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PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

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Date: 31 October 2025

Queensland Government

# New Beith Rail Overbridge

Design Report

Prepared for

**Frasers Property Australia**

Client representative

**Belinda Ryan**

Date

**14 January 2025**

Rev H

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**Revision History**

| Rev No. | Description | Prepared by | Reviewed by | Authorised by | Date |
|---|---|---|---|---|---|
| A | 15% Concept Design Issue | FM | DLC | DLC | 11/07/2022 |
| B | 15% Concept Design Re-Issue | FM | DLC | DLC | 11/07/2022 |
| C | 50% Preliminary Design Issue | JM | DLC | DLC | 25/11/2022 |
| D | 85% Substantial Design Issue | JM | DM | DLC | 07/07/2023 |
| E | 100% Final Design Issue – PE Review | JM | DLC | DLC | 27/08/2024 |
| F | 100% Final Design Issue | JM | DLC | DLC | 25/10/2024 |
| G | 100% Final Design Issue – Updates for Landscape Design | JM | DLC | DLC | 02/12/2024 |
| H | 100% For Approval | JM | DLC | DLC | 14/01/2025 |

# Definitions

| Reference | Meaning |
|---|---|
| ARTC | Australian Rail Track Corporation |
| CAD | Computer Aided Design |
| CoP | Code of Practice |
| Design Documentation | Design deliverables prepared to specify the design |
| Design Package | Collation of Design Documents for submission for an element or aspect of the Works at a particular Design Stage |
| Design Stage | Defined stages in the development of the IFC design as follows:<br>• Concept Design (CD) – 15%<br>• Preliminary Design (PD) – 50%<br>• Substantial Design (SD) – 85%<br>• Final Design (FD) – 100%; and<br>• Issued for construction (IFC). |
| DWS | Deck Wearing Surface |
| DTMR | Department of Transport and Main Roads |
| EDQ | Economic Development Queensland |
| FDD | Final Design Documentation (100% complete design) |
| Frasers | Frasers Property New Beith Pty Ltd |
| HV | High Voltage |
| IDR | Inter-Disciplinary Review |
| IFC | Issued for Construction |
| LCC | Logan City Council |
| LGA | Local Government Area |
| NCR | Non-Conformance Report |
| PE | Proof Engineer |
| QR | Queensland Rail |
| RFI | Request for Information |

| Reference | Meaning |
|---|---|
| RPEQ | Registered Professional Engineer Queensland |
| SDD | Substantial Detailed Design (Notionally 85% complete design) |
| SiD | Safety in Design |
| State | State of Queensland |
| Temporary Works | Works required for the purpose of constructing the structure that do not form part of the permanent Works or in-service loading. Design for Temporary Works includes design for construction configurations whether or not the design results in additional works being specified |
| TMR or DTMR | Department of Transport and Main Roads |
| VE | Value Engineering |
| WOL | Whole of Life |
| Works | Activities undertaken or required to be undertaken by the Contractor to complete the structure including inter alia design, supply, load, deliver, haul, unload, construct, install, establish, disestablish, produce, manufacture, maintain, investigate, inspect, test, commission, modify, demolish, remove, spoil, dispose, train |

# 1. Introduction

Frasers Property Group (Frasers) has recently acquired a parcel of land to the west of South McLean adjacent to the Flagstone development. The parcel of land is to be developed into residential blocks but is currently landlocked with restrictions to access to the east created by the Brisbane-Sydney railway line and to the south by Flagstone Creek. In order to unlock access to enable development of the land to proceed, a new rail overbridge is required to provide an extension of Mountain Ridge Road to cross the railway line. Refer to Figure 1 for location.

The current railway line is a single non-electrified track managed by ARTC. There is currently ongoing work on planning for a future passenger rail connection to the west of the existing railway line. This will comprise of two electrified railway tracks. This arrangement is similar to that allowed for on the recently constructed Homestead Drive Railway Overpass at Flagstone, to the south of the proposed new structure. This will have to be taken into consideration during the design process.

The bