail infrastructure, thereby maintaining the investment made on behalf of the community;

- Minimise the trail manager's exposure to potential public liability claims arising from incidents which may occur along the trail; and
- Set in place a management process to cover most foreseeable risks.

Erosion (caused by weather and unauthorised users), regrowth of vegetation (including grass and weeds on the trail corridor but not on the trail surface), fallen trees and branches, and damage to signage and fences are likely to be the greatest maintenance activities on the trail. Providing these effects are attended to early, they are largely labour intensive rather than capital expensive. Calamitous events such as fire or major flood will naturally generate significant rebuilding activity and consequent costs. These events are generally unmanageable and should simply be accepted as part of the longer-term reality of trail management.

7.5.2 PUBLIC LIABILITY AND RISK MANAGEMENT

It is important that both the Snowy Monaro Regional Council and the Queanbeyan Palerang Council be aware that – whether or not visitors are actively encouraged to come to the trail – they carry a significant duty of care towards those visitors accessing the trail. The maintenance of a quality trail is therefore critical from this perspective. Liability generally rests with the land managers and hence, every attempt should be made to minimise the risk of accident or injury to trail users (and therefore the risk of legal action).

While public liability is certainly an issue for all land managers, it is not a reason to turn away from providing safe, sustainable and enjoyable resources. It is simply a mechanism by which to recognise the responsibilities inherent in managing natural and built resources. Dealing with a perceived liability threat is not about totally removing that threat – it is about doing all that is manifestly possible to provide safe access opportunities for visitors, thereby minimising the risk of liability claims.

A formal Hazard Inspection process is crucial in the ongoing maintenance plan. Not only will this define maintenance required and/or management decisions to be addressed, but it is also vital in ensuring safe conditions and therefore in dealing with any liability claim which may arise in the future. Courts are strongly swayed by evidence of a clear and functional program, and a regular series of reports, with follow-up actions, will go a long way to mitigating responsibility for injuries. Further, clearly defined 'User Responsibility' statements in brochures, maps, policy documents, plans and public places will assist this process.

7.5.3 TRAIL MAINTENANCE

The following information is provided as general maintenance guidance. An inventory of works and locations needs to be prepared for maintenance purposes – this cannot be prepared until construction is completed. An example of a checklist for a trail is included in Appendix 8. The Councils will need to create a specific checklist based on this example once the trail is completed.

Maintenance on the trail should be divided between regular inspections and simple repairs, a one (or two) person job, and quarterly programs undertaking larger jobs such as significant signage repairs or weed / vegetation control. A range of basic machinery, tools and equipment will be required for this work.

At the core of any trail maintenance program is an inspection program. The relevant Australian Standards sets out the basis for frequency of trail inspections. It only covers walking tracks and provides for inspections every 30 days (or less) for Class 1 trails, every 90 days for Class 2 trails, and annually for Class 3-6 trails. This sets the minimum standard for inspections and is a guide only. What the Australian Standards do not include but should include is an inspection of any trail after significant weather events such as storms, fire, floods, and high winds in addition to the regular inspection program. The proposed inspection regime recommends inspections every 90 days.

Clear records of each activity/inspection will be kept by the body with responsibility for maintenance. Pro-formas serve to maximise user safety and minimise liability risks. It will also provide a valuable record of works undertaken and make for efficient use of maintenance resources over time.

Volunteers organised by the Committee of Management at a busy bee to undertake maintenance work along the rail trail near Port Fairy in Victoria.

In general, Maintenance Plans are based around regular inspections, at which time simple maintenance activities should take place concurrently. More time-consuming maintenance activities should take place every six months, while detailed Hazard Inspections should occur annually. Further, the capacity to respond immediately to random incoming reports of hazards or major infrastructure failures should be built into the Plans. Table 8 gives a suggested schedule for general maintenance activities to achieve acceptable maintenance levels and provides explanatory notes pertaining to each Activity.

The Trail Management Plan tasks listed below and costed in Table 9 (and in the more detailed tables in Appendix 9) only cover the costs of maintaining the rail trail and associated infrastructure such as trailheads. It does not cover any costs associated with other assets such as station buildings (where they are not directly related to trailhead development).

Table 8: General Maintenance Activities

Activity	Activity Description	Site	Frequency
Undertake full inspection of the trail.	***At Trailheads*** The trailhead should be carefully checked to ensure that all signage is present, and that all signs are clearly visible and legible. An inventory needs to be prepared to assist in regular maintenance. Surface of access tracks and parking areas need to be checked and potholes eliminated. Inspect and check trailhead facilities and infrastructure: ○ Parking areas and access tracks (check surfaces) ○ Trailhead (map) panel ○ interpretive panel ○ Seating/shelter/picnic tables ○ Trailhead signage (on road) ○ Trail directional marker posts ***At Road Crossings*** Particular attention needs to be given to signs at road crossings or junctions. Each crossing should be carefully checked to ensure that all signage is present, and that all signs are clearly visible. Particular attention must be given to ensuring that “Trail Crossing ahead” signs (on roadside at approach to trail crossing) are not obscured by overhanging vegetation. Replace damaged and/or missing signs.	Entire trail	Every third month

	Check management access gates and trail user chicanes for structural stability and function. ***Fencing*** Check and make repairs to side fencing. To be done by arrangement with adjoining landowners.		
Check signage and clean, replace or repair as required esp. road crossing signage and directional markers. **All signage should be checked for vandalism and cleaned if necessary. If damage is too great, replacement is essential.** **An inventory of locations of all signs needs to be prepared to assist in regular maintenance.**	Check, repair or replace all trail signage, including interpretive signage, trail distance and directional markers (logo/arrow plates). Replace missing and/or damaged signs.	All locations	Every third month - at each trail inspection.
Slashing of trail environs.		Various locations	Timing dependent on seasonal growth patterns. Allowance for up to 5 times per year.
Check trail surface and arrange repair as required.		Entire trail	Every third month. Arrange repairs immediately if acute, or schedule maintenance for six monthly work sessions if not.

Maintenance of trail surface.	Check condition of trail surface for damage and arrange repairs if necessary; trim off regrowth vegetation.	Entire trail	Every six months.
Sweep or rake debris from trail surfaces, especially at road crossing points.		Various locations	Every six months.
Maintenance of culverts and other drainage measures.	Check and clear drains and culverts. Drains need to be checked and cleared once or twice/year and after heavy rainfall events. Regular maintenance especially after heavy rainfall is essential. Most maintenance will involve clearing of material from silted up or blocked drains. Drain blockages should be cleared as urgent priority. Silt traps at culvert discharges or entry points should be cleared regularly. Cess drains in cuttings should be checked to ensure they function effectively.	Entire trail	Every six months.
Cut back regrowth, intruding and overhanging vegetation.	Check overhanging or intruding vegetation. Cut back where required. Clear fallen trees and branches. Undergrowth vegetation grows quickly, and over time will continue to intrude into the trail 'corridor'. Such intruding vegetation needs to be cut back to provide clear and safe passage for trail users. "Blow-downs" - trees or limbs that have fallen across the trail – need to be cleared as/when required. Sight lines must be kept clear either side of road crossings, to ensure that users can clearly see a safe distance either way at road crossings.	Entire trail	Every six months, unless obviously requiring attention at regular inspections.

Check structural stability of interpretive signage, and interpretive shelters. **Check structural stability of seating, distance posts. Inspect and replace when needed.**	Interpretive panels should be checked for vandalism and cleaned if necessary. If damage is too great, replacement is essential. An inventory of locations needs to be prepared to assist in regular maintenance. Furniture alongside trails, if installed, needs to be checked regularly for damage to ensure safety and comfort of trail users.	Entire trail	Every six months.
Undertake Hazard Inspection and prepare Hazard Inspection Report.	This should be done annually. Inclusion of a formal Hazard Inspection process, crucial in addressing risk, is necessary in the ongoing maintenance plan. Not only will this define maintenance required and/or management decisions to be addressed, but it is also vital in ensuring safe conditions and therefore in dealing with any liability claim which may arise in the future. Courts are strongly swayed by evidence of a clear and functional program, and a regular series of reports, with follow-up actions, will go a long way to mitigating responsibility for injuries. Further, clearly defined 'User Responsibility' statements in brochures, maps, policy documents, plans and public places will assist this process.	Entire trail	Annually.
Check structural integrity of bridges. **Inspect and maintain bridges.** **Check for obstructions and clearing under bridges.**	Visual inspection is appropriate though detailed inspection should follow storm and flood events. After floods, bridge should be inspected, and damaged components replaced as soon as possible. Handrails and surface decking on bridge should be inspected for damage at regular intervals.		Annually.

It should be noted that this schedule does not allow for repair works above and beyond 'normal' minor activities. For example, if a section is subject to heavy rain, and erosion control fails, additional repair works will need to be undertaken.

7.5.4 MAINTENANCE COSTS

Resourcing a maintenance program is crucial, and funds will be required on an ongoing basis to enable this essential maintenance. It would be short sighted to go ahead and build the Monaro Rail Trail and then baulk at the demands of managing and maintaining it.

Estimating the cost of maintaining a trail is difficult due to the unpredictability of events such as floods, fires, high winds and stormwater runoff, as well as the tenure and management arrangements for the trail. Deliberate and willful damage and vandalism can also contribute significantly to the need for ongoing maintenance and replacement of infrastructure. Volunteers can be organised (through a coordinated program) to carry out much of the work at a limited cost to the trail manager.

Evidence of actual trail maintenance costs for individual items along a rail trail, or any trail for that matter, is scarce. The Rail to Trails Conservancy in the USA (*Rail-Trail Maintenance and Operation – Ensuring the Future of Your Trails – A Survey of 100 Rail-Trails, July 2005*) provides two general answers for why it is difficult to estimate maintenance costs. First, the trail may be part of a larger budget for a single park or even an entire parks and recreation department. Specific costs for the trail are not separated out. Second, small trail groups, though run by competent and extremely dedicated volunteers, tend to be 'seat-of-the-pants' operations. Maintenance is done "as needed," funds are raised "as needed," and the people are volunteering because they love the trail, not because they love doing administrative tasks like budgeting.

Maintenance responsibility does appear to significantly affect cost. Approximately 60% of the surveyed trails reporting costs were maintained primarily by a government agency, implying paid staff and/or contractors. The other 40% of trails were primarily maintained by a non-profit or volunteer organisation. Adjusting for exchange rates and inflation since 2005, annual costs for government-run trails were just over $2,465/km. This is not much more than the overall average of $1,855/km, but it nearly triples the average for volunteer-run trails of $868/km.

In Victoria, the Murrindindi Shire Council manages and maintains approximately 85% of the (134km) Great Victorian Rail Trail. It spends around $2,000/km on maintenance activities each year which the trail manager believes is insufficient (2014 data). Anecdotal information indicates that initial construction issues necessitate an increased level of maintenance of the trail surface (and drainage through cuttings). A higher level of (initial) construction quality (i.e. better trail surfacing) would mean less ongoing maintenance.

The Kilkivan Kingaroy Rail Trail in South East Queensland opened in September 2017. In October 2019, representatives of the South Burnett Regional Council (responsible for approximately half the trail) advised that maintenance costs were in the order of $500/km/year.

A 2016 study of the Great Rides of New Zealand (*The Great Rides of the New Zealand Cycle Trails 2016*) examined the 22 "great bike rides" of New Zealand and reported an average maintenance cost of $1,285 per kilometre (adjusted for exchange rates and inflation). This figure is based on the actual reports of 9 of the 22 trails. It is difficult to know precisely what items have been included in these figures as the 9 individual trail reports are not available.

Verbal advice to NERT Inc. from Indigo Shire Council was that maintenance for the Murray to the Mountains Rail Trail costs in the order of $915/km/year.

There are significant variations across the available research costs and it is not clear from available data what has been included and what has not been included in consideration of costs. There are two issues when considering the quoted costs and what has been included and not included.

- The "age" of the trail. The Kilkivan Kingaroy Rail Trail (KKRT) was only 2 years old at the time the data was sourced. Early life maintenance costs tend to be very limited. The $500/km/year cited for the KKRT reflects actual expenditure on maintenance to date. Very little maintenance beyond slashing and minor repairs would have been needed. Figures for the other trails reflect trails that are a little more mature and may need more minor maintenance done. Whist there is appeal in setting aside the minimal amount for maintenance in the first 2-3 years, a more appropriate approach would be to set aside higher amounts from trail inception. The likely maintenance costs in the first few years of a trail's life will focus on sign damage and inspections. These "day to day" costs can and should be funded by the trail manager (using their own resources including volunteers).
- The more critical element is the treatment of replacement of major assets over time. It is highly likely that the available figures from the research do not provide for how replacement of major capital items is considered. The biggest "maintenance costs" are maintenance and replacement of the items that initially cost the most to install – surfacing, and fencing. Bridges will need to be replaced at some point but if the designs recommended in the WRD report are adopted, the design life is 75-100 years. Maintenance on three critical elements is less likely to be needed in the first 5-10 years if the trail is built well in the first place. Allowance for repair and replacement of these items should be treated differently. In addition to maintenance, there will be a requirement for asset renewal – particularly of surfaces, bridges, and fences. The timing of this renewal will generally be between 10 and 50 years – an Asset Management Plan is the appropriate method for dealing with these items. Good asset management practice suggests money be put aside every year for renewal of these major items, even though much of it will not be spent initially. Funding for these items could be sourced from external funding programs as compared with ongoing minor repairs for which major external funding is hard to find. **Little maintenance will be required on newly built trail surfaces, bridge structures and other elements of the rail trail for several years after construction.** There will be very limited need for surface repairs in the first 5 years. Bridges are even less likely to need repair for the first 10 years of a trail's life. Re-constructed and refurbished bridges will require little or no maintenance for many years. However, after perhaps a decade of use they will require more and more maintenance of decking timbers (if used) and more scrutiny of fixings (depending on what materials are used for decking). Pre-fabricated bridges require less maintenance over time. The same comments apply to fencing (though its active life is probably shorter than bridges and surfacing). Advice from local landholders is that properly constructed fencing will yield a life of between 30 and 40 years, particularly if new fencing includes electric fencing outliers which prevent livestock leaning into the fence. There should be very limited need for fencing repairs in the first 15 years. It may be appropriate to share ongoing repair costs with adjoining landholders once the initial investment is made. This is a matter for the trail manager to consider.

It is difficult estimating the costs involved in maintaining a trail until every last bridge and other infrastructure items have been installed. As stated earlier, ongoing maintenance can be minimised by building a trail well in the first place.

The use of volunteers to undertake many of the routine repairs and cleaning tasks can substantially reduce the costs.

7.5.5 ESTIMATE OF MAINTENANCE COSTS FOR MONARO RAIL TRAIL STAGE 1A

No maintenance costs have been included for the Queanbeyan to Tralee section because a route has not been determined. If the two options outlined in Section 4.5 are both adopted, the only maintenance required in the initial years will be sign repairs and replacements as it is assumed that maintenance of other assets such as existing paths and potential trailhead sites such as Queen Elizabeth Park will be covered elsewhere in QPRC maintenance provisions. The signage repair and replacement provisions detailed in the following tables should be taken to provide the costs for the Queanbeyan to Tralee section i.e. replacement of trail directional marker logo/arrow plates and trail kilometre posts ($800/yr) and replacement of miscellaneous signs along the trail ($1,000/yr).

Full maintenance costings are included in Appendix 9. Table 9 provides an estimate of the amounts that may be required on an annual basis for maintaining the three proposed sections of the Monaro Rail Trail for regular “day to day” maintenance.

Table 9: Estimate of “Day to Day” Maintenance Costs for Monaro Rail Trail Stage 1A

Section	*Distance*	*Estimated Annual maintenance costs*	*Annual maintenance cost/km/yr*
Tralee-Michelago	39.334 km	$107,660 excl GST	$2,760
Nimmitabel-Old Bombala Road	10.298 km	$44,300 excl GST	$4,301
Jincumbilly-Bombala	24.58 km	$64,950 excl GST	$2,640

Note 1: The necessity to slash will be much reduced if the rail trail is located within a narrower, fenced corridor and adjoining landowners graze stock within that part of the corridor deemed surplus to requirements. Slashing costs are based on slashing the 7m wide trailway.

Note 2: Reporting of routine maintenance requirements by trail users will obviate need for many scheduled inspections. Appointment of a Trail Manager, with responsibility for regular inspections of entire trail, will substantially reduce need for unscheduled and expensive maintenance.

A number of observations are relevant to Table 9 (and to the more detailed tables in Appendix 9):

- The likely maintenance costs in the first few years of a trail’s life will focus on sign damage and inspections.
- Costings are at full commercial rates (but of course this would be far less if volunteers are involved). US evidence suggests significant savings using volunteer maintenance (trails maintained by volunteers cost one-third of those maintained by Government entities).

- The maintenance estimate provided in the report is an estimate only based upon certain design parameters and construction standards. For example, it is recommended that timber bridges be restored using timber decking and timber handrails because it more fully provides the rail trail experience. However, bridges could be re-purposed using other material such as expanded steel mesh or fibreglass reinforced plastic for the decking which would have a different maintenance regime and costing. It is impossible to estimate maintenance costs to the most accurate possible level until construction is finished and every construction item is catalogued (noting that events like wildfires and major floods are events that maintenance budgets never account for).

7.5.5 ASSET RENEWAL - MONARO RAIL TRAIL

As noted in 7.5.4, asset renewal provisions should be provided for separately and cover replacement of surfacing, fencing and bridges.

A sealed surface will yield a longer practical life than an unsealed surface. Whilst it is difficult to obtain precise data, 20 years seems to be a common lifespan identified in the literature (this is also the advice provided by the Project Manager from the Tumbarumba Rosewood Rail Trail). Under this model, a provision of 5% of replacement cost should be set aside per year in asset renewal for surfacing renewal. This would result in the following annual provisions:

- Tralee-Michelago $164,650/year (a total cost of $3.292 million).
- Nimmitabel-Old Bombala Rd $51,490/year (a total cost of $1.029 million).
- Jincumbilly-Bombala $124,250/year (a total cost of $2.485 million).

According to landholders spoken to for the project, well-constructed fencing should have a life of between 30 and 40 years especially if electrical outliers prevent stock leaning into it. Taking a conservative estimate of 30 years, a provision of 3.4% of replacement cost should be set aside per year in asset renewal for fencing.

- Tralee-Michelago. New fencing is proposed for 12,215 metres of this corridor (noting some of this will be on both sides while some will be on one side only). Provision for its replacement on a 30 year schedule would mean setting aside $6,230/year (a total cost of $183,325). This makes no provision for replacement of existing fencing elsewhere on the corridor.
- Nimmitabel-Old Bombala Road. New fencing is proposed for 17,045 metres of this corridor (noting most new fencing will be on both sides while some will be on one side only). Provision for its replacement on a 30 year schedule would mean setting aside $8,690/year (a total cost of $255,675). This makes no provision for replacement of existing fencing elsewhere on the corridor though this would be limited to the northern end of the trail.
- Jincumbilly- Bombala. New fencing is proposed for 42,430 metres of this corridor (noting most new fencing will be on both sides while some will be on one side only). Provision for its replacement on a 30 year schedule would mean setting aside $21,640/year (a total cost of $636,450). This makes no provision for replacement of existing fencing elsewhere on the corridor though this would be fairly limited.

Bridge replacements are more difficult to assess. Provisions for minor repairs have been included within each of the maintenance tables (in Appendix 9 and the summary table above – Table 9), while it is recommended that the major timber bridges are being restored with a 75-100 year design life. New prefabricated bridges are proposed for many locations where there are currently small timber bridges and will also have a long design life. Appropriate provisions in asset renewal programs need to be made for all bridges.

Spending money on refurbishment at the beginning of the project will yield long-term benefits in terms of longer life spans before major works are needed. The costs of surface replacement will depend on the initial costs of construction.

7.2.8 REDUCING MAINTENANCE COSTS

Using volunteers is the key element in reducing the maintenance costs. Volunteers could undertake much of the ongoing maintenance of the trail if a volunteer maintenance programme is arranged. It should be ensured that whoever is charged with ongoing responsibility for managing the trails has genuine and specific trail knowledge. It is not sufficient to be a skilled gardener, conservationist or environmental scientist. If training is required to bring staff knowledge levels up to a high standard, this should be seen as a priority to be undertaken early in the construction process. Trail skills are better learned over a longer time, with hands-on practice, than in short briefing sessions.

- The Munda Biddi Trail Foundation assists with planning, developing, marketing and maintaining the trail. It enlists paid memberships, enrolls and manages volunteers, holds trail and community events, and provides information and resources to enhance the quality of the trail experience. **Over 85% of that trail is maintained by volunteers.**
- Activities of the Friends of the Lilydale to Warburton Rail Trail include revegetation, weed eradication, protection of remnant species, and building and restoration work.
- Parklands Albury Wodonga a community-based, not for profit organisation focused on undertaking the conservation of "bush parks" in and around Albury-Wodonga from an ecological perspective, whilst allowing sympathetic recreational access. One of the Group’s projects is managing and maintaining the High Country Rail Trail.

The Bibbulmun Track is Western Australia’s premier long-distance walking track. The Track’s success can be put down in large part to the efforts of the Bibbulmun Track Foundation. The Bibbulmun Track Foundation is probably the most successful ‘Friends of’ Group in Australia, with a paid-up membership in excess of 2,200 (in a number of categories).

The Bibbulmun Track Volunteer Program relies on the bushwalking community, and Bibbulmun Track walkers in particular, to commit their time to assist in the maintenance and delivery of the Foundation’s Programs and services (the Bibbulmun Track is 1,000 kms walking track from Perth to Albany). **It is estimated that around 80% of the Bibbulmun Track in maintained by volunteers in this program.** An enormous amount of money is saved as the volunteers carry out many of the inspections and minor repair work.

Volunteers:

- Undertake a range of light maintenance tasks including pruning, clearing debris from the Track, replacing missing trail markers, installing water bars, removing litter and monitoring the campsite.

- Attends to their section at least 4 times per year (i.e. once every 3 months). In areas closer to Perth, or on sections that require a higher level of maintenance, more frequent visits are preferred.
- Submits a report to the Volunteer Coordinator after each maintenance visit. These reports are vital in assisting the Bibbulmun Track Foundation and DPAW in dealing with immediate problems and in planning for the future of the Track.

Monaro Rail Trail Inc has prepared quite an extensive paper on maintenance and how it can contribute including some detailed costings. This will be an important factor for consideration by both Councils. In addition, Monaro Rail Trail Inc also prepared a paper entitled *Monaro Rail Trail Business Model: The Case for a Public Private Partnership/Users Pays Model*. Within the paper, a number of income projections were made and possible sources of income identified. Sources identified included commercial operator levies, commissions from billboard advertising, memberships of a Friends group and sales of merchandise. Funds could be used for trail operation and maintenance.

Many of these options are in place on other trails and fund a range of activities by the trail manager and the relevant trail support group (or Friends of the Trail). Importantly, the NSW Government's *NSW Rail Trails* Framework paper recognises the need to allow commercial activity and sets out aa process for corridor transfer and management that ensures minimal constraints on commercial opportunities along the Rail Trail.

Sponsorship along the Trail

There are examples of rail trails around Australia that use a sponsorship program to generate income for upkeep of the rail trail. The Riesling Trail in SA sells a small number of signs along the trail for local businesses on an annual basis, with all the money being returned into the trail. This trail also sells opportunities at the main trail head and on their website to increase revenue for trail maintenance. Sponsorship opportunities include:

- Trail signage;
- Events;
- Merchandise;
- Corporate events; and
- Promotion through social media and newsletters etc.

Friends of a trail group

Friends of the Trail groups are a resource for many trails across the country. They usually have some form of annual fee which offers regular users and supporters a way to contribute as well as providing some benefit in terms of specific merchandise or access to events. They also provide a base from which volunteers can be found to assist in the maintenance of the trail. Two of the best models are the Bibbulmun Track Foundation and the Munda Biddi Trail Foundation, both in WA and both centred on long walk and cycle trails (respectively) connecting Perth with Albany.

The Bibbulmun Track is Western Australia's premier long-distance walking track. The Track's success can be put down in large part to the efforts of the Bibbulmun Track Foundation. The Bibbulmun Track Foundation is probably the most successful 'Friends of' Group in Australia, with a paid-up membership in excess of 2,200 (in a number of categories).

Memberships are offered in a range of categories (with a range of prices):

- **Individual** - this is the most common type of membership for individual people. It entitles you to all member benefits.
- **Family** - is defined as one adult and their partner/spouse and all children from birth until they turn 18.
- **Senior** - this membership category is for individual seniors who are over 60 years of age and working less than 25 hours per week.
- **Senior Plus** - for a couple who are both over 60 years of age, working less than 25 hours per week and living at the same address.
- **Life Member** - any individual can become a life member or upgrade to a life membership. This is available only to individuals.
- **Student/concession** - this includes any individual who is currently studying full-time, or an individual who holds a current Australian or WA government concession or health care card. Note that a three year membership is not available with this category.
- **Affiliated Organisation** - for any non-tourism organisation, school or club wishing to be associated with the Foundation to support the Track.

Members receive a newsletter three times/year, discounts on merchandise and gear, an electronic update and a range of other opportunities.

The Munda Biddi Trail Foundation offers a similar range of membership categories.

In a similar approach, some trails have donation models operating where users can choose to make cash or online donations towards the Trail Management Committee.

Business programs

Both the Bibbulmun Track Foundation and the Munda Biddi Trail Foundation also offer business support programs. A number of cycle hire, cycle repair and guided cycle tour businesses are accredited businesses under the Munda Biddi Trail Foundation's Cycle Friendly Business program. These businesses offer a range of services along the length of the trail and pay an annual subscription fee to remain in the accredited program.

Again, taking the Bibbulmun Track Foundation as a good guide, the **Walker Friendly Business Program** is offered for businesses along the Track offering accommodation, tours and services who wish to promote their business to walkers. Walker Friendly Business Program members receive a range of extra benefits.

The aim of Walker Friendly Business Program is to connect walkers with businesses along the Track which provide facilities for walkers to make their stay enjoyable and aid them on their journey. The Walker Friendly Business Program has been developed to:

- Specifically promote accommodation and service providers which cater for walkers.
- Easily identify businesses as walker friendly.
- Establish some basic criteria that meet the needs of walkers.
- Complement the cycle friendly business program developed by the Munda Biddi Trail Foundation.

By becoming a Walker Friendly Business, a business agrees to offer a range of walker friendly services. In return, the business is promoted through the Bibbulmun Track Foundation's marketing and promotional initiatives.

Merchandising

Revenue from merchandise sales can contribute to trail funding. Common merchandise includes:

- Trail maps (Mankies printed on microfibre);
- Shirts, hats and other apparel;
- Trail guides with historical and cultural interpretation;
- Bike accessories;
- Stubby holders; and
- Water bottles.

The Bibbulmun Track Foundation sells a range of branded products including CDs and DVDs, day walk map packs, clothing, gifts and souvenirs, guidebooks and other trail-related books. They offer a 10% discount on all purchases for members.

"Space" renting

Within the existing railway corridor there are several outdoor advertising signs. There is a very noticeable cluster of signs adjacent to Kelly Road for example. These are listed in the asset register supplied to SMRC and QPRC and assessed as part of this project. They are a potential source of revenue as it is understood that the owners of the billboards pay a fee to the railway corridor owner. It is not known the size of the fee, but it may be a significant amount of money particularly where there are large numbers of signs. It is recommended that these assets are included in any hand-over of the corridor and assets to the Councils if the trail proceeds.

Additionally, there may be limited opportunities to use existing railway buildings such as the station at Michelago for commercial purposes and derive a rent from commercial leases. The Murwillumbah Station on the Northern Rivers Rail Trail (under construction) has a bike hire business operating within the building for example.

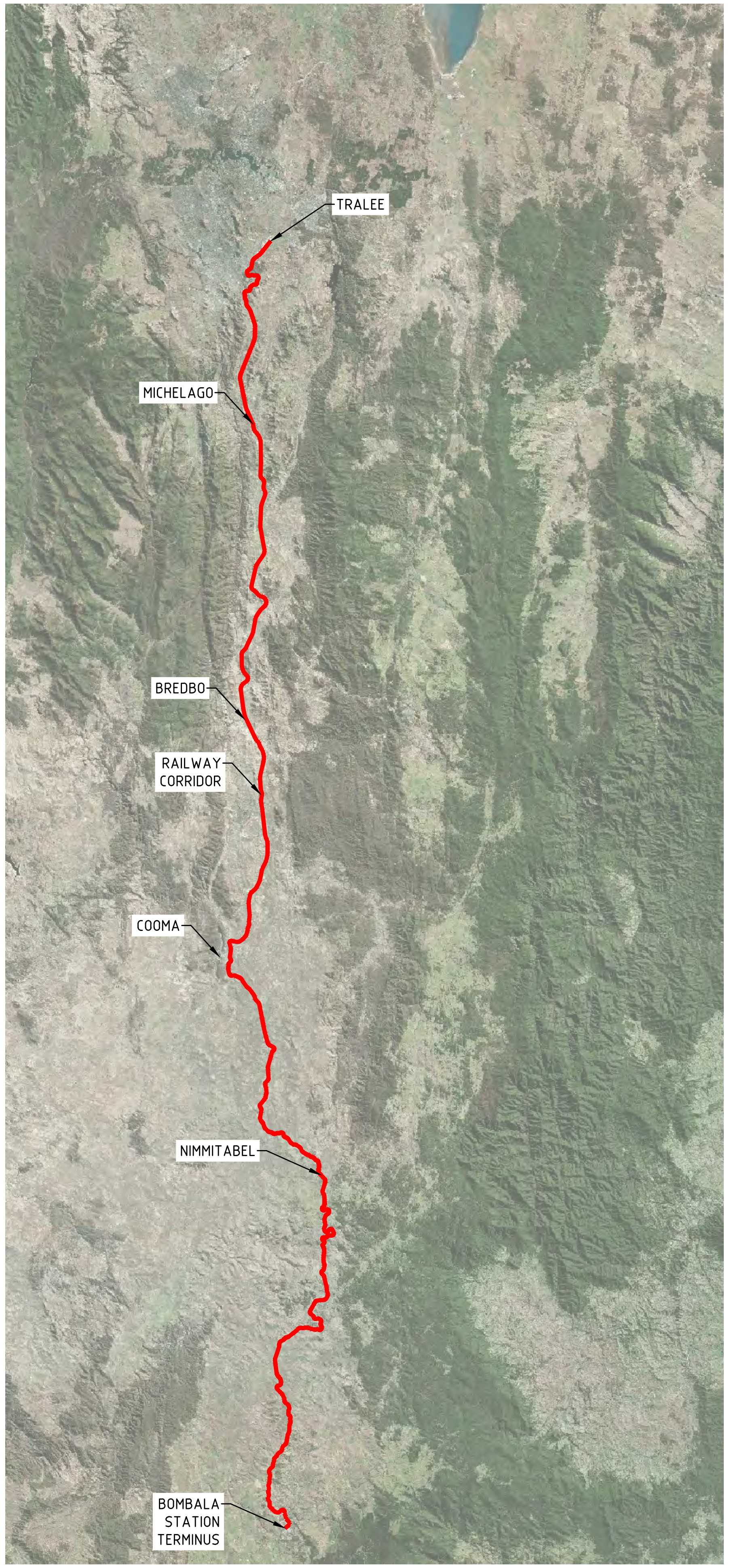
APPENDICES

APPENDIX 1: TRAIL CONCEPT DESIGN SET OF DRAWINGS

MONARO RAIL TRAIL

CONCEPT DESIGN

CONTRACT BE220145



LOCALITY PLAN

N.T.S.

SCHEDULE OF DRAWINGS	
Drawing No.	Drawing Title
C000	COVER SHEET
C100	OVERALL LAYOUT AND KEY PLAN
C101	GENERAL ARRANGEMENT PLAN SHEET 1
C102	GENERAL ARRANGEMENT PLAN SHEET 2
C103	GENERAL ARRANGEMENT PLAN SHEET 3
C104	GENERAL ARRANGEMENT PLAN SHEET 4
C105	GENERAL ARRANGEMENT PLAN SHEET 5
C110	TYPICAL SECTION DETAILS
C111	TYPICAL SIGNAGE DETAILS
C112	TYPICAL ROAD CROSSING PLAN AND ACCESS MANAGEMENT ARRANGEMENTS

PRELIM DRAFT

PREPARED FOR

Mike Halliburton Associates
Trail Consultants

PREPARED BY

BURCHILLS
ENGINEERING SOLUTIONS

Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

DATE : 24.05.22

PROJECT No.:	DRAWING No. :	VERSION:
BE220145	C000	B

PRELIM DRAFT

OVERALL LAYOUT AND KEY PLAN

N.T.S.

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

DISCLAIMER
This drawing and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended.
Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the drawing for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party.

NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

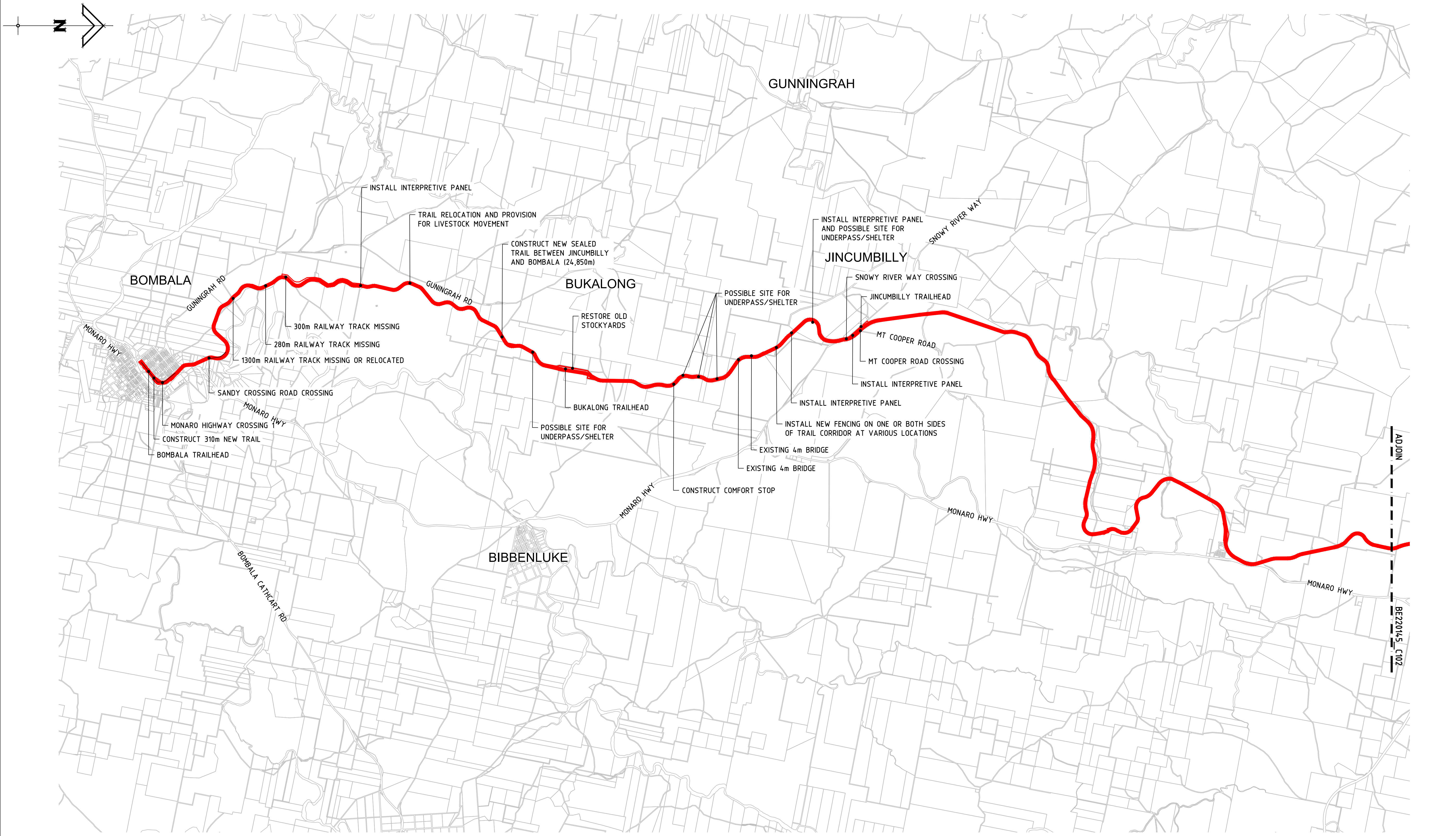
BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT: MONARO RAIL TRAIL

DRAWING TITLE: OVERALL LAYOUT AND KEY PLAN

DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C100
VERSION: B

PLOTTED: 25 May 2022



PLAN 1

SCALE 500 0 500 1000 1500 2000 2500 (metres)
1 : 50000 (FULL SIZE)

PRELIM DRAFT

FILENAME: V:\v2v dropbox\v2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C101_C107.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

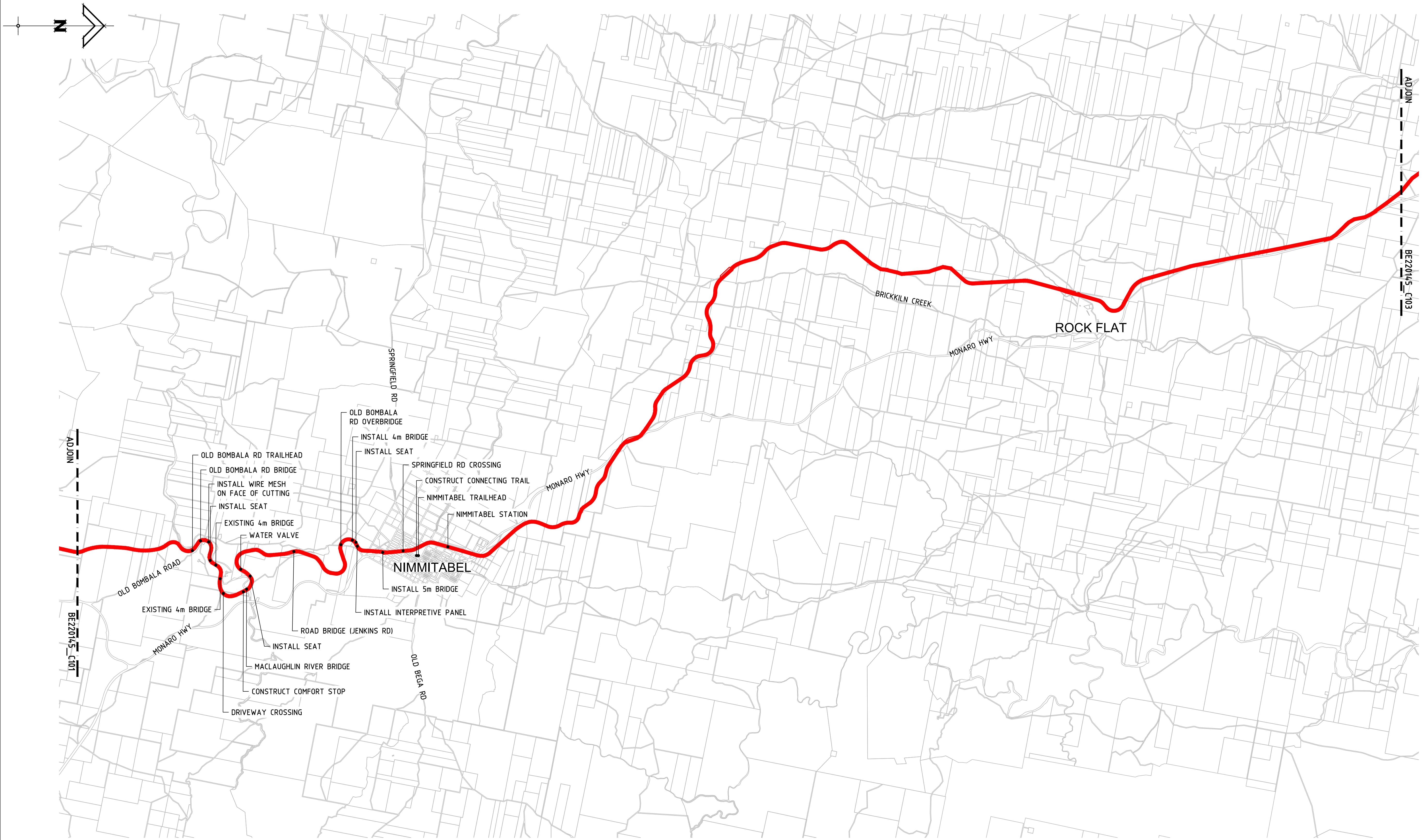
VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE:
GENERAL ARRANGEMENT PLAN SHEET 1

DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No. : BE220145
DRAWING No. : C101
VERSION: B



PLAN 2

SCALE 500 0 500 1000 1500 2000 2500 (metres)
1 : 50000 (FULL SIZE)

PRELIM DRAFT

FILENAME: V:\o2v dropbox\o2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C101_C107.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

DISCLAIMER
This drawing and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended.
Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the drawing for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party.

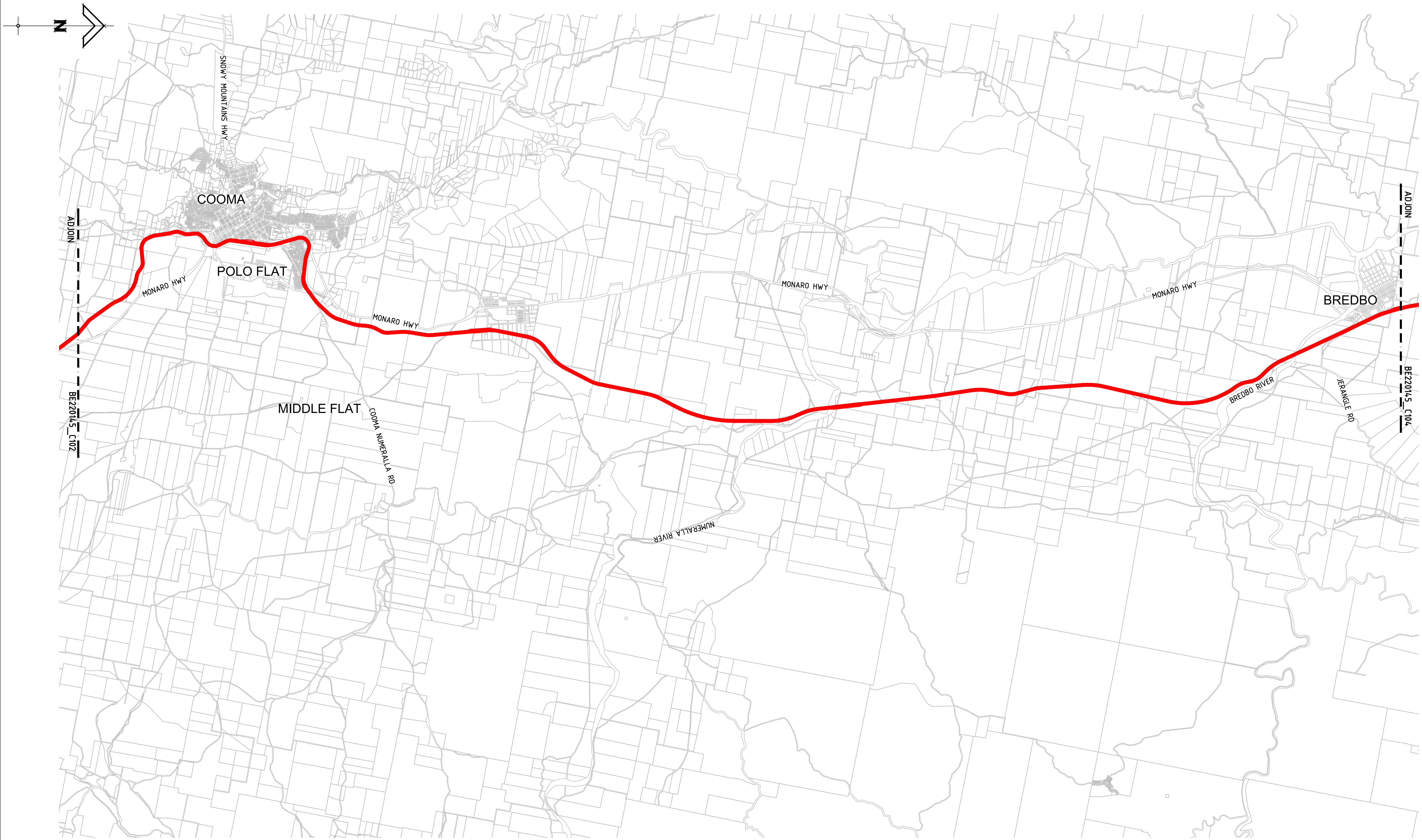
NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE:
GENERAL ARRANGEMENT PLAN SHEET 2

DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C102
VERSION: B



PLAN 3

SCALE 500 0 500 1000 1500 2000 2500 (metres)
1 : 50000 (FULL SIZE)

PRELIM DRAFT

FILENAME: V:\o2v dropbox\o2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C101_C107.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

DISCLAIMER
This drawing and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended.
Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the drawing for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party.

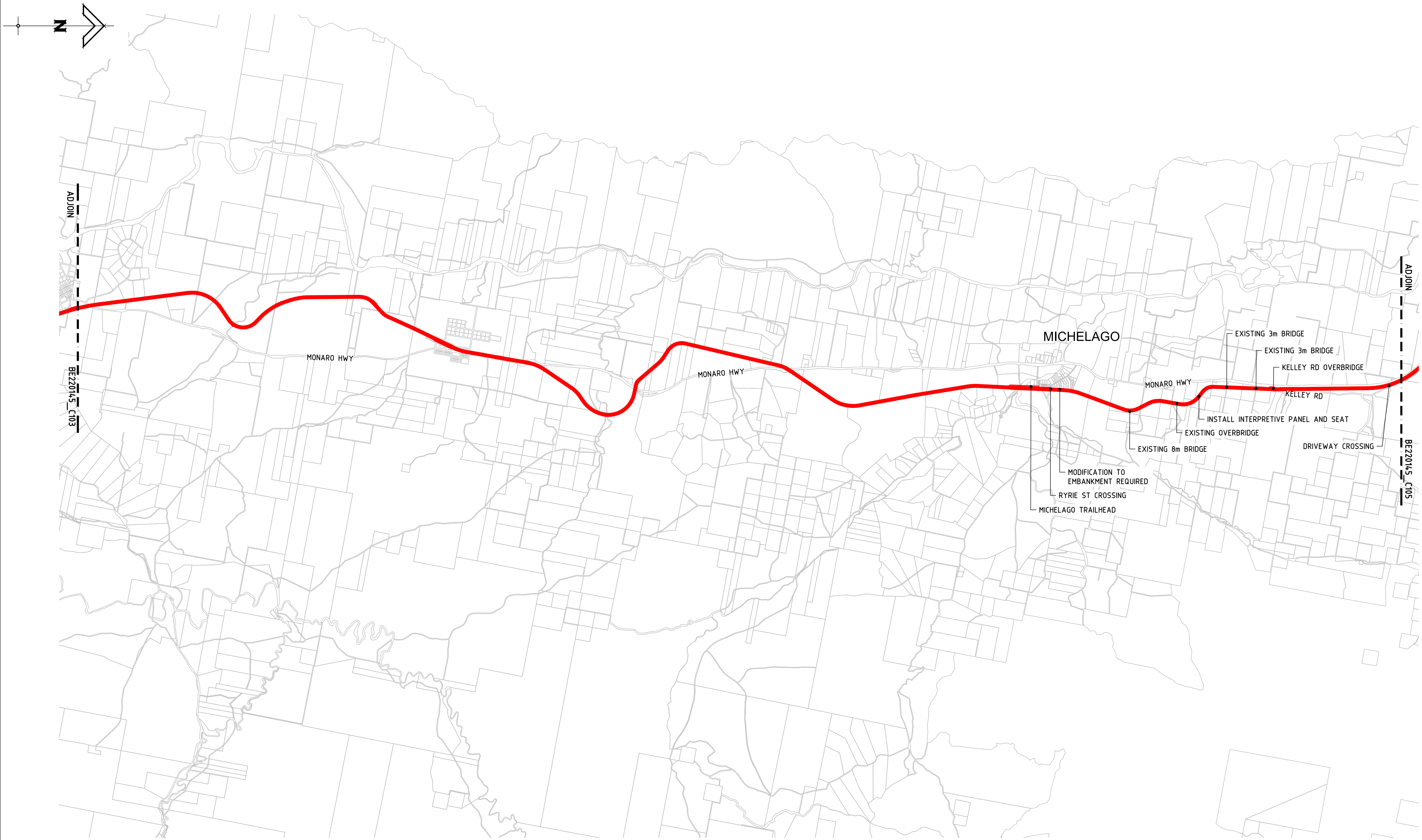
NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE:
GENERAL ARRANGEMENT PLAN SHEET 3

DEVEL. APPLIC. No. :
DATE : 25.04.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C103
VERSION: B



PLAN 4

SCALE 500 0 500 1000 1500 2000 2500 (metres)
1 : 50000 (FULL SIZE)

PRELIM DRAFT

FILENAME: V:\o2v dropbox\o2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C101_C107.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

DISCLAIMER
This drawing and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended.
Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the drawing for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party.

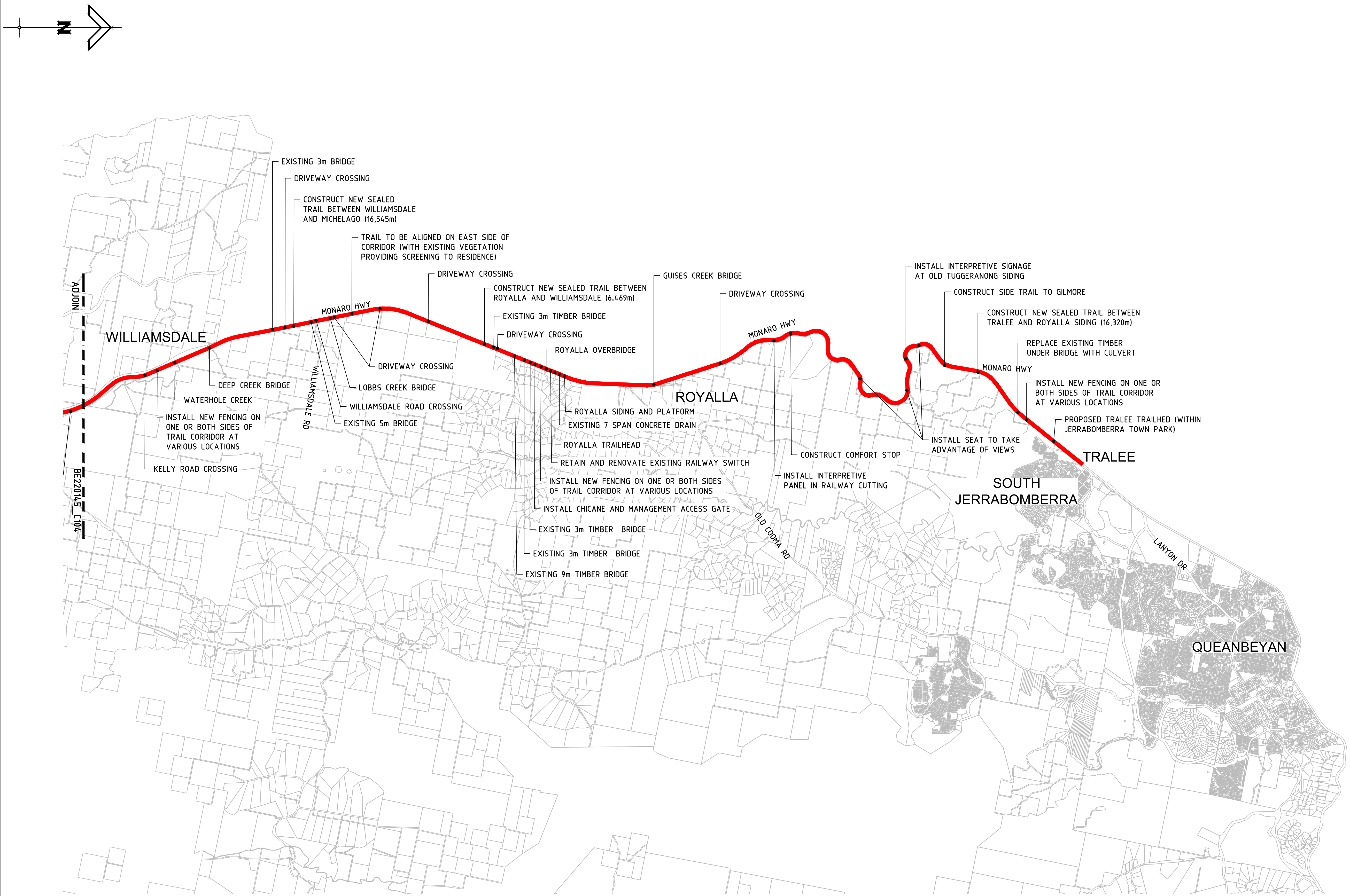
NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE :
GENERAL ARRANGEMENT PLAN SHEET 4

DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C104
VERSION: B



PLAN 5

SCALE 500 0 500 1000 1500 2000 2500 (metres)
1 : 50000 (FULL SIZE)

PRELIM DRAFT

B	PLAN AMENDED	24.05.22	
A	ORIGINAL ISSUE	19.05.22	
VER.	DESCRIPTION	DATE	

MONARO RAIL TRAIL

FOR

MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

DISCLAIMER
This drawing and its contents are electronically generated, are confidential and may only be used for the purpose for which they were intended.
Burchills Engineering Solutions will not accept responsibility for any consequences arising from the use of the drawing for other than its intended purpose or where the drawing has been altered, amended or changed either manually or electronically by any third party.

NOTE
This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

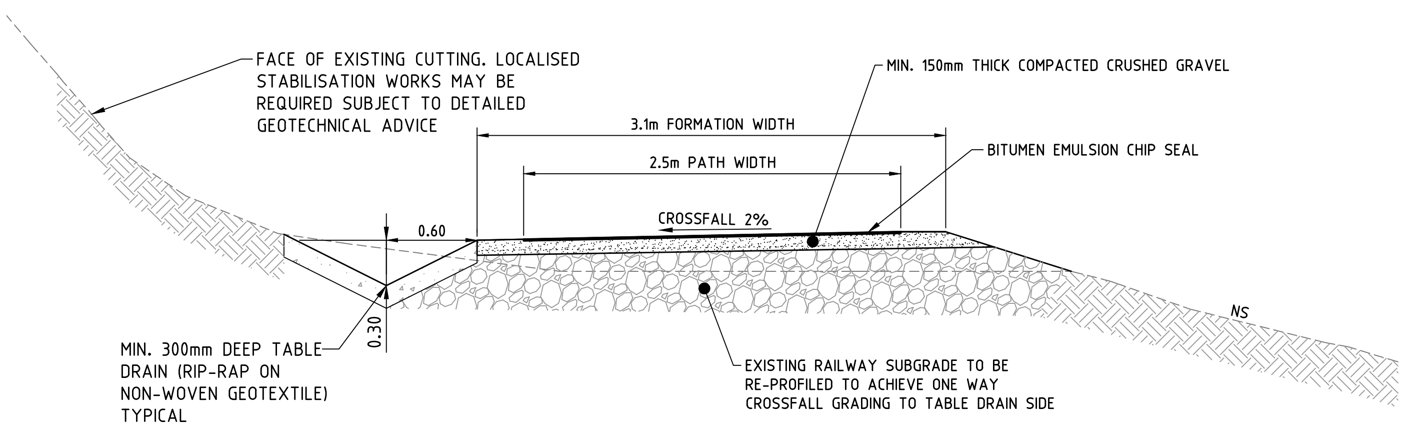
BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE :
GENERAL ARRANGEMENT PLAN SHEET 5

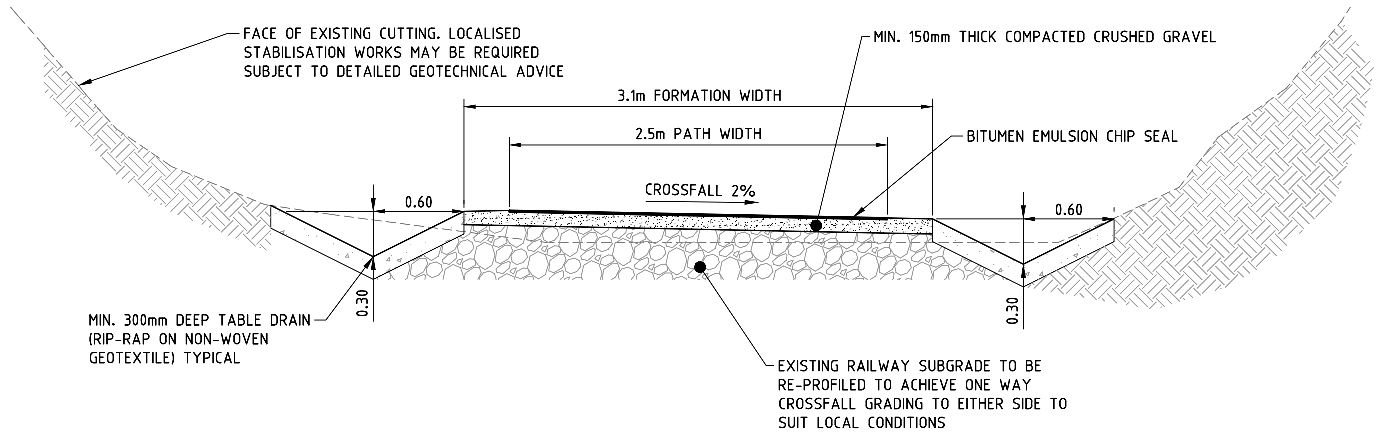
DEVEL. APPLIC. No. :	DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT	DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN	CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365 RPEQ No. :	
SCALE :	DATUM : AHD
FULL SIZE : A1	
PROJECT No.: BE220145	DRAWING No. : C105
VERSION: B	

FILENAME: V:\v2v dropbox\v2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C101_C107.dwg
PLOTTED: 25 May 2022



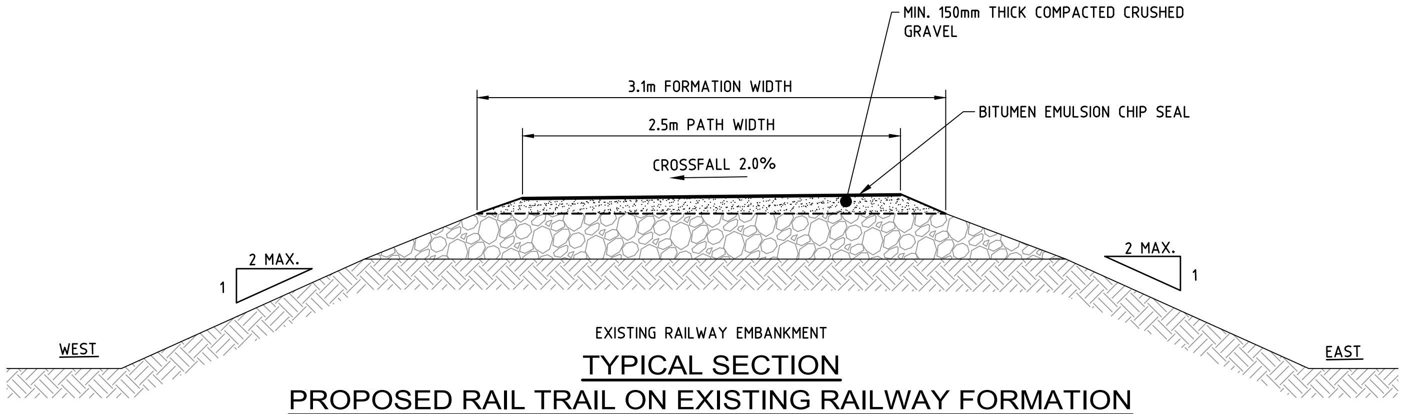
TYPICAL SECTION
PROPOSED RAIL TRAIL THROUGH EXISTING CUTTING ON ONE SIDE

SCALE 0.5 0 0.5 1.0 (metres)
1 : 25 (FULL SIZE)



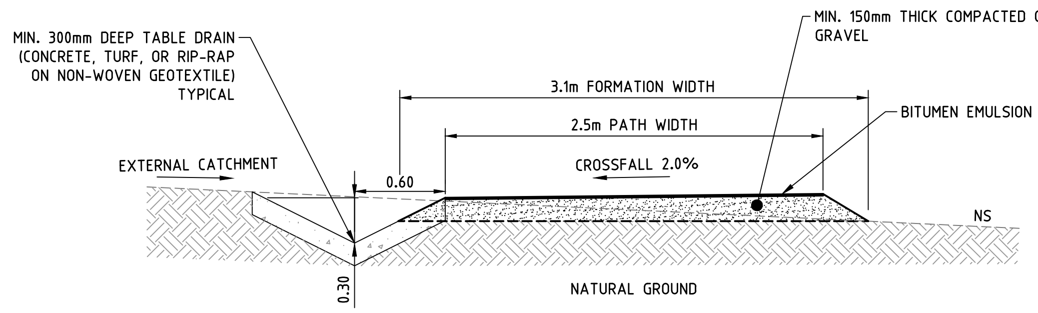
TYPICAL SECTION
PROPOSED RAIL TRAIL THROUGH EXISTING CUTTING ON BOTH SIDES

SCALE 0.5 0 0.5 1.0 (metres)
1 : 25 (FULL SIZE)



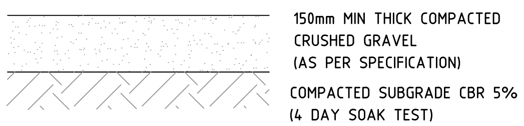
TYPICAL SECTION
PROPOSED RAIL TRAIL ON EXISTING RAILWAY FORMATION

SCALE 0.5 0 0.5 1.0 (metres)
1 : 25 (FULL SIZE)



TYPICAL SECTION
PROPOSED RAIL TRAIL ON NATURAL GROUND

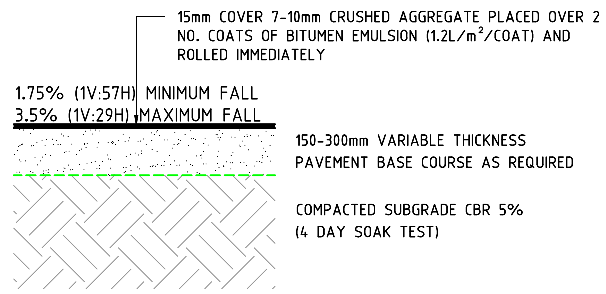
SCALE 0.5 0 0.5 1.0 (metres)
1 : 25 (FULL SIZE)



OFF-FORMATION SECTON

UNSEALED PAVEMENT SECTIONS

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)



SEALED PAVEMENT SECTIONS

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)

FILENAME: V:\v2v dropbox\v2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C110_C112.dwg

PRELIM DRAFT

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

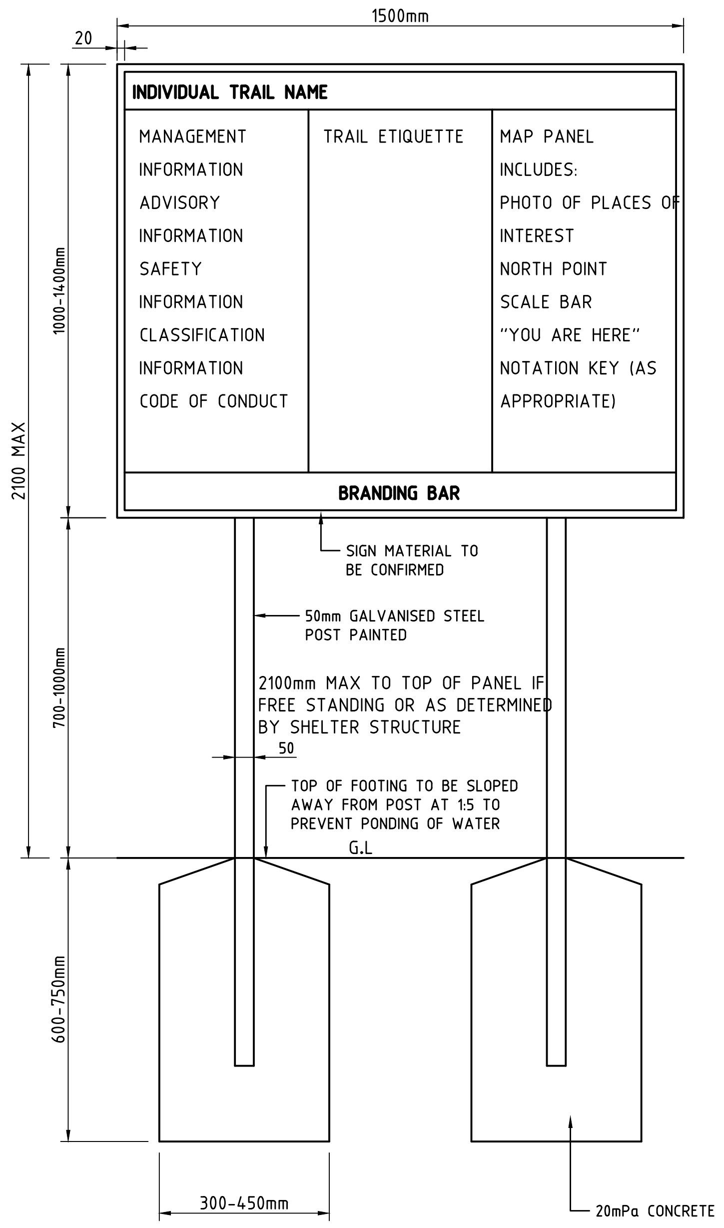
VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE:
TYPICAL SECTION DETAILS

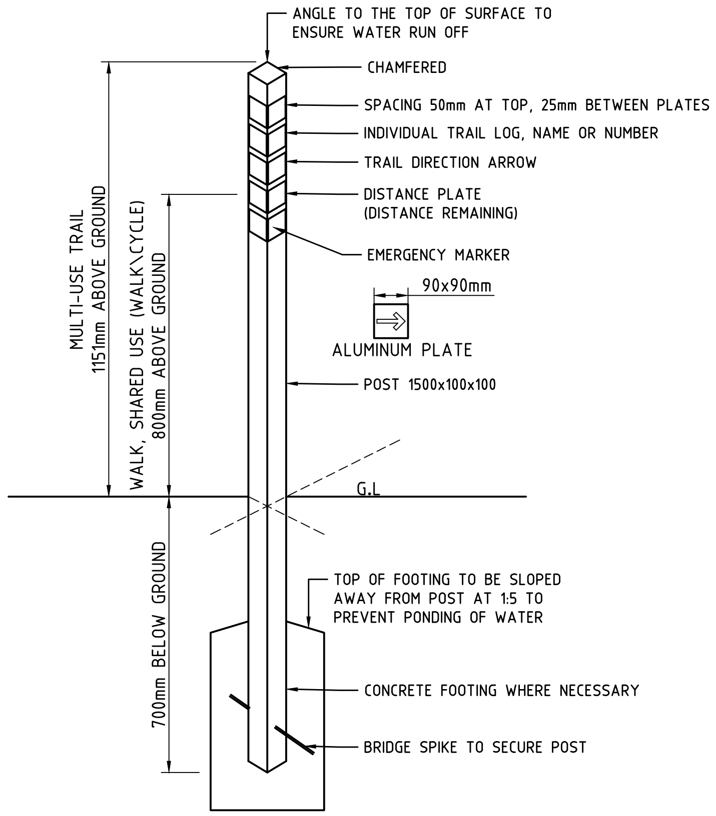
DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C110
VERSION: B



SIGNAGE TRAILHEAD

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)

NOTE:
PLATES AND MARKINGS TO BE INSTALLED ON OPPOSITE SIDES OF POSTS RATHER THAN RIGHT ANGLES UNLESS NEEDED



SIGNAGE TRAIL DIRECTIONAL MARKER

SCALE 0.1 0 0.1 0.2 0.3 0.4 0.5 (metres)
1 : 10 (FULL SIZE)

PRELIM DRAFT

FILENAME: V:\v2v dropbox\v2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C110_C112.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR
MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

BURCHILLS ENGINEERING SOLUTIONS
Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

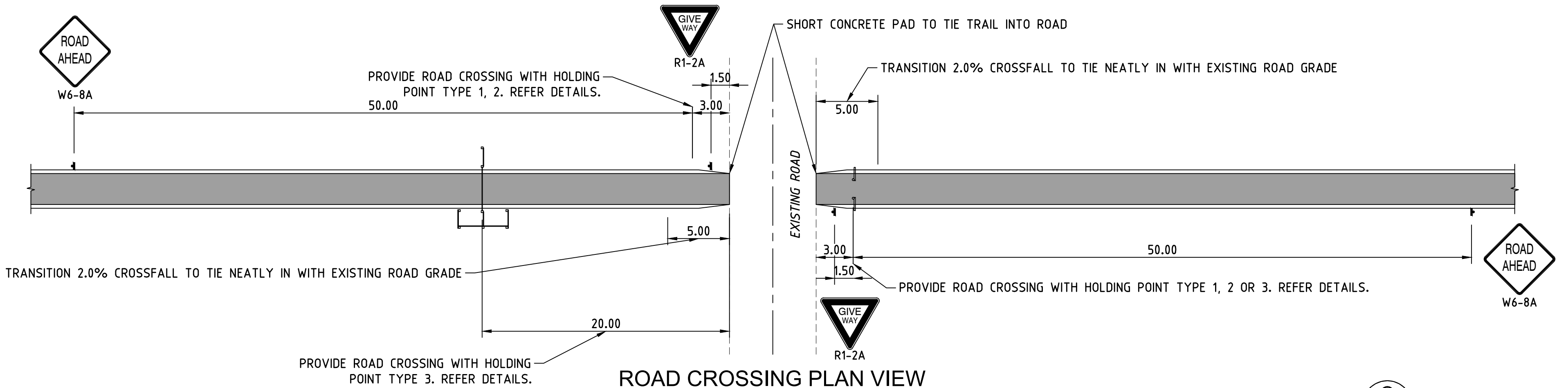
PROJECT:
MONARO RAIL TRAIL

DRAWING TITLE :
TYPICAL SIGNAGE DETAILS

DEVEL. APPLIC. No. :	DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT	DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN	CHECKED : TOBY BENNETT

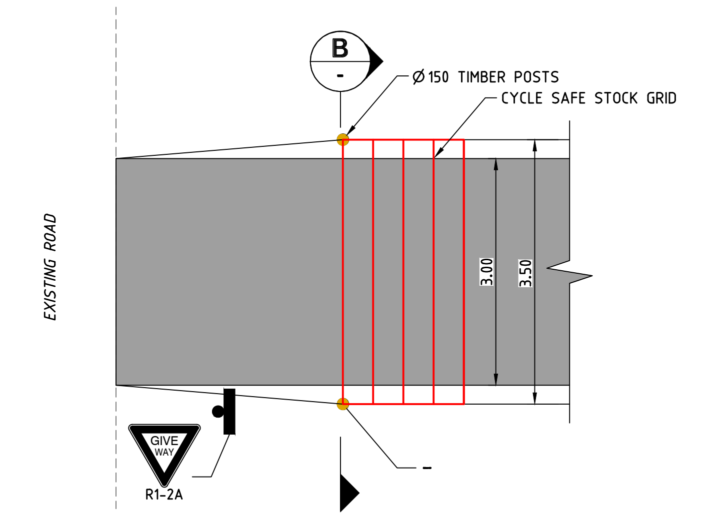
APPROVED FOR AND ON BEHALF OF
BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :

SCALE :	DATUM : AHD	FULL SIZE : A1
PROJECT No.: BE220145	DRAWING No. : C111	VERSION: B



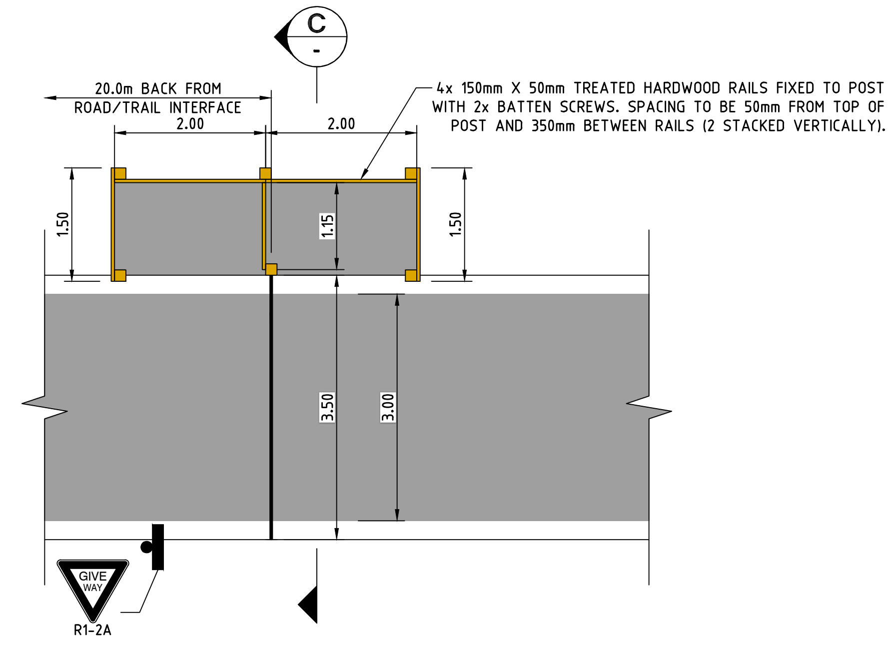
ROAD CROSSING PLAN VIEW

SCALE 1:250



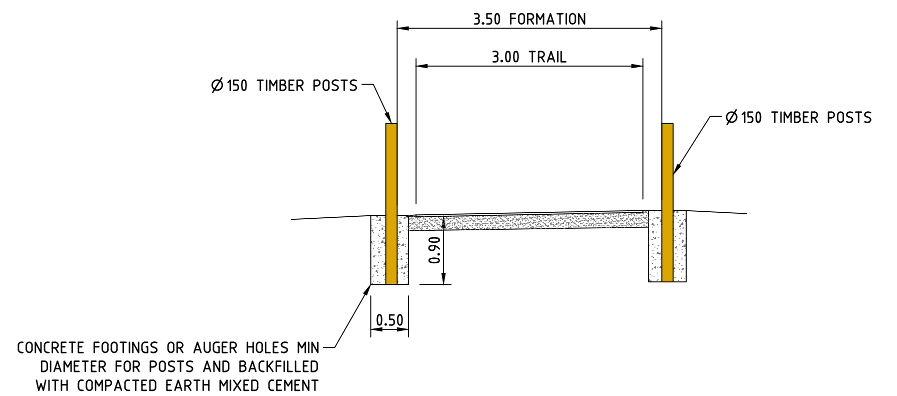
ROAD CROSSING TYPE 2

SCALE 1:50



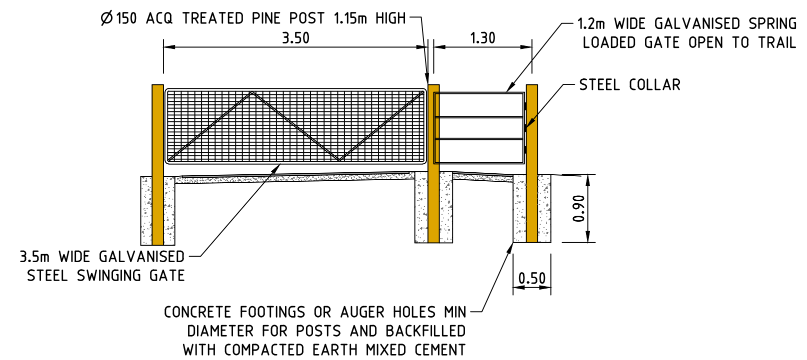
ROAD CROSSING TYPE 3

SCALE 1:50



SECTION B

SCALE 1:50



SECTION C

SCALE 1:50

PRELIM DRAFT

FILENAME: V:\o2v dropbox\o2v server\Projects\BE\2022\be220145 monaro rail trail\Acad\BE220145_C112.dwg

PLOTTED: 25 May 2022

MONARO RAIL TRAIL

FOR

MIKE HALLIBURTON AND ASSOCIATES

A1 ORIGINAL SIZE BEFORE REDUCTION

VER.	DESCRIPTION	DATE
B	PLAN AMENDED	24.05.22
A	ORIGINAL ISSUE	19.05.22

NOTE

This is an uncontrolled document issued for information purposes only, unless the checked sections are signed or completed.
Figured dimensions take precedence over scale. Do not scale reduced size drawings. Verify dimensions prior to commencing any on-site or off-site works or fabrication.

BURCHILLS ENGINEERING SOLUTIONS

Gold Coast I Brisbane I Toowoomba
Ipswich I Moreton Bay
Phone: +61 7 5509 6400
Fax: +61 7 5509 6411
Email: admin@burchills.com.au
Coote Burchills Engineering Pty Ltd
ABN 76 166 942 365

PROJECT:

MONARO RAIL TRAIL

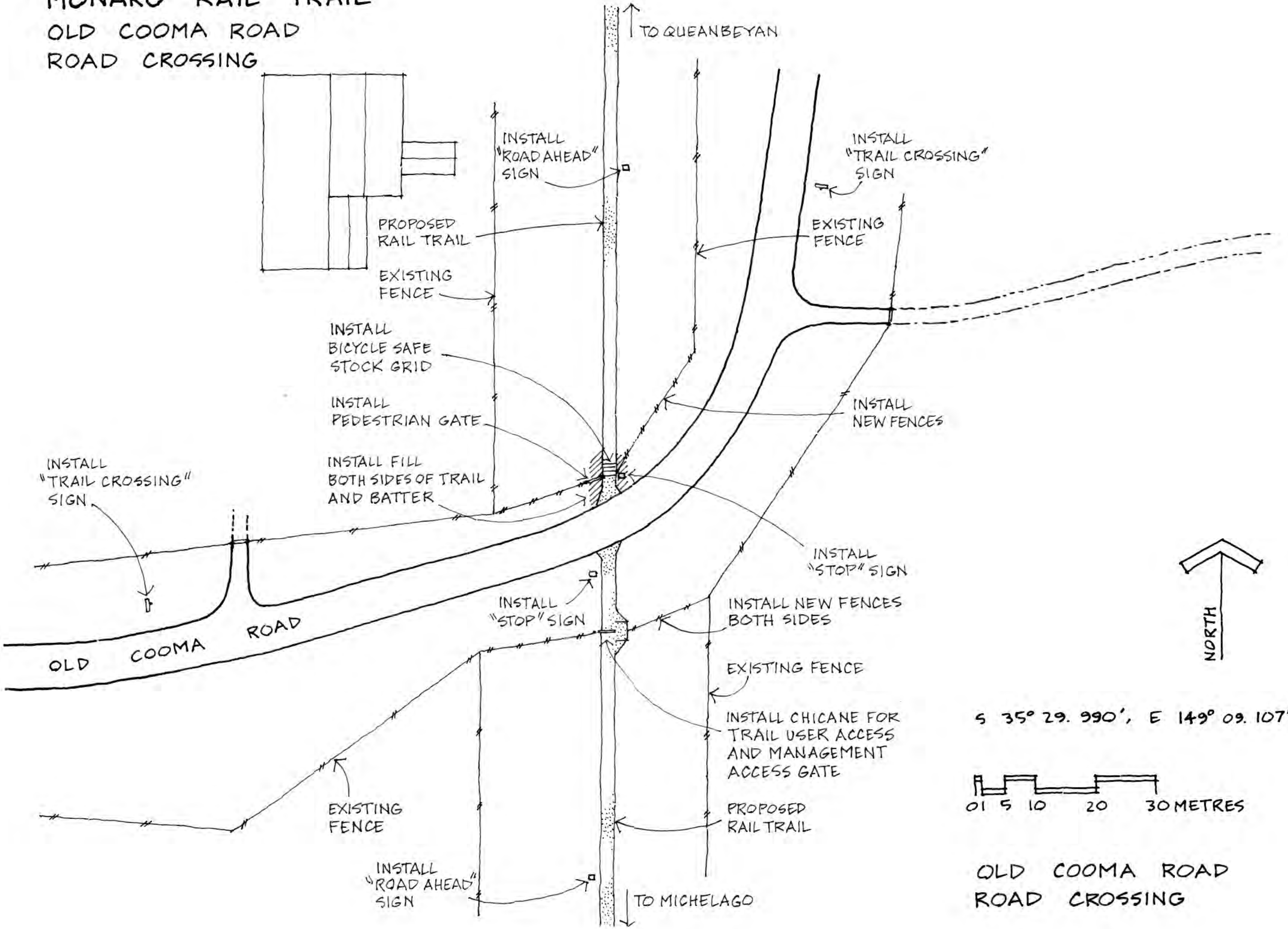
DRAWING TITLE:

TYPICAL ROAD CROSSING PLAN AND ACCESS MANAGEMENT ARRANGEMENTS

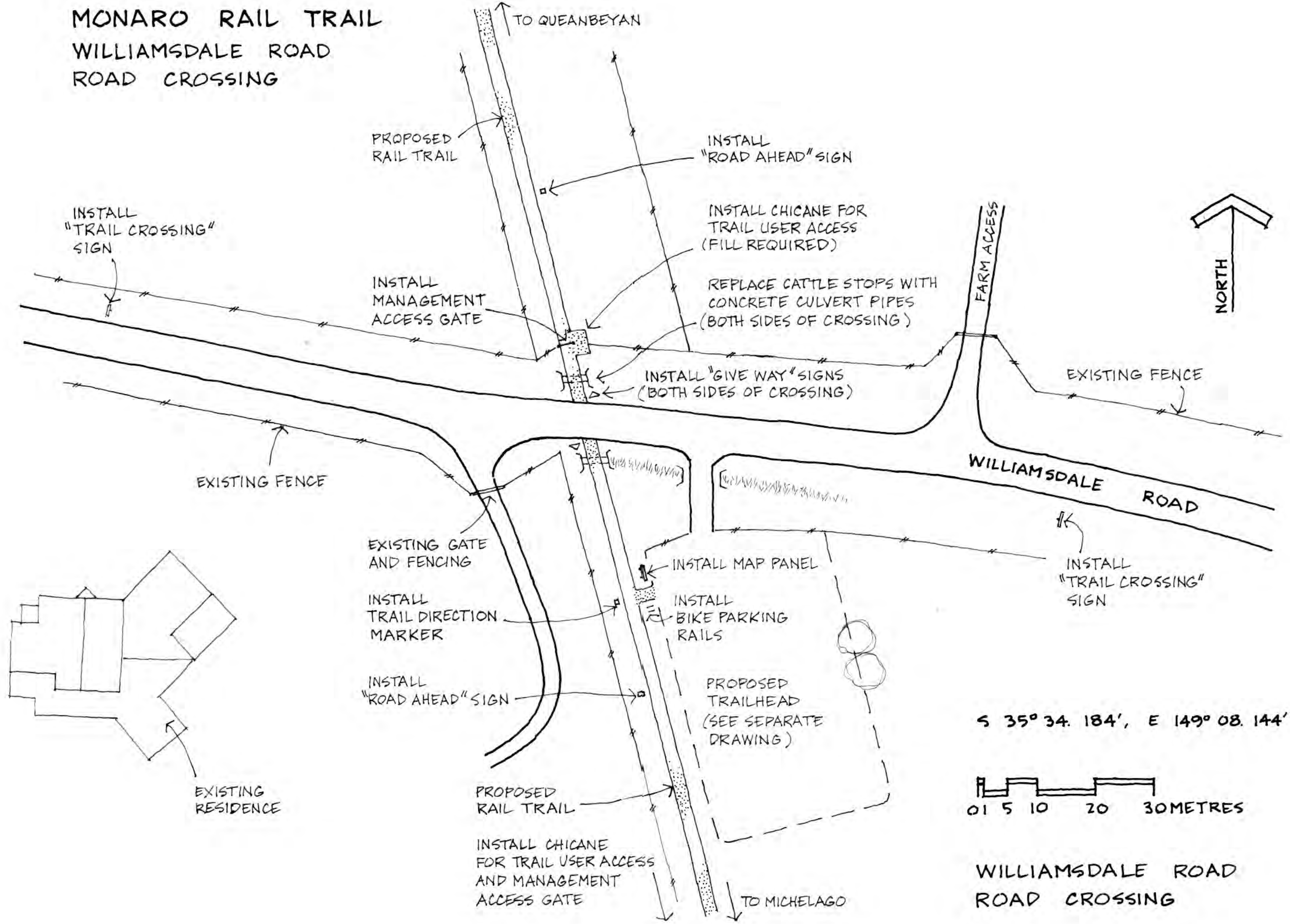
DEVEL. APPLIC. No. :
DATE : 24.05.22
PROJECT LEADER : TOBY BENNETT
DESIGNER : VAN LE
DRAFTSPERSON : CUONG NGUYEN
CHECKED : TOBY BENNETT
APPROVED FOR AND ON BEHALF OF BURCHILLS ENGINEERING SOLUTIONS ABN 76 166 942 365
RPEQ No. :
SCALE :
DATUM : AHD
FULL SIZE : A1
PROJECT No.: BE220145
DRAWING No. : C112
VERSION: B

APPENDIX 2: ROAD CROSSING DRAWINGS

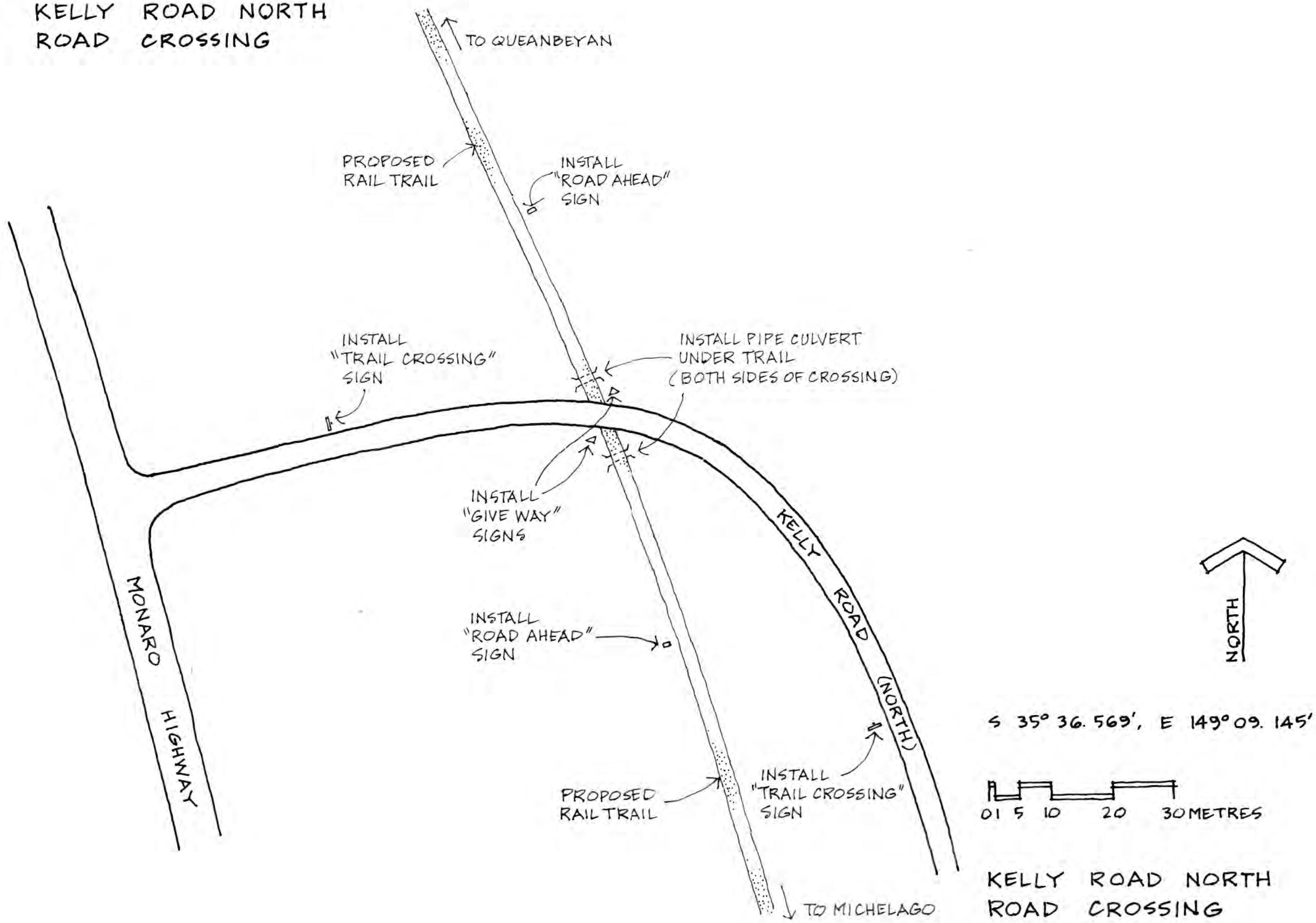
MONARO RAIL TRAIL
OLD COOMA ROAD ROAD CROSSING



OLD COOMA ROAD ROAD CROSSING

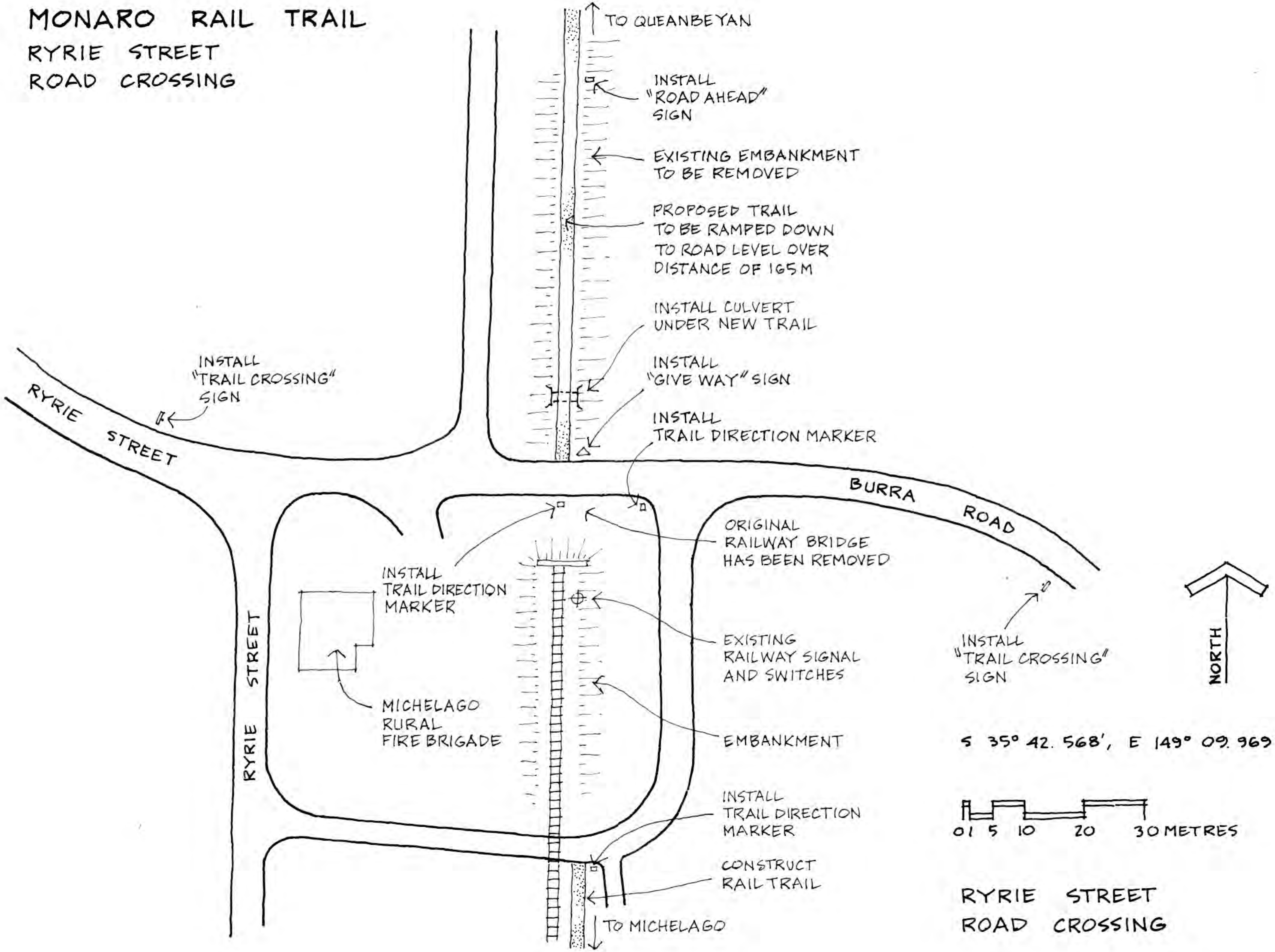

MONARO RAIL TRAIL
WILLIAMSDALE ROAD
ROAD CROSSING
TO QUEANBEYAN
PROPOSED RAIL TRAIL
INSTALL "ROAD AHEAD" SIGN
INSTALL "TRAIL CROSSING" SIGN
INSTALL CHICANE FOR TRAIL USER ACCESS (FILL REQUIRED)
INSTALL MANAGEMENT ACCESS GATE
REPLACE CATTLE STOPS WITH CONCRETE CULVERT PIPES (BOTH SIDES OF CROSSING)
FARM ACCESS
NORTH
INSTALL "GIVE WAY" SIGNS (BOTH SIDES OF CROSSING)
EXISTING FENCE
EXISTING FENCE
WILLIAMSDALE ROAD
EXISTING GATE AND FENCING
INSTALL MAP PANEL
INSTALL "TRAIL CROSSING" SIGN
INSTALL TRAIL DIRECTION MARKER
INSTALL BIKE PARKING RAILS
INSTALL "ROAD AHEAD" SIGN
PROPOSED TRAILHEAD (SEE SEPARATE DRAWING)
S 35° 34. 184', E 149° 08. 144'
EXISTING RESIDENCE
PROPOSED RAIL TRAIL
0 1 5 10 20 30 METRES
INSTALL CHICANE FOR TRAIL USER ACCESS AND MANAGEMENT ACCESS GATE
TO MICHELAGO
WILLIAMSDALE ROAD
ROAD CROSSING

MONARO RAIL TRAIL
KELLY ROAD NORTH
ROAD CROSSING



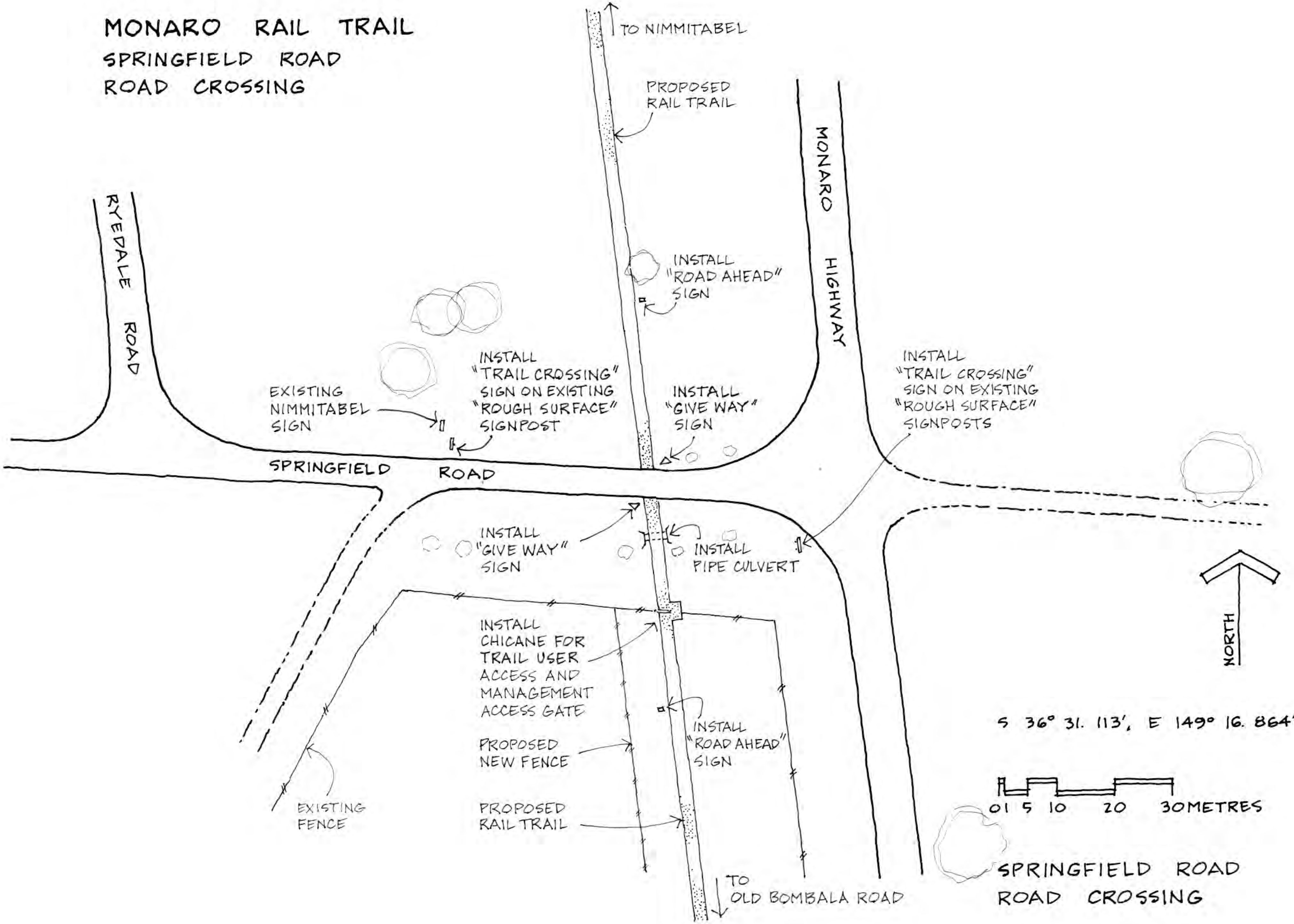
KELLY ROAD NORTH
ROAD CROSSING

MONARO RAIL TRAIL
RYRIE STREET ROAD CROSSING



MONARO RAIL TRAIL

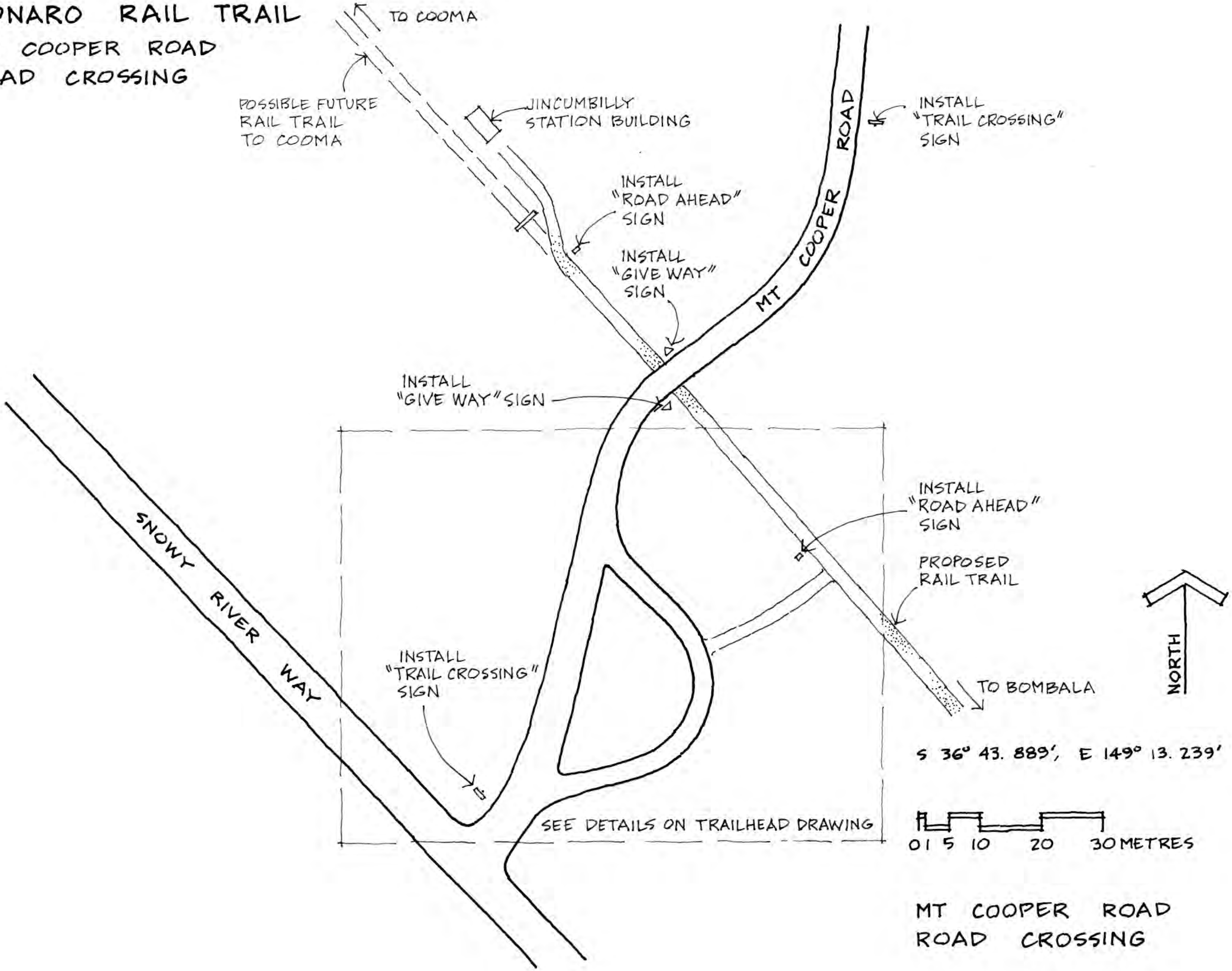
SPRINGFIELD ROAD ROAD CROSSING



SPRINGFIELD ROAD ROAD CROSSING

MONARO RAIL TRAIL

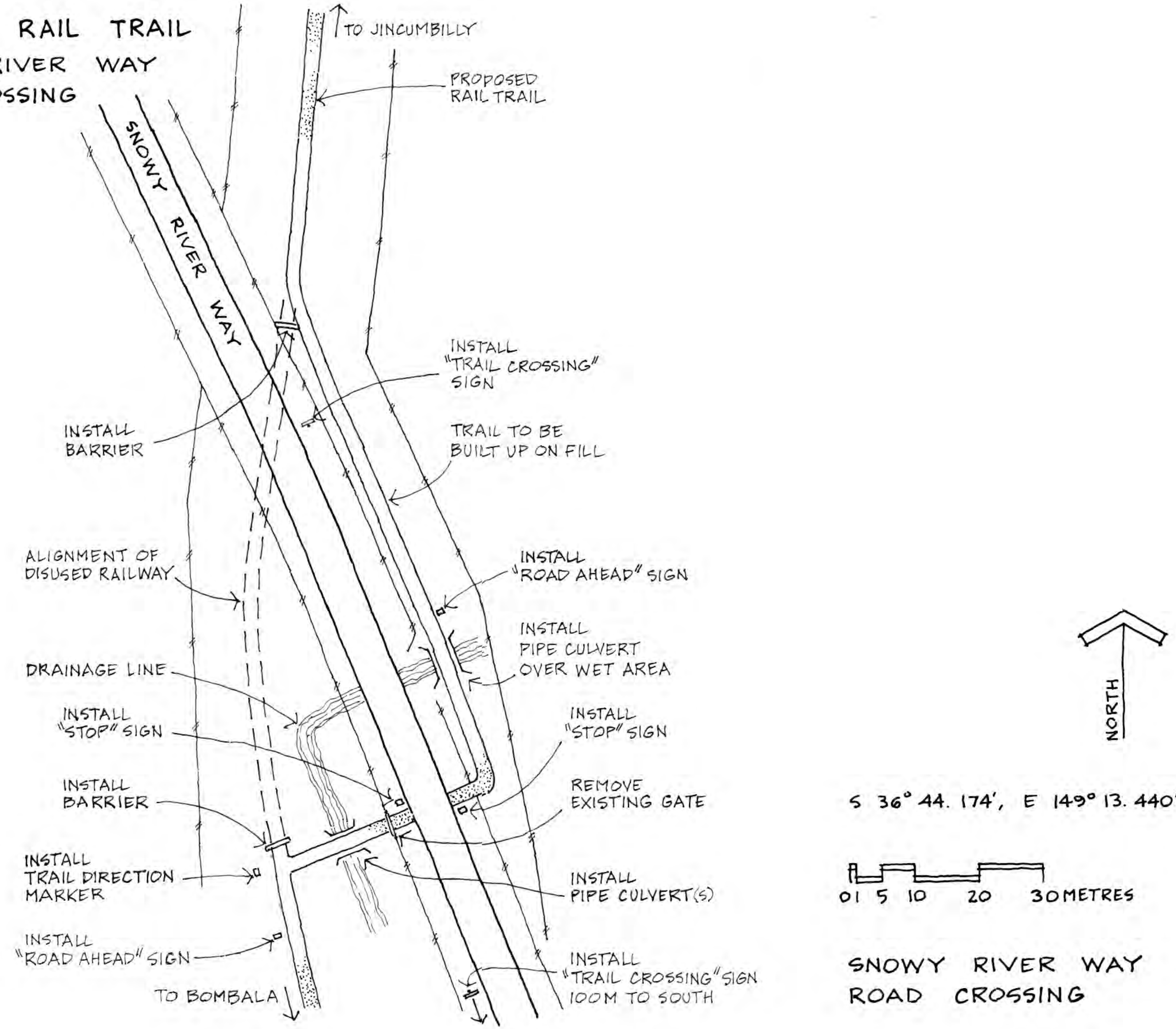
MT COOPER ROAD ROAD CROSSING



MT COOPER ROAD ROAD CROSSING

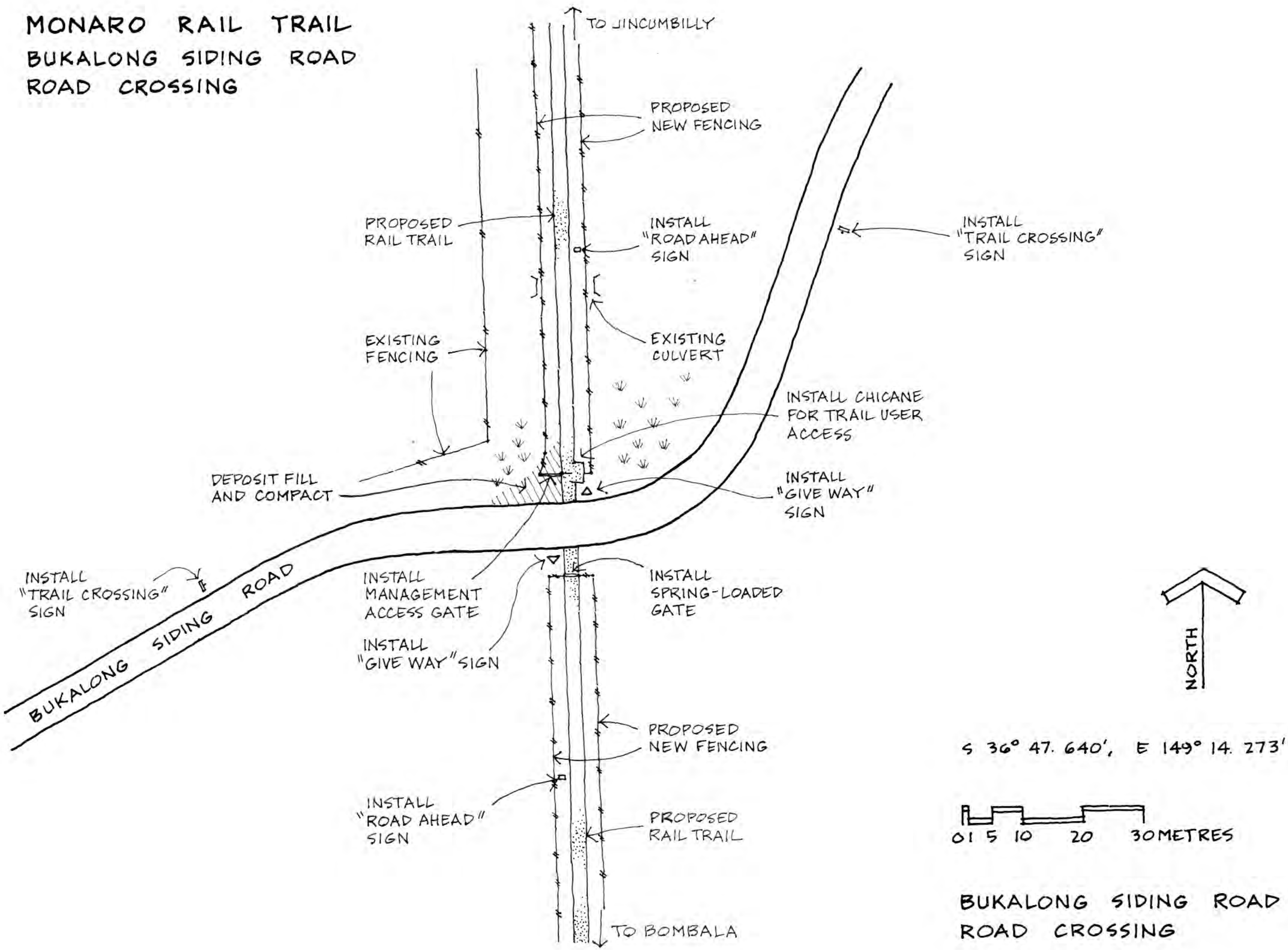
MONARO RAIL TRAIL

SNOWY RIVER WAY ROAD CROSSING



SNOWY RIVER WAY ROAD CROSSING

MONARO RAIL TRAIL
BUKALONG SIDING ROAD ROAD CROSSING

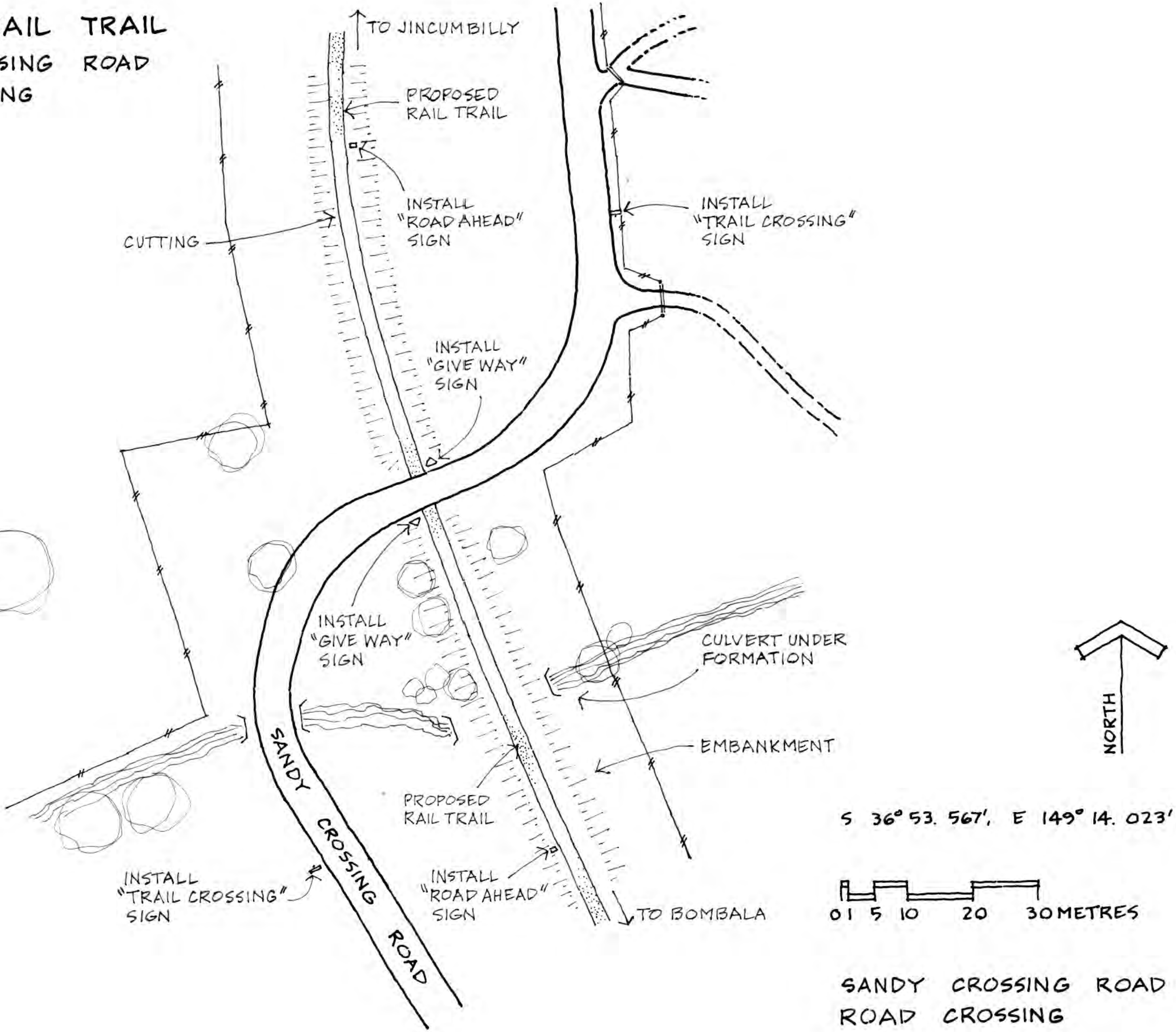


BUKALONG SIDING ROAD ROAD CROSSING

MONARO RAIL TRAIL

SANDY CROSSING ROAD

ROAD CROSSING

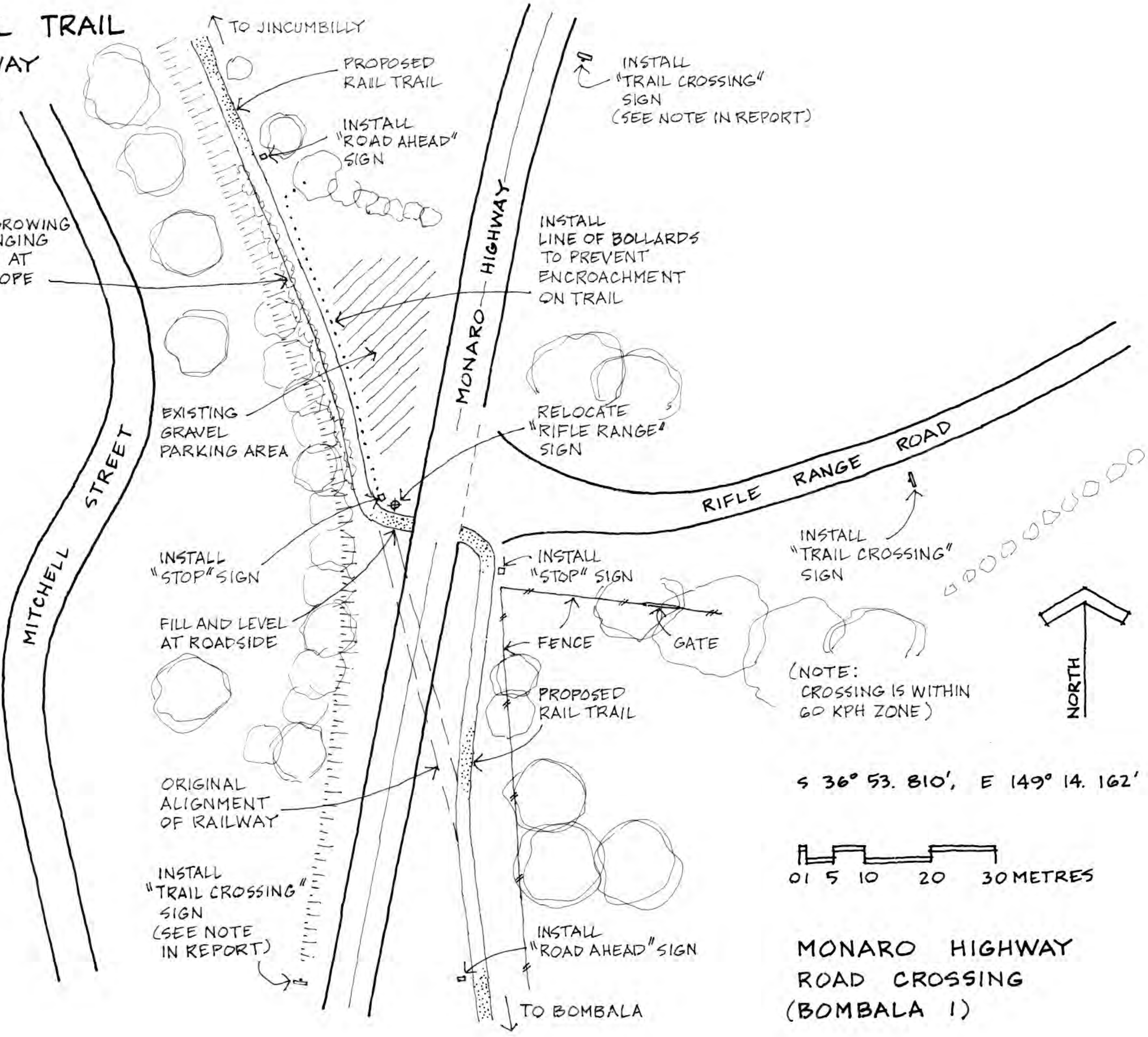


SANDY CROSSING ROAD

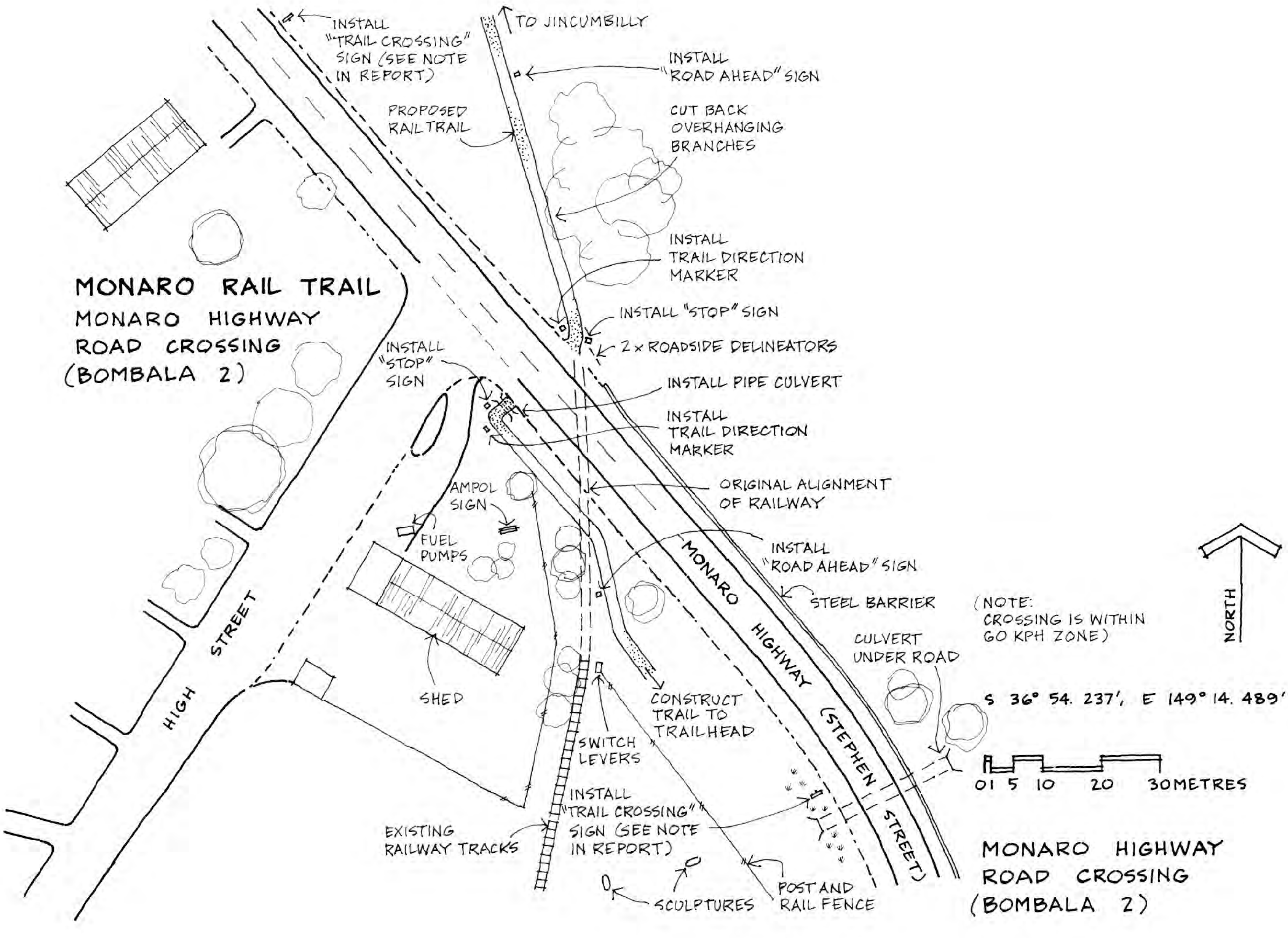
ROAD CROSSING

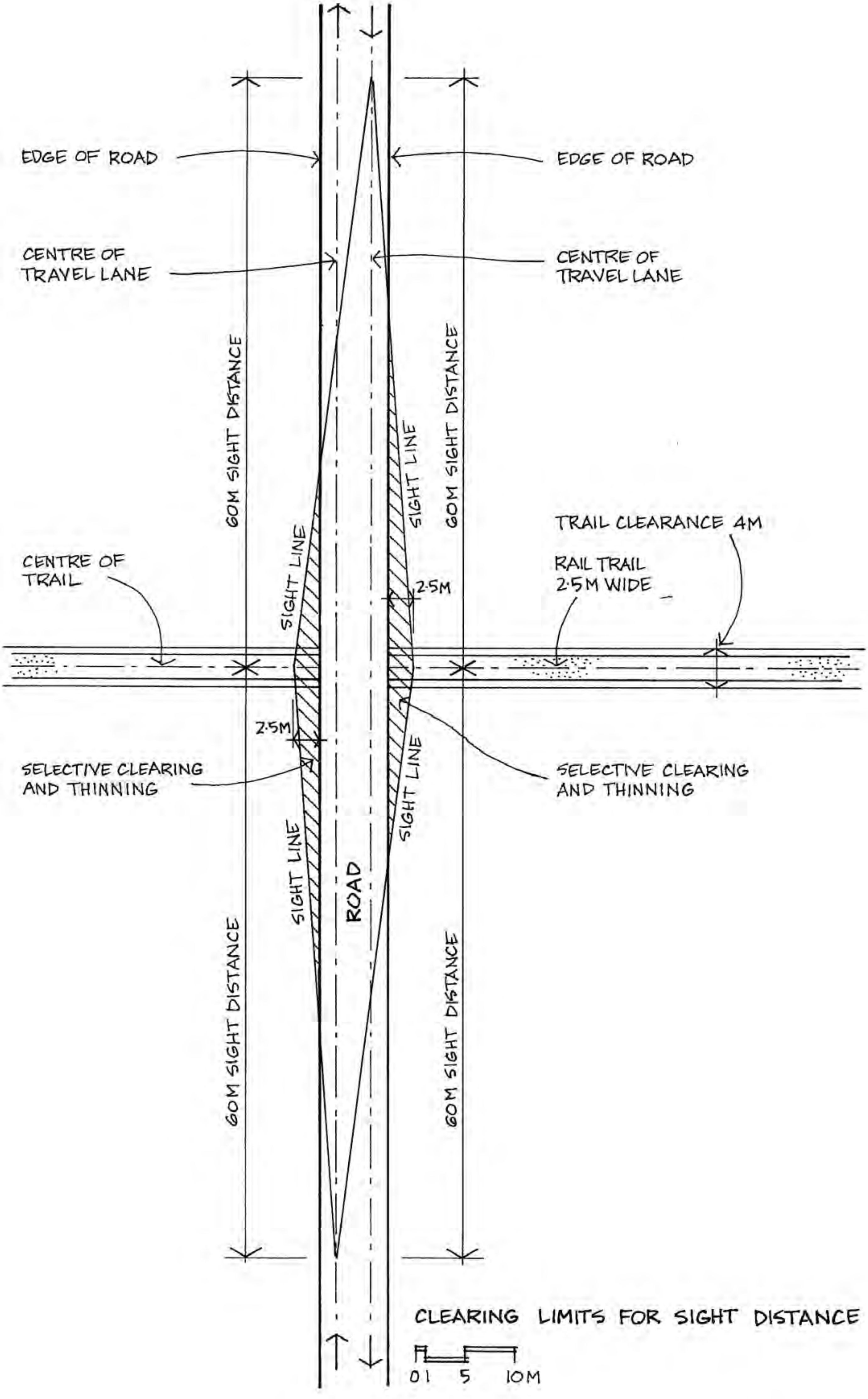
MONARO RAIL TRAIL

MONARO HIGHWAY ROAD CROSSING (BOMBALA 1)



MONARO HIGHWAY ROAD CROSSING (BOMBALA 1)


MONARO RAIL TRAIL
MONARO HIGHWAY
ROAD CROSSING
(BOMBALA 2)
TO JINCUMBILLY
INSTALL "TRAIL CROSSING" SIGN (SEE NOTE IN REPORT)
INSTALL "ROAD AHEAD" SIGN
PROPOSED RAIL TRAIL
CUT BACK OVERHANGING BRANCHES
INSTALL TRAIL DIRECTION MARKER
INSTALL "STOP" SIGN
2 x ROADSIDE DELINEATORS
INSTALL "STOP" SIGN
INSTALL PIPE CULVERT
INSTALL TRAIL DIRECTION MARKER
ORIGINAL ALIGNMENT OF RAILWAY
AMPOL SIGN
FUEL PUMPS
INSTALL "ROAD AHEAD" SIGN
STEEL BARRIER
(NOTE: CROSSING IS WITHIN 60 KPH ZONE)
NORTH
MONARO HIGHWAY (STEPHEN STREET)
HIGH STREET
CULVERT UNDER ROAD
SHED
S 36° 54. 237', E 149° 14. 489'
CONSTRUCT TRAIL TO TRAILHEAD
SWITCH LEVERS
0 1 5 10 20 30 METRES
INSTALL "TRAIL CROSSING" SIGN (SEE NOTE IN REPORT)
EXISTING RAILWAY TRACKS
SCULPTURES
POST AND RAIL FENCE
MONARO HIGHWAY
ROAD CROSSING
(BOMBALA 2)



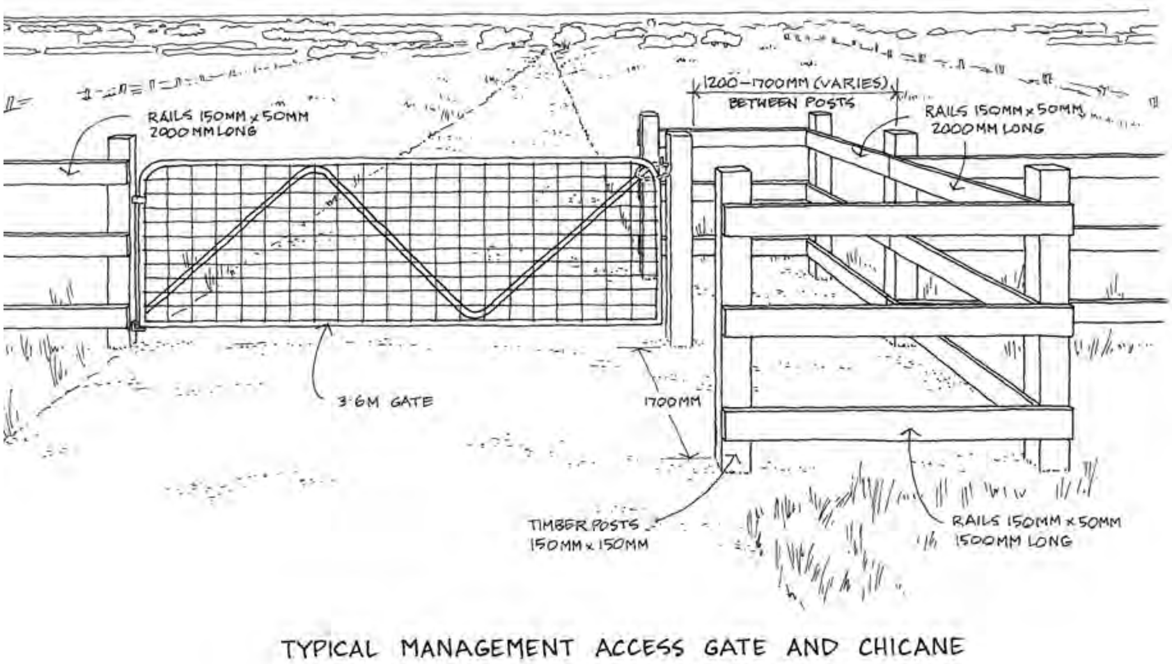
CLEARING LIMITS FOR SIGHT DISTANCE

APPENDIX 3: ROAD CROSSING CHICANE DRAWINGS

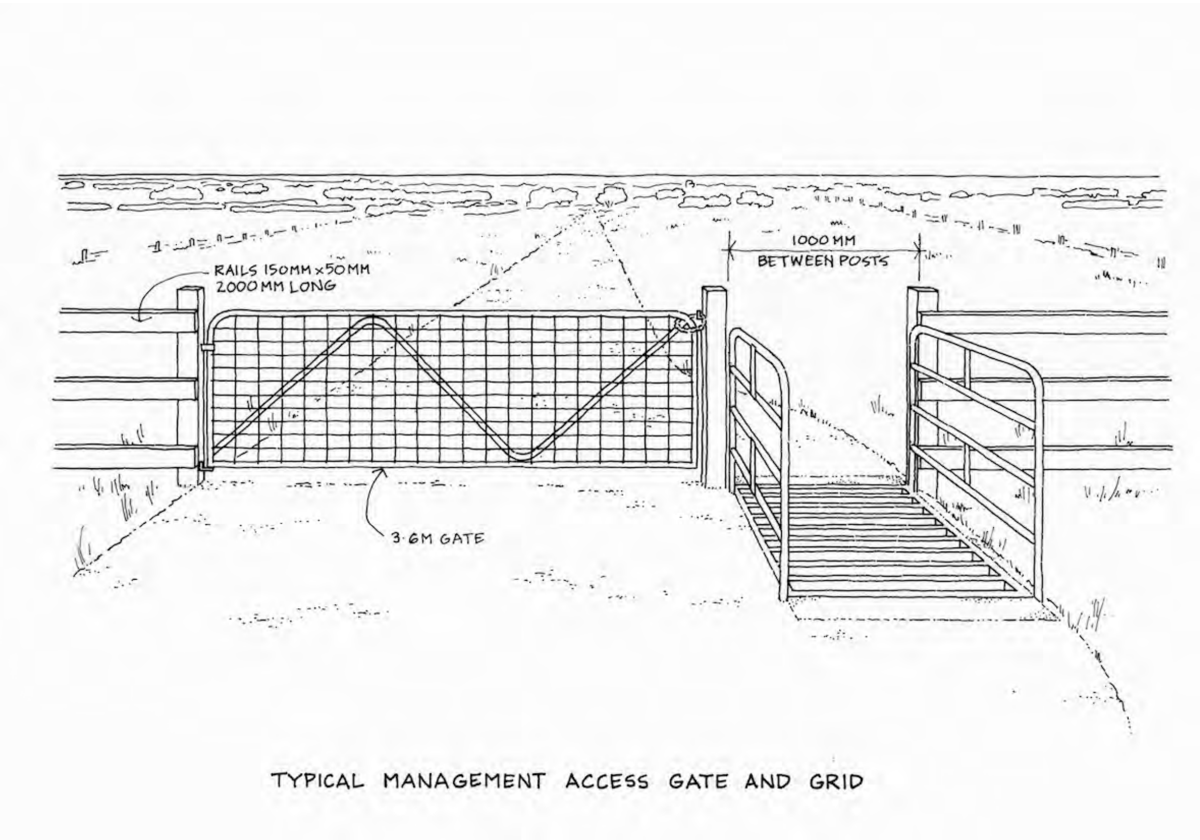
The spring loaded 1200mm gate should only be installed where there is the likelihood of livestock on the trail (if the trail manager deems that appropriate and agreements and licences are in place). The gate should open “inwards” – to the trail rather than to the road (to prevent livestock pushing it open). The gate deliberately “stops” on the inside centre post (the gate is wider than the opening) to prevent livestock pushing it open.

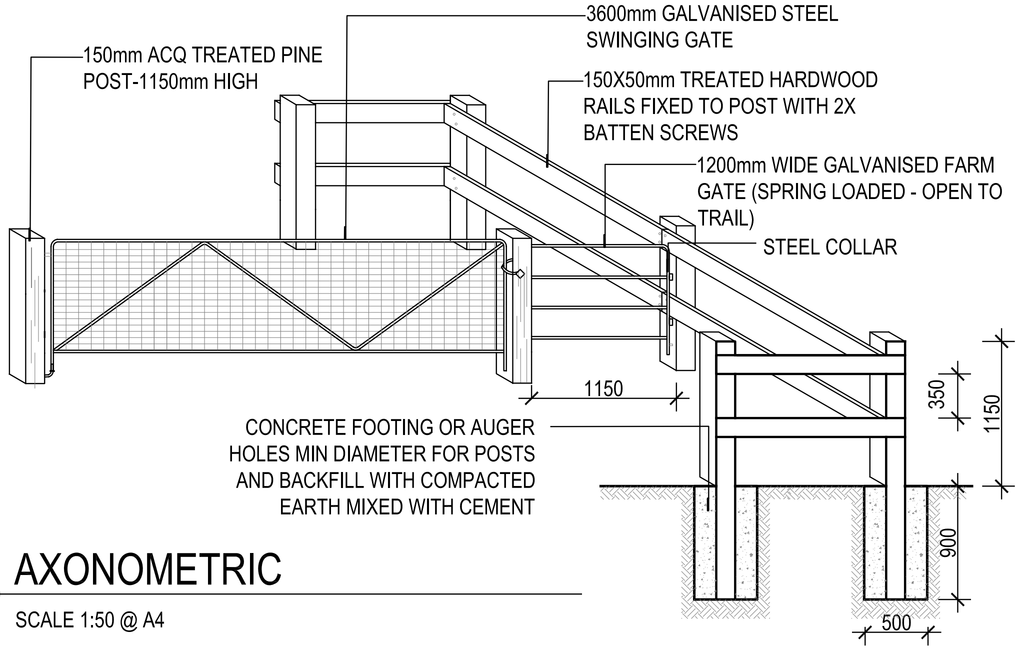
Where there is no likelihood of livestock, a gate should be installed only if the trail manager has a need to lock the gate on a regular basis (such as for events). In these cases, a standard gate (with no spring) could be used (the photo from the Lilydale Warburton Rail Trail shows such a gate).

Above: a management access gate and access chicane on the Lilydale to Warburton Rail Trail (Vic).



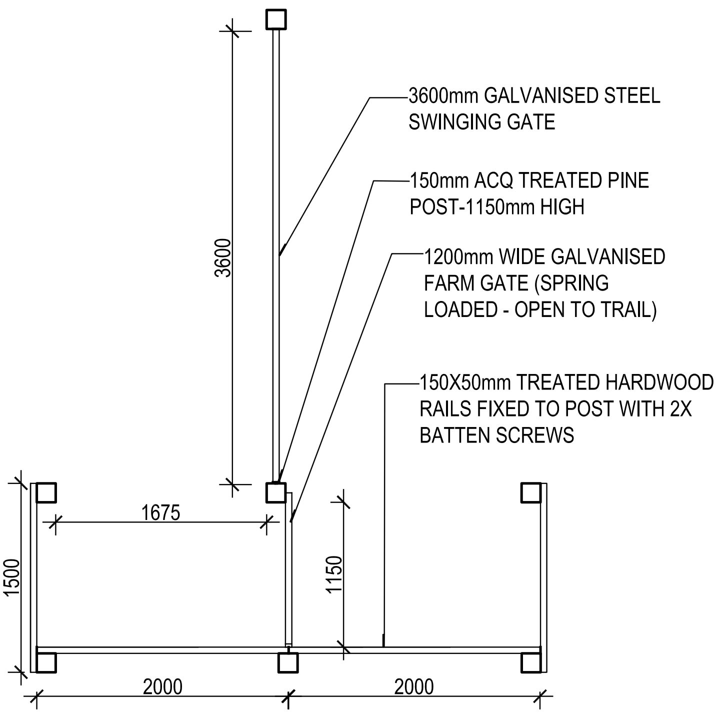
Above: a newly constructed management access gate and access grid on the Brisbane Valley Rail Trail (Qld).





A1 AXONOMETRIC

SCALE 1:50 @ A4



P1 PLAN

SCALE 1:50 @ A4

APPENDIX 4: BRIDGE REPORT BY WRD

Proposed Monaro Rail Trail
8 Timber Bridges - Level 1 Condition Report

WRD Project #2076

Version 01

16 March 2022








PREPARED FOR:
Mike Halliburton
Mike Halliburton Associates

SUBMITTED BY:
ANDREW LA SPINA - MIEAust
& DAN TINGLEY - PhD | PEng (CA) | MIEAust | CPEng | RPEQ

WRD
WOOD RESEARCH AND DEVELOPMENT
2/49-53 KABI CIRCUIT
DECEPTION BAY, 4508
CABOOLTURE, QLD, 4510
(07) 5432 3063
www.woodrandd.com

Quality Assurance		
Prepared by **Tristan McMahon** Engineering Cadet		16 March 2022
Reviewed by **Andrew La Spina** PhD Civil Engineering		16 March 2022
Authorised by **Dan Tingley** PhD, PEng (Canada) MIEAust, CPEng, RPEQ		16 March 2022

Version History					
Version	Description	Prepared	Reviewed	Authorised	Date
01	Issue to Client	T McMahon	A La Spina	D Tingley	16/03/22

ABSTRACT

Wood Research and Development was commissioned by Mike Halliburton Associates to complete a detailed Level 1 visual inspection and refurbishment options report based on the current condition of the major and minor bridges along the proposed Monaro Rail Trail. The main objective of the investigation was to establish the general condition of the primary structural elements, and to assess what techniques could be utilized to safely repurpose the structure into a rail trail bridge for pedestrian and cyclist use.

The following is a summary of the Condition State Rating (CSR) for each bridge:

1. **Guises Creek Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 3-4**
    c. **Deck CSR 5**
    d. **Overall CSR 4**
2. **10m Bridge – Guises Creek Inlet Stream**
    a. **Substructure CSR 4**
    b. **Superstructure CSR 3**
    c. **Deck CSR 3**
    d. **Overall CSR 3**
3. **Lobbs Hole Creek**
    a. **Substructure CSR 3**
    b. **Superstructure CSR 4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**
4. **6m Bridge**
    a. **Substructure CSR 3**
    b. **Superstructure CSR 4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**
5. **Deep Creek Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 3-4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**
6. **Bobundara Creek Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 4**
    c. **Overall CSR 4**
7. **MacLaughlin River**
    a. **Substructure CSR 4**
    b. **Superstructure CSR 3-4**
    c. **Overall CSR 4**
8. **Old Bombala Rd Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 3-4**
    c. **Overall CSR 4**

This rating was based on a small sample size of NDT field data collected and it is highly recommended to conduct a detailed inspection of the entire bridge. See **Figure 12-1** and **Appendix A** for more detail about this technology. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Sections 4.3, 5.3, 6.3, 7.3, 8.3, 9.3, 10.3 & 11.3.**

Each bridge differs in configuration and levels of deterioration, requiring varying levels of restoration; however moderate to severe deterioration of the elements is noted in all structures. **Sections 4 to 11** outline the proposed replacement and repair strategies for each bridge. Based on the information compiled from both the visual inspection and brief SWT testing, the bridges will require several repairs/replacements to repurpose the railway bridges as rail trail bridges for pedestrian and cycle use. Two (2) options have been developed to refurbish the structures into a rail trail bridges.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

Another option was explored for repurposing these rail trail bridges that utilizes the entire existing structure (minus the ballast, transom, and railway line) in its 'current' condition with the existing poor (missing) deck planks being replaced and a new code compliant handrail system installed to the exterior girders. Given the very poor condition of most of the elements in all the bridges this option is not viable due to it being structurally unsafe and have a very limited life span with major maintenance costs.

TABLE OF CONTENTS

ABSTRACT **3**

TABLE OF CONTENTS **5**

1.0 INTRODUCTION & BACKGROUND **7**

1.1 HERITAGE SIGNIFICANCE: 10

2.0 CONDITION STATE RATING DESCRIPTIONS **11**

3.0 MAJOR CAUSES OF WOOD DETERIORATION **12**

3.1 WOOD DETERIORATION DUE TO BIOTIC AGENTS 12
3.1.2 Bacteria 13
3.1.3 Fungi 13
3.2 WOOD DETERIORATION DUE TO VERTICAL FASTENERS 14

4.0 INSPECTION FINDINGS – GUISES CREEK BRIDGE **15**

4.1 VISUAL INSPECTION – GUISES CREEK BRIDGE 15
4.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – GUISES CREEK BRIDGE 20
4.3 REFURBISHMENT RECOMMENDATIONS & COST ESTIMATES 21
4.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) 22
4.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) 23

5.0 INSPECTION FINDINGS – 10M BRIDGE – (GUISES CREEK INLET STREAM) **24**

5.1 VISUAL INSPECTION – 10M BRIDGE – (GUISES CREEK INLET STREAM) 24
5.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – 10M BRIDGE (GUISES CREEK INLET STREAM) 29
5.3 REFURBISHMENT RECOMMENDATIONS & COST ESTIMATES 30
5.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) 31
5.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) 32

6.0 INSPECTION FINDINGS – LOBBS HOLE CREEK BRIDGE **33**

6.1 VISUAL INSPECTION – LOBBS HOLE CREEK BRIDGE 33
6.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – LOBBS HOLE CREEK BRIDGE 38
6.3 REFURBISHMENT RECOMMENDATIONS & COST ESTIMATES 39
6.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) 40
6.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) 41

7.0 INSPECTION FINDINGS – 6M MINOR BRIDGE (WILLIAMSDALE RD) **42**

7.1 VISUAL INSPECTION – 6M MINOR BRIDGE (WILLIAMSDALE RD) 42
7.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – 6M MINOR BRIDGE (WILLIAMSDALE RD) 46
7.3 REFURBISHMENT RECOMMENDATIONS & COST ESTIMATES 47
7.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) 48
7.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) 49

8.0 INSPECTION FINDINGS – DEEP CREEK BRDGE **50**

8.1 VISUAL INSPECTION – DEEP CREEK BRIDGE 50
8.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – DEEP CREEK BRIDGE 57
8.3 REFURBISHMENT RECOMMENDATIONS 58
8.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) 59
8.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) 60

9.0 INSPECTION FINDINGS – BOBUNDARA CREEK BRDGE **61**

9.1 VISUAL INSPECTION – BOBUNDARA CREEK BRIDGE 61
9.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – BODUNDARA CREEK BRIDGE 67
9.3 REFURBISHMENT RECOMMENDATIONS 68

9.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) ... 69
9.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) ... 70

10.0 INSPECTION FINDINGS – MACLAUGHLIN RIVER BRDGE ... 71

10.1 VISUAL INSPECTION – MACLAUGHLIN RIVER BRIDGE ... 71
10.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – MACLAUGHLIN RIVER BRIDGE ... 77
10.3 REFURBISHMENT RECOMMENDATIONS ... 78
10.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) ... 79
10.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) ... 80

11.0 INSPECTION FINDINGS – OLD BOMBALA RD BRIDGE ... 81

11.1 VISUAL INSPECTION – OLD BOMBALA RD BRIDGE ... 81
11.2 BRIDGE CONFIGURATION & CONDITION STATE RATING – OLD BOMBALA RD BRIDGE ... 87
11.3 REFURBISHMENT RECOMMENDATIONS ... 88
11.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years) ... 89
11.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years) ... 90

12.0 CONCLUSION ... 91

APPENDIX ... 98

APPENDIX A – ADDITIONAL INFORMATION ABOUT STRESS WAVE TIMER TECHNOLOGY ... 99
APPENDIX B – ADDITIONAL INFORMATION ABOUT BORATE SALT ROD DIFFUSERS ... 100
APPENDIX C – ADDITIONAL INFORMATION ABOUT PENTA TREATED GLULAM TIMBER ... 101

1.0 INTRODUCTION & BACKGROUND

The detailed visual condition state inspection of the major and minor timber bridges along the proposed Monaro Rail Trail was completed by a Wood Research and Development (WRD) Level II Certified Inspection Engineer on the 27th - 29th of January 2022. The objective of the investigation was to establish the general condition of the primary structural elements, and to assess what techniques could be utilized to safely repurpose the structures into rail trail bridges for pedestrian and cyclist use. A detailed visual inspection was commissioned and used in this investigation along with a brief, low density cavity test of several elements using non-destructive tests, including EPHOD® Stress Wave Technology. Refer to **Appendix A** for more information about this technology.

This inspection report has been prepared by Dan Tingley Ph.D., P.Eng. (Canada), MIEAust, CPEng, RPEQ, senior engineer and wood technologist for WRD and Andrew La Spina, Timber Structures Engineers for WRD.

There are many timber bridges situated along the decommissioned rail branch line connecting Queanbeyan to Bombala and eight timber structures were identified for this investigation. The 5 bridges apart of the northern section that were inspected are situated on the railway line between the towns of Tralee and Michelago which opened in 1889 and continued operation until 1988, the 3 bridges present in the southern section of the rail trail are situated between towns of Nimmitabel and McLaughlin Siding and concluded operation in 1984 due to the deteriorating condition of the rail line. These eight bridges encompass the inspection scope of this report with the location of each bridge depicted in **Figure 1-1**.

Majority of the bridges assessed have ballast top deck that consist of a full timber decking that supports the 300mm thick rock ballast that the timber transoms (sleepers/rail ties) bear on. The bridges inspected in sections 9, 10 and 11 are timber girder under bridges. Refer to Table 1-1 for a full summary of the bridge configurations.

The nomenclature used in this report is consistent with that adopted by the respective bridge inspection manuals. The abutments and bents are numbered in increasing order as they progress further along the railway line away from Queanbeyan, and the girders and corbels are numbered increasing from left to right.

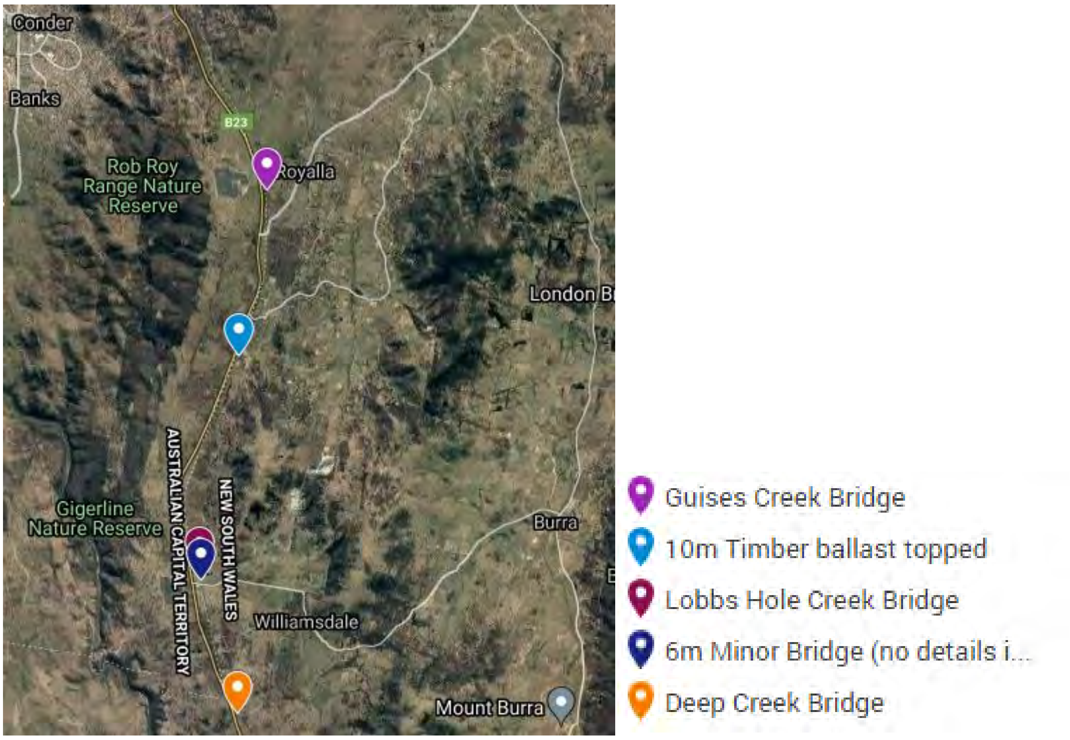


Figure 1-1: Location of each of the bridges within the Tralee to Michelago (Northern) Section of the proposed rail trail.

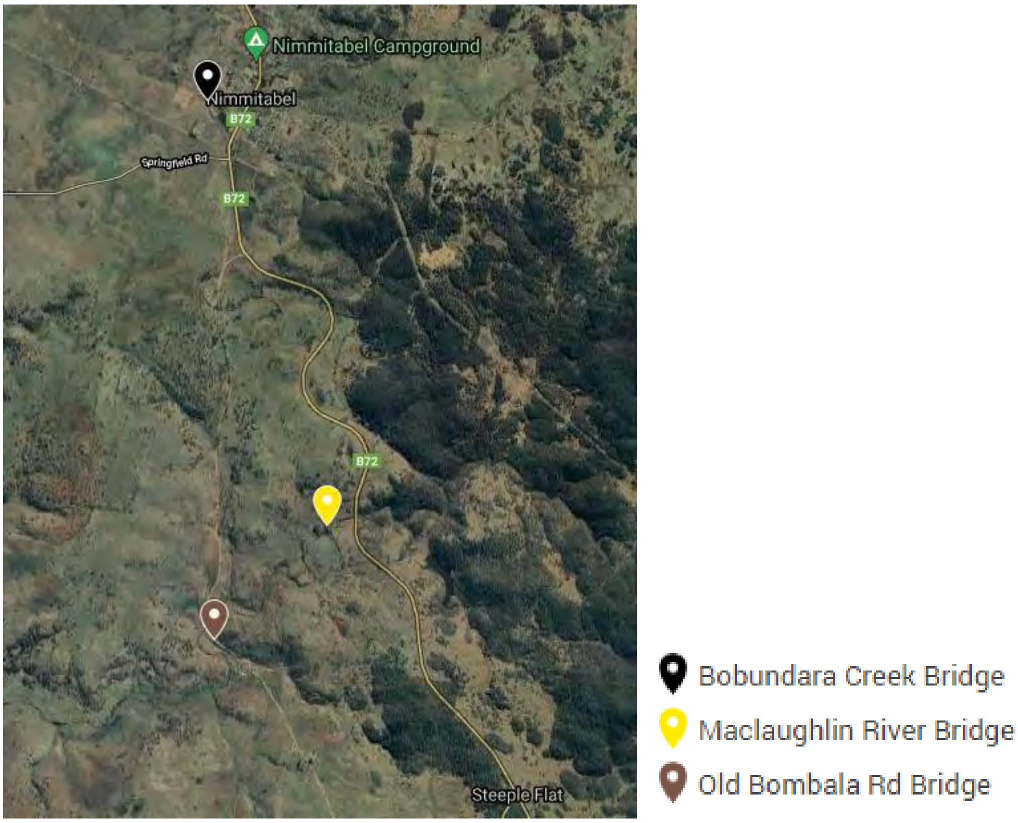


Figure 1-2: Location of each of the bridges within the Nimmitabel to McLaughlin Siding (Southern) Section of the proposed rail trail.

Table 1-1: Summary of Configuration and Dimensions for Major Bridges along the Proposed Monaro Rail Trail

Bridge Name	GPS Location	Type of Bridge/Span	State Heritage Listed	Total Length	Number of Spans	Span Length	Type of Substructure (supports)	Water Spans/ depth
Guises Creek	35 29.472 S 149 9.090 E	Timber ballast topped	No	24m	3	8m	Timber piles and cross and lateral bracing at pier 1.	S2/0.5m
10m Bridge	35 31.445 S 149 8.669 E	Timber ballast topped	No	10m	3	3.3m	Timber piles.	S2/0.1m
Lobbs Hole Creek	35 33.990 S 149 8.085 E	Timber ballast topped	No	12m	4	3m	Timber piles.	S1/0.3m
6m Bridge	35 34.137 S 149 8.135 E	Timber ballast topped	No	6m	3	2	Timber piles.	S1-3/0.5m
Deep Creek	35 35.704 S 149 8.657 E	Timber ballast topped	No	32m	5	Span 1 & 5 are 4m Span 2-4 are 8m	Timber piles and cross bracing.	S3/0.5m
Bobundara Creek	36 30.741 S 149 16.702 E	Timber girder under	No	25m	3	7.5-8m	Timber piles and cross bracing.	PB1/0.3m
MacLaughlin Creek	36 33.385 S 149 17.625 E	Timber girder under	No	60m	8	7.5-8m	Timber piles, cross bracing.	S3/0.7m
Old Bombala Rd	36 34.109 S 149 16.773 E	Timber girder under	No	22m	3	S1-7.8m, S2-6.8, S3-6.6m	Timber piles, cross bracing.	N/A

Note: The dimensions and descriptions were sourced from the original drawings and brief site inspections. A detail inspection and survey are required to be completed before any design and repair work is undertaken.

1.1 Heritage Significance:

When John Whitton, Engineer-in-Chief for Railways 1856-1890, extended the railway from Queanbeyan to Cooma, 1887–1889, he was under government pressure to reduce construction costs. One method was to build timber, mostly ballast tray, timber bridges which is seen for the 5 bridges in the northern section of the line. But for two major waterways, Ingalara Creek and Bredbo River, he chose to use the same type of timber truss viaduct (Queen post deck trusses) that he had already used on the Main North between Glen Innes to Wallangarra. Nearer to Cooma, at Chakola, he chose a different type of timber viaduct to cross Numeralla River. Note these bridges were outside the scope of this current investigation.

In summary, even though the bridges aren't heritage listed it is recommended that the bridges are restored/rehabilitated to the existing configuration with exception to the decking surface to possible allow pedestrian and cycle traffic to maintain the heritage value the original bridges add to the rail trail experience.

2.0 CONDITION STATE RATING DESCRIPTIONS

The Condition State Rating system in **Table 2-1** has been developed by Wood Research and Development, through timber inspection experience, to clearly describe the condition of the elements inspected. While similar rating systems are found in bridge inspection manuals, the ratings outlined in this report are not based on standard manual for evaluation procedures.

The definitions of the various Condition State Ratings used in this report are as follows:

Table 2-1: Condition State Rating Descriptions

Condition State	Subjective Rating	Estimated Remaining Life Span		Description
1	Good	100%	80 Years	Like new condition and free of defects.
2	Fair	80%	64 Years	Free of defects affecting structural performance, integrity and durability. Deterioration of a minor nature in the protective coating and/or parent material is evident.
3	Poor	30%	24 Years	Defects affecting the durability/serviceability which may require monitoring and/or remedial action or inspection by a structural engineer. Component or element shows marked and advancing deterioration including loss of protective coating and minor loss of section from the parent material is evident. Intervention is normally required.
4	Very Poor	5%	4 Years	Defects affecting the performance and structural integrity of the structure which require urgent action as determined by a detailed structural engineering inspection. Component or element shows advanced deterioration, loss of section from the parent material, signs of overstressing or evidence that it is acting differently to its intended design mode or function.
5	Unsafe	1%	Less Than 2 Years	Bridge should be closed. Structural integrity is severely compromised, and the structure must be taken out of service until a structural engineer has inspected the structure and recommended the required remedial action.

1. Typically a structure may be defined as defective when greater than 25% of principal components are rated as Condition State 4 in a single abutment, pier or span group.

3.0 MAJOR CAUSES OF WOOD DETERIORATION

Wood deteriorates for numerous reasons, and as deterioration implies this adversely affects woods properties. The two primary causes of deterioration in wood are: biotic (living) agents and physical (nonliving) agents. In many cases the agents that first alter the wood, provide the conditions for other agents to attack (e.g. insects bring woodpeckers). The effectiveness of an inspection of deteriorated wood depends upon the inspector's knowledge of the agents of deterioration. A well-trained inspector is essential for accurately assessing wood deterioration.

3.1 Wood Deterioration Due to Biotic Agents

Biotic, or living, organisms that attack wood include bacteria, fungi, insects, and marine borers. As living organisms, they require certain conditions for survival such as moisture, oxygen, temperature, and food, which is usually the wood. When the basic necessary living conditions are available biotic agents of wood deterioration are free to proliferate, but if any one of them is removed the wood is safe from further biotic attack. Geographical regions tend to have higher moisture content due to average temperature and relative humidity. See **Figure 3-1** below for the decay hazard zones for Australia.

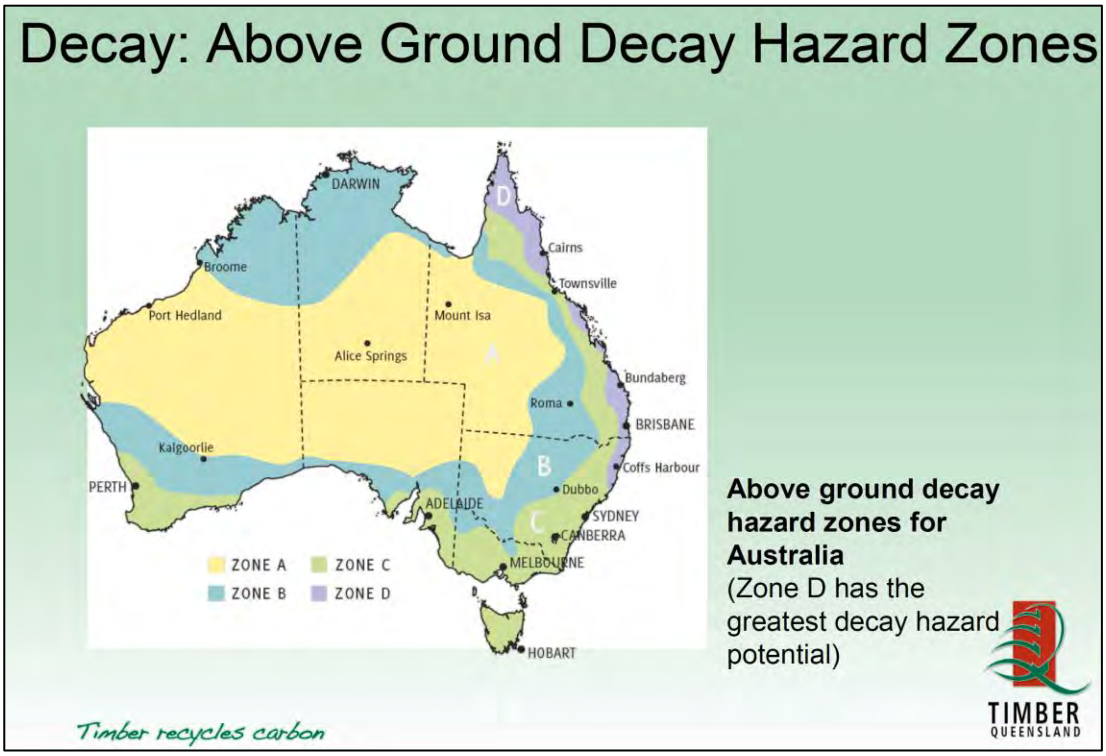


Figure 3-1: Decay Hazard Map for Australia showing that the proposed Monaro Rail Trail bridges are in Zone C of the decay hazard zones in Australia. The typical moisture contents in these timber bridges are 16.4% for open deck bridges and 14.2% for closed deck bridges. Decay doesn't begin in wood till the moisture content reaches 22%. The majority of decay in timber elements is due to vertical fasteners and design details that allow moisture to accumulate in and around timber elements.

3.1.2 Bacteria

In very wet environments bacteria can colonize untreated wood. Bacterial damage can include softening of the wood surface, increased permeability, and even degradation of chemical preservatives so that the wood becomes more susceptible to less chemically tolerant organisms. Usually, the process bacterial attack is very slow, but under extensive exposure for long periods, damage can become significant.

3.1.3 Fungi

When exposed to favourable conditions, most types of wood become an attractive food source for a variety of decay-producing fungi. The fungi require moderate temperature, oxygen, and a moisture content of approximately 22% or greater (oven dry basis) to become active. Decay progresses most rapidly at temperatures between 10°C (50°F) and 35°C (95°F), outside this range decay growth slows considerably, and ceases when the temperature drops as low as 2°C (35°F) or rises as high as 38°C (100°F). Wood can be too wet for decay also. If the wood is water-soaked, the supply of oxygen may be inadequate to support development of typical decay fungi. Thus, wood will not decay, and decay already present from prior infestation will not progress if appropriate conditions are not met.

Examples of wood preservation by environmental conditions are common. Timber pagodas in China have survived hundreds of years, and in some cases over 1,000 years, because the wood was kept dry. Entrepreneurs in the United States are recovering old growth wood from sunken transport ships and selling the recovered wood. The sunken wood has been almost perfectly preserved by being kept saturated such that oxygen is not available for decay to proceed.

Decay fungi may be generally classified into two categories by the appearance on the wood surface.

1. **Brown Rot |** Appears darker and can crack across the grain. Brown rot fungi attack the cellulose in the wood fibres. The brown colour is due to the remaining lignin (the binder which holds the cellulose structure together), which is not consumed by the fungi. The decayed wood tends to form into small cubic shaped sections, which is a sign of advanced decay.

2. **White Rot |** Appears lighter in colour and does not crack across the grain until severely degraded. In contrast to brown rot, white rot consumes both the lignin and cellulose and leaves the surface appearing generally intact, but with little or no significant mechanical strength. The surface of the decayed wood tends to have a “white” appearance.

Dry rot is a common term utilized by building inspectors to describe wood that becomes brown and crumbly and in an apparent dry condition. However, dry rot is a misnomer, because the wood must have some moisture in it to decay, although it may become dry later. A few fungi have water-conducting strands (hyphae) which can carry water, usually from the soil, into buildings or wood piles where they moisten and rot wood that would otherwise be dry. The material they are calling dry rot is frass or the residual material left after the decay causing fungal colony has moved on.

Interior decay damage can occur even when some precaution has been taken. Surface treated wood material can form cracks, which extend beyond the treated surface into untreated core material. Water can also get into the core of “protected” wood by the fungi hyphae. In either case water enters the core material and provides the adequate conditions for decay fungi to live. Wood with as little as a 10% loss in Specific Gravity (SG) due to decay can have up to 75% loss in bending strength and 80% loss in compression perpendicular to grain strength.

3.2 Wood Deterioration Due to Vertical Fasteners

Figure 3-2 below shows the level of decay typically found due to vertical through bolts. A similar occurrence happens to the base of the pile when they are sitting directly on concrete. The timber soaks up the water from the concrete, which accelerates decay.

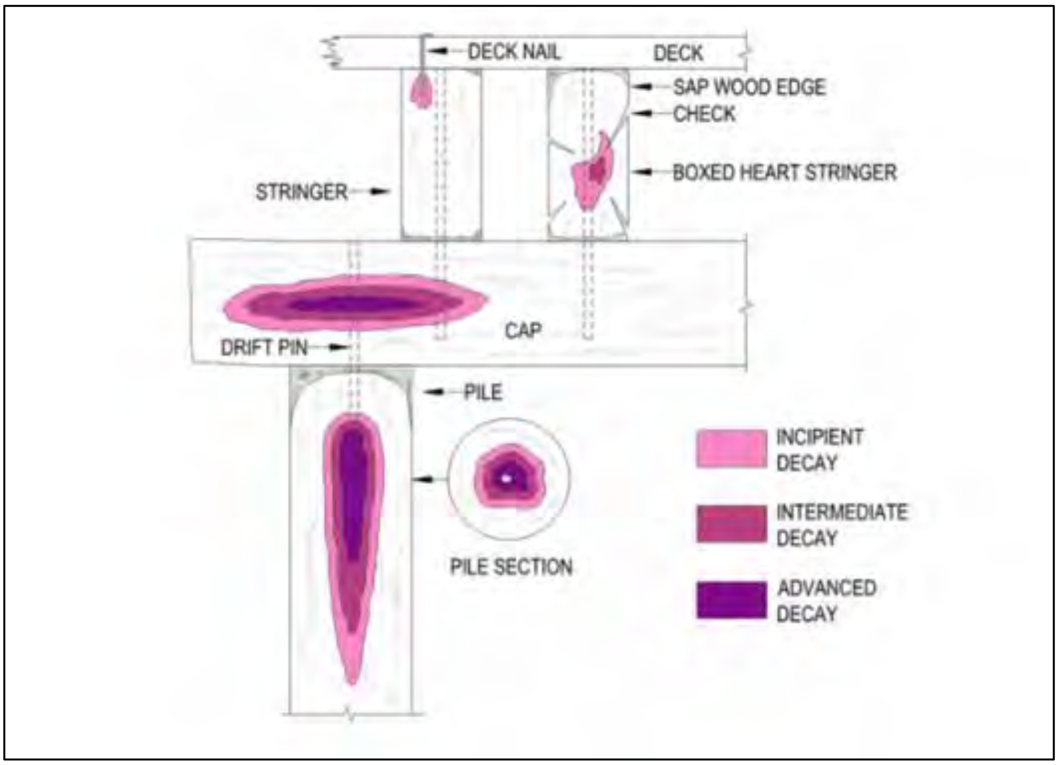


Figure 3-2: Shows the level of decay that occurs in timber due to the use of vertical fasteners. Vertical fasteners increase the rate of decay in timber as they allow moisture to travel down the fastener into the heartwood of the headstock (cap), girders (stringers), corbels and piles, therefore increasing the moisture content in the middle of these elements. The heartwood of a log element is less capable of breathing and expelling moisture than the sapwood that surrounds it, so vertical connectors funnel the moisture directly into the heartwood accelerating decay. Once the moisture content exceeds 22%, timber consuming fungi are activated, and the decay process begins.

4.0 INSPECTION FINDINGS – GUISES CREEK BRIDGE

4.1 Visual Inspection – Guises Creek Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and considering the surroundings in addition to the main structural elements. See **Figure 4-1** through **Figure 4-9** below for a summary of findings as well as the description of each bridge.

Figure 4-1: View of Guises Creek Bridge from end 1. The timber bridge is 3 spans long and approximately 24m metres long (8 metre spans). Note at all bents each girder has a corbel. Note that the corbels and girders are dimension timber when typically, they will be round log. At the time of inspection there was only water underneath span 2 with an approximate depth of 0.5m. There is a large amount of vegetation growth around the timber bents which keeps the moisture content of the timber high. When the moisture level in the timber is above 22%, decay-causing fungi can start to grow; when the moisture content drops below this level, the fungi become dormant, and decay will be arrested until the moisture content rises again. It is noted that a resin treatment has been used to fill existing cavities in majority of the girders. Note the rounded drip edge on the corbels. A positive detail. However, plenty of poor detailing vertical fasteners originating from the top of the girders are in use.

Figure 4-2: View of the typical timber pile bent configuration. The bent is comprised of 4 driven piles, single timber head stocks and corbels. The bent is also supported by a double cross bracing system with sashes at halfway and timber wales at the bottom. Overall, the timber bents were found to be in a poor to very poor condition. Note the surface brown rot fruiting bodies on the faces of some of the cross braces -orange brown colour.

Figure 4-3: Both abutments consist of 4 timber piles, timber headstock, timber corbels and timber sheeting. It was noted that the bottom section of several piles has started to undergo decay. Note abutment sheeting is rotted and failing. Timber pile and sheeting wing walls present on both sides of each abutment. Once the moisture content in the timber elements reaches 22%, decay causing fungi are activated and the decay process begins. Large trees need to be cleared as their root systems apply lateral pressure on the substructure elements as will the branches and trunks on super structure elements.

Figure 4-4: The bottom sections of the timber piles were determined to be a ‘hotspot’ for decay, this is caused by the moisture retained by debris increasing the moisture content in timber members. Sapwood decay in the timber piles is photographed on the right-hand side. Refer to Section 4.1 below for a full list of recommended repair options for refurbishment to a pedestrian/cycle bridge.

Figure 4-5: The timber transoms were found to be in a very poor (unsafe) condition. The timber ballast tray side walls and rock ballast were in poor condition with erosion of material found in several locations. If the bridge was to be repurposed for pedestrian and cycle use the timber transoms, railway line and rock ballast would need to be removed. Depending on the condition the existing ballast tray side boards they can left in place to act as a kerb/kick rail in the re-purposed bridge. To meet the current standards and Australian codes; vertical balustrade panels and a 1.4m high cycle rail will need to be installed. Note: Significant vegetation growth. The ballast tray will provide a great subgrade for the walking track.

Figure 4-6: View of 2/4 girders. Consists of 4 girder lines which are double stacked with the top girder serving as a lateral bearer beam end stabilizer as well increasing the elevation of the ballast tray floor. All girders exhibited major water stains and decaying fungal growth. Girders were found to be in poor to very poor condition.

Figure 4-7: The photo on the left shows a failed deck plank from below. The photo on the right shows another failed deck plank located above the abutment. Decking failure causes the above rock ballast to erode and elements below experience excess weathering and load. These planks will require replacement before the bridge can be reopened for pedestrian and cycle use.

Figure 4-8: The timber wingwalls have undergone significant deterioration with timber sheeting completely rotted and failing in several locations. Due to this the walls' ability retain the approach fill material is poor leading to erosion and excessive loading.

Figure 4-9: Left photo is the general downstream view from bridge deck & photo on the right is the upstream view.

4.2 Bridge Configuration & Condition State Rating – Guises Creek Bridge

Overall, Guises Creek Bridge is in poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 4.3** below. See **Table 4-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 4-2** below.

Table 4-1: Bridge Configuration & Condition State Rating Table– Guises Creek Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	Ø400-500	-	Situated under girder lines.	4	4	16	30%	60%	10%
Backwalls/Wingwalls	-	-	Butted up as retaining wall.	AB1-15, AB2-10	2	25	0%	20%	80%
Pile Bent Cross-Bracing	-	-	Cross bracing slashes at centre.	2	2	4	20%	70%	10%
Headstock/Cap	300 x 300	-	N/A	1	4	4	50%	30%	20%
Corbels	300 x 300	2.5	Same as Girders.	4	4	16	50%	35%	15%
Girders	300 x 300	-	1m for exterior & 1.5m for interior.	4	3	12	10%	40%	50%
Timber Wale	-	-	300 apart.	2	2	4	100%	0%	0%
Deck planks	-	-	Stacked tight.	-	-	-	0%	30%	70%
Kerb/Ballast Support Planks	-	24	Installed on top of exterior girders.	N/A	N/A	48 lin.m	0%	20%	80%
Transom (Sleeper)	-	-	0.5m apart.	3	16	48	0%	20%	80%

Table 4-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	-	-	-	-	-
Corbels	-	-	-	-	-
Caps	-	-	-	-	-
Piles	0%	30%	30%	20%	10%

4.3 Refurbishment Recommendations & Cost Estimates

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

4.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Guises Creek Bridge Option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$25,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$20,000
3	Bridge access (scaffold, ladders)	$25,000
4	Crane / Excavator Hire including demolition	$50,000
5	Shipping material to job site	$5,000
	Sub Total:	**$125,000**
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$70,000
7	New Hardwood Superstructure Elements (girders)	$45,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$80,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$195,000**
	Total:	**$320,000**
	Contingency (15%)	**$48,000**
	GST (10%):	**$36,800**
	Grand Total:	**$404,800**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

4.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

Wood Research and Development

Monaro Rail Trail - Guises Creek Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$20,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$10,000
3	Bridge Access (scaffolding)	$45,000
4	Crane / Excavator Hire including demolition	$20,000
5	Shipping material to job site	$5,000
	Sub Total:	**$100,000**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$125,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$40,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$80,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$245,000**

Total:	**$345,000**
Contingency (15%)	**$51,750**
GST (10%):	**$39,675**
Grand Total:	**$436,425**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

5.0 INSPECTION FINDINGS – 10m BRIDGE – (GUISES CREEK INLET STREAM)

5.1 Visual Inspection – 10m Bridge – (Guises Creek Inlet Stream)

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and considering the surroundings in addition to the main structural elements. See **Figure 5-1** through **Figure 5-9** below for a summary of findings as well as the description of each bridge.

Figure 5-1: The top image shows a general view of the minor 10m Bridge from an abutment. The timber girder under bridge consists of 3 spans of 3.3m. Each bent consists of 4 driven timber piles and a single headstock. Headstocks are attached to the piles using a vertical steel bracket on either side. Note kerb support completely split vertically through middle.

Figure 5-2: General configuration of each pile bent. Large vegetation growth and cobbles located around the base of piles. All piles were found to be in very poor condition with large splits and sapwood decay are present in majority of piles, predominately at ground level. Excess vegetation growth leads to an increase in moisture content within timber members resulting in accelerated decay.

Figure 5-3: View of piles at PB1, pile 3 and PB2 pile 4, both are in very poor condition and were found to be completely decayed at ground level and hanging freely above ground.

Figure 5-4: View from in between internal girders, all girders were found to be in fair condition with no major deterioration present. Corbels and bent caps were found to be in fair to poor condition throughout with evidence of minor decay present. Brief NDT testing was completed using non-destructive methods, such as EPHOD® Stress Wave Technology. Refer to Appendix A for more information of this type of testing method. Readings for girders were found to be between 300-500µs, Corbels – 400-100µs and caps 300-800µs. This is the time taken for the compression wave to travel across the section of the member tested. This was recorded on most elements and aids in verifying the condition of the elements. The pile tops are in better condition due to the use of horizontal connectors with side plates.

Figure 5-5: View of abutment shows the general formation. The timber sheeting was found to be in poor condition, with water stains and decaying fungi growth present. Significant sapwood deterioration was located on members near the ground. Gaps between lower planks show minor erosion of backfill material. The breast wall planks are spiked to the backside of the piles which has resulted in their shrinkage producing gaps and subsequent loss of fines. They should be stitched.

Figure 5-6: A view of abutment wingwall. The wingwall was found to be in fair to poor condition with minor deterioration present throughout all components. Minor deformation was present at top of wall due to bearing load of ballast.

Figure 5-7: View of both ballast tray side walls. Both side walls were found to be in fair to poor condition, with minor deterioration of sapwood present at all lengths. Photo on the right shows the side walls support leaning backwards creating a deformation in side wall length. Photo on the left shows a significant bow in middle length due to bearing the load from the rock ballast.

Figure 5-8: Top view of rock ballast looking in opposite directions. The rock ballast was found to be in fair condition with no major erosion present, no holes were found in bridge decking. Transoms were found to be in fair to poor condition with moderate deterioration and decay found.

Figure 5-9: View of small inlet creek that trickles through rocks under the span 2 into a pool on the opposite side.

5.2 Bridge Configuration & Condition State Rating – 10m Bridge (Guises Creek Inlet Stream)

Overall 10m Bridge (Guises Creek Inlet Stream) is in poor condition (CSR of 3) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 5.3** below. See **Table 5-1** below for a breakdown of the condition state rating (CSR) per each of the element types. The accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 5-2** below.

Table 5-1: Bridge Configuration & Condition State Rating Table– 10m Bridge (Guises Creek Inlet Stream)

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	Ø400-500	-	situated under girder lines.	4	4	16	0%	0%	100%
Backwalls/Wingwalls	-	-	Butted up as retaining wall.	AB1-7, AB2-4	2	11	60%	30%	10%
Headstock/Cap	300 x 300	-	N/A	1	4	4	70%	30%	0%
Corbels	300 x 300	1.5	same as Girders	4	4	16	60%	40%	0%
Girders	300 x 300	-	0.9, 1.5, 0.9	4	3	12	70%	30%	0%
Deck planks	-	-	Stacked tight	-	-	-	50%	50%	0%
Kerb/Ballast Support Planks	-	10	Installed on top of exterior girders	NA	NA	20 lin. m	50%	30%	20%
Transom (Sleeper)	-	-	0.5m apart.	3	6	18	80%	20%	0%

Table 5-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	40%	60%	0%	0%	0%
Corbels	0%	50%	50%	0%	0%
Caps	50%	40%	10%	0%	0%
Piles/Posts	0%	30%	30%	5%	35%

5.3 Refurbishment Recommendations & Cost Estimates

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new single span treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

5.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - 10m Bridge option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$10,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge access (scaffold, ladders)	$5,000
4	Crane / Excavator Hire including demolition	$20,000
5	Shipping material to job site	$2,500
	Sub Total:	**$42,500**

	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$40,000
7	New Hardwood Superstructure Elements (girders)	$20,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$30,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$90,000**

Total:	**$132,500**
Contingency (15%)	**$19,875**
GST (10%):	**$15,238**
Grand Total:	**$167,613**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

5.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - 10m Bridge Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$10,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge Access (scaffolding)	$5,000
4	Crane / Excavator Hire including demolition	$30,000
5	Shipping material to job site	$2,500
	Sub Total:	**$52,500**

	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$40,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$25,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$40,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$105,000**

Total:	**$157,500**
Contingency (15%)	**$23,625**
GST (10%):	**$18,113**
Grand Total:	**$199,238**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

6.0 INSPECTION FINDINGS – LOBBS HOLE CREEK BRIDGE

6.1 Visual Inspection – Lobbs Hole Creek Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and taking into account the surroundings in addition to the main structural elements. See **Figure 6-1** through **Figure 6-8** below for a summary of findings as well as the description of each bridge.

Figure 6-1: General view of Lobbs Hole Creek Bridge from the side of the bridge. The Creek that flows underneath span 1 at the time of inspection was flowing very slowly/still. The configuration of the bridge is a girder under and consists of 3 spans, 2 abutments and 2 pile bents. The span length is 3m equating to a total length of 12m. Note: abutment 1 and abutment corbels as does one of the bents.

Figure 6-2: **View of the typical timber pile bent configuration with each bent varying in height. The bent comprises of 4 driven piles a capsule (cap) and at bent 2 4 corbels located directly underneath girders. Overall, the timber bents were found to be in fair to poor condition. Note: large Wombat hole at abutment 2 between pile 2 and 3 and the significant amount of vegetation growth surrounding the substructure elements. Note that the use of horizontal bolts in the side plates have let to improved pile top condition. Also note the notches in the caps for the girders to drop into.**

Figure 6-3: **A view of Bent 2 shows the timber piles were driven into the creek. Significant sapwood decay is present in the lower length of each pile as seen by the noticeable change in cross section. This is seen as a length that is subject to temporary exposure to moisture which causes accelerated decay compared to constant saturation. Once the moisture content exceeds 22%, timber consuming fungi are activated, and the decay process begins. Refer to Figure 3-2 for a detailed description of how and where the decay occurs due to these vertical bolts.**

Figure 6-4: **General view of Abutment 1 shows the timber sheeting in very poor condition as top half is failing and backfill material is eroding. Note: Hole in decking above abutment causing significant material loss from rock ballast above.**

Figure 6-5: **Above photos show the existing condition of the wingwalls. The wingwalls were found to be in a poor to very poor condition, multiple members had failed, and significant deterioration was present throughout.**

Figure 6-6: Above photos show the ends of the pile bent caps at PB1&2. Minor deterioration and cavities were found at all ends of caps. Overall, the caps were in poor condition. Brief NDT testing was completed at the mid length using non-destructive methods, such as EPHOD® Stress Wave Technology. Refer to Appendix A for more information of this type of testing method. Readings for bent caps were found to be between 200-1000µs. This is the time taken for the compression wave to travel across the section of the member tested. This aided in verifying the overall condition of the elements.

Figure 6-7: Above two photos show 2 of 3 deck collapses. The ballast tray floor boards are in very poor condition with major deterioration and rot present throughout.

Figure 6-8: View of timber ballast tray side walls, spacing between side walls was 3.5m. Side walls were found to be in very poor condition with significant rot and decay present.

6.2 Bridge Configuration & Condition State Rating – Lobbs Hole Creek Bridge

Overall Lobbs Hole Creek Bridge is in poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a very small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 6.3** below.

See **Table 6-1** below for a breakdown of the condition state rating (CSR) per each of the element types.

Table 6-1: Bridge Configuration & Condition State Rating Table– Lobbs Hole Creek Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	Ø325-400	-	Situated under girder lines.	4	4	16	40%	50%	10%
Backwalls/Wingwalls	-	-	Butted up as retaining wall.	AB1-20, AB2-12	2	32	0%	20%	80%
Headstock/Cap	300 x 300	-	N/A	1	4	4	20%	60%	20%
Corbels	323 x 325	-	same as Girders.	4	4	16	60%	40%	0%
Girders	325 x 325	-	0.9, 1.5, 0.9.	4	3	12	60%	40%	0%
Deck planks	75 x 210	-	Stacked tight.	-	-	-	0%	30%	70%
Kerb/Ballast Support Planks	150 x 250	12	Installed on top of exterior girders.	NA	NA	24 lin. m	0%	50%	50%
Transom (Sleeper)	-	-	0.5m apart.	6	4	24	0%	20%	80%

Table 6-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	50%	50%	-	-	-
Corbels	50%	50%	-	-	-
Caps	50%	20%	30%	-	-
Piles/Posts	70%	20%	10%	-	-

6.3 Refurbishment Recommendations & Cost Estimates

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new single span treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

6.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Lobbs Hole Creek Bridge option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$15,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge access (scaffold, ladders)	$5,000
4	Crane / Excavator Hire including demolition	$25,000
5	Shipping material to job site	$2,500
	Sub Total:	**$52,500**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$35,000
7	New Hardwood Superstructure Elements (girders)	$15,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$35,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$85,000**

Total:	**$137,500**
Contingency (15%)	**$20,625**
GST (10%):	**$15,813**
Grand Total:	**$173,938**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

6.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Lobbs Hole Creek Bride Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$15,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge Access (scaffolding)	$5,000
4	Crane / Excavator Hire including demolition	$25,000
5	Shipping material to job site	$2,500
	Sub Total:	**$52,500**
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$40,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$30,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$45,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$115,000**
	Total:	**$167,500**
	Contingency (15%)	**$25,125**
	GST (10%):	**$19,263**
	Grand Total:	**$211,888**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

7.0 INSPECTION FINDINGS – 6m MINOR BRIDGE (WILLIAMSDALE RD)

7.1 Visual Inspection – 6m Minor Bridge (Williamsdale Rd)

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and taking into account the surroundings in addition to the main structural elements. See **Figure 7-1** through **Figure 7-7** below for a summary of findings as well as the description of each bridge.

Figure 7-1: The image above shows a general view of the 7m minor bridge (Williamsdale Rd). The consists of 3 spans each span is 2m in length, substructure includes 2 pile bents and 2 abutments that each have 4 driven piles, a pile cap and 4 girders. At the time of inspection there was water approximately 0.5m deep in Spans 1-3. There is a large amount of vegetation growth around the substructure which keeps the moisture content high in the timber. When the moisture level in the timber is above 22%, decay-causing fungi can start to grow; when the moisture content drops below this level, the fungi become dormant, and decay will be arrested until the moisture content rises again.

Figure 7-2: Shows the general configuration of the pile bents. Piles are approximately 1m high and in fair condition. Minor deterioration of sapwood is present at water level due to increased moisture content. Water stains and fungal growth present. Note: top plank in abutment sheeting has failed leading to erosion of backfill material.

Figure 7-3: View of abutment 2, overall, in a poor condition. Sheeting planks have separated due to spiking to the pile backs in the breast wall, causing loss of fines in the approach fill material through gaps.

Figure 7-4: Top view of abutment cap connection. Cap is in very poor condition; severe deterioration is present in the ends and at the vertical connection. When a vertical connection is not sealed appropriately it exposes the heart wood to excess moisture accelerating decay. As seen in the photo a large crack is present at the end and a cavity is present at the top of the vertical connection.

Figure 7-5: Top view of floorboards in the ballast tray at abutment. Large hole caused be abutment/ballast tray failure allowing significant erosion of ballast to occur.

Figure 7-6: Above photos show a ballast tray side wall lengths that have completely rotted away, significantly reducing its ability to retain the ballast material.

Figure 7-7: The photo above shows the general view down the rail line. Significant overgrown vegetation present through rock ballast and surrounding the substructure. Note: Ballast is 450mm thick.

7.2 Bridge Configuration & Condition State Rating – 6m Minor Bridge (Williamsdale Rd)

Overall, the 6m Minor Bridge (Williamsdale Rd) is in very poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 7.3** below.

See **Table 7-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 7-2** below.

Table 7-1: Bridge Configuration & Condition State Rating Table– 6m Minor Bridge (Williamsdale Rd)

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	-	~1	Situated under girder lines.	4	4	16	50%	50%	0%
Backwalls/Wingwalls	-	-	Butted up as retaining wall.	AB1-3, AB2-3	2	6	40%	60%	0%
Headstock/Cap	300 x 300	-	N/A	1	4	4	33%	66%	0%
Girders	-	-	0.9, 1.5, 0.9	4	3	12	50%	50%	0%
Deck planks	Depth-100	-	Stacked tight, longitudinal.	-	-	-	20%	40%	40%
Kerb/Ballast Support Planks	150 x 250	6	Installed on top of exterior girders	N/A	N/A	12 lin. m	0%	10%	90%
Transom (Sleeper)	-	-	0.5m apart.	3	4	12	0%	30%	70%

7.3 Refurbishment Recommendations & Cost Estimates

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new single span treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

7.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - 6m Bridge option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$10,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge access (scaffold, ladders)	$5,000
4	Crane / Excavator Hire including demolition	$20,000
5	Shipping material to job site	$2,500
	Sub Total:	**$42,500**

	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$30,000
7	New Hardwood Superstructure Elements (girders)	$10,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$25,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$65,000**

Total:	**$107,500**
Contingency (15%)	**$16,125**
GST (10%):	**$12,363**
Grand Total:	**$135,988**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

7.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - 6m Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$10,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$5,000
3	Bridge Access (scaffolding)	$10,000
4	Crane / Excavator Hire including demolition	$20,000
5	Shipping material to job site	$2,500
	Sub Total:	**$47,500**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$35,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$15,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$25,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$75,000**

Total:	**$122,500**
Contingency (15%)	**$18,375**
GST (10%):	**$14,088**
Grand Total:	**$154,963**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 2 weeks to perform retrofit tasks. This is an estimate only.

8.0 INSPECTION FINDINGS – DEEP CREEK BRDGE

8.1 Visual Inspection – Deep Creek Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and taking into account the surroundings in addition to the main structural elements. See **Figure 8-1** through **Figure 8-10** below for a summary of findings as well as the description of each bridge.

Figure 8-1: General view of Deep Creek Bridge from abutment 1 looking towards abutment 2. The timber bridge is 5 spans long and approximately 32 metres in length (Spans 1 & 5 – 4m and spans 2, 3 and 4 – 8m). Note span 2 passes over the road (4.2m Clearance) and span 3 passes over a creek 2m wide and 0.5m deep.

Figure 8-2: View of the typical timber pile bents configuration. The bents comprise of 6 driven piles (4 Plum piles directly under the girders and 2 batter piles on either side). Pile bent 2 and 3 are supported by cross bracing and timber wales at the bottom of the bent. Pile bent 3 was constructed on a concrete footing. The two abutments do not contain the cross bracing and wales. It was noted that the bottom section of several posts and timber cap wales have started to undergo decay. This can be expected due to the timber posts bearing directly on the concrete footing which typically has a high moisture content. Over time the timber post undergoes capillary action and draws up the moisture like a 'straw'. Once the moisture content in the timber elements reaches 22%, decay causing fungi are activated and the decay process begins. Overall, the timber bents were found to range from fair to very poor condition.

Figure 8-3: General view of pile bent 3 bearing on a concrete sill, piles were found to be in poor to very poor condition. The bottom sections of the timber piles were determined to be a 'hotspot' for decay and determined to be an ideal area to test using non-destructive methods, such as EPHOD® Stress Wave Technology. The timber piles were estimated to produce SWT data ranging between 300-1400µs. Readings above 700µs indicates that there is significant decay present and are required to be monitored. Reading of above 1000µs indicate severe decay is present resulting in the member being unable to support its own dead load.

Figure 8-4: The images above show the condition of the breast wall at PB1 & 4. The left photo shows the breast wall at PB1 to be poor to very poor condition with significant decay in timber elements present, surrounding overgrown vegetation and erosion of back fill material. The right image shows the breast wall at PB4 to be in fair to poor condition, it was noted that the back fill material had forced the wall to "lean" forward. Note: Severely decayed batter pile at PB3.

Figure 8-5: View of pile caps at PB1 & 4. Caps were found to be in very poor condition due to the significant cavities present in both ends of each cap. Note: The right photo also shows the backfill from PB4 pushing the breast wall forward.

Figure 8-6: A view of a cross bracing plank connection. Plank was found to be in very poor condition as the end has completely decayed away to the connection point. Timber wales were found to be in poor condition with significant water stains and decay present throughout.

Figure 8-7: View of timber pile and cross bracing connection.

Figure 8-8: View of Abutment cap and spacing logs, cap is in very poor condition due to the large cavity and significant decay present at both ends. Spacing members were found to be in fair to poor condition with sapwood decay and cavities present.


Figure 8-9: Top view of ballast, found to be in very poor condition due to bridge ballast tray floor board degradation and failure leading to a significant hole in the ballast. Transoms appear to be in fair to poor condition with no major decay or defects present.

Figure 8-10: View of pile at PB4. Pile was found to be in very poor condition with significant decay present. Decay of approximately 50% of the cross section.

8.2 Bridge Configuration & Condition State Rating – Deep Creek Bridge

Overall Deep Creek Bridge is in poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 8.3** below.

See **Table 8-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 8-2** below.

Table 8-1: Bridge Configuration & Condition State Rating Table– Deep Creek Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	Ø400-500	-	Situated under girder lines and 2 batter piles on either side.	6	5	30	30%	40%	30%
Concrete footing	-	-	Under PB3.	1	1	1	0%	100%	0%
Backwalls/Wingwalls	-	-	Planks butted up as retaining wall.	1@AB1&2	2	2	10%	30%	60%
Headstock/Cap	300 x 300	-	N/A	1	5	5	0%	10%	90%
Corbels	300 x 300	-	Same as Girders.	4	5	20	60%	30%	10%
Girders	300 x 300	-	0.9, 1.5, 0.9.	4	5	20	70%	30%	0%
Deck planks	75 x 210	-	Stacked tight.	-	-	-	0%	30%	70%
Kerb/Ballast Support Planks	150 x 250	32	Installed on top of exterior girders.	NA	NA	64 lin. m	0%	50%	50%
Transom (Sleeper)	-	-	0.5m apart.	5	8-16	64	50%	50%	0%

Table 8-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	-	70%	20%	10%	-
Corbels	-	70%	20%	10%	-
Caps	-	-	-	10%	90%
Piles/post	15%	30%	45%	10%	-

8.3 Refurbishment Recommendations

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

8.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Deep Creek Bridge Option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$20,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$10,000
3	Bridge access (scaffold, ladders)	$45,000
4	Crane / Excavator Hire including demolition	$45,000
5	Shipping material to job site	$5,000
	Sub Total:	**$125,000**

	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$80,000
7	New Hardwood Superstructure Elements (girders)	$35,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$85,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$200,000**

Total:	**$325,000**
Contingency (15%)	**$48,750**
GST (10%):	**$37,375**
Grand Total:	**$411,125**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

8.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Deep Creek Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$20,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$10,000
3	Bridge Access (scaffolding)	$55,000
4	Crane / Excavator Hire including demolition	$45,000
5	Shipping material to job site	$5,000
	Sub Total:	**$135,000**

	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$70,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$50,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$105,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$225,000**

Total:	**$360,000**
Contingency (15%)	**$54,000**
GST (10%):	**$41,400**
Grand Total:	**$455,400**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

9.0 INSPECTION FINDINGS – BOBUNDARA CREEK BRDGE

9.1 Visual Inspection – Bobundara Creek Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and considering the surroundings in addition to the main structural elements. See **Figure 9-1** through **Figure 9-9** below for a summary of findings as well as the description of each bridge.

Figure 9-1: General view of Bobundara Creek Bridge from abutment 1 looking towards abutment 2. The timber bridge is 3 spans long and approximately 22.5 metres in length (7.5m spans). Note Bobundara creek runs underneath span 2 and is approximately 1m wide and 1ft deep. note the inner guard rail to prevent derailment leading to the train going off the bridge when train operations were occurring.

Figure 9-2: View of the timber pile bents configuration. PB 2 and 3 comprise of 5 driven piles (3 Plum piles directly under the girders and 2 batter piles on either side). Pile bent 2 and 3 are supported by cross bracing. The two abutments do not contain the cross bracing and are support by timber sheeting to retain backfill. It was noted that the bottom section of several posts has started to undergo decay. This can be expected due to the timber posts being exposed to increased moisture in overgrown vegetation, debris, and the nearby creek. Once the moisture content in the timber elements reaches 22%, decay causing fungi are activated and the decay process begins. Overall, the timber bents were found to range from poor to very poor condition.


Figure 9-3: The images above show the substructure configuration. It is seen that double stacked girders have been used in addition to split headstocks and corbels. Both images show significant water stains and decaying of corbel ends. The left image identifies a large cavity present in the end of corbel 1 AB1. It was noted that AB1 sheeting has failed.

Figure 9-4: The images above show the condition of the split headstocks. The majority of headstocks were found to be in poor to very poor condition. The left member in the image above is completely decayed through the end and in very poor condition.

Figure 9-5: Large amounts of sapwood decay is present throughout the structure piles. It is recommended that this is monitored and removed appropriately.

Figure 9-6: A view of two pile defects located at AB1 and PB2. The left image shows decay of sapwood forming a vertical cavity. The right image shows significant deterioration of sapwood (Peeling off).

Figure 9-7: View of Abutment 1 and 2 and respective wingwalls. Abutment 1 breast/wingwall was found to be in poor condition due to the missing members and gaps between planks causing erosion of backfill. Abutment 2 was found to be in very poor condition with missing elements throughout and the right side wingwall had failed (collapsed).

Figure 9-8: Top view of bridge surface, found to be in poor to very poor condition due to major vertical crack through the middle girder and major decay present in all other girder lengths. Vertical connections expose the bright wood to weathering and funnel watering, this leads to accelerated decay and higher moisture content. Transoms appear to be in fair to poor condition with no major decay or defects present. Note the smaller guard inner guard rail on this open deck railway bridge

9.2 Bridge Configuration & Condition State Rating – Bodundara Creek Bridge

Overall Bobundara Creek Bridge is in poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 9.3** below.

See **Table 9-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 9-2** below.

Table 9-1: Bridge Configuration & Condition State Rating Table– Bodundara Creek Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	-	-	Situated under girder lines and 2 batter piles on either side.	5	4	20	20%	30%	50%
Backwalls/Wingwalls	-	-	Planks butted up as retaining wall.	-	2	-	10%	30%	60%
Headstocks	-	-	Twin headstocks	2	4	8	0%	30%	70%
Cross-bracing	-	-	Located at PB1&2. Slashed at centres.	2	2	4	50%	50%	0%
Corbels	-	-	same as Girders.	3	4	12	60%	10%	30%
Girders	-	-	Double Stacked.	6	4	24	30%	40%	30%
Transom (Sleeper)	-	-	0.5m apart.	16	3	48	80%	20%	0%

Table 9-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	-	-	-	-	-
Corbels	-	-	-	-	-
Caps	-	-	-	-	-
Piles/post	-	100%	-	-	-

9.3 Refurbishment Recommendations

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

9.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Bobundara Creek Bridge Option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$20,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$10,000
3	Bridge access (scaffold, ladders)	$30,000
4	Crane / Excavator Hire including demolition	$50,000
5	Shipping material to job site	$5,000
	Sub Total:	**$115,000**
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$70,000
7	New Hardwood Superstructure Elements (girders)	$40,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$80,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$190,000**

Total:	**$305,000**
Contingency (15%)	**$45,750**
GST (10%):	**$35,075**
Grand Total:	**$385,825**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 4 weeks to perform retrofit tasks. This is an estimate only.

9.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - Bobundara Creek Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$25,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$10,000
3	Bridge Access (scaffolding)	$45,000
4	Crane / Excavator Hire including demolition	$50,000
5	Shipping material to job site	$5,000
	Sub Total:	**$135,000**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$75,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$30,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$90,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$195,000**

Total:	**$330,000**
Contingency (15%)	**$49,500**
GST (10%):	**$37,950**
Grand Total:	**$417,450**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

10.0 INSPECTION FINDINGS – MACLAUGHLIN RIVER BRDGE

10.1 Visual Inspection – MacLaughlin River Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and considering the surroundings in addition to the main structural elements. See **Figure 10-1** through **Figure 10-9** below for a summary of findings as well as the description of each bridge.

Figure 10-1: General view of MacLaughlin River Bridge from abutment 2 looking towards abutment 1. The timber bridge is 8 spans long and approximately 60 metres in length (7.5-8m spans). Note MacLaughlin River runs underneath span 3 and is approximately 3m wide and 0.7m deep. It was also noted that the bridge curved left and had appropriate camber. Note the double cross bracing on the bents as well the absence of a sash brace.

Figure 10-2: View of the timber pile bents configuration. Each pile bent comprises of 5 driven piles (3 Plum piles directly under the girders and 2 batter piles on either side) and are supported by double cross bracing ("X" at top and bottom of piles) and timber wales at the bottom. The two abutments do not contain the cross bracing and only exhibit 3 plum piles. It was noted that significant water stains were present on all timber members of each pile bent. This indicates a high moisture content, when timber elements reach 22%, decay causing fungi are activated and the decay process begins. Overall, the timber bents were found to range from fair to poor condition. Sapwood decay is present at on the piles within the image above. Note that the cross braces do not go all the way to the head stocks.

Figure 10-3: Significant decay is present on all piles in above image. Large decrease in pile cross-section on the bottom end of the piles located in the river (Body of water). Debris is caught up in the wales and surrounding areas of pile bents. It is recommended that deteriorated sapwood be removed appropriately.

Figure 10-4: The images above show the condition of the split headstocks and the abutment breast wall. The headstocks were found to be in poor to very poor condition, exhibiting significant decay. The breast wall is in poor condition with missing members and weathered elements with splits and cracking throughout. Note: major vertical crack down middle pile exposing bright wood and acerating decay. Typically, these decay cracks are initiated by fastener systems

Figure 10-5: View of the walk out standing platform. Platform appears to be in poor to very poor condition with missing/failed members. This would not be safe to stand on. All timber appears to exhibit significant decay.

Figure 10-6: Top view of bridge open deck. Transoms and girders can be seen to be in poor to very poor condition, with significant deterioration present in all elements. This is seen to be caused by the vertical connections used in construction. If not sealed appropriately they are seen to funnel water and become moisture traps, when moisture content within timber exceeds 22%, decay causing fungi are activated and the decay process begins. Note: Large cavity around vertical connection in right side photo.

Figure 10-7: Above image shows the left curve and camber in the bridge. The bent configuration is also highlighted, it was noted that significant overgrown vegetation and debris build up was present at the base of all bents. This increases moisture retention leading to accelerated decay of the lower timber elements.

Figure 10-8: View of abutment 2 configuration, the abutment was found to be in poor condition with significant decay present. It was noted that the left two piles had large vertical splits in them, whilst the right pule had significant decay of sapwood.

Figure 10-9: Left side image shows the view looking upstream and the right-side image shows the view downstream of the bridge of the edge of the open deck bridge.

10.2 Bridge Configuration & Condition State Rating – MacLaughlin River Bridge

Overall, MacLaughlin River Bridge is in poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 10.3** below.

See **Table 10-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural elements were tested using the SWT machine with the limited results displayed in **Table 10-2** below.

Table 10-1: Bridge Configuration & Condition State Rating Table– MacLaughlin River Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	**Size (Width x Depth)**	**Length (m)**	**Typ. Spacings (Centre to Centre)**	**QTY per Span/Bent**	**# Spans/Bents Applicable**	**Total QTY**	**Fair (2)**	**Poor (3)**	**Very Poor (4)**
Timber Pile	Ø350-400	-	Situated under girder lines and 2 batter piles on either side.	5 3@AB1&2	8	36	20%	50%	30%
Backwalls/Wingwalls	-	-	Planks butted up.	1@AB1	1	1	30%	70%	0%
Headstocks	-	-	Twin headstocks.	2	8	16	0%	30%	70%
Cross-bracing	-	-	Slashed at centres.	4	6	24	40%	50%	10%
Wales	-	-	Located at bottom of each bent.	2	6	12	20%	60%	20%
Corbels	-	-	Same as Girders.	3	8	24	60%	30%	10%
Girders	-	7.5m-8m	Double Stacked.	6	8	48	40%	10%	50%
Transom (Sleeper)	-	-	Every half meter.	16	8	128	0%	20%	80%

Table 10-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	-	-	-	-	-
Corbels	-	-	-	-	-
Caps	-	-	-	-	-
Piles/post	-	30%	70%	-	-

10.3 Refurbishment Recommendations

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

10.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - MacLaughlin Creek Bridge Option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$45,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$20,000
4	Bridge access (scaffold, ladders)	$110,000
3	Crane / Excavator Hire including demolition	$95,000
4	Shipping material to job site	$10,000
	Sub Total:	**$280,000**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
5	New Substructure Elements including abutment/pier repairs as required	$140,000
6	New Hardwood Superstructure Elements (girders)	$75,000
7	New Deck and Code Compliant Handrail (with cycle rail) System	$155,000
8	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$370,000**

Total:	**$650,000**
Contingency (15%)	**$97,500**
GST (10%):	**$74,750**
Grand Total:	**$822,250**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 6 weeks to perform retrofit tasks. This is an estimate only.

10.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

WOOD RESEARCH AND DEVELOPMENT

Monaro Rail Trail - MacLaughlin Creek Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$40,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$20,000
3	Bridge Access (scaffolding)	$110,000
4	Crane / Excavator Hire including demolition	$95,000
5	Shipping material to job site	$10,000
	Sub Total:	**$275,000**

ITEM	DESCRIPTION	TOTAL
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$120,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$75,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$210,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$405,000**

Total:	**$680,000**
Contingency (15%)	**$102,000**
GST (10%):	**$78,200**
Grand Total:	**$860,200**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 4 weeks to perform retrofit tasks. This is an estimate only.

11.0 INSPECTION FINDINGS – OLD BOMBALA RD BRIDGE

11.1 Visual Inspection – Old Bombala Rd Bridge

An essential step in evaluating the condition of a structure is undertaking a visual inspection. The visual aspect of the investigation is used to pick up missing or failed elements, cracks and splits, cavitation, connection details, abutment condition, undermining and debris build-up, among other important information. Gathering this information is essential for completing a comprehensive investigation and considering the surroundings in addition to the main structural elements. See **Figure 11-1** through **Figure 11-8** below for a summary of findings as well as the description of each bridge.

Figure 11-1: General view of Old Bombala Rd Bridge from abutment 1 looking towards abutment 2. The timber bridge is 3 spans long and approximately 22 metres in length (Sp1=7.8m, SP2=6.8m & SP3=6.6m). Note span 2 passes over the road (4.1m Clearance).

Figure 11-2: View of pile bent 1 configuration. The bents comprise of 3 driven piles. Pile bent 2 and 3 are supported by cross bracing. The two abutments do not contain the cross bracing but are supported by sheeting planks to retain backfill. It was noted that several piles and headstocks have started to undergo decay. It can be seen on pile 3 significant sapwood decay occurring.

Figure 11-3: General view of pile bent 2. piles were found to be in poor condition. With significant sapwood decay present in all piles, it was noted that all piles have large vertical splits through the horizontal connections. The bottom sections of the timber piles were determined to be a 'hotspot' for decay due to increased moisture retained by the overgrown vegetation.

Figure 11-4: The images above show the condition of the breast wall at AB2. The abutment sheeting was found to be in fair condition with minor decay of the sapwood present. The headstock ends were in poor condition with decay and cracking present.

Figure 11-5: View of abutment 1, found to be in poor condition with major decay of sapwood present in piles and broken/missing elements in abutment sheeting.

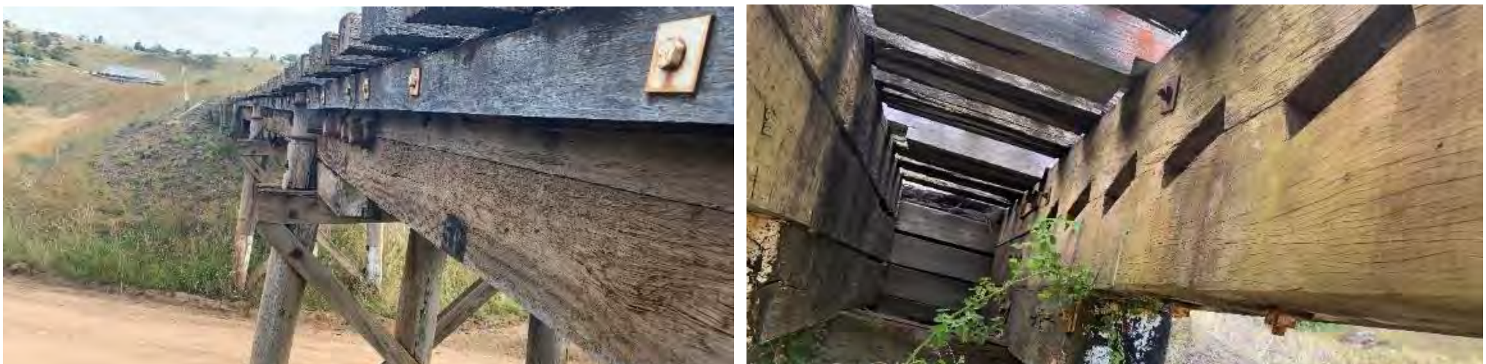


Figure 11-6: A view of girders formation and condition. Girders were found to be in fair to poor condition, the left photo shows a horizontal crack that is seen to be progressively increasing in size. The right photo shows sapwood decay of the internal girders.

Figure 11-7: View of the bridge open deck, transom sleepers were found to be in poor to very poor condition with significant decay, cavities and severely damaged members present throughout. It was noted that the vertical connections to the top girders were seen to funnel moisture and increase the moisture content present in both elements causes significant decay. When the moisture content exceeds 22%, timber consuming fungi are activated, and the decay process begins. Top girders were found to be in poor to very poor condition.

Figure 11-8: View of overgrown approach.

Figure 11-9: View of corbel 3 at abutment 1, Corbel was found to be in very poor condition with a large cavity present in the end. The vertical connection is visible highlighting the depth. The corbel needs replacement due to multiple failure points. Note the vertical fastener has split the corbel and the anti-splitter bolts have done the same thing. So many of these old details contributed to higher maintenance costs and reduced longevity.

11.2 Bridge Configuration & Condition State Rating – Old Bombala Rd Bridge

Overall Old Bombala Rd Bridge is in very poor condition (CSR of 4) with significant works required to repurpose the bridge for pedestrian and cycle use. This rating does not speak to the load rating. A load rating of the structure was not completed for this report. This condition rating was based on a small sample size of data collected and it is highly recommended to conduct a detailed Level 2/3 inspection of the entire bridge. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Section 11.3** below.

See **Table 11-1** below for a breakdown of the condition state rating (CSR) per each of the element types. As previously mentioned, the accessible structural

Table 11-1: Bridge Configuration & Condition State Rating Table – Old Bombala Rd Bridge

	Element Details						Overall Visual Condition State Rating per Element Type %		
Element	Size (Width x Depth)	Length (m)	Typ. Spacings (Centre to Centre)	QTY per Span/Bent	# Spans/Bents Applicable	Total QTY	Fair (2)	Poor (3)	Very Poor (4)
Timber Pile	Ø400	15ft	Situated under girder lines and 2 batter piles on either side.	3	4	12	30%	50%	20%
Backwalls/Wingwalls	-	1m high	Planks butted up as retaining wall.	-	2	-	0%	50%	50%
Headstocks	175 x 300	-	Twin headstocks	2	4	8	60%	40%	0%
Cross-bracing	-	-	Located at PB1&2. Slashed at centres.	2	2	4	100%	0%	0%
Corbels	300 x 300	-	Same as Girders.	3	4	12	50%	20%	30%
Girders	300 x 300	-	Double Stacked @1.1m centres.	6	3	18	40%	20%	40%
Transom (Sleeper)	125 x 250	-	0.5m apart.	~14	3	42	0%	20%	80%

elements were tested using the SWT machine with the limited results displayed in **Table 8-2** below.

Table 11-2: Scatted SWT Readings (adjusted values) - Breakdown Percentage %					
Element	200-400µS	400-700 µS	700-1000 µS	1000-1500 µS	1500+ µS
Girders	-	-	-	-	-
Corbels	20%	20%	20%	40%	-
Caps	-	-	50%	50%	-
Piles/post	-	20%	30%	50%	-

11.3 Refurbishment Recommendations

Based on the information compiled from both the visual inspection and brief SWT testing, the bridge will require significant repairs/replacement to repurpose the railway bridge as a rail trail bridge for pedestrian and cycle use. Two (2) options have been developed to refurbish the structure into a rail trail bridge.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described in Appendix B.

See below for high level (level D) cost estimates for each of the options mentioned above.

11.3.1 Option 1 - Intermediate Term Refurbishment Cost Estimate (25-50 years)

Monaro Rail Trail - Old Bombala Rd Bridge Option #1 - Like-For-Like Replacement of the Substructure and Superstructure and New Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$25,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$15,000
3	Bridge access (scaffold, ladders)	$40,000
4	Crane / Excavator Hire including demolition	$40,000
5	Shipping material to job site	$5,000
	Sub Total:	**$125,000**
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs as required	$70,000
7	New Hardwood Superstructure Elements (girders)	$40,000
8	New Deck and Code Compliant Handrail (with cycle rail) System	$70,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$180,000**
	Total:	**$305,000**
	Contingency (15%)	**$45,750**
	GST (10%):	**$35,075**
	Grand Total:	**$385,825**

Additional Notes:
ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.
Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.
It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

11.3.2 Option 2 - Long Term Refurbishment Cost Estimate (75-100 years)

Monaro Rail Trail - Old Bombala Rd Bridge Option #2 - Repair/Replace Substructure and New Glulam Superstructure and Deck for 5kPa Loading & 2.5m clear width Cost Estimate (Level D)

ITEM	DESCRIPTION	TOTAL
	Engineering & Project Management, Site Set-up & Running Costs & Machinery Hire	
1	Engineering, report writing, CAD drawings, Project Management and Supervision	$25,000
2	Crew Mobilisation, Site establishment, running costs and disestablishment	$15,000
3	Bridge Access (scaffolding)	$40,000
4	Crane / Excavator Hire including demolition	$40,000
5	Shipping material to job site	$5,000
	Sub Total:	**$125,000**
	Supply and Installation	
6	New Substructure Elements including abutment/pier repairs and cross bracing re-installation as required	$70,000
7	New Glulam Superstructure Elements (girders and lateral bracing)	$45,000
8	New Glulam Deck and Code Compliant Handrail (with cycle rail) System	$85,000
9	Approach Works to be completed by trail contractor	$0
	Sub Total:	**$200,000**
	Total:	**$325,000**
	Contingency (15%)	**$48,750**
	GST (10%):	**$37,375**
	Grand Total:	**$411,125**

Additional Notes:

ASSUMES PILES BELOW GROUND AND CONCRETE FOUNDATION ARE GOOD FOR SUPPORTING A 5KPA PEDESTRIAN LOAD.

Estimate includes engineering analysis and sign-off by P.Eng as per the recommendations in the report.

It is anticipated that it will take 3 weeks to perform retrofit tasks. This is an estimate only.

12.0 CONCLUSION

Wood Research and Development was commissioned by Mike Halliburton Associates to complete a detailed Level 1 visual inspection and refurbishment options report based on the current condition of the major and minor bridges along the proposed Monaro Rail Trail. The main objective of the investigation was to establish the general condition of the primary structural elements, and to assess what techniques could be utilized to safely repurpose the structure into a rail trail bridge for pedestrian and cyclist use.

The following is a summary of the Condition State Rating (CSR) for each bridge:

9. **Guises Creek Bridge**
   a. **Substructure CSR 3-4**
   b. **Superstructure CSR 3-4**
   c. **Deck CSR 5**
   d. **Overall CSR 4**

10. **10m Bridge – Guises Creek Inlet Stream**
    a. **Substructure CSR 4**
    b. **Superstructure CSR 3**
    c. **Deck CSR 3**
    d. **Overall CSR 3**

11. **Lobbs Hole Creek**
    a. **Substructure CSR 3**
    b. **Superstructure CSR 4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**

12. **6m Bridge**
    a. **Substructure CSR 3**
    b. **Superstructure CSR 4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**

13. **Deep Creek Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 3-4**
    c. **Deck CSR 4**
    d. **Overall CSR 4**

14. **Bobundara Creek Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 4**
    c. **Overall CSR 4**

15. **MacLaughlin River**
    a. **Substructure CSR 4**
    b. **Superstructure CSR 3-4**
    c. **Overall CSR 4**

16. **Old Bombala Rd Bridge**
    a. **Substructure CSR 3-4**
    b. **Superstructure CSR 3-4**
    c. **Overall CSR 4**

This rating was based on a small sample size of NDT field data collected and it is highly recommended to conduct a detailed inspection of the entire bridge. See **Figure 12-1** and **Appendix A** for more detail about this technology. This will gain a higher level of accuracy for the recommended repair options listed and costed in **Sections 4.3, 5.3, 6.3, 7.3, 8.3, 9.3, 10.3 & 11.3.**

Each bridge differs in configuration and levels of deterioration, requiring varying levels of restoration; however moderate to severe deterioration of the elements is noted in all structures. **Sections 4 to 11** outline the proposed replacement and repair strategies for each bridge. Based on the information compiled from both the visual inspection and brief SWT testing, the bridges will require several repairs/replacements to repurpose the railway bridges as rail trail bridges for pedestrian and cycle use. Two (2) options have been developed to refurbish the structures into a rail trail bridges.

Option 1 involves removing the existing railway line, transoms, and deck whilst repairing/replacing substructure and superstructure elements where required with kind for kind elements. A new hardwood deck system with a code compliant handrail and cycle rail system will be fitted on top of the girders utilizing a horizontal connection system that achieves a 25–50-year design life for this option along with a 5kPa load rating.

Option 2 will result in the longest design life (75-100 years) as this option involves installing a new treated glulam superstructure and deck with handrail system on top of the restored existing substructure. Refer to Appendix C for more information on treated glulam products.

Another option was explored for repurposing these rail trail bridges that utilizes the entire existing structure (minus the ballast, transom, and railway line) in its 'current' condition with the existing poor (missing) deck planks being replaced and a new code compliant handrail system installed to the exterior girders. Given the very poor condition of most of the elements in all the bridges this option is not viable due to it being structurally unsafe and have a very limited life span with major maintenance costs.

Examples of the recommended refurbishment options can be found in Figures 12-2 to 12-4. Option 2 offers the longest design life and improves the Overall Condition State Rating to 1 based on the following assumptions:

a) Overall Condition State Rating 1 – 100% Remaining Life (80 years)
b) Overall Condition State Rating 2 – 80% Remaining Life (64 years)
c) Overall Condition State Rating 3 – 30% Remaining Life (24 years)
d) Overall Condition State Rating 4 – 5% Remaining Life (4 years)
e) Overall Condition State Rating 5 – 1% Remaining Life (< 2 years)

All options include the remaining hardwood elements to be diffused with Borate salt rods to increase the life of the structure by preventing decay as described below in **Appendix B.** Finally, it is highly recommended that all exposed bright wood be treated with Copper Naphthenate and seal end-grain with a paraffin wax sealant.

Dan Tingley Ph.D., P. Eng. (Canada), MIEAust, CPEng, RPEQ

Senior Wood Technology/ Structural Engineer
Wood Research and Development

Andrew La Spina

Timber Structural Engineer
Wood Research and Development

(a)

(b)

Figure 12-1: Photos showing global failure of a timber log girders. Both failures were caused by advanced decay in the ends of the girders and transverse shear failures. The primary cause of this decay was due to vertical fasteners. These failures were found in elements with SWT values in the 3k µs (photos a. above) to 6k µs range (photos b. below). Typically, similar bending extreme tensile fibre failures in log girders occur in zones of decay where there are over 2k µs SWT values. Similarly, if vast portions of the log girder have SWT values over 3k µs the failures may occur.

Figure 12-2: The above photo series demonstrates a similar repair to Option 1 type of refurbishment (build off existing railway bridge) used for the construction of a pedestrian bridge in Bundaberg CDB. The existing railway bridge was left un-touched and a new hardwood deck system with handrails was installed. Six 100mm x 250mm timber joists were placed on top of the existing transoms (rail ties) with a 38-50mm thick hardwood deck installed on top. This option will likely be the lowest cost but also carries the shortest expected lifespan. As seen in the bottom left photo above, one of the girders has failed and fallen out creating a 'weak' point along the bridge. Due to a high residual capacity of timber and the continuous joists, a complete failure of the bridge (span) hasn't occurred yet but is only a matter of time unless extensive maintenance is undertaken.

(a)

(b)

(c)

Figure 12-3: The above photo series demonstrates Option 2 type of fix (hardwood) used for the construction of two Mary to Bay Rail Trail Bridges. Seen above in photo (a) is the construction of a frame bent using an intermediate cap which was installed on top of the existing pile stubs. This allowed the hardwood posts, cross bracing, and cap to be installed at the correct reference height. Also note the yellow plugs that indicate that Decaystop® rods have been installed. Photo (b) shows the girders being installed using a horizontal connection system and a rubber liner between the timber girder and concrete pier. In photo (c) the pre-panelised deck is installed along with the modulus handrail and cycle rail system.

Figure 12-4: The photo series above demonstrates Option 3 type of fix that was completed on Jimmy Gully Bridge along the BVRT. The existing poor condition superstructure was removed, and the piles were repaired with high strength fibre or posted with new section. New glulam back wall, caps, girders and deck system were installed utilising a horizontal connection detail.

Figure 12-5: The repair of Meachams Bridge in Cassowary Coast. The bridge was retrofitted with fibre reinforcement on the bottom of the girders, some corbels and girders were injected with a high strength epoxy. Some piles were also wrapped with high strength fibre and injected with epoxy, then the entire bridge was diffused with borate salt rods to neutralize decay growth.

APPENDIX

Appendix A - Additional Information about Stress Wave Timer Technology

Appendix B – Additional Information about Borate Salt Rod Diffusers

Appendix C – Additional Information about Penta Treated Glulam Timber

Appendix A – Additional Information about Stress Wave Timer Technology

A typical inspection by Wood Research and Development (WRD) includes the use of non-destructive test equipment identified as EPHOD® (Electronic Pulse Highlight and Outline Diagnostic) compression wave technology. The EPHOD® equipment was utilized to complete stress wave measurements along with other WRD techniques to locate internal decay in a non-destructive nature. Stress wave times are recorded on the accessible timber structural elements within the scope of the inspection.

The 'raw' SWT data is the number recorded in the field for each member tested across a measured distance i.e. diameter or width. The 'adjusted' SWT data is calculated using a calibrated 300mm gauge length to standardize the data into categories where it can be analysed based on its magnitude. When the through wave time values (adjusted for a 300mm gauge length, treatment, temperature, submersion, or other factors that affect the SWT results such as species) exceed 700 microseconds (μs) but are below 1000μs (shown in yellow) the area measured can carry its own dead weight and an unknown live load at the localized area where the reading is recovered. When the times exceed 1000μs (shown in red) the element is not capable of carrying its own dead weight at that localized area. Readings more than 2200μs are indicative of cavities within the member. When the values reach numbers over 3300μs, the element can no longer support its own dead load and is at risk of failing at any point. The element can often be red with high SWT values and still be in place in the bridge. This doesn't mean the element is sound and the SWT data is wrong. It means that other criteria are impacting the situation such as fasteners which might be holding the element in place even though it is red throughout. **Figure 9-7** shows the colour scheme correlating to the SWT readings utilized in this report.

Readings are recovered in a clock-like format to ensure no cavity or deteriorated timber was missed. These directions typically include a 2/8, 3/9 and 4/10 reading. **Figure 9-6** below depicts the typical SWT configuration for round and rectangular timber cross sections.

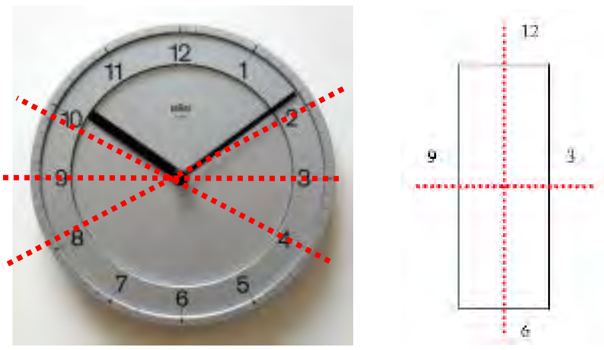


Figure 12-6: SWT configurations for round and rectangular timber

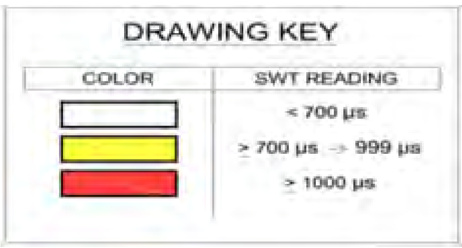


Figure 12-7: Stress Wave Timer Results Drawing Key

Appendix B – Additional Information about Borate Salt Rod Diffusers

Borate Salt Rod Diffusers:
Another complimentary method of controlling decay, should it commence due to the less frequent occurrence of ideal decay progression conditions, is to install Borate salt rod diffusers. These are included as an additional option at this stage due to budget constraints and can be installed at a later date during maintenance works to increase the longevity of the structures. The vitrified glass borate salt rod upon reaching a moisture content of approximately 22%, emits an alkaline brine throughout the wood cellular structure up to a radius of 150 mm from the rod. This brine neutralises the acidic enzyme that is secreted by a growing decay colony. Without the enzyme chemically attacking the cellular structure of the wood, decay cannot proceed. If diffusers are installed into the timber structure as insurance against the occurrence of ideal decay producing conditions and these diffusers are maintained throughout the life of the structure, then the achievement of the design life requirements for the structures proposed, is Guaranteed. Australian hardwoods, particularly the class 1 and 2 durability timbers can have a significantly longer life expectancy than previously thought based on the former statistical average element lifetimes.

Figure 12-8: Diffuser (Borate Salt) rods are installed in the remaining hardwood elements to resist further deterioration of the timber caused by fungi growth. Note the red bungs are the decay 'hotspots' where the timber is prone to have a higher moisture content. These holes are required to be checked for rod depletion as per the issued maintenance manual (typically every 2-5 years depending on environmental conditions).

Appendix C – Additional Information about Penta Treated Glulam Timber

Glulam timber manufactured from a wide range of timber species that is treated with Pentachlorophenol (Penta), a synthetic preservative treatment that is used only for heavy construction timbers such as railway ties, utility poles and bridge timbers. Penta, being an oil-based preservative treatment, has low solubility and is water repellent therefore has a very low leach rate.

Over 60 years ago, Pentachlorophenol was formulated to contain high levels of toxicity to act as a mass defoliant. Produced as polychlorinated dioxins 2,3,7,8-T or 2,4,5-T, Pentachlorophenol was highly toxic and ultimately dangerous to humans. These formulations are now banned or heavily restricted and the Pentachlorophenol formulation used to preservative-treat timber has a completely different dioxin with a much lower toxicity but still must be handled with care – same as for any treated timber. By minimising direct contact with immediate water environment, this significantly reduces impact on the environment. All glulam members are prefabricated in the factory where it is cut to length and all holes drilled before treatment. Where possible; avoid any cutting, drilling of treated timber whether in the factory or on site however, when it is required, appropriate PPE must be worn.
Heavy duty wood preservatives, such as Penta, are applied to wood in specialised high pressure treatment cylinders at wood treatment facilities. With oil-borne preservatives such as Penta, bleeding after application can occur. To reduce this, timbers are vacuum treated, extracting excess treatment solution that has not been fixed in the wood. Performing a double vacuum treatment is a standard practice for penta-treated wood intended for use in sensitive environments, such as open water locations. These vacuuming procedures reduce the chance that the Penta and carrier solution will migrate into the environment through water runoff. With most of the penta-treated glulam being used in the superstructure of bridges, this minimising the contact of penta-treated glulam to the environment.

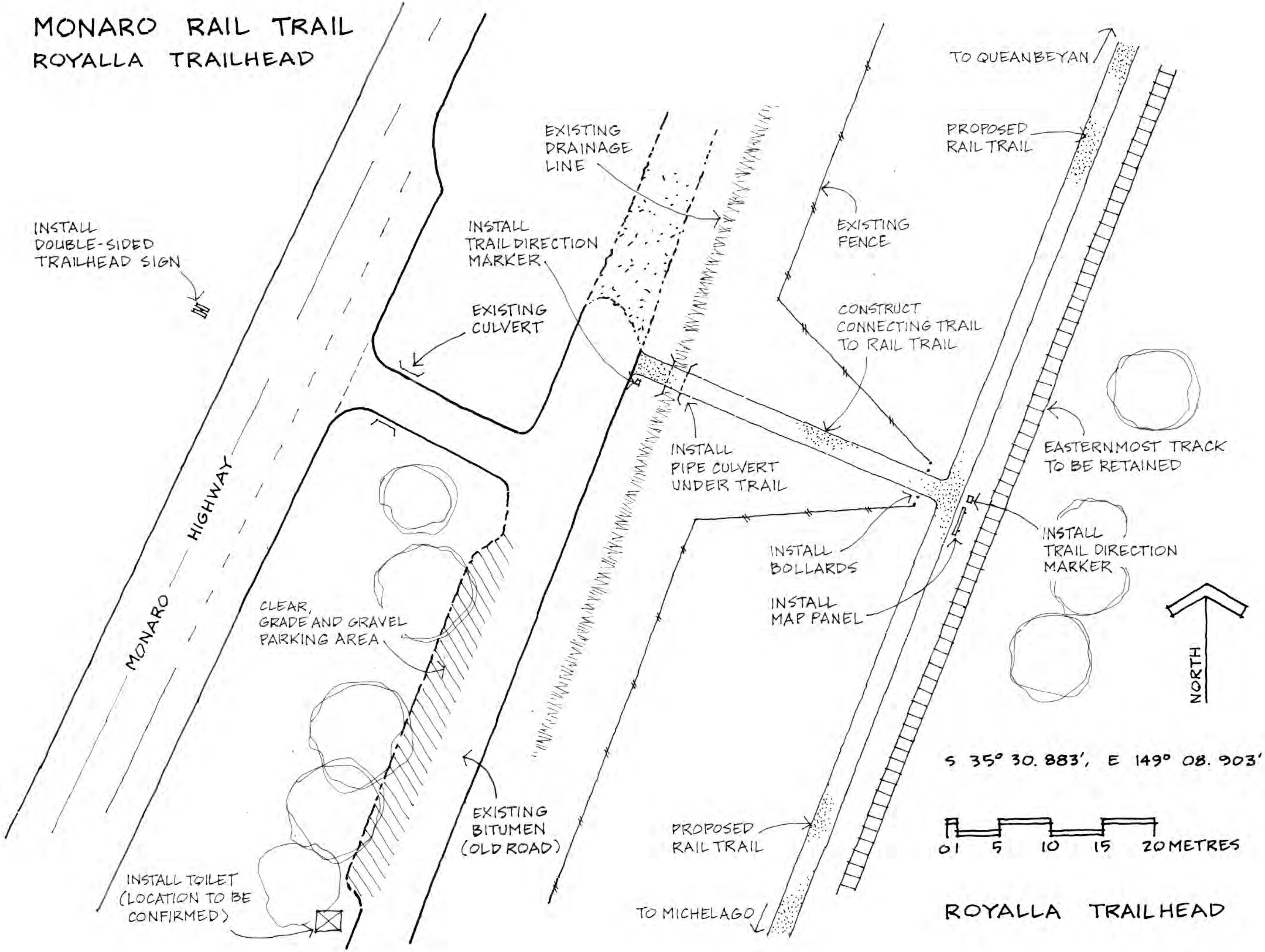
Over the last 30 years, there have been multiple examinations by US, Canadian and private agencies of treated timber's environmental effects on organisms and surrounds. Through due diligence, Penta is the right product to treat its glulam beams and will not adversely impact the environment. Penta readily degrades in the environment by chemical, microbiological, photolysis and photochemical processes. Photolysis appears to be a significant process for degradation since a measured photolysis half-life has been reported to be 52 minutes in running water under sunlight.

Glulam Elements – Material Specification Summary	
Material	Engineered Timber - Glulam
Typical Timber Species	Slash Pine, Douglas Fir, Southern Yellow Pine, Radiata Pine
Treatment	Pentachlorophenol (member incised, holes pre-drilled and pressure treated)
Treatment Concentration	9 kg/m^3
Weight of Timber (Density)	550-700 kg/m^3 (depending on timber species and strength grade)
Design Life	75-100 years (with minimal to no maintenance required)
Typically Panel Size	0.65m long x 2.5m wide x 80mm thick (can vary pending on design specifications)
Load Capacity	From 1kPa to 5kPa to SM1600 loading

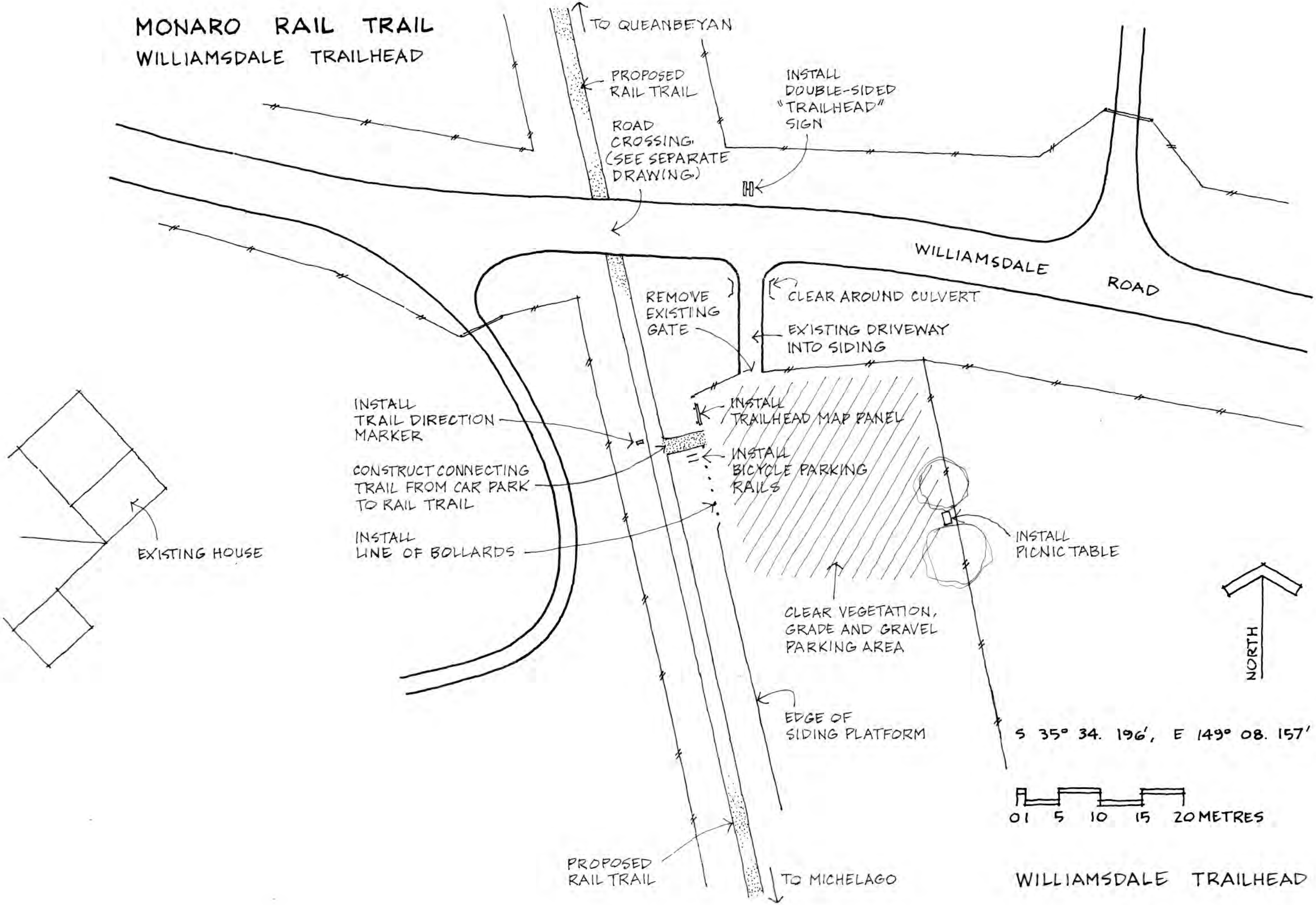
Figure 12-9: The photo series above demonstrates an Option 2 type of fix that was done for Jimmy Gully Bridge along the BVRT. The existing poor condition superstructure was removed, and the piles were repaired or posted with new section. New glulam back wall, caps, girders, and deck system were installed utilising a horizontal connection detail.

APPENDIX 5: TRAILHEAD DRAWINGS

MONARO RAIL TRAIL
ROYALLA TRAILHEAD

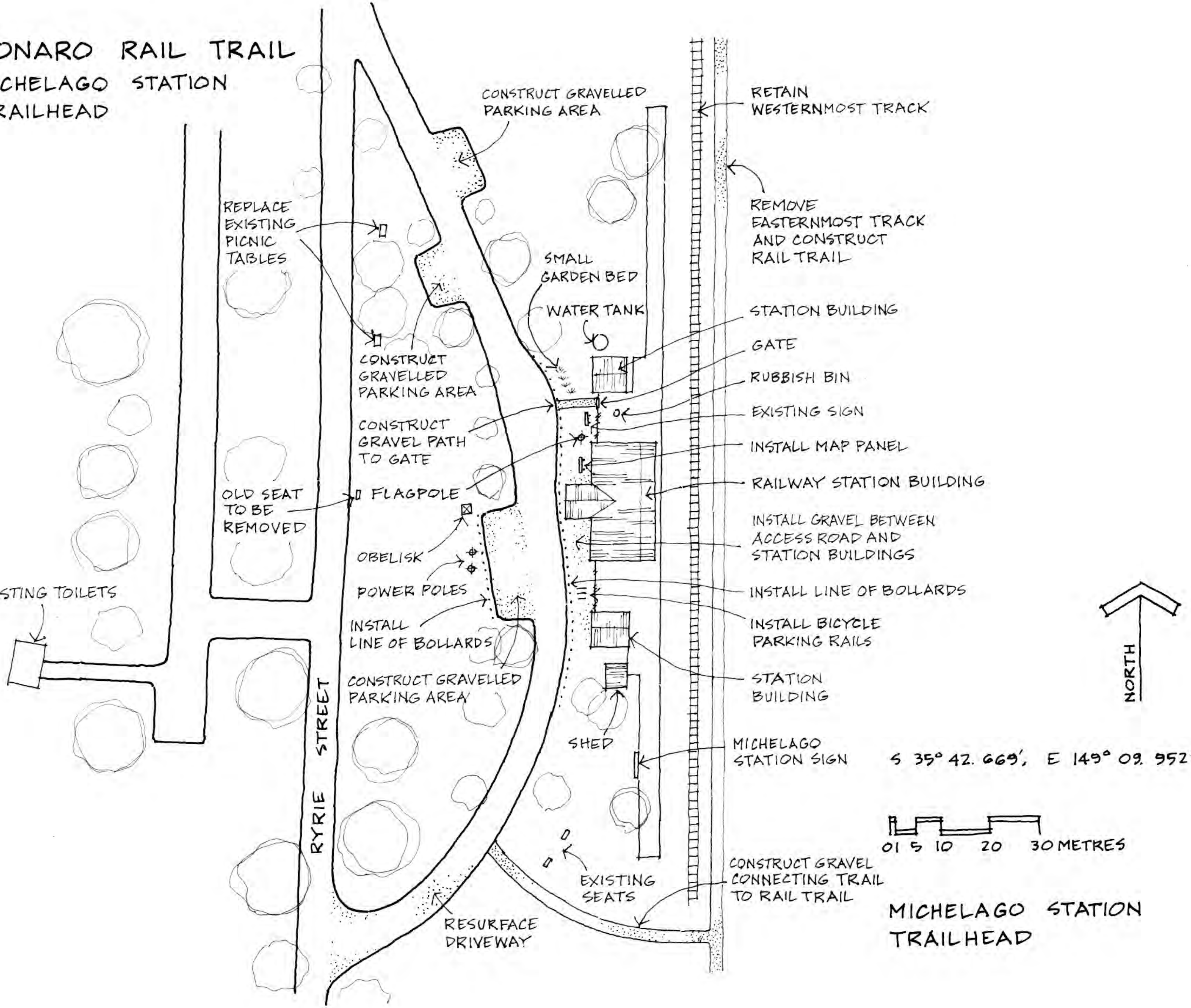


ROYALLA TRAILHEAD


MONARO RAIL TRAIL
WILLIAMSDALE TRAILHEAD
TO QUEANBEYAN
PROPOSED RAIL TRAIL
INSTALL DOUBLE-SIDED "TRAILHEAD" SIGN
ROAD CROSSING (SEE SEPARATE DRAWING)
WILLIAMSDALE ROAD
REMOVE EXISTING GATE
CLEAR AROUND CULVERT
EXISTING DRIVEWAY INTO SIDING
INSTALL TRAIL DIRECTION MARKER
INSTALL TRAILHEAD MAP PANEL
CONSTRUCT CONNECTING TRAIL FROM CAR PARK TO RAIL TRAIL
INSTALL BICYCLE PARKING RAILS
INSTALL LINE OF BOLLARDS
EXISTING HOUSE
INSTALL PICNIC TABLE
CLEAR VEGETATION, GRADE AND GRAVEL PARKING AREA
NORTH
EDGE OF SIDING PLATFORM
S 35° 34. 196', E 149° 08. 157'
0 1 5 10 15 20 METRES
PROPOSED RAIL TRAIL
TO MICHELAGO
WILLIAMSDALE TRAILHEAD

MONARO RAIL TRAIL

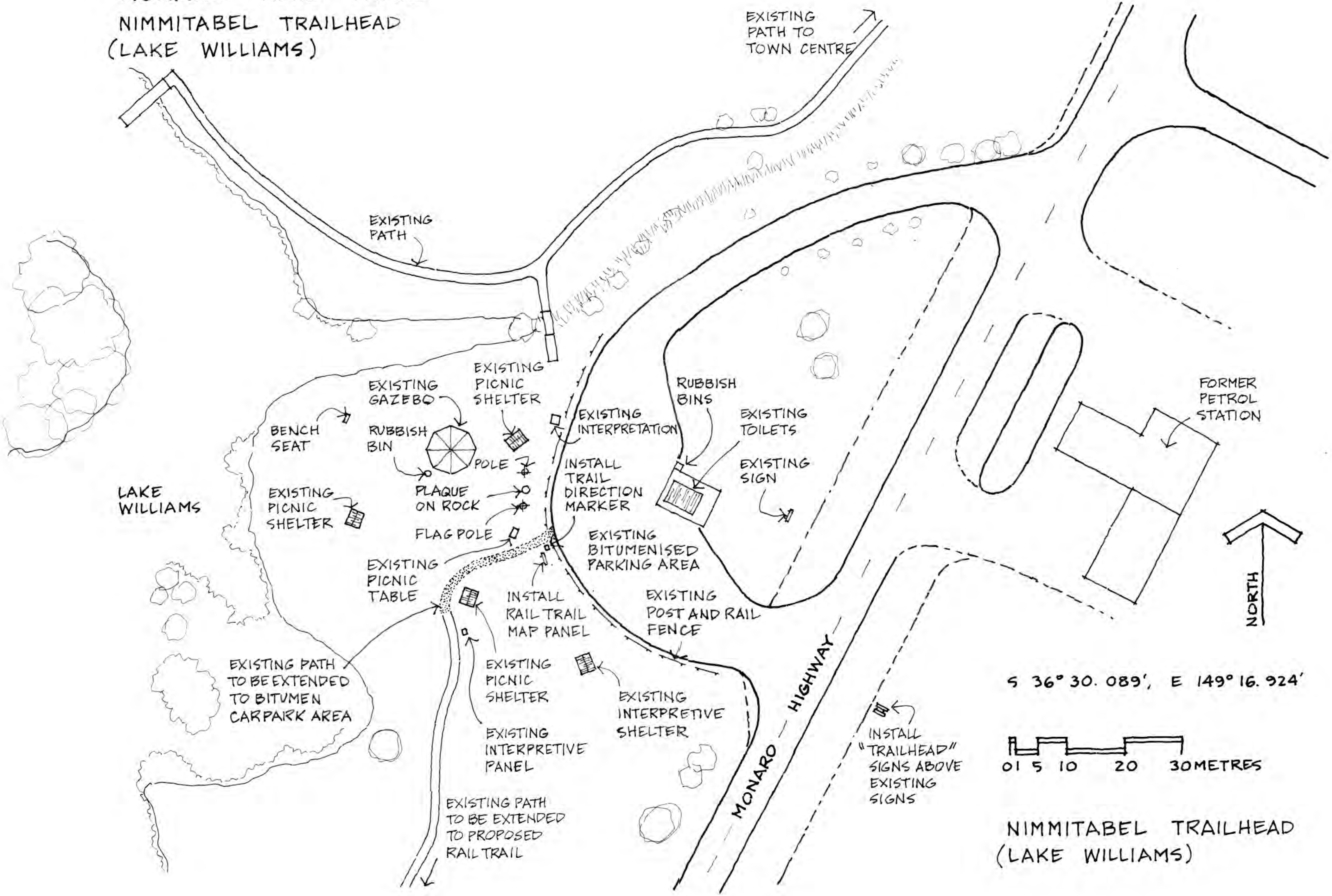
MICHELAGO STATION TRAILHEAD



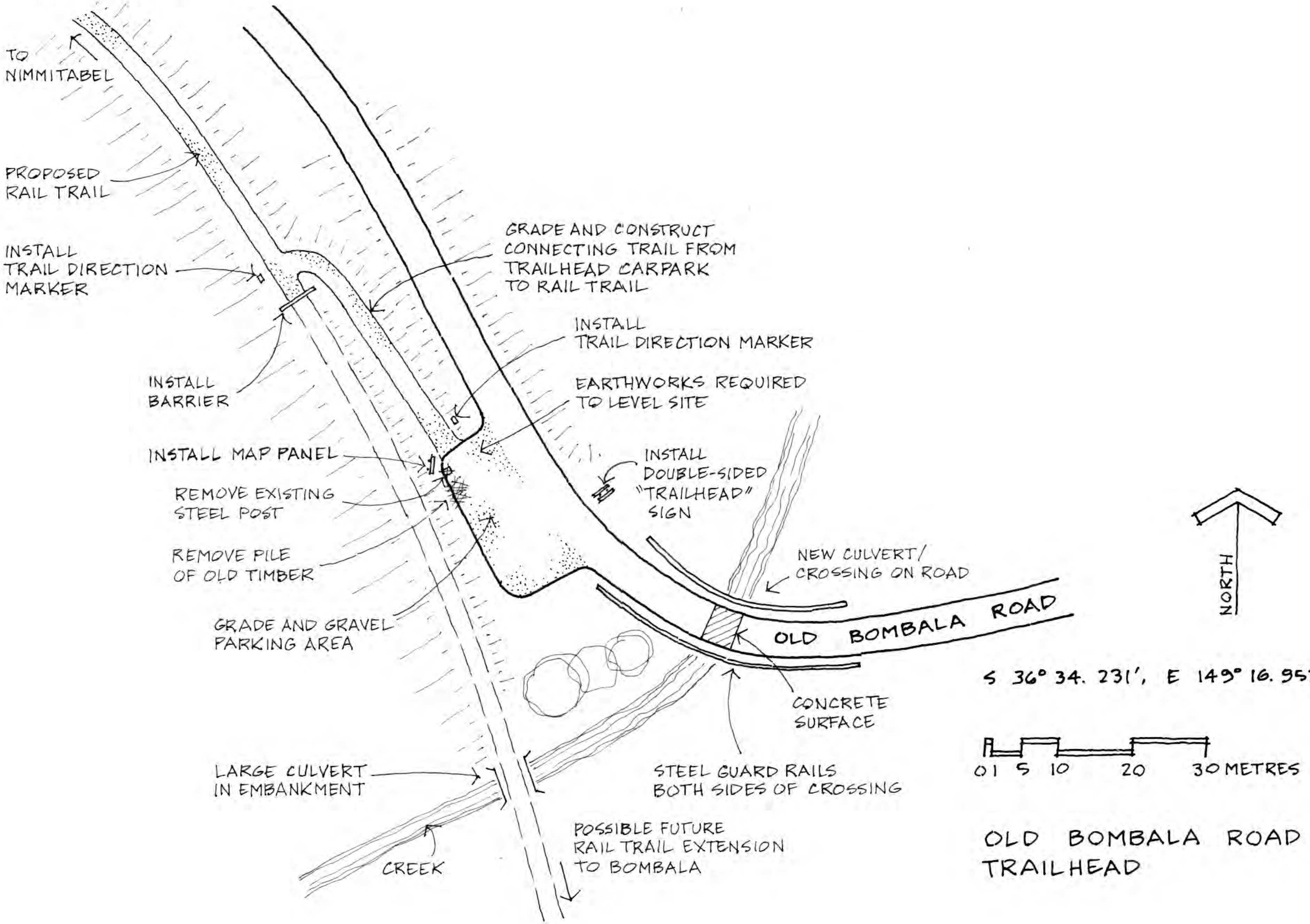
MICHELAGO STATION TRAILHEAD

MONARO RAIL TRAIL

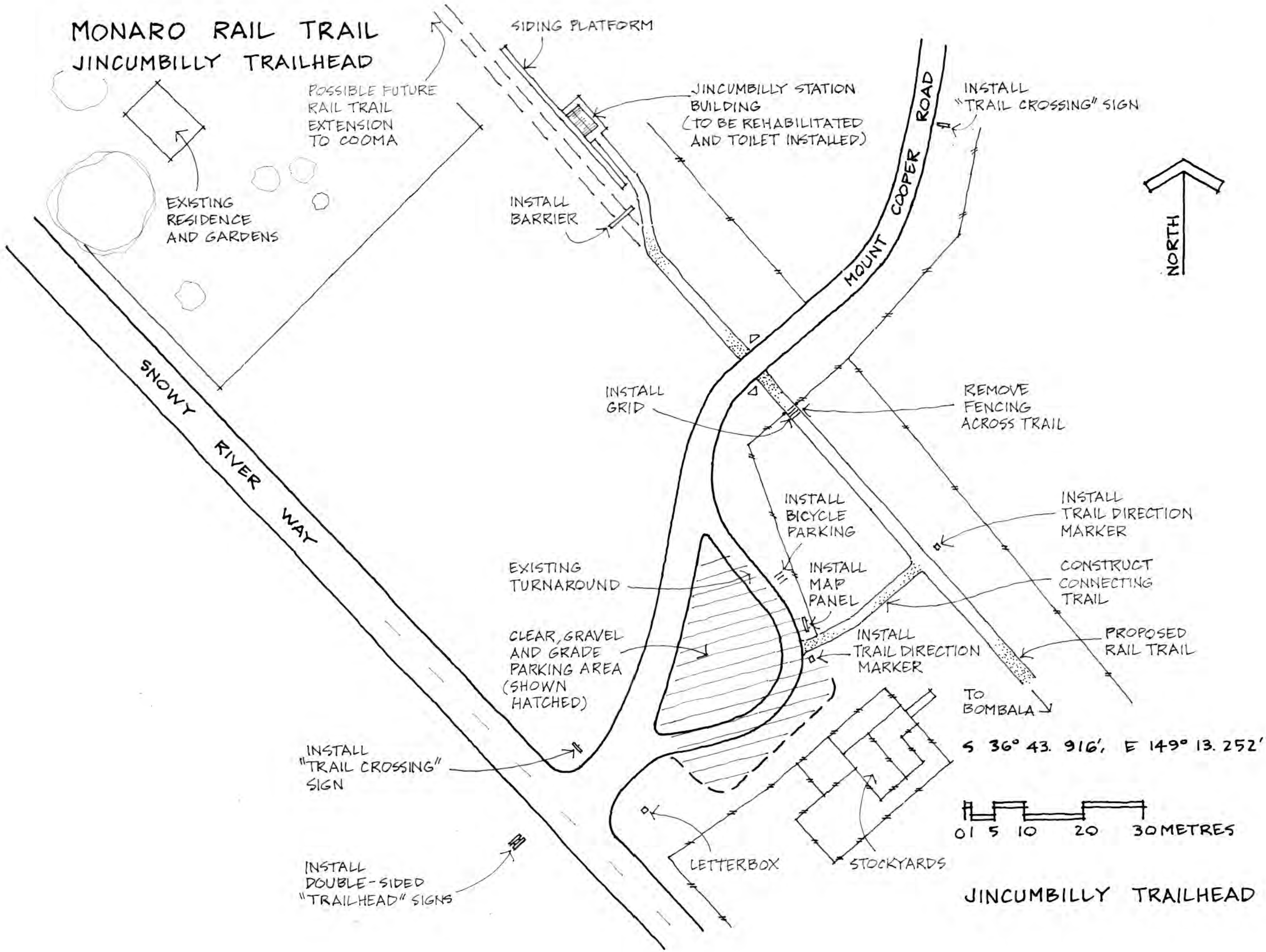
NIMMITABEL TRAILHEAD (LAKE WILLIAMS)



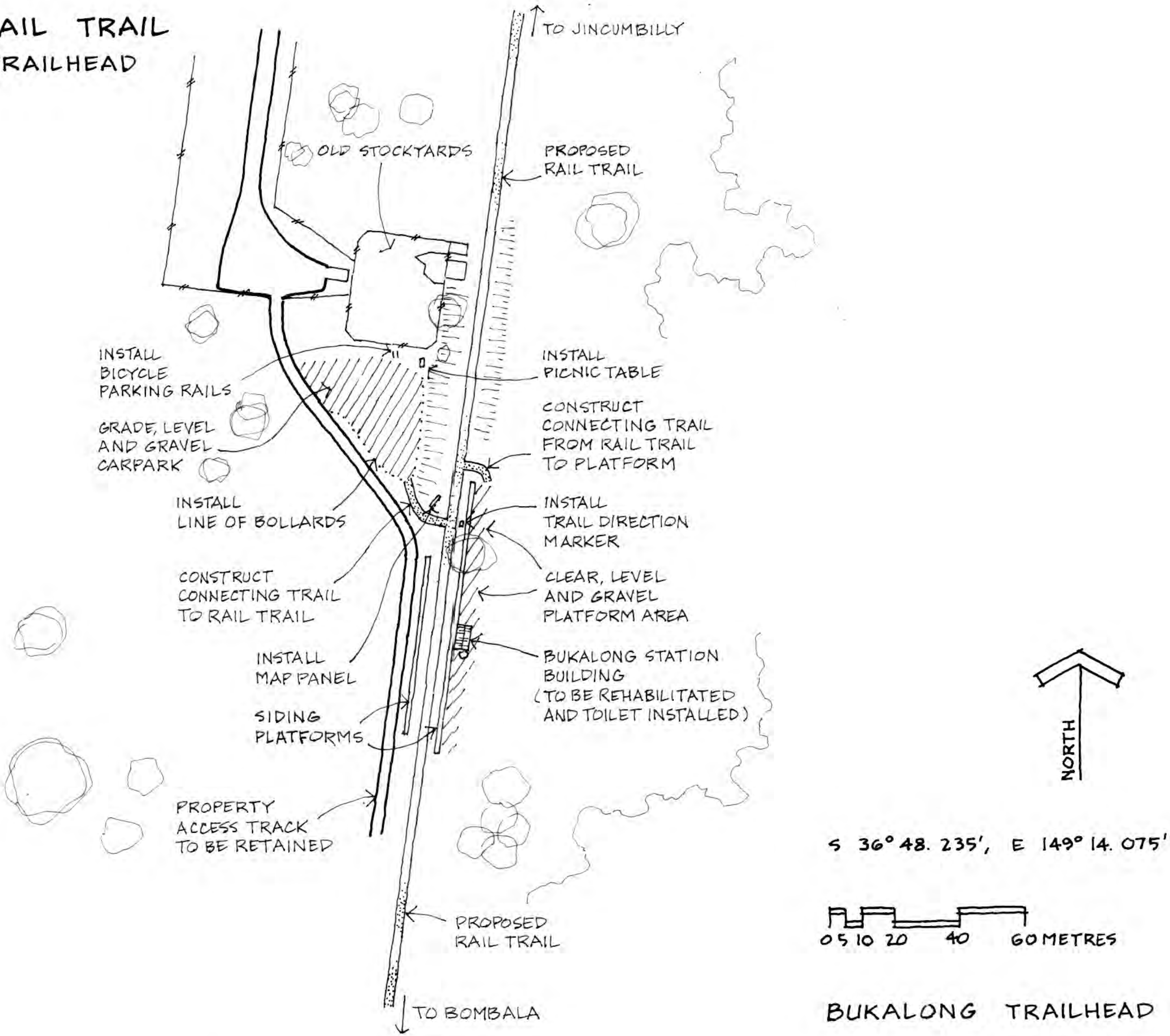
MONARO RAIL TRAIL
OLD BOMBALA ROAD TRAILHEAD



OLD BOMBALA ROAD TRAILHEAD

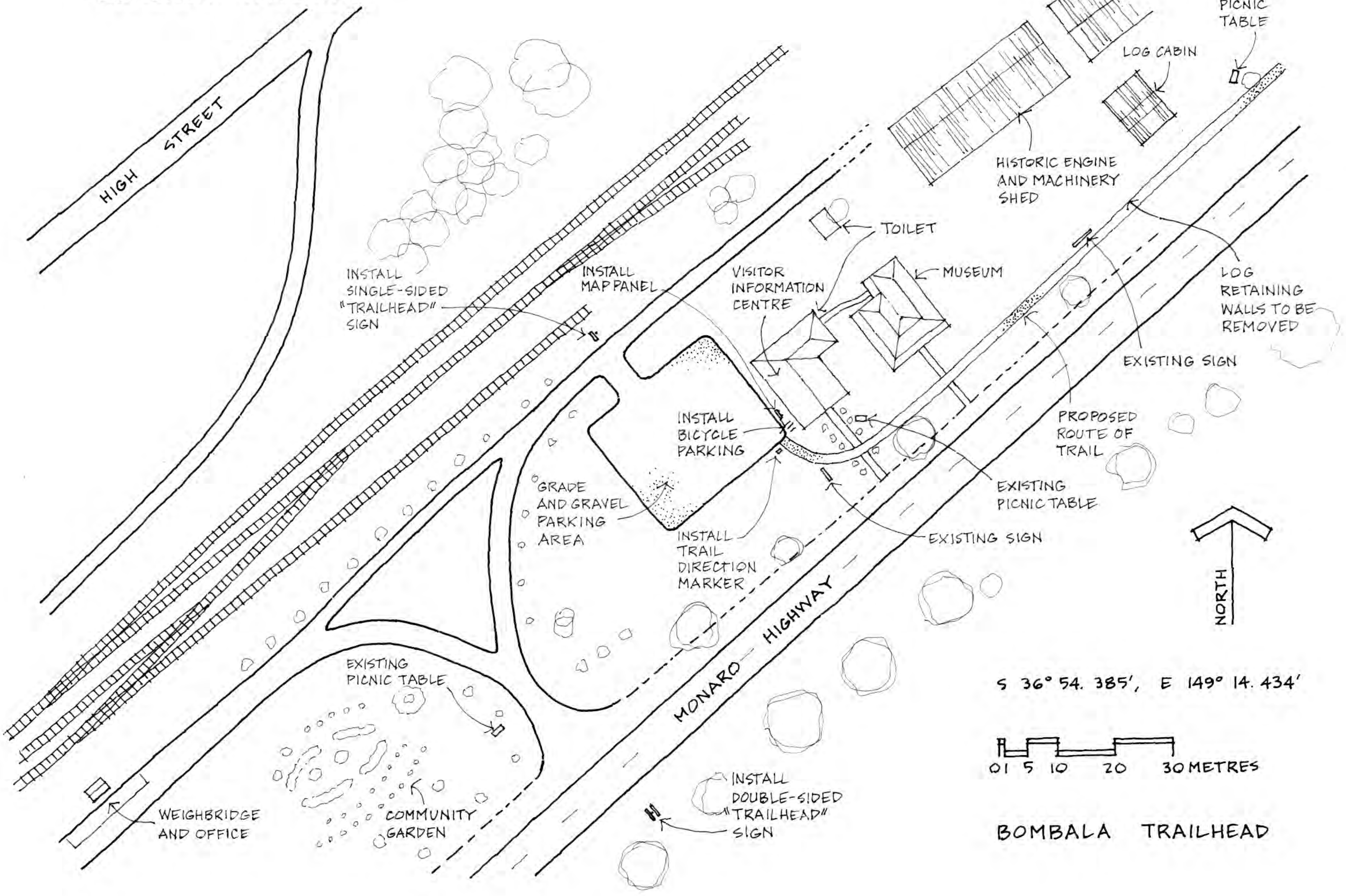

MONARO RAIL TRAIL
JINCUMBILLY TRAILHEAD
POSSIBLE FUTURE RAIL TRAIL EXTENSION TO COOMA
SIDING PLATFORM
JINCUMBILLY STATION BUILDING (TO BE REHABILITATED AND TOILET INSTALLED)
INSTALL "TRAIL CROSSING" SIGN
MOUNT COOPER ROAD
NORTH
EXISTING RESIDENCE AND GARDENS
INSTALL BARRIER
SNOWY RIVER WAY
INSTALL GRID
REMOVE FENCING ACROSS TRAIL
INSTALL BICYCLE PARKING
INSTALL TRAIL DIRECTION MARKER
EXISTING TURNAROUND
INSTALL MAP PANEL
CONSTRUCT CONNECTING TRAIL
CLEAR, GRAVEL AND GRADE PARKING AREA (SHOWN HATCHED)
INSTALL TRAIL DIRECTION MARKER
PROPOSED RAIL TRAIL
TO BOMBALA
S 36° 43. 916', E 149° 13. 252'
INSTALL "TRAIL CROSSING" SIGN
0 1 5 10 20 30 METRES
LETTERBOX
STOCKYARDS
INSTALL DOUBLE-SIDED "TRAILHEAD" SIGNS
JINCUMBILLY TRAILHEAD

MONARO RAIL TRAIL
BUKALONG TRAILHEAD



BUKALONG TRAILHEAD

MONARO RAIL TRAIL
BOMBALA TRAILHEAD



APPENDIX 6: PRELIMINARY PROJECT COST ESTIMATES: AMALGAMATED SECTIONS

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Tralee to Michelago section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
1.		**SITE ESTABLISHMENT:**					
	(a)	Provision for construction access - management access gates in fences alongside road and access track	Item	5	$2,200.00	11,000	
	(b)	Provision for traffic control and cable locators at road crossings	Item	4	$3,000.00	12,000	
	(c)	Sediment and erosion control					
	(d)	(i) clean side drains (both sides) in cuttings	lin m	2,760	$20.00	55,200	
		(ii) clean side drains (one side only) in cuttings	lin m	53	$10.00	525	
		(iii) construct built up trail in cutting	lin m	11,490	$30.00	344,700	
	(e)	Vegetation clearing					
	(f)	(i) minor clearing	lin m	35,134	3.00	105,402	
		(ii) moderate clearing	lin m	1,350	6.80	9,180	
		(iii) heavy clearing	lin m	790	14.00	11,060	
		(iv) slashing	lin m	1,860	1.50	2,790	
		(v) additional allowance for blackberry clearing	lin m	185	10.00	1,850	
	(g)	Weed spraying before and during construction	Allowance	1	12,000.00	12,000	
	(h)	Surveying for fencing alignments	km	41	3,000.00	123,000	
	(i)	Remove cross fences and gates	No.	2	200.00	400	
	(j)	Allowance for marking trees - cleared, pruned, untouched	Allowance			7,600	
	(k)	Allowance for marking trail centreline prior to construction	Allowance			10,800	
							$707,507
2.		**RAIL TRAIL WORKS:**					
	(a)	Supply and Install 2.5m wide rail trail (on formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing	lin. m.	39,334	100.00	3,933,400	
	(b)	Supply and Install 2.5m wide rail trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing (2 locations)	lin. m.	705	120.00	84,600	
	(c)	Supply and install 2.5m wide trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, and compacting (gravel surface)	lin m.	80	60.00	4,800	
	(d)	Carparking (at trailheads)					
		(i) gravelling	sq. m	1,035	25.00	25,875	
		(ii) bollards	No.	78	130.00	10,140	
	(e)	Road crossings					
		(i) chicane gating system - management access gate and trail user gate	No.	7	4,000.00	28,000	
		(ii) bicycle friendly stock grid and pedestrian gate	No.	2	3,000.00	6,000	
		(iii) Fill and batter (1 location)	Item	1	900.00	900	
		(iii) Remove cattle stops and install RCPs	No.	5	5,000.00	25,000	
	(f)	Supply and install signage					
		(i) Trailhead sign	No.	6	1,600.00	9,600	
		(ii) Trailhead map panel	No.	5	5,500.00	27,500	
		(iii) Trail directional marker	No.	55	1,000.00	55,000	
		(iv) Trail interpretive signs/new siding signs	No.	13	3,000.00	39,000	
		(v) Other miscellaneous trail signs	No.	42	200.00	8,400	
		(vi) Specific warning signs (rock fall; horses prohibited)	No.	3	500.00	1,500	
		(vii) Giveway/stop signs	No.	23	500	11,500	
		(viii) Road crossing ahead	No.	7	500	3,500	
		(ix) Trail crossing ahead	No.	8	600	4,800	
	(g)	Trailside furniture (seats)	No.	10	3,000	30,000	
	(h)	Repair/renovate/repaint railway paraphanenalia					
		(i) Signs - minor repairs	No.	66	200	13,200	
		(ii) Signs - moderate repairs	No.	8	400	3,200	
		(iii) switches and signals repairs	No.	5	500	2,500	

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Tralee to Michelago section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
		(iv) Railway post and electrical boxes repairs	No.	2	1,000	2,000	
	(i)	Fencing					
		(i) Erect new stock fencing	lin. m.	12,275	15	184,125	
		(ii) Repair proportion of existing boundary fencing where new fencing not erected	lin m.	6,640	5	33,200	
	(j)	Existing culvert structures					
		(i) Check existing culvert structures (small)	no.	1	100	100	
		(ii) Clean small culverts	No.	84	500	42,000	
		(iii) Clean medium culverts	No.	29	600	17,400	
		(iv) Clean large culverts	No.	2	700	1,400	
		(v) Clean major culverts	No.	3	1,000	3,000	
		(vi) Clean creek culverts	No.	1	3,000	3,000	
	(k)	Rock battering on unstable cuttings	lin m.	80	300	24,000	
	(l)	Ryrie Street North - earthworks to construct a ramp to road crossing	lin m.	165	100	16,500	
	(m)	Install pipe and fill over (fill amount varies slightly)	No.	6	1,500	9,000	
	(n)	Fill and pipe within concrete ripple drain	Item	1	6,000	6,000	
	(o)	Composting toilets	Item	1	80,000	80,000	
	(q)	Comfort stops	Item	1	13,000	13,000	
	(p)	New side gates (landholder access)	Item	1	1,000	1,000	
	(q)	Clear, widen and stabilise trail access points	Item	1	3,000	3,000	
	(r)	Install Picnic tables	No.	3	8,000	24,000	
	(s)	Install small bike parking rack	Item	1	2,000	2,000	
	(t)	Install large bike parking rack	Item	1	3,000	3,000	
							4,796,140
3.		**WATERWAY CROSSINGS:**					
	(a)	3 m long box culvert	No.	4	15,000.00	60,000	
	(b)	1m long box culvert	No.	2	6,000.00	12,000	
	(c)	Prefabricated bridges	lin m	19	6,000.00	114,000	
	(d)	Add handrails to existing bridges	lin m.	12	2,000.00	24,000	
	(e)	Add deck and handrails onto existing I-Beam bridges	lin. m.	9	6,000.00	54,000	
	(f)	Refurbished bridges					
		(i) Guises Creek	Item	1	396,750.00	396,750	
		(ii) Lobbs Hole Creek	Item	1	192,625	192,625	
		(iii) Deep Creek	Item	1	414,000.00	414,000	
		(iv) Unnamed Creek (8m bridge between Williamsdale and	Item	1	133,400.00	133,400	
							1,400,775
4.		**OTHER ALLOWANCES**					
	(a)	Screen Planting					
		(i) screen rail trail from nearby houses (5m deep planting)	Lin. M	1,015	30	30,450	
		(ii) Establishment and Maintenance watering	planting lot	4	1,000	4,000	
	(b)	Allowance for landowner requests (additional fencing and vegetation screening)	Allow	1	35,000	35,000	
	(c)	Allowance for leaving all historic telegraph poles	Allow	1	2,500	2,500	
	(d)	Allowance for steep embankment signs and delineators	lin. m	3,000	35	105,000	
	(c)	Allowance for restoring loading platforms (Royalla trailhead)	Allow	1		10,000	
	(d)	Allowance for drainage rehabilitation	Allow	2 locations		3,000	
	(e)	Michelago station improvements					
		(i) site tidy up	Allow	1	1,000	1,000	
		(ii) Driveway resurfacing	Allow	1	2,500	2,500	
		(iii) Station and other building minor repairs and painting	Allow	1	10,000	10,000	
		(iv) Toilet renovations	Allow	1	20,000	20,000	
		(v) Landcaping	Allow	1	5,000	5,000	
		(vi) Refurbishment railway paraphanalia	Allow	1	2,000	2,000	
							$230,450

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Tralee to Michelago section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM	SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
	TOTAL CONSTRUCTION COST: (GST Exclusive)					**$7,134,872**
(a)	Project Management	%	5		356,744	
(b)	Design & Approvals	%	2.5		178,372	
(c)	Contingency allowance	%	20		1,426,974	
(d)	Allowance for additional construction costs: more time will be spent hauling material from stockpile sites created where the railway corridor crosses a publicly accessible roads. 5% of construction costs to allow for this additional time (one sub-section only)	Allowance			149,245	
						$2,111,335
	TOTAL ESTIMATED PROJECT COST: (GST Exclusive)					**$9,246,207**

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Nimmitabel to Old Bombala Rd section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
1.		**SITE ESTABLISHMENT:**					
	(a)	Provision for construction access - management access gates in fences alongside road and access track	Item		$2,200.00		
	(b)	Provision for traffic control and cable locators at road crossings	Item	1	$3,000.00	3,000	
	(c)	Sediment and erosion control					
	(d)	(i) clean side drains (both sides) in cuttings	lin m	580	$20.00	11,600	
		(ii) clean side drains (one side only) in cuttings	lin m	70	$10.00	700	
		(iii) construct built up trail in cutting	lin m	3,390	$30.00	101,700	
	(e)	Vegetation clearing					
	(f)	(i) minor clearing	lin m	10,298	3.00	30,894	
		(ii) moderate clearing	lin m		6.80		
		(iii) heavy clearing	lin m	250	14.00	3,500	
		(iv) slashing	lin m		1.50		
		(v) additional allowance for blackberry clearing	lin m	50	10.00	500	
	(g)	Weed spraying before and during construction	Allowance	1	4,000.00	4,000	
	(h)	Surveying for fencing alignments	km	10	3,000.00	30,000	
	(i)	Remove cross fences and gates	No.	7	200.00	1,400	
	(j)	Allowance for marking trees - cleared, pruned, untouched	Allowance			2,000	
	(k)	Allowance for marking trail centreline prior to construction	Allowance			3,000	
	(l)	Tree lopping: retain and lop	No.	2	400.00	800	
							$193,094
2.		**RAIL TRAIL WORKS:**					
	(a)	Supply and Install 2.5m wide rail trail (on formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing	lin. m.	10,298	100.00	1,029,800	
	(b)	Supply and Install 2.5m wide rail trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing (2 locations)	lin. m.		120.00		
	(c)	Supply and install 2.5m wide trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, and compacting (gravel surface)	lin m.	190	60.00	11,400	
	(d)	Carparking (at trailheads)					
		(i) gravelling	sq. m	300	25.00	7,500	
		(ii) barriers	No.	1	1,000.00	1,000	
		(iii) Site clean up and earthworks: Old Bombala Rd	Allowance			12,000	
	(e)	Road crossings					
		(i) chicane gating system - management access gate and trail user gate	No.	2	4,000.00	8,000	
		(ii) bicycle friendly stock grid and pedestrian gate	No.		3,000.00		
		(iii) Fill and batter (1 location)	Item		900.00		
		(iii) Remove cattle stops and install RCPs	No.	1	5,000.00	5,000	
	(f)	Supply and install signage					
		(i) Trailhead sign	No.	2	1,600.00	3,200	
		(ii) Trailhead map panel	No.	2	5,500.00	11,000	
		(iii) Trail directional marker	No.	14	1,000.00	14,000	
		(iv) Trail interpretive signs/new siding signs	No.	3	3,000.00	9,000	
		(v) Other miscellaneous trail signs	No.	14	200.00	2,800	
		(vi) Specific warning signs (rock fall; horses prohibited)	No.		500.00		
		(vii) Giveway/stop signs	No.	4	500	2,000	
		(viii) Road crossing ahead	No.	2	500	1,000	
		(ix) Trail crossing ahead	No.	2	600	1,200	
	(g)	Trailside furniture (seats)	No.	4	3,000	12,000	
	(h)	Repair/renovate/repaint railway paraphanenalia					
		(i) Signs - minor repairs	No.	10	200	2,000	

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Nimmitabel to Old Bombala Rd section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
		(ii) Signs - moderate repairs	No.	3	400	1,200	
		(iii) switches and signals repairs	No.		500		
		(iv) Railway post and electrical boxes repairs	No.		1,000		
	(i)	Fencing					
		(i) Erect new stock fencing	lin. m.	17,045	15	255,675	
		(ii) Repair proportion of existing boundary fencing where new fencing not erected	lin m.	360	5	1,800	
	(j)	Existing culvert structures					
		(i) Check existing culvert structures (small)	no.		100		
		(ii) Clean small culverts	No.	24	500	12,000	
		(iii) Clean medium culverts	No.		600		
		(iv) Clean large culverts	No.		700		
		(v) Clean major culverts	No.		1,000		
		(vi) Clean creek culverts	No.		3,000		
	(k)	Rock battering on unstable cuttings	lin m.		300		
	(l)	Wire mesh retaining on rock face of cutting	sq m	500	40	20,000	
	(m)	Install pipe and fill over (fill amount varies slightly)	No.	6	1,500	9,000	
	(n)	Fill and pipe within concrete ripple drain	Item		6,000		
	(o)	Composting toilets	Item		80,000		
	(q)	Comfort stops	Item	1	13,000	13,000	
	(p)	New side gates (landholder access)	Item	4	1,000	4,000	
	(q)	Clear, widen and stabilise trail access points	Item		3,000		
	(r)	Install Picnic tables	No.		8,000		
	(s)	Install small bike parking rack	Item		2,000		
	(t)	Install large bike parking rack	Item		3,000		
	(u)	Tyre and boot cleaning station	No.	2	3,000	6,000	
	(v)	Cattle stops: remove and fill	No.	1	500	500	
	(w)	Install water pipes under new trail	No.	2	1,000	2,000	
							1,458,075
3.		**WATERWAY CROSSINGS:**					
	(a)	3 m long box culvert	No.		15,000.00		
	(b)	1m long box culvert	No.	1	6,000.00	6,000	
	(c)	Replace bridge with pipe and fill	Item	1 location		3,000	
	(c)	Prefabricated bridges	lin m	16	6,000.00	96,000	
	(d)	Add handrails to existing bridges	lin m.		2,000.00		
	(e)	Add deck and handrails onto existing I-Beam bridges	lin. m.		6,000.00		
	(f)	Refurbished bridges					
		(i) Maclaughlin River	Item	1	782,000.00	782,000	
		(ii) Old Bombala Road	Item	1	373,750	373,750	
							1,260,750
4.		**SPECIFIC LANDHOLDER SOLUTIONS (REQUESTED AND**					
	(a)	Livestock grids and spring loaded gates at property boundaries	No.	3	3,000.00	9,000	
	(b)	Livestock/machinery crossing points	No.	14	20,000.00	280,000	
	(c)	Underpasses	No.	1	50,000.00	50,000	
	(d)	Stock watering points	No.	7	5,000.00	35,000	
							374,000
4.		**OTHER ALLOWANCES**					
	(a)	Screen Planting					
		(i) screen rail trail from nearby houses (5m deep planting)	Lin. M		30		
		(ii) Establishment and Maintenance watering	planting lot		1,000		
	(b)	Allowance for landowner requests (additional fencing and vegetation screening)	Allow	1	15,000	15,000	
	(c)	Allowance for leaving all historic telegraph poles	Allow	1	750	750	

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Nimmitabel to Old Bombala Rd section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM	SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
	(d) Allowance for steep embankment signs and delineators	lin. m	1,500	35	52,500	
	(c) Allowance for restoring loading platforms	Allow				
	(d) Allowance for additional earthworks and drainage rehabilitation	Allow	5 locations		18,500	
						86,750
	<u>TOTAL CONSTRUCTION COST:</u>					**$3,372,669**
	(GST Exclusive)					
	(a) Project Management	%	5		168,633	
	(b) Design & Approvals	%	2.5		84,317	
	(c) Contingency allowance	%	20		674,534	
	(d) Allowance for additional construction costs: more time will be spent hauling material from stockpile sites created where the railway corridor crosses a publicly accessible roads. 5% of construction costs to allow for this additional time	%	5		168,633	
						$1,096,117
	<u>TOTAL ESTIMATED PROJECT COST:</u>					**$4,468,786**
	(GST Exclusive)					

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Jincumbilly to Bombala section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
1.		**SITE ESTABLISHMENT:**					
	(a)	Provision for construction access - management access gates in fences alongside road and access track	Item		$2,200.00		
	(b)	Provision for traffic control and cable locators at road crossings	Item	6	$3,000.00	18,000	
	(c)	Sediment and erosion control					
	(d)	(i) clean side drains (both sides) in cuttings	lin m	1,490	$20.00	29,800	
		(ii) clean side drains (one side only) in cuttings	lin m	470	$10.00	4,700	
		(iii) construct built up trail in cutting	lin m	7,190	$30.00	215,700	
	(e)	Vegetation clearing					
	(f)	(i) minor clearing	lin m	22,045	3.00	66,135	
		(ii) moderate clearing	lin m	1,125	6.80	7,650	
		(iii) heavy clearing	lin m	980	14.00	13,720	
		(iv) slashing	lin m		1.50		
		(v) additional allowance for blackberry clearing	lin m		10.00		
	(g)	Weed spraying before and during construction	Allowance	1	10,000.00	10,000	
	(h)	Surveying for fencing alignments	km	24	3,000.00	72,000	
	(i)	Remove cross fences and gates	No.	17	200.00	3,400	
	(j)	Allowance for marking trees - cleared, pruned, untouched	Allowance			4,800	
	(k)	Allowance for marking trail centreline prior to construction	Allowance			7,200	
	(l)	Tree lopping: retain and lop	No.		400.00		
	(m)	Bombala trailhead - remove log retaining walls	Item	1	500.00	500	
							$453,605
2.		**RAIL TRAIL WORKS:**					
	(a)	Supply and Install 2.5m wide rail trail (on formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing	lin. m.	24,580	100.00	2,458,000	
	(b)	Supply and Install 2.5m wide rail trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, compacting and sealing	lin. m.	1,085	120.00	130,200	
	(c)	Supply and install 2.5m wide trail (off formation) including stripping of top soil, boxing out, compacting subgrade, filling with road base, levelling, trimming, shaping, and compacting (gravel surface)	lin m.	65	60.00	3,900	
	(d)	Carparking (at trailheads)					
		(i) gravelling	sq. m	2,390	25.00	59,750	
		(ii) barriers	No.	3	1,000.00	3,000	
		(iii) bollards	No.	60	130.00	12,000	
	(e)	Road crossings					
		(i) chicane gating system - management access gate and trail user gate	No.	4	4,000.00	16,000	
		(ii) pedestrian gate	No.	1	600.00	600	
		(iii) Fill and level at crossing point (1 location)	Item	1	1,000.00	1,000	
		(iv) Fill and compact (1 location)	Item	1	4,500.00	4,500	
		(v) Remove cattle stops and install RCPs	No.	3	5,000.00	15,000	
		(vi) bollards	No.	43	130.00	5,590	
		(vii) Relocate signage (1 location)	Item	1	500.00	500	
		(viii) Cut back overhanging branches (1 location)	Allowance	1	200.00	200	
		(ix) Install roadside delineators (1 location)	item	2	50.00	100	
	(f)	Supply and install signage					
		(i) Trailhead sign	No.	3	1,600.00	4,800	
		(ii) Trailhead signs - single sided	No.	1	1,000.00	1,000	
		(iii) Trailhead map panel	No.	3	5,500.00	16,500	
		(iv) Trail directional marker	No.	32	1,000.00	32,000	
		(v) Trail interpretive signs/new siding signs	No.	5	3,000.00	15,000	
		(v) Other miscellaneous trail signs	No.	24	200.00	4,800	

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Jincumbilly to Bombala section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
		(vi) Specific warning signs (rock fall; horses prohibited)	No.		500.00		
		(vii) Giveway/stop signs	No.	14	500	7,000	
		(viii) Road crossing ahead	No.	12	500	6,000	
		(ix) Trail crossing ahead	No.	9	600	5,400	
		(X) Trail crossing Ahead - large signs	No.	4	2,500	10,000	
	(g)	Trailside furniture (seats)	No.	6	3,000	18,000	
	(h)	Repair/renovate/repaint railway paraphanenalia					
		(i) Signs - minor repairs	No.	10	200	2,000	
		(ii) Signs - moderate repairs	No.	2	400	800	
		(iii) switches and signals repairs	No.		500		
		(iv) Railway post and electrical boxes repairs	No.		1,000		
	(i)	Fencing					
		(i) Erect new stock fencing	lin. m.	42,430	15	636,450	
		(ii) Repair proportion of existing boundary fencing where new fencing not erected	lin m.	330	5	1,650	
	(j)	Existing culvert structures					
		(i) Check existing culvert structures (small)	no.		100		
		(ii) Clean small culverts	No.	69	500	34,500	
		(iii) Clean medium culverts	No.		600		
		(iv) Clean large culverts	No.	3	700	2,100	
		(v) Clean major culverts	No.		1,000		
		(vi) Clean creek culverts	No.		3,000		
	(k)	Rock battering on unstable cuttings	lin m.		300		
	(l)	Wire mesh retaining on rock face of cutting	sq m		40		
	(m)	Install pipe and fill over (fill amount varies slightly)	No.	7	1,500	10,500	
	(n)	New culverts - replace cattle stops	Item	2	5,000	10,000	
	(o)	Rehabilitate station building and install composting toilet	Item	2	50,000	100,000	
	(q)	Comfort stops	Item	1	13,000	13,000	
	(p)	New side gates (landholder access)	Item	4	1,000	4,000	
	(q)	Clear, widen and stabilise trail access points	Item		3,000		
	(r)	Install Picnic tables	No.	1	8,000	8,000	
	(s)	Install small bike parking rack	Item	1	2,000	2,000	
	(t)	Install large bike parking rack	Item	2	3,000	6,000	
	(u)	Tyre and boot cleaning station	No.	2	3,000	6,000	
	(v)	Cattle stops: remove and fill	No.	2	500	1,000	
	(w)	Install water pipes under new trail	No.	2	500	1,000	
	(x)	Retain existing water pipes under trail	No.	2	200	400	
							3,670,240
3.		**WATERWAY CROSSINGS:**					
	(a)	3 m long box culvert	No.		15,000.00		
	(b)	1m long box culvert	No.		6,000.00		
	(c)	Replace bridge with pipe and fill	Item				
	(c)	Prefabricated bridges	lin m	4	6,000.00	24,000	
	(d)	Add handrails to existing bridges	lin m.		2,000.00		
	(e)	Add deck and handrails onto existing I-Beam bridges	lin. m.		6,000.00		
	(f)	Refurbished bridges					
		(i) Unnamed 7m bridge	Item	1	103,675.00	103,675	
							127,675
4.		**SPECIFIC LANDHOLDER SOLUTIONS (REQUESTED AND**					
	(a)	Livestock grids and spring loaded gates	No.	8	3,000.00	24,000	
	(b)	Livestock/machinery crossing points	No.	15	20,000.00	300,000	
	(c)	Underpasses	No.	4	50,000.00	200,000	
	(d)	Stock watering points - pipe and trough only	No.	1	1,500.00	1,500	
	(e)	Machinery crossing points with reinforced trail surface	No.	1	5,000.00	5,000	
							530,500

PRELIMINARY PROJECT COST ESTIMATE

Project: MONARO RAIL TRAIL STAGE 1A:Jincumbilly to Bombala section DATE: 26/7/22
(Based on Trail Development Plan)

ITEM		SECTION & DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SUB-TOTAL
4.		**OTHER ALLOWANCES**					
	(a)	Screen Planting					
		(i) screen rail trail from nearby houses (5m deep planting)	Lin. M	380	30	11,400	
		(ii) Establishment and Maintenance watering	planting lot	2	1,000	2,000	
	(b)	Allowance for landowner requests (additional fencing and vegetation screening)	Allow	1	60,000	60,000	
	(c)	Allowance for leaving all historic telegraph poles	Allow	1	1,000	1,000	
	(d)	Allowance for steep embankment signs and delineators	lin. m	500	35	17,500	
	(d)	Allowance for additional earthworks and drainage rehabilitation	Allow	1 location	2,500	2,500	
	(e)	Allowance for refurbishment of old stockyards - Bukalong siding	Allow	1	10,000	10,000	
							104,400
		TOTAL CONSTRUCTION COST:					**$4,886,420**
		(GST Exclusive)					
	(a)	Project Management	%	5		244,321	
	(b)	Design & Approvals	%	2.5		122,161	
	(c)	Contingency allowance	%	20		977,284	
	(d)	Allowance for additional construction costs: more time will	%	5		244,321	
							$1,588,087
		TOTAL ESTIMATED PROJECT COST:					**$6,474,507**
		(GST Exclusive)					

APPENDIX 7: RECOMMENDATIONS ON ASSETS TO BE RETAINED

Tralee – Michelago (assets starting south west of Alderson Pl crossing)

Note: Except in rare circumstances, the asset registers do not include any railway speed signs, on-track distance signs, platform /station signs, yard limits, and railway paraphernalia such as signals and switches. The Trail Development Plan identifies all of these items and attaches a refurbishment cost to each one. There are hundreds of such items along the corridor. They should be retained and refurbished as they add to the user experience. It is not clear what the process is for the transfer of these items from the State Government to the trail manager.

Asset register reference	Description	Location (using asset register code)	Start measurement (distance from Sydney Central Station)	End measurement	Heritage listed (Yes/No)	Necessary for rail trail – Green Desirable for rail trail – Orange Not necessary for rail trail – Red	Comments
CUS50331A	1 cell Concrete Culvert Tuggeranong	TGN	331.158	331.161	No		
UBS50331A	Underbridge – Timber Ballast Topped Tuggeranong	TGN	331.713	331.716	No		Existing Timber bridge. Trail Development Plan recommends replacing with culvert. Asset presumably needs to be taken by QPRC to allow replacement

CUS50332A	1 cell steel Culvert Tuggeranong	TGN	332.156	332.157	No		
CUS50332B	1 cell Concrete Culvert Tuggeranong	TGN	332.538	332.540	No		
UBS50333A	Underbridge – Steel Transom Topped Tuggeranong	TGN	333.137	333.139	No		Existing bridge with steel I-beams. Trail Development Plan recommends retaining and redecking.
CUS50333A	2 cell Concrete Culvert Tuggeranong	TGN	333.677	333.678	No		
CUS50334A	1 cell Concrete Culvert Tuggeranong	TGN	334.085	334.087	No		
CUS50334B	2 cell Concrete Culvert Tuggeranong	TGN	334.295	334.297	No		
CUS50334C	1 cell Concrete Culvert Tuggeranong	TGN	334.423	334.424	No		
CUS50334D	1 cell Concrete Culvert Tuggeranong	TGN	334.826	334.827	No		
CUS50335A	1 cell Concrete Culvert Tuggeranong	TGN	335.045	335.046	No		
CUS50335B	Steel Culvert Tuggeranong	TGN	335.541	335.542	No		
UBS50335A	Underbridge - Other Tuggeranong	TGN	335.700	335.701	No		Shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail

							Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50335C	Concrete Culvert Tuggeranong	TGN	335.988	335.989	No		
UBS50336A	Underbridge – Timber Tuggeranong	TGN	336.205	336.207	No		Shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50336A	Concrete Culvert Tuggeranong	TGN	336.486	336.488	No		
CUS50337A	Concrete Culvert Tuggeranong	TGN	337.033	337.034	No		
CUS50337B	Concrete Culvert Tuggeranong	TGN	337.223	337.224	No		
CUS50337C	Concrete Culvert Tuggeranong	TGN	337.665	337.667	No		

CUS50337D	Concrete Culvert Tuggeranong	TGN	337.869	337.871	No		
CUS50338A	Concrete Culvert Tuggeranong	TGN	338.201	338.202	No		
CUS50338B	Steel Culvert Tuggeranong	TGN	338.293	338.294	No		
CUS50338C	Concrete Culvert Tuggeranong	TGN	338.385	338.386	No		
CUS50338D	Steel Culvert Tuggeranong	TGN	338.441	338.443	No		
CUS50338E	Steel Culvert Tuggeranong	TGN	338.466	338.468	No		
CUS50338F	Concrete Culvert Tuggeranong	TGN	338.548	338.549	No		
CUS50339A	Concrete Culvert Tuggeranong	TGN	339.022	339.023	No		
CUS50339B	Concrete Culvert Tuggeranong	TGN	339.076	339.077	No		
CUS50339C	Concrete Culvert Tuggeranong	TGN	339.333	339.335	No		
CUS50339D	Concrete Culvert Tuggeranong	TGN	339.703	339.704	No		
CUS50339E	Concrete Culvert Tuggeranong	TGN	339.949	339.950	No		
CUS50340A	Concrete Culvert Tuggeranong	TGN	340.135	340.136	No		
CUS50340B	Concrete Culvert Tuggeranong	TGN	340.356	340.357	No		
CUS50340C	Concrete Culvert Tuggeranong	TGN	340.810	340.811	No		

CUS50340D	Concrete Culvert Tuggeranong	TGN	340.946	340.947	No		
CUS50341A	Concrete Culvert Royalla	ROY	341.285	341.287	No		
CUS50341B	Concrete Culvert Royalla	ROY	341.583	341.585	No		
UBS50341A	Underbridge – Concrete Ballast Topped Royalla	ROY	341.980	341.982	No		Shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50342A	Steel Culvert Royalla	ROY	342.093	342.093	No		
CUS50342B	Steel Culvert Royalla	ROY	342.871	342.873	No		
UBS50343A	Underbridge – Timber Ballast Topped Royalla	ROY	343.396	343.398	No		Shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either

							way, it is a culvert which needs to come over to QPRC.
UBS50344A	Underbridge – Steel Transom Topped Royalla	ROY	344.061	344.064	No		Shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
UBS50344B	Underbridge – Timber Ballast Topped Royalla	ROY	344.439	343.63	No		Existing timber bridge over Guises Creek. To be refurbished as part of rail trail development
CUS50344A	Steel Culvert Royalla	ROY	344.966	344.967	No		
CUS50345A	Concrete Culvert Royalla	ROY	345.283	345.285	No		
CUS50345B	Concrete Culvert Royalla	ROY	345.246	345.426	No		

LCS50345A	Public Vehicle Only Level Crossing Old Cooma Rd Royalla	ROY	345.446	345.446	No		
CUS50345C	Concrete Culvert Royalla	ROY	345.647	345.649	No		
CUS50345D	Concrete Culvert Royalla	ROY	345.903	345.905	No		
CUS50346A	Concrete Culvert Royalla	ROY	346.222	346.224	No		
VSS50346A	Building – Trike Shed Royalla	ROY	346.735	346.735	No		
CUS50346B	Concrete Culvert Royalla	ROY	346.802	346.805	No		
ASS50346A	Advertising Board- Royalla, Monaro Highway	ROY	346.802	346.802	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50346B	Advertising Board- Royalla, Monaro Highway	ROY	346.803	346.803	No		Not necessary for the functioning of the rail trail.

							However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
LCS50346A	Public Vehicle Only Level Crossing Royalla	ROY	346.834	346.834	No		In place as an "authority" but appears to be no longer in use.
ASS50346C	Advertising Board-Royalla, Monaro Highway	ROY	346.877	346.877	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.

ASS50346D	Advertising Board-Royalla, Monaro Highway	ROY	346.878	346.878	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
CUS50346C	Concrete Culvert Royalla	ROY	346.984	346.986	No		
ASS50347A	Advertising Board-Royalla, Monaro Highway	ROY	347.009	347.009	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.

ASS50347B	Advertising Board-Royalla, Monaro Highway	ROY	347.011	347.011	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
UBS50347A	Underbridge – Timber Royalla	ROY	347.166	347.170	No		Shown in Trail Development Plan as a 7 span concrete drain on a concrete base. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
UBS50347B	Underbridge – Timber Ballast Topped Royalla	ROY	347.825	337.828	No		Existing Timber bridge. Trail

							Development Plan recommends replacing with culvert. Asset presumably needs to be taken by QPRC to allow replacement
UBS50347C	Underbridge – Timber Ballast Topped Royalla	ROY	347.966	337.969	No		Existing Timber bridge. Trail Development Plan recommends replacing with culvert. Asset presumably needs to be taken by QPRC to allow replacement
UBS50348A	Underbridge – Timber Ballast Topped Royalla	ROY	348.227	348.236	No		Existing timber bridge over Guises Creek Inlet. Trail Development Plan recommends replacement with pre-fabricated bridge. Presumed that QPRC needs to have the asset before it can replace it

UBS50348B	Underbridge – Timber Ballast Topped Royalla	RPY	348.808	348.811	No		Existing timber bridge with steel pipe running under. Trail Development Plan recommends redecking and installing handrails.
CUS50349A	Concrete Culvert Royalla	ROY	349.446	349.447	No		
CUS50349B	Concrete Culvert Royalla	ROY	349.531	349.533	No		
CUS50349C	Steel Culvert Royalla	ROY	349.755	349.756	No		
CUS50349D	Steel Culvert Royalla	ROY	349.780	349.781	No		
CUS50349E	Concrete Culvert Royalla	ROY	349.886	349.887	No		
CUS50349F	Concrete Culvert Royalla	ROY	349.952	349.953	No		
CUS50350A	Concrete Culvert Royalla	ROY	350.156	350.158	No		
CUS50350B	Steel Culvert Royalla	ROY	350.274	350.275	No		
CUS50350C	Concrete Culvert Royalla	ROY	350.390	350.391	No		
CUS50350D	Concrete Culvert Royalla	ROY	350.582	350.583	No		
CUS50350E	Concrete Culvert Royalla	ROY	350.592	350.593	No		
CUS50350F	Concrete Culvert Royalla	ROY	350.710	350.711	No		
CUS50351A	Steel Culvert Royalla	ROY	351.060	351.062	No		

UBS50351A	Underbridge – Steel Royalla	ROY	351.069	351.071	No		Shown in Trail Development Plan as a rectangular concrete culvert with steel pipes in place. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50351B	Timber culvert Royalla	ROY	351.381	351.381	No		Plan recommends replacement with small box culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC and be replaced as recommended.
UBS50351B	Underbridge – Timber Ballast Topped Royalla	ROY	351.766	352.778	No		Shown in Trail Development Plan

							as a single steel pipe culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
UBS50352A	Underbridge – Timber Ballast Topped Royalla	ROY	352.274	352.277	No		Shown in Trail Development Plan as a single steel pipe culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50352A	Steel Culvert Royalla	ROY	352.466	352.467	No		
UBS50352B	Underbridge – Timber Ballast Topped Royalla	ROY	352.540	352.543	No		Shown in Trail Development Plan as a single steel pipe culvert. Asset register is dated

							and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to QPRC.
CUS50352B	Steel Culvert Royalla	ROY	352.734	352.735	No		
CUS50352C	Concrete Culvert Royalla	ROY	352.869	352.871	No		
CUS50353A	Steel Culvert Royalla	ROY	353.013	353.014	No		
LCS50353A	Private Vehicle Only Level Crossing Royalla	ROY	353.130	353.130	No		Driveway
UBS50353A	Underbridge – Timber Ballast Topped Royalla	ROY	353.167	353.179	No		Existing timber bridge over Lobbs Hole Creek. To be refurbished as part of rail trail development
LCS50353B	Public Vehicle Only Level Crossing Williamsdale Rd Royalla	ROY	353.530	353.530	No		
VSS50353A	Building – Trike Shed Williamsdale	WMS	353.630	353.630	No		
UBS50353B	Underbridge – Concrete Royalla	ROY	353.681	353.693	No		Existing 12 m concrete bridge over unnamed creek. Trail Development plan

							recommends installing handrails only.
CUS50354A	Concrete Culvert Royalla	ROY	354.103	354.104	No		
CUS50354B	Concrete Culvert Royalla	ROY	354.176	354.177	No		
CUS50354C	Steel Culvert Royalla	ROY	354.417	354.418	No		
QPRC/SMRC border							
UBS50354A	Underbridge – Timber Ballast Topped Royalla	ROY	354.713	354.716	No		Shown in Trail Development Plan as a concrete culvert with steel pipe. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to SMRC.
UBS50354B	Underbridge – Timber Ballast Topped Royalla	ROY	354.875	354.878	No		Shown in Trail Development Plan as a concrete culvert with steel pipe. Asset register is dated and Trail Development Plan matches what's on

							the ground. Either way, it is a culvert which needs to come over to SMRC.
CUS50354D	Concrete Culvert Royalla	ROY	354.994	354.995	No		
CUS50355A	Steel Culvert Royalla	ROY	355.078	355.079	No		
CUS50355B	Steel Culvert Royalla	ROY	355.188	355.189	No		
UBS50355A	Underbridge – Timber Ballast Topped Royalla	ROY	355.336	355.339	No		Existing timber bridge. Trail Development Plan recommends replacement with pre-fabricated bridge. Presumed that SMRC needs to have the asset before it can replace it
UBS50356A	Underbridge – Timber Ballast Topped Royalla	ROY	356.459	356.491	No		Existing timber bridge over Deep Creek. To be refurbished as part of rail trail development
CUS50357A	Concrete Culvert Royalla	ROY	357.079	357.080	No		
CUS50357B	Concrete Culvert Royalla	ROY	357.335	357.341	No		At Waterhole Creek

CUS50358A	Concrete Culvert Royalla	ROY	358.005	358.006	No		
LCS50358A	Public Vehicle Only Level Crossing Kellys Rd Royalla	ROY	358.158	358.164	No		
CUS50358B	Steel Culvert Royalla	ROY	358.260	358.261	No		
CUS50358C	Concrete Culvert Royalla	ROY	358.445	358.446	No		
CUS50358D	Concrete Culvert Michelago	MGO	358.644	358.645	No		
CUS50358E	Steel Culvert Michelago	MGO	358.987	358.988	No		
CUS50359A	Concrete Culvert Michelago	MGO	359.243	358.245	No		
CUS50359B	Concrete Culvert Michelago	MGO	359.493	358.493	No		
CUS50359C	Steel Culvert Michelago	MGO	359.589	358.590	No		
ASS50359A	Advertising Board-Michelago, Monaro Highway	MGO	359.703	359.703	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.

ASS50359B	Advertising Board- Michelago, Monaro Highway	MGO	359.704	359.704	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359C	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	359.775	359.775	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359D	Misc. Structure - Advertising Board-	MGO	359.776	359.776	No		Not necessary for the functioning of

	Michelago, Monaro Highway						the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359E	Misc. Structure - Advertising Board-Michelago, Monaro Highway	MGO	359.791	359.791	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359F	Misc. Structure - Advertising Board-Michelago, Monaro Highway	MGO	359.792	359.792	No		Not necessary for the functioning of the rail trail. However, Trail

							Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359G	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	359.831	359.831	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359H	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	359.832	359.832	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as

							sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
CUS50359D	Steel Culvert Michelago	MGO	359.913	359.914	No		
ASS50359I	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	359.951	359.951	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50359J	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	359.952	359.952	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income

							that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
ASS50360A	Misc. Structure - Advertising Board- Michelago, Monaro Highway	MGO	360.027	360.027	No		Not necessary for the functioning of the rail trail. However, Trail Development Plan identifies these as sources of income that can be used for trail operation and maintenance. Recommended that Council seek ownership of this asset.
CUS50360A	Concrete Culvert Michelago	MGO	360.193	360.194	No		
CUS50360B	Steel Culvert Michelago	MGO	360.304	360.305	No		
CUS50360C	Concrete Culvert Michelago	MGO	360.524	360.525	No		
CUS50360D	Concrete Culvert Michelago	MGO	360.654	360.655	No		
CUS50361A	Steel Culvert Michelago	MGO	361.024	361.025	No		

CUS50361B	Concrete Culvert Michelago	MGO	361.222	361.223	No		
CUS50361C	Concrete Culvert Michelago	MGO	361.253	361.254	No		
CUS50361D	Concrete Culvert Michelago	MGO	361.451	361.452	No		
CUS50361E	Concrete Culvert Michelago	MGO	361.524	361.525	No		
CUS50361F	Steel Culvert Michelago	MGO	361.599	361.600	No		
CUS50361G	Steel Culvert Michelago	MGO	361.688	361.689	No		
CUS50361H	Concrete Culvert Michelago	MGO	361.826	361.827	No		
CUS50361I	Concrete Culvert Michelago	MGO	361.988	361.989	No		
CUS50362A	Steel Culvert Michelago	MGO	362.172	362.173	No		
CUS50362B	Concrete Culvert Michelago	MGO	362.350	362.351	No		
CUS50362C	Concrete Culvert Michelago	MGO	362.521	362.522	No		
CUS50362D	Concrete Culvert Michelago	MGO	362.591	362.592	No		
CUS50362E	Concrete Culvert Michelago	MGO	362.851	362.852	No		
CUS50363A	Steel Culvert Michelago	MGO	363.054	363.056	No		
OBS50363A	Kelly Road Overbridge Michelago	MGO	363.533	363.533	No		Presumably SMRC already manage this road as part of local road network. Not needed for rail

							trail (as bridge passes over trail).
CUS50363B	Concrete Culvert Michelago	MGO	363.951	363.952	No		
UBS50364A	Underbridge - Timber Michelago	MGO	364.009	364.012	No		Existing bridge with steel I-beams. Trail Development Plan recommends retaining and redecking.
CUS50364A	Timber Culvert Michelago	MGO	364.214	364.215	No		Does not appear to be in place anymore. Not clear what has replace it.
CUS50364B	Concrete Culvert Michelago	MGO	364.543	364.544	No		
CUS50364C	Concrete Culvert Michelago	MGO	364.680	364.682	No		
UBS50364B	Underbridge – Timber Ballast topped Michelago	MGO	364.837	364.840	No		Existing timber bridge. Trail Development Plan recommends replacing with box culvert.
CUS50365A	Concrete Culvert Michelago	MGO	365.593	365.394	No		
CUS50365B	Concrete Culvert Michelago	MGO	365.630	365.631	No		
CUS50365C	Concrete Culvert Michelago	MGO	365.854	365.855	No		

CUS50365D	Concrete Culvert Michelago	MGO	365.956	365.958	No		
CUS50366A	Concrete Culvert Michelago	MGO	366.006	366.007	No		
CUS50366B	Concrete Culvert Michelago	MGO	366.120	366.122	No		
CUS50366C	Concrete Culvert Michelago	MGO	366.227	366.228	No		
OBS50366A	Unnamed Road Overbridge Michelago	MGO	366.471	366.471	No		Listed in Trail Development Plan as existing overbridge for farm access and no work is needed. Not needed for rail trail (as bridge passes over trail).
CUS50366D	Concrete Culvert Michelago	MGO	366.957	366.958	No		
UBS50367A	Underbridge – Timber Michelago	MGO	367.132	367.133	No		Listed in Trail Development Plan as a rectangular concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to

							come over to SMRC.
CUS50367A	Concrete Culvert Michelago	MGO	367.480	367.481	No		
UBS50367B	Underbridge – Timber Ballast Topped Michelago	MGO	367.641	367.649	No		Existing 8m timber bridge. To be refurbished as part of rail trail development.
CUS50367B	Concrete Culvert Michelago	MGO	367.870	367.872	No		
UBS50368A	Underbridge – Timber Ballast Topped Michelago	MGO	368.688	369.692	No		Listed in Trail Development Plan as a rectangular concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to SMRC.
UBS50368B	Underbridge – Timber Ballast Topped Michelago	MGO	368.946	369.950	No		Listed in Trail Development Plan as a rectangular concrete culvert. Asset register is dated and Trail

							Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to SMRC.
UBS50369A	Underbridge – steel Michelago	MGP	369.106	369.107	No		Existing bridge. Trail Development Plan recommends replacing with box culvert.
CUS50369A	Concrete Culvert Michelago	MGO	369.284	369.285	No		
CUS50369B	Steel Culvert Michelago	MGO	369.445	369.446	No		
CUS50369C	Concrete Culvert Michelago	MGO	369.707	369.708	No		
VS505370B	Building – Trolley Shed Michelago	MGO	370.05	370.05	Yes		
PWS50370A	Misc. structure – Platform Michelago	MGO	370.067	371.172	Yes		
ATS50370A	Building – Amenities Building Michelago	MGO	370.10	370.10	Yes		Trail Development Plan makes capital provision for refurbishing existing toilets (which it is assumed this building is). Need to retain asset

							control if toilets are to be re-used.
SSS50370A	Building – Station Building Michelago	MGO	370.120	370.120	Yes		Trail Development Plan makes capital provision for refurbishing existing station building as a one off expenditure item. SMRC does not need to retain control; however, if building was to be re-purposed to allow commercial uses such as bike hire of café (suggested in 2019 Feasibility Study), rent could provide an income source for trail maintenance. SMRC would need to be in control of the asset.
RPS5037A	Precinct – Michelago Station	MGO	370.120	370.120	Yes		Unclear what this covers however station grounds are proposed for

							trailhead development. Both trailhead works and general landscaping have been included within Trail Development Plan.
Other assets listed in Michelago Station (out of shed, signal box, concrete culvert (CUS50370A), engine shed and turntable) are south of what is required for this stage of trail development.							

Nimmitabel - Old Bombala Rd

Note: Except in rare circumstances, the asset registers do not include any railway speed signs, on-track distance signs, platform /station signs, yard limits, and railway paraphernalia such as signals and switches. The Trail Development Plan identifies all of these items and attaches a refurbishment cost to each one. There are hundreds of such items along the corridor. They should be retained and refurbished as they add to the user experience. It is not clear what the process is for the transfer of these items from the State Government to the trail manager.

Asset register reference	Description	Location (using asset register code)	Start measurement (distance from Sydney Central Station)	End measurement	Heritage listed (Yes/No)	Necessary for rail trail – Green Desirable for rail trail – Orange Not necessary for rail trail – Red	Comments
CUS50474A	Concrete Culvert Nimmitabel	NBL	474.69	474.691	No		
LCS50474A	Public Vehicle Only Level Crossing Springfield Rd Nimmitabel	NBL	474.875	474.882	No		
CUS50474B	Concrete Culvert Nimmitabel	NBL	474.996	474.997	No		
UBS50475A	Underbridge – Timber Open Topped Nimmitabel	NBL	475.446	475.448	No		Existing timber bridge. Trail Development Plan recommends

							replacement with pre-fabricated bridge. Presumed that SMRC needs to have the asset before it can replace it
CUS50475A	Concrete Culvert Nimmitabel	NBL	475.696	475.697	No		
UBS50476A	Underbridge – Timber Open Topped Nimmitabel	NBL	476.289	476.291	No		Existing timber bridge. Trail Development Plan recommends replacement with pre-fabricated bridge. Presumed that SMRC needs to have the asset before it can replace it
OBS50476A	Old Bombala Rd Overbridge Nimmitabel	NBL	476.780	476.780	No		Existing road bridge passing over railway corridor
UBS50476B	Underbridge – Timber Open Topped Nimmitabel	NBL	476.887	475.889	No		Existing timber cattle stop (rather than bridge). Trail Development Plan recommends replacement with grid gating system

							(WI 28 in Table 6 in Section 4.7). Presumed that SMRC needs to have the asset before it can replace it
CUS50477A	Concrete Culvert Nimmitabel	NBL	477.055	477.056	No		
CUS50477B	Concrete Culvert Nimmitabel	NBL	477.687	477.689	No		
CUS50478A	Concrete Culvert Nimmitabel	NBL	478.221	478.222	No		
CUS50478B	Concrete Culvert Nimmitabel	NBL	478.610	478.611	No		
CUS50478C	Concrete Culvert Nimmitabel	NBL	478.944	478.945	No		
CUS50479A	Timber Culvert Nimmitabel	NBL	479.056	479.057	No		
OBS50479A	Unnamed road overbridge – Nimmitabel	NBL	479.146	479.146	No		Disused Existing timber road bridge on Jenkins Rd. Road has been re-built on a parallel embankment. Trail Development Plan recommends bridge stays in place and underpass

							constructed under road. Bridge not needed.
CUS50479B	Concrete Culvert Nimmitabel	NBL	479.282	479.283	No		
CUS50479C	Concrete Culvert Nimmitabel	NBL	479.478	479.479	No		
CUS50479D	Concrete Culvert Nimmitabel	NBL	479.578	479.579	No		
CUS50479E	Concrete Culvert Nimmitabel	NBL	479.940	479.941	No		
CUS50480A	Concrete Culvert Nimmitabel	NBL	480.382	480.383	No		
CUS50480B	Concrete Culvert Nimmitabel	NBL	480.787	480.788	No		
CUS50480C	Concrete Culvert Nimmitabel	NBL	480.942	480.943	No		
CUS50481A	Concrete Culvert Nimmitabel	NBL	481.323	481.324	No		
CUS50481B	Concrete Culvert Nimmitabel	NBL	481.467	481.468	No		
CUS50481C	Concrete Culvert Nimmitabel	NBL	481.722	481.723	No		
UBS50481A	Underbridge – Timber Open Topped Nimmitabel	NBL	481.838	481.897	No		Existing timber bridge over Maclaughlin River. To be refurbished as part of rail trail development

CUS50482A	Concrete Culvert Nimmitabel	NBL	482.872	482.873	No		
CUS50483A	Concrete Culvert Nimmitabel	NBL	483.041	483.042	No		
CUS50483B	Concrete Culvert Nimmitabel	NBL	483.460	483.461	No		
CUS50483C	Timber Culvert Holts Flat	HLF	483.770	483.771	No		
CUS50484A	Steel Culvert Holts Flat	HLF	484.163	484.164	No		Note: shown in Trail Development Plan as a concrete culvert. Asset register is dated and Trail Development Plan matches what's on the ground. Either way, it is a culvert which needs to come over to SMRC.
CUS50484B	Concrete Culvert Holts Flat	HLF	484.205	484.205	No		
USB50484A	Underbridge – Timber Holts Flat	HLF	484.451	484.473	No		Bridge over Old Bombala Rd. To be refurbished as part of rail trail development

Jincumbilly - Bombala

Note: Except in rare circumstances, the asset registers do not include any railway speed signs, on-track distance signs, platform /station signs, yard limits, and railway paraphernalia such as signals and switches. The Trail Development Plan identifies all of these items and attaches a refurbishment cost to each one. There are hundreds of such items along the corridor. They should be retained and refurbished as they add to the user experience. It is not clear what the process is for the transfer of these items from the State Government to the trail manager.

Asset register reference	Description	Location (using asset register code)	Start measurement (distance from Sydney Central Station)	End measurement	Heritage listed (Yes/No)	Necessary for rail trail – Green Desirable for rail trail – Orange Not necessary for rail trail – Red	Comments
ROS50510A	Building – waiting room Jincumbilly	JNC	510.158	510.158	No	Green	Earmarked for installation of toilet with capital costs allowance included in works items.
LCS50510A	Public Vehicle Only Level Crossing Mt Cooper Rd Jincumbilly	JNC	510.176	510.182	No	Green	
SYS50510A	Misc. Structure – Stockyards Jincumbilly	JNC	510.230	510.260	Yes	Red	Beside proposed trailhead. No need for SMRC to take this asset.

UBS50510A	Underbridge – Timber Jincumbilly	JNC	510.497	510.499	No		Timber bridge which has now been removed. Trail Development Plan recommends install cross pipes to manage drainage.
CUS50510A	Concrete Culvert Jincumbilly	JNC	510.689	510.690	No		
CUS50511A	Concrete Culvert Jincumbilly	JNC	511.071	511.072	No		
CUS50511B	Concrete Culvert Jincumbilly	JNC	511.664	511.665	No		
CUS50512A	Concrete Culvert Jincumbilly	JNC	512.128	512.129	No		
CUS50512B	Concrete Culvert Jincumbilly	JNC	512.309	512.310	No		
CUS50512C	Concrete Culvert Jincumbilly	JNC	512.579	512.580	No		
CUS50512D	Concrete Culvert Jincumbilly	JNC	512.764	512.765	No		
CUS50513A	Concrete Culvert Jincumbilly	JNC	513.209	513.210	No		
CUS50513B	Concrete Culvert Jincumbilly	JNC	513.435	513.436	No		
CUS50513C	Concrete Culvert Jincumbilly	JNC	513.576	513.577	No		
UBS50514A	Underbridge – Timber Jincumbilly	JNC	514.241	514.245	No		Existing timber bridge. To be

							refurbished as part of rail trail development
CUS50514A	Concrete Culvert Bukalong	BUK	514.843	514.844	No		
CUS50515A	Concrete Culvert Bukalong	BUK	515.254	515.255	No		
CUS50515B	Concrete Culvert Bukalong	BUK	515.370	515.371	No		
CUS50515C	Concrete Culvert Bukalong	BUK	515.618	515.619	No		
CUS50515D	Concrete Culvert Bukalong	BUK	515.837	515.838	No		
CUS50515E	Concrete Culvert Bukalong	BUK	515.852	515.853	No		
CUS50516A	Concrete Culvert Bukalong	BUK	516.085	516.086	No		
CUS50516B	Concrete Culvert Bukalong	BUK	516.331	516.337	No		
CUS50516C	Concrete Culvert Bukalong	BUK	516.552	516.553	No		
CUS50516D	Concrete Culvert Bukalong	BUK	516.984	516.985	No		
CUS50517A	Concrete Culvert Bukalong	BUK	517.235	517.236	No		
CUS50517B	Concrete Culvert Bukalong	BUK	517.516	517.517	No		
CUS50517C	Concrete Culvert Bukalong	BUK	517.735	517.736	No		

CUS50517D	Concrete Culvert Bukalong	BUK	517.875	517.876	No		
CUS50517E	Concrete Culvert Bukalong	BUK	517.955	517.956	No		
CUS50518A	Concrete Culvert Bukalong	BUK	518.267	518.268	No		
LCS50518A	Public Vehicle Only Level Crossing Bukalong Siding Rd Bukalong	BUK	518.304	518.310	No		
CUS50518B	Concrete Culvert Bukalong	BUK	518.503	518.505	No		
CUS50518C	Concrete Culvert Bukalong	BUK	518.688	518.689	No		
CUS50518D	Concrete Culvert Bukalong	BUK	518.792	518.792	No		
CUS50518E	Concrete Culvert Bukalong	BUK	518.921	518.922	No		
CUS50519A	Concrete Culvert Bukalong	BUK	519.115	519.116	No		
CUS50519B	Concrete Culvert Bukalong	BUK	519.372	519.373	No		
SYS50519A	Misc. Structure – Stockyards Bukalong	BUK	519.377	519.411	Yes		Beside proposed trailhead. No need for SMRC to take this asset. However it is historic and an allowance of $10,000 has been included within the Trail Development

							Plan for works to restore these stockyards by a Mens Shed or similar organisation. Heritage listing may mitigate against restoration.
PWS50519A	Misc. Structure – Platform Bukalong	BUK	519.450	519.532			Beside proposed trailhead. Trail Development Plan makes provision for clearing, levelling and restoring platform and building connecting trail. Waiting room (ROS50519A) is on the platform and this has been recommended for repurposing as a toilet. If the waiting room is refurbished as a toilet, SMRC would need to take ownership of the platform on which it sits.

CUS50519C	Concrete Culvert Bukalong	BUK	519.575	519.576	No		
ROS50519A	Building – waiting room Bukalong	BUK	519.660	519.660	No		Earmarked for installation of toilet with capital costs allowance included in works items.
CUS50519D	Concrete Culvert Bukalong	BUK	519.783	519.784	No		
CUS50520A	Concrete Culvert Bukalong	BUK	520.058	520.059	No		
CUS50520B	Concrete Culvert Bukalong	BUK	520.407	520.408	No		
CUS50520C	Concrete Culvert Bukalong	BUK	520.544	520.545	No		
CUS50520D	Concrete Culvert Bukalong	BUK	520.691	520.692	No		
CUS50520E	Concrete Culvert Bukalong	BUK	520.787	520.788	No		
CUS50520F	Concrete Culvert Bukalong	BUK	520.983	520.984	No		
CUS50521A	Concrete Culvert Bukalong	BUK	521.339	521.340	No		
CUS50521B	Concrete Culvert Bukalong	BUK	521.482	521.483	No		
CUS50521C	Concrete Culvert Bukalong	BUK	521.797	521.798	No		
CUS50522A	Concrete Culvert Bukalong	BUK	522.098	522.099	No		

CUS50522B	Concrete Culvert Bukalong	BUK	522.440	522.441	No		
CUS50522C	Concrete Culvert Bukalong	BUK	522.586	522.587	No		
CUS50523A	Concrete Culvert Bukalong	BUK	523.255	523.256	No		
CUS50523B	Concrete Culvert Bukalong	BUK	523.708	523.709	No		
CUS50523C	Concrete Culvert Bukalong	BUK	523.918	523.919	No		
CUS50524A	Concrete Culvert Bukalong	BUK	524.340	524.341	No		
CUS50524B	Concrete Culvert Bukalong	BUK	524.562	524.563	No		
CUS50525A	Concrete Culvert Bukalong	BUK	525.095	525.096	No		
CUS50525B	Concrete Culvert Bukalong	BUK	525.327	525.328	No		
CUS50525C	Concrete Culvert Bukalong	BUK	525.975	525.976	No		
CUS50526A	Concrete Culvert Bukalong	BUK	526.255	526.256	No		
CUS50526B	Concrete Culvert Bukalong	BUK	526.390	526.391	No		
CUS50526C	Concrete Culvert Bukalong	BUK	526.759	526.760	No		
CUS50527A	Concrete Culvert Bombala	BOA	527.367	527.368	No		
CUS50527B	Concrete Culvert Bombala	BOA	527.825	527.826	No		

CUS50528A	Concrete Culvert Bombala	BOA	528.602	528.604	No		
CUS50529A	Concrete Culvert Bombala	BOA	529.034	529.035	No		
CUS50529B	Concrete Culvert Bombala	BOA	529.434	529.435	No		
CUS50529C	Concrete Culvert Bombala	BOA	529.605	529.606	No		
CUS50529D	Concrete Culvert Bombala	BOA	529.745	529.747	No		
CUS50530A	Concrete Culvert Bombala	BOA	530.150	530.151	No		
CUS50530B	Concrete Culvert Bombala	BOA	530.606	530.607	No		
CUS50530C	Concrete Culvert Bombala	BOA	530.797	530.798	No		
CUS50531A	Concrete Culvert Bombala	BOA	531.090	531.091	No		
CUS50531B	Concrete Culvert Bombala	BOA	531.215	531.217	No		
CUS50531C	Concrete Culvert Bombala	BOA	531.520	531.521	No		
CUS50531D	Concrete Culvert Bombala	BOA	531.693	531.694	No		
CUS50531E	Concrete Culvert Bombala	BOA	531.864	531.865	No		
CUS50532A	Concrete Culvert Bombala	BOA	532.439	532.440	No		
CUS50532B	Concrete Culvert Bombala	BOA	532.609	532.610	No		

CUS50532C	Concrete Culvert Bombala	BOA	532.838	532.839	No		
CUS50533A	Concrete Culvert Bombala	BOA	533.295	533.297	No		
CUS50533B	Concrete Culvert Bombala	BOA	533.957	533.958	No		
SPS50534A through to VSS50534A	Various	BOA	534.140	534.687	Yes/No		Every item on the asset register bounded by these two asset numbers are significant built structures such as turntables, signal boxes and sheds. The trail will be developed outside the precinct as detailed in the trail development plan along the south western and north western side of the Monaro Highway and not traverse the railway corridor within the station grounds. Consequently, SMRC has no need for the remaining railway assets for a successful rail trail.

APPENDIX 8: TRAIL MAINTENANCE CHECKLIST: AN EXAMPLE

KEP TRACK MAINTENANCE CHECKLIST

The checklist that follows has been designed to be copied before each regular inspection, filled out and filed for future reference. It assumes the inspection will commence at Mt Helena and proceed in an easterly direction towards Wooroloo. This is an essential component of the maintenance program.

KEP TRACK (Mt Helena to Wooroloo) - MAINTENANCE CHECKLIST

Inspection Date (circle a year and tick one box):

☐ Jan 2005/6/7	☐ Feb 2005/6/7	☐ Mar. 2005/6/7	☐ Apr 2005/6/7
☐ May 2005/6/7	☐ Jun 2005/6/7	☐ Jul 2005/6/7	☐ Aug 2004/5/6
☐ Sep 2004/5/6	☐ Oct 2004/5/6	☐ Nov. 2004/5/6	☐ Dec 2004/5/6

Actual Date: ______________________

Person undertaking inspection: ______________________________ Signature:

LOCATION	ACTION REQUIRED	TICK IF OKAY	ACTION TAKEN (IF ANY)
Sawyers Road Crossing in Mt Helena	• Check gate west side • Check directional markers • Check totems and signage • Check promotional signage		
Johnston Street (Mt Helena)	• Check gate west side • Check directional markers • Check totems and signage		
Lion St crossing	• Check gates both sides • Check interpretive sign (north west corner) • Check directional markers • Check totems and signage • Check promotional signage		
Exit from Eastern Hills High School (crossing)	• Check gate east side • Check directional markers • Check totems and signage • Check interpretive sign (opposite Sime Rd)		
Thomas / Elliot road crossing	• Check gates both sides • Check directional markers • Check totems and signage • Check promotional signage • Check interpretive sign (opposite booster station)		
Chidlow Reserve	• Check interpretive signs (at turnoff to Lake Leschenaultia;opposite standpipe; opposite stone building; at old interpretive shelter) • Check condition of new trail through reserve		

KEP TRACK (Mt Helena to Wooroloo) - MAINTENANCE CHECKLIST

LOCATION	ACTION REQUIRED	TICK IF OKAY	ACTION TAKEN (IF ANY)
Old Northam Rd (Chidlow)	• Check gate east side • Check directional markers • Check totems and signage • Check promotional signage • Check culvert west side • Check ramps • Check interpretive sign (mid point between Old Northam Rd & Ash Rd)		
Ash Rd crossing	• Check gates both sides • Check directional markers • Check totems and signage • Check promotional signage		
Doconing Rd crossing	• Check gates both sides • Check directional markers • Check totems and signage • Check promotional signage • Check interpretive sign (150 metres east of crossing)		
Old Northam Rd crossing	• Check gates both sides • Check directional markers • Check totems and signage • Check promotional signage • Check culverts (both sides) • Check interpretive sign (SW corner)		
Entrance to horse trials paddocks	• Check gates • Check directional markers • Check totems and signage • Check road warning signs		
Government Rd crossing	• Check gates both sides • Check directional markers • Check totems and signage • Check new 40 metre section of trail at road crossing		
Government Road to Green St	• Check interpretive sign (where pipeline crosses trail) • Check interpretive sign (opposite Jason St)		
Green Street	• Check gates both sides • Check directional markers • Check totems and signage		
Any additional work required?			
Hazard Inspection	Whole trail - annually		
Annual budget allocation	Discuss with staff		

APPENDIX 9: TRAIL MAINTENANCE COSTS IN DETAIL

Resourcing a maintenance program is crucial, and funds will be required on an ongoing basis to enable this essential maintenance. It would be short sighted to go ahead and build the Monaro Rail Trail and then baulk at the demands of managing and maintaining it.

Estimating the cost of maintaining a trail is difficult due to the unpredictability of events such as floods, fires, high winds and stormwater runoff, as well as the tenure and management arrangements for the trail. Deliberate and willful damage and vandalism can also contribute significantly to the need for ongoing maintenance and replacement of infrastructure. Volunteers can be organised (through a coordinated program) to carry out much of the work at a limited cost to the trail manager.

The Trail Management Plan tasks costed below only cover the costs of maintaining the rail trail and associated infrastructure such as trailheads. It does not cover any costs associated with other assets such as station buildings (where they are not directly related to trailhead development).

Table 9 provides an estimate of the amounts that may be required on an annual basis for maintaining the proposed section of the Monaro Rail Trail from Tralee to Michelago for regular “day to day” maintenance.

Table 9: Estimate of “Day to Day” Maintenance Costs for Tralee to Michelago – 39.334 km

Task	***Frequency/note***	***Possible costs***
Inspect and check trailhead facilities and infrastructure (Tralee, Royalla, Williamsdale, Michelago): - parking areas (check surfaces) - interpretive panel - picnic tables - trailhead signage (on road) - trailhead (map) panel - trail directional marker posts	4 trailheads at average repairs of $1,500 per site/year. *(noting that any work at the Tralee trailhead will be in conjunction with work on the South Jerrabomberra Town Centre Park and the Williamsdale trailhead is an optional development)*	$6,000
Check side vegetation growth and overhead vegetation and cut back where required. Clearing of fallen trees and branches.	Allowance of 3 person days/10kms/ year (@ $700/day).	$8,400
Slash corridor both sides of trail to reduce weeds and fire load/risk. *(See Note 1).*	Allowance for 80% corridor, both sides of trail (62 km) @ $100/hr). Corridor slashed 5 times a year.	$12,000
Inspection and routine maintenance of bridges (all timber components, decking, handrails, etc.). Check for obstructions and clearing under	3 existing small bridges with new decking and handrails	$30,000 (covers inspection and minor repairs)

bridges (note that limited maintenance will be required in first 10 years – allowance includes future costs beyond 10 years).	1 existing large bridge with new handrails 4 existing large bridges to be refurbished 3 prefabricated bridges	
Check and clear culverts.	Allowance of 30 hours for checking and cleaning.	$3,000
Check road crossings. Replace damaged and/or missing signs and undertake other tasks: - Give Way and Road Ahead signs - Trail Crossing warning signs - Road name signs - Regulatory signs - Check sight distances and clear vegetation if necessary	4 crossings at average repairs of $500 per crossing/year.	$2,000
Allowance for replacement of trail directional marker logo/arrow plates and trail kilometre posts.	2 replacements/10kms/year.	$3,200
Allowance for repairs to trailside furniture and occasional replacements (when required).	Inspection and minor repairs every 6 months. 1 replacement per year.	$4,000
Check and replace miscellaneous signs along trail (e.g. trail name, distance signs, “No Trespassing”, bridge load signs, etc).	5 replacements/10kms/year.	$4,000
Check management access gates and fences at road crossings. Make repairs where necessary.	4 road crossings. Allowance of $8,000 per year for repairs.	$8,000
Check operation of stock crossings (fences, gates, grids).	Allowance for minor repairs	$0 (no stock crossings provided in this section)
Fencing repairs (minor).	Allowance for minor repairs – mainly in existing fencing (2% of length)	$1,560
Check interpretation signs along trail for damage and structural stability.	Allowance for repair/replacement of 1 panel per year.	$3,000

Check toilets (2).	Allowance for cleaning (5 times /year @$200/visit) (assumes toilets at South Jerrabomberra Town Park are cleaned as a separate project)	$2,000
Inspection of rail trail (3 times/year). *(See Note 2).*	Allowance for 3 inspection trips per year.	$4,500
Preparation of annual Hazard Inspection Report.	1 person days @ $1000/day.	$1,000
Additional weed management allowance.		$10,000/yr
Trail surface repair and maintenance allowance.		$5,000/yr
		$107,660 excl GST (per annum)

This equates to a rate of approximately $2,760 per kilometre per annum.

Table 10 provides an estimate of the amounts that may be required on an annual basis for maintaining the proposed section of the Monaro Rail Trail from Nimmitabel to Old Bombala Road for regular "day to day" maintenance.

Table 10: Estimate of "Day to Day" Maintenance Costs for Nimmitabel to Old Bombala Road – 10.298 km

Task	*Frequency/note*	*Possible costs*
Inspect and check trailhead facilities and infrastructure (Nimmitabel, Old Bombala Rd): - parking areas (check surfaces) - interpretive panel - picnic tables - trailhead signage (on road) - trailhead (map) panel - trail directional marker posts	2 trailheads at average repairs of $1,500 per site/year. *(noting that any work at the Nimmitabel trailhead will be in conjunction with work on Lake Williams Park)*	$3,000
Check side vegetation growth and overhead vegetation and cut back where required. Clearing of fallen trees and branches.	Allowance of 3 person days/10kms/ year (@ $700/day).	$2,100
Slash corridor both sides of trail to reduce weeds and fire load/risk. *(See Note 1).*	Allowance for 80% corridor, both sides of trail (16.5 km) @ $100/hr). Corridor slashed 5 times a year.	$3,200

Inspection and routine maintenance of bridges (all timber components, decking, handrails, etc.). Check for obstructions and clearing under bridges (note that limited maintenance will be required in first 10 years – allowance includes future costs beyond 10 years).	2 existing large bridges to be refurbished 4 prefabricated bridges	$10,000 (covers inspection and minor repairs)
Check and clear culverts.	Allowance of 10 hours for checking and cleaning.	$1,000
Check road crossings. Replace damaged and/or missing signs and undertake other tasks: - Give Way and Road Ahead signs - Trail Crossing warning signs - Road name signs - Regulatory signs - Check sight distances and clear vegetation if necessary	1 crossing at average repairs of $500 per crossing/year.	$500
Allowance for replacement of trail directional marker logo/arrow plates and trail kilometre posts.	2 replacements/10kms/year.	$800
Allowance for repairs to trailside furniture and occasional replacements (when required).	Inspection and minor repairs every 6 months. 1 replacement per year.	$4,000
Check and replace miscellaneous signs along trail (e.g. trail name, distance signs, “No Trespassing”, bridge load signs, etc).	5 replacements/10kms/year.	$1,000
Check management access gates and fences at road crossings. Make repairs where necessary.	1 road crossing. Allowance of $2,000 per year for repairs.	$2,000
Check operation of stock crossings (fences, gates, grids).	Allowance for minor repairs (15)	$7,500
Fencing repairs (minor).	Allowance for minor repairs – mainly in existing fencing (2% of length)	$200

Check interpretation signs along trail for damage and structural stability.	Allowance for repair/replacement of 1 panel per year.	$3,000
Check toilets (0).	Allowance for cleaning (5 times /year @$200/visit) (assumes toilets at Nimmitabel are cleaned as a separate project)	$0
Inspection of rail trail (3 times/year). *(See Note 2).*	Allowance for 3 inspection trips per year.	$1,500
Preparation of annual Hazard Inspection Report.	1 person days @ $1000/day.	$1,000
Additional weed management allowance		$2,500/yr
Trail surface repair and maintenance allowance		$1,000/yr
		$44,300 excl GST (per annum)

This equates to a rate of approximately $4,301 per kilometre per annum.

Table 11 provides an estimate of the amounts that may be required on an annual basis for maintaining the proposed section of the Monaro Rail Trail from Jincumbilly to Bombala for regular "day to day" maintenance.

Table 11: Estimate of "Day to Day" Maintenance Costs for Jincumbilly to Bombala – 24.58 km

Task	***Frequency/note***	***Possible costs/yr***
Inspect and check trailhead facilities and infrastructure (Jincumbilly, Bukalong, Bombala): - parking areas (check surfaces) - interpretive panel - picnic tables - trailhead signage (on road) - trailhead (map) panel - trail directional marker posts	3 trailheads at average repairs of $1,500 per site/year.	$4,500
Check side vegetation growth and overhead vegetation and cut back where required. Clearing of fallen trees and branches.	Allowance of 3 person days/10kms/ year (@ $700/day).	$8,400

Slash corridor both sides of trail to reduce weeds and fire load/risk. *(See Note 1).*	Allowance for 80% corridor, both sides of trail (40 km) @ $100/hr). Corridor slashed 5 times a year.	$7,750
Inspection and routine maintenance of bridges (all timber components, decking, handrails, etc.). Check for obstructions and clearing under bridges (note that limited maintenance will be required in first 10 years – allowance includes future costs beyond 10 years)	2 prefabricated bridges	$1,000 (covers inspection and minor repairs)
Check and clear culverts.	Allowance of 20 hours for checking and cleaning.	$2,000
Check road crossings. Replace damaged and/or missing signs and undertake other tasks: - Give Way and Road Ahead signs - Trail Crossing warning signs - Road name signs - Regulatory signs - Check sight distances and clear vegetation if necessary	6 crossings at average repairs of $500 per crossing/year.	$3,000
Allowance for replacement of trail directional marker logo/arrow plates and trail kilometre posts.	2 replacements/10kms/year.	$2,000
Allowance for repairs to trailside furniture and occasional replacements (when required).	Inspection and minor repairs every 6 months. 1 replacement per year.	$4,000
Check and replace miscellaneous signs along trail (e.g. trail name, distance signs, “No Trespassing”, bridge load signs, etc).	5 replacements/10kms/year.	$2,600
Check management access gates and fences at road crossings. Make repairs where necessary.	4 road crossings involving gating systems. Allowance of $8,000 per year for repairs.	$8,000

Check operation of stock crossings (fences, gates, grids).	Allowance for minor repairs (15)	$7,500
Fencing repairs (minor).	Allowance for minor repairs – mainly in existing fencing (2% of length)	$200
Check interpretation signs along trail for damage and structural stability.	Allowance for repair/replacement of 1 panel per year.	$3,000
Check toilets (2).	Allowance for cleaning (5 times /year @$200/visit) (assumes toilets at Bombala are cleaned as a separate project)	$2,000
Inspection of rail trail (3 times/year). *(See Note 2).*	Allowance for 3 inspection trips per year.	$3,000
Preparation of annual Hazard Inspection Report.	1 person days @ $1,000/day.	$1,000
Additional weed management allowance		$2,500
Trail surface repair and maintenance allowance		$2,500
		$64,950 excl GST (per annum)

This equates to a rate of approximately $2,640 per kilometre per annum.

Note 1: The necessity to slash will be much reduced if the rail trail is located within a narrower, fenced corridor and adjoining landowners graze stock within that part of the corridor deemed surplus to requirements. Slashing costs are based on slashing the 7m wide trailway.

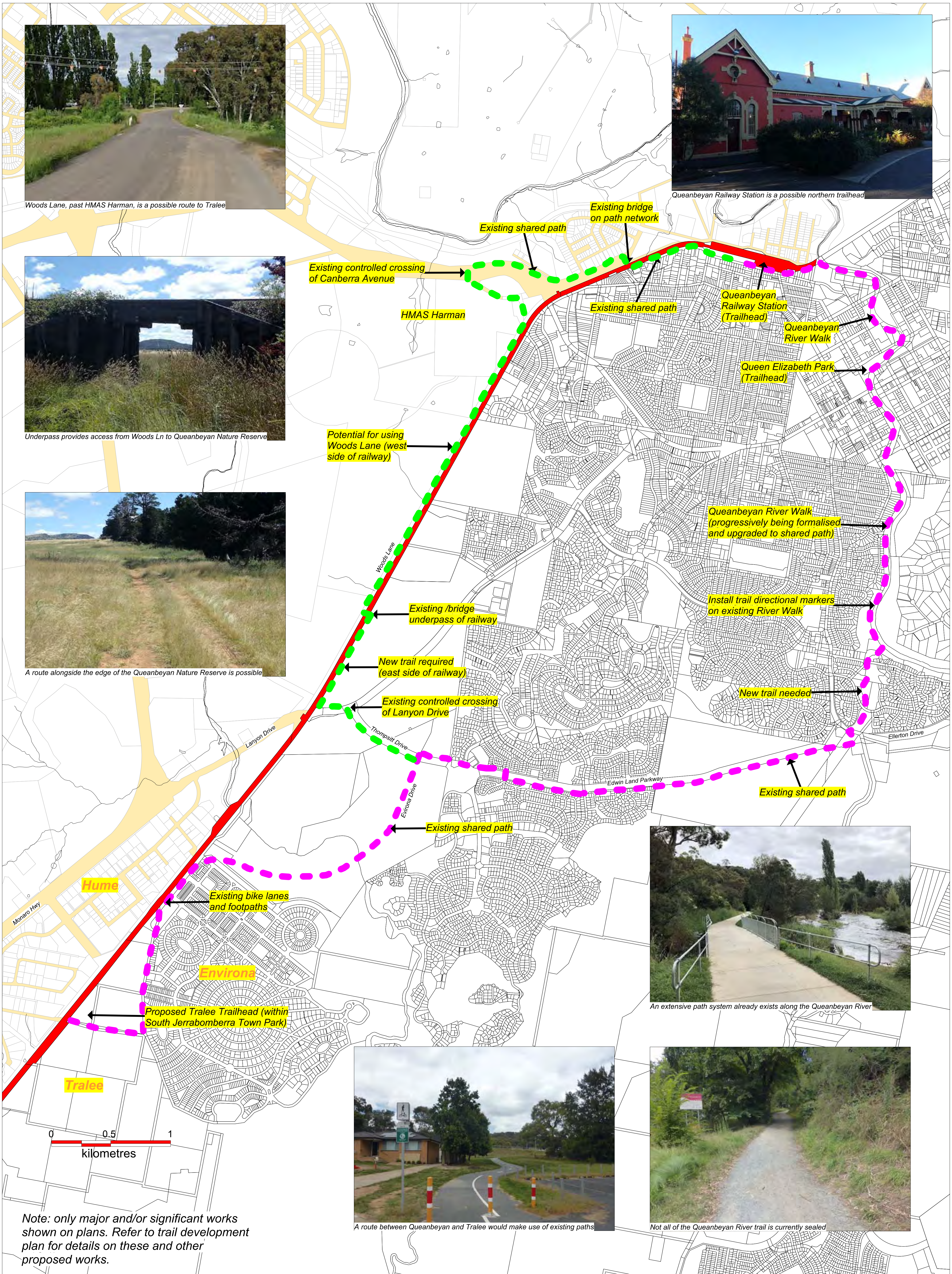
Note 2: Reporting of routine maintenance requirements by trail users will obviate need for many scheduled inspections. Appointment of a Trail Manager, with responsibility for regular inspections of entire trail, will substantially reduce need for unscheduled and expensive maintenance.

A number of observations are relevant to these tables:

- The likely maintenance costs in the first few years of a trail's life will focus on sign damage and inspections.
- Costings are at full commercial rates (but of course this would be far less if volunteers are involved). US evidence suggests significant savings using volunteer maintenance (trails maintained by volunteers cost one-third of those maintained by Government entities).
- The maintenance estimate provided in the report is an estimate only based upon certain design parameters and construction standards. For example, it is recommended that timber bridges be restored using timber decking and timber handrails because it more fully provides the rail trail experience. However, bridges could be re-purposed using other material such as expanded steel mesh or fibreglass reinforced plastic for the decking which would have a different

maintenance regime and costing. It is impossible to estimate maintenance costs to the most accurate possible level until construction is finished and every construction item is catalogued (noting that events like wildfires and major floods are events that maintenance budgets never account for).

APPENDIX 10: RAIL TRAIL PLANS 1 – 6



Woods Lane, past HMAS Harman, is a possible route to Tralee

Underpass provides access from Woods Ln to Queanbeyan Nature Reserve

A route alongside the edge of the Queanbeyan Nature Reserve is possible

Queanbeyan Railway Station is a possible northern trailhead

An extensive path system already exists along the Queanbeyan River

A route between Queanbeyan and Tralee would make use of existing paths

Not all of the Queanbeyan River trail is currently sealed

Note: only major and/or significant works shown on plans. Refer to trail development plan for details on these and other proposed works.

TRANSPLAN PTY LTD Planning and Design

Mike Halliburton Associates

March 2022

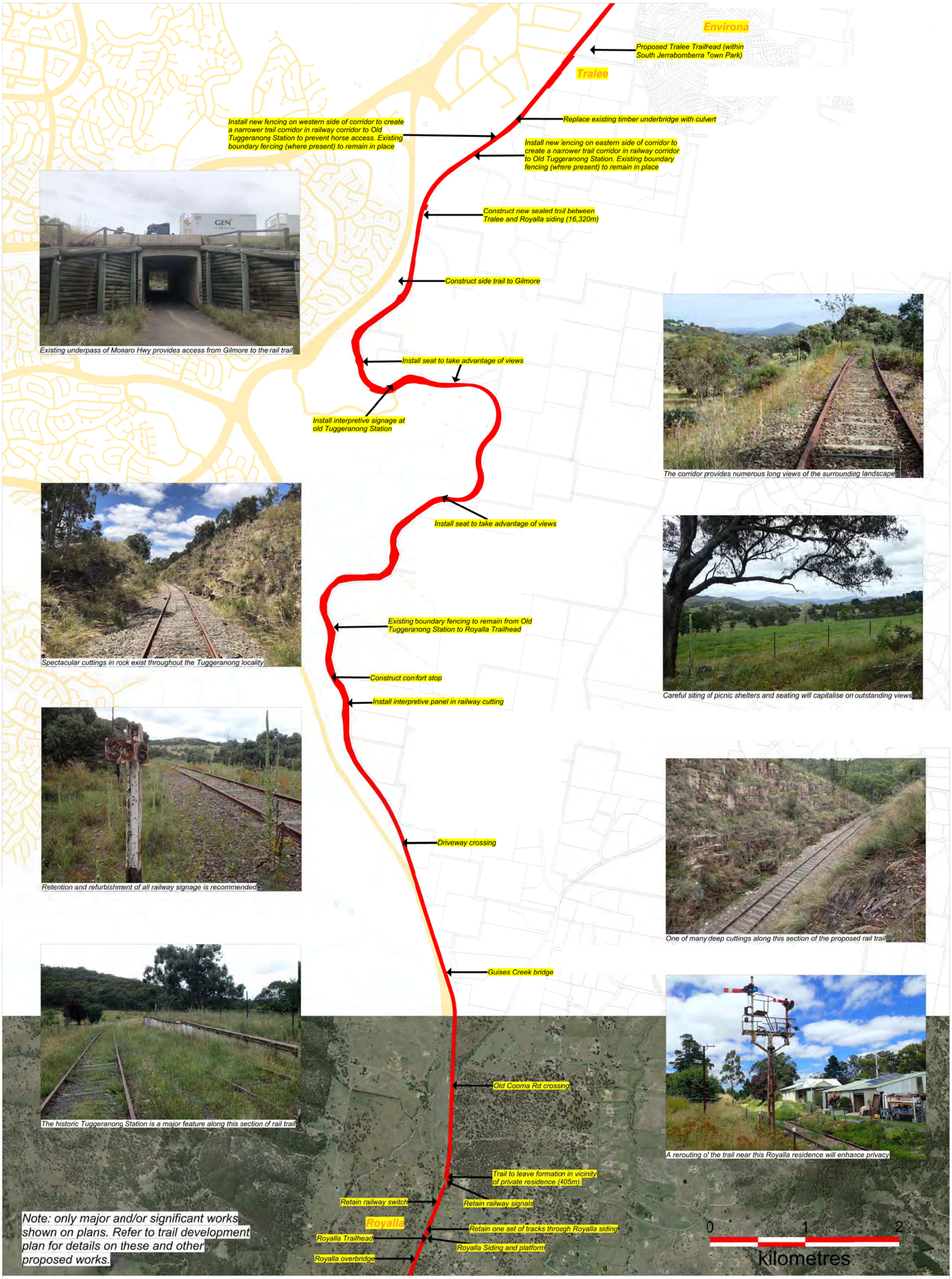
Monaro Rail Trail
Trail Development Plans

Plan 1: Queanbeyan to Tralee

MONARO RAIL TRAIL

QPRC

SNOWY MONARO REGIONAL COUNCIL



Monaro Rail Trail
Trail Development Plans

Plan 2: Tralee to Royalla

TRANSPLAN PTY LTD Planning and Design

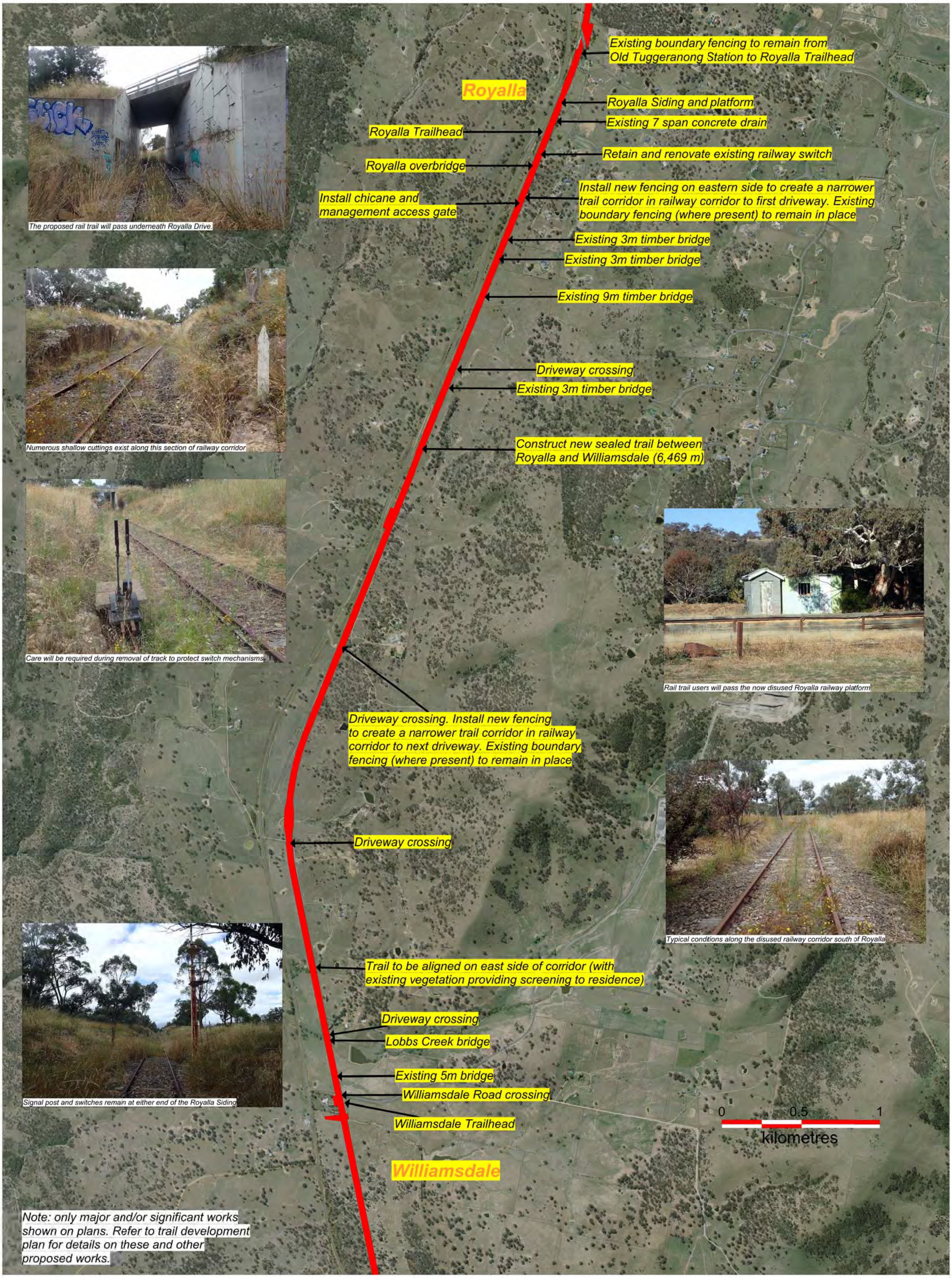
Mike Halliburton Associates

March 2022

MONARO RAIL TRAIL

QPRC

SNOWY MONARO REGIONAL COUNCIL



TRANSPLAN PTY LTD Planning and Design

Mike Halliburton Associates

March 2022

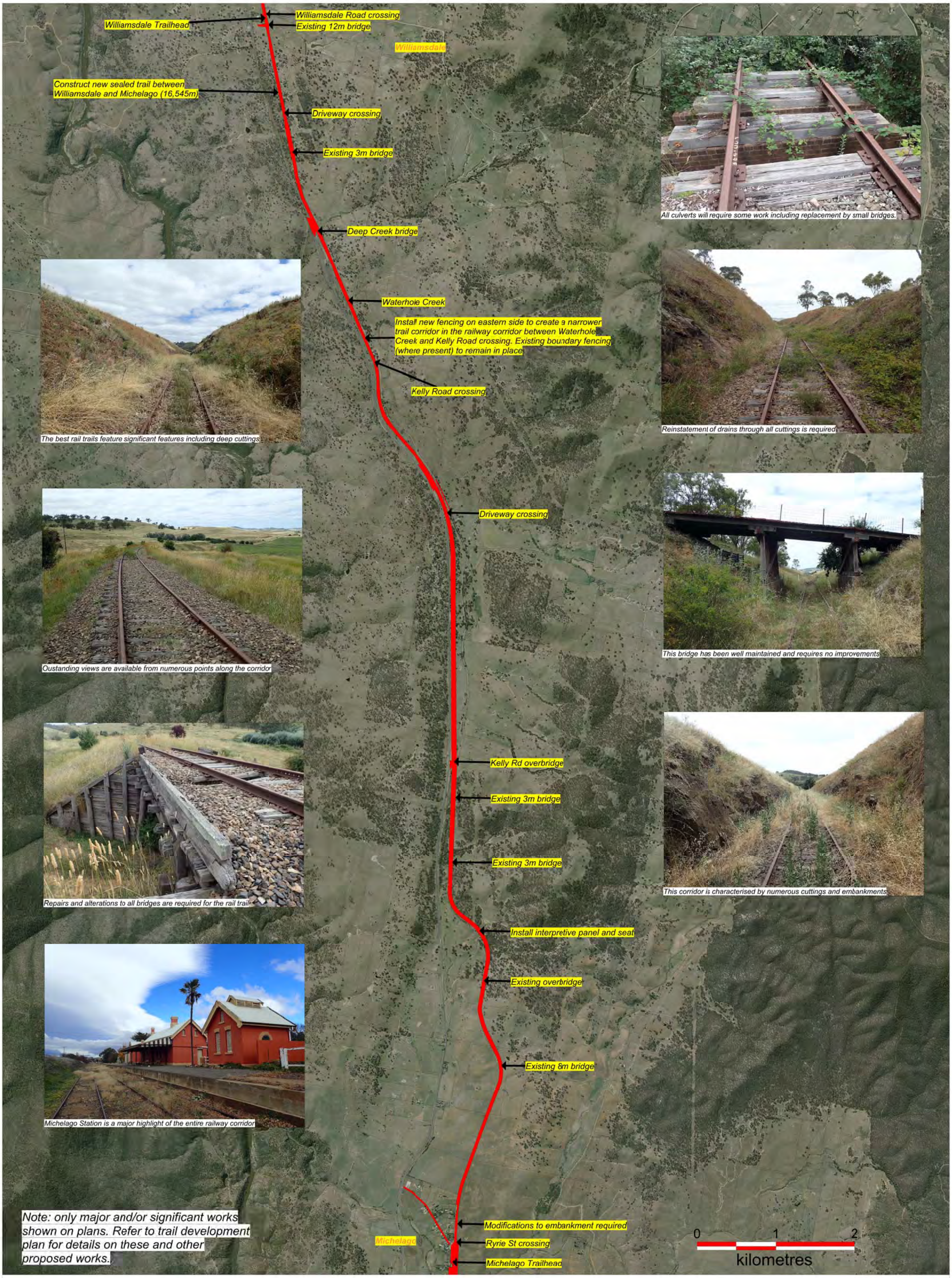
Monaro Rail Trail
Trail Development Plans

Plan 3: Royalla to Williamsdale

MONARO RAIL TRAIL

QPRC

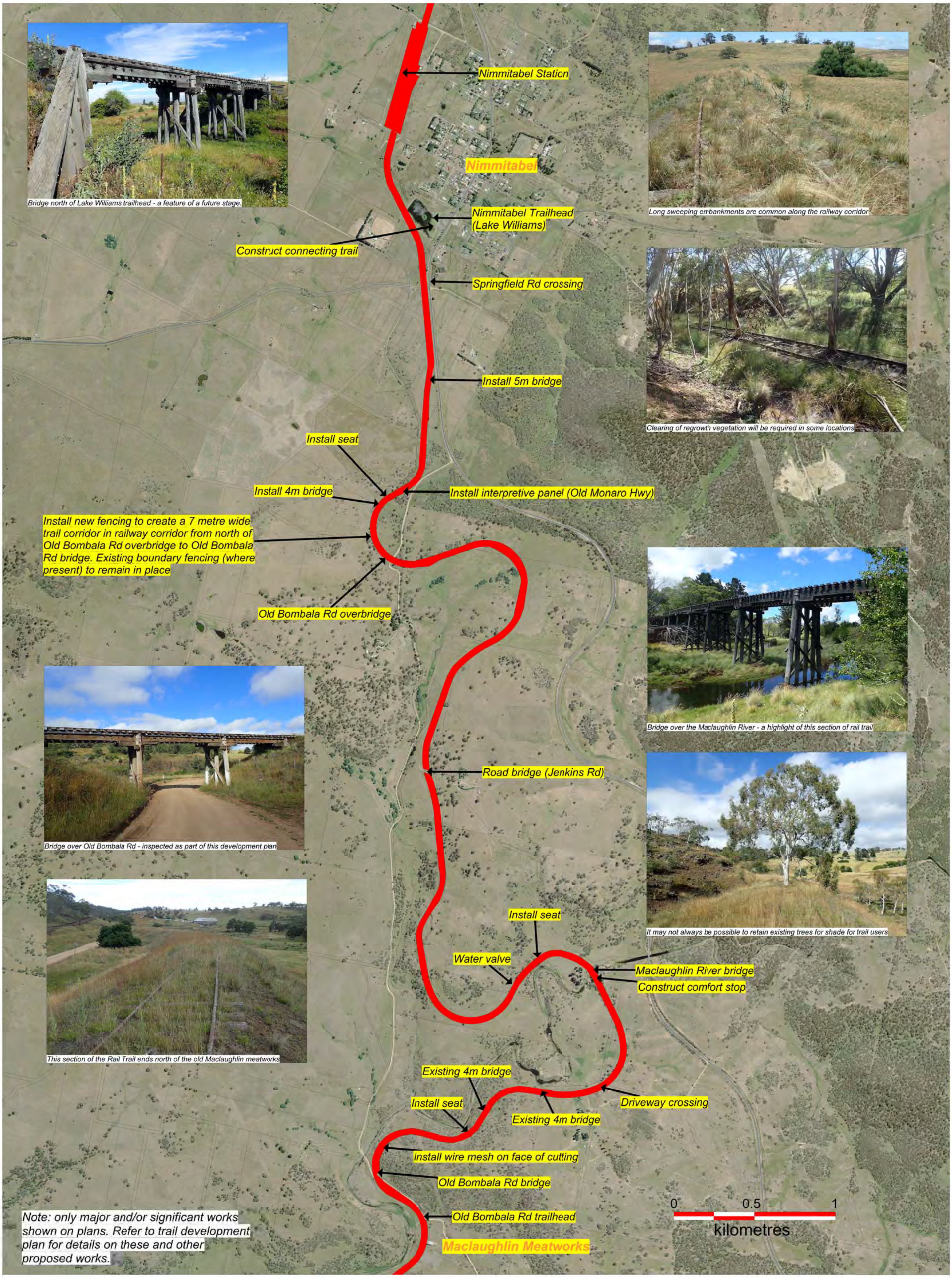
SNOWY MONARO REGIONAL COUNCIL



Monaro Rail Trail
Trail Development Plans

Plan 4: Williamsdale to Michelago

March 2022



TRANSPLAN PTY LTD Planning and Design

Mike Halliburton Associates

March 2022

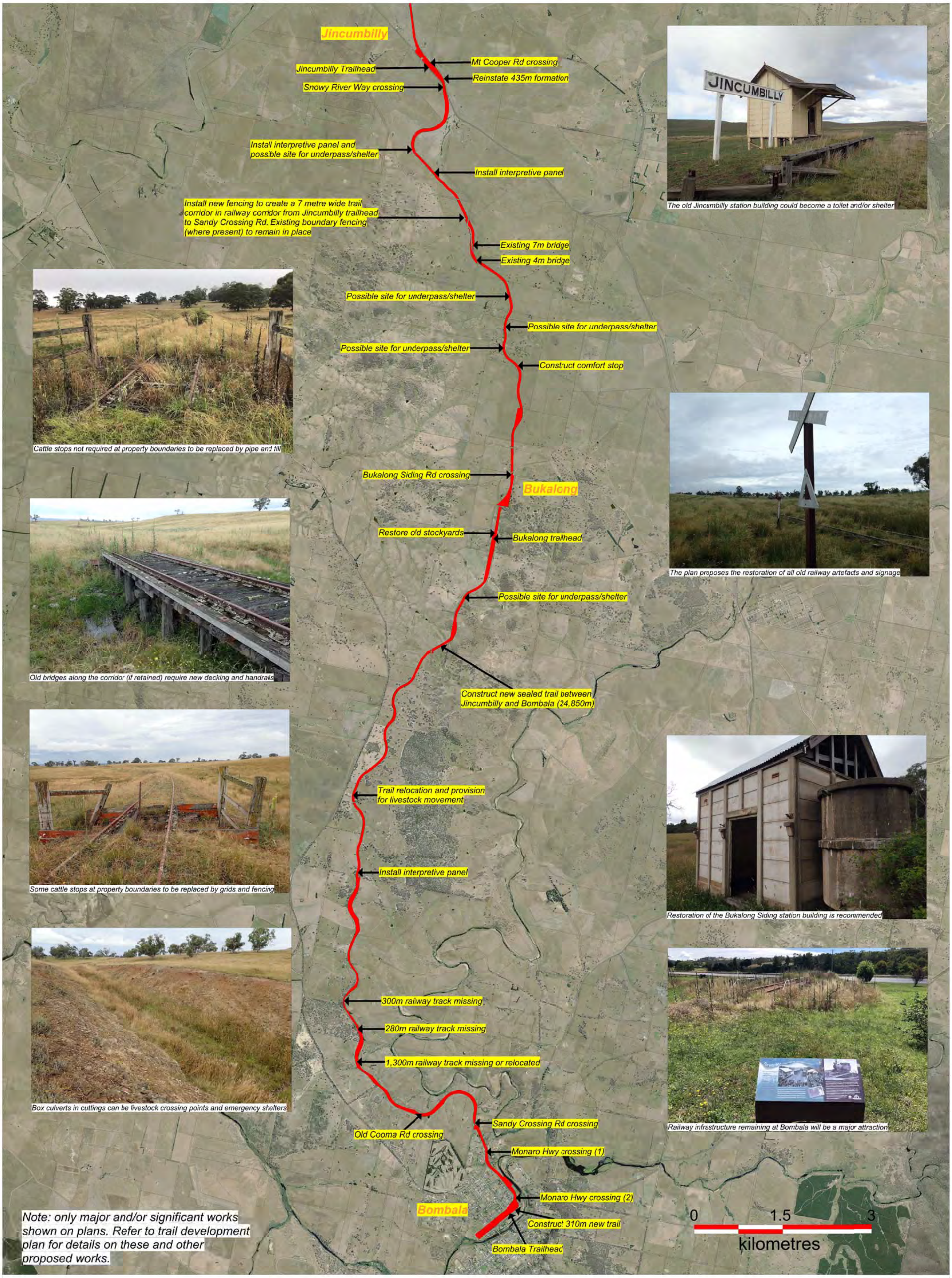
Monaro Rail Trail
Trail Development Plans

Plan 5: Nimmitabel to Old Bombala Rd (Maclaughlin)

MONARO RAIL TRAIL

QPRC

SNOWY MONARO REGIONAL COUNCIL



The old Jincumbilly station building could become a toilet and/or shelter

Cattle stops not required at property boundaries to be replaced by pipe and fill

The plan proposes the restoration of all old railway artefacts and signage

Old bridges along the corridor (if retained) require new decking and handrails

Some cattle stops at property boundaries to be replaced by grids and fencing

Restoration of the Bukalong Siding station building is recommended

Box culverts in cuttings can be livestock crossing points and emergency shelters

Railway infrastructure remaining at Bombala will be a major attraction

Note: only major and/or significant works shown on plans. Refer to trail development plan for details on these and other proposed works.

Monaro Rail Trail
Trail Development Plans

Plan 6: Jincumbilly to Bombala

TRANSPLAN PTY LTD Planning and Design

Mike Halliburton Associates

March 2022

MONARO RAIL TRAIL

QPRC

SNOWY MONARO REGIONAL COUNCIL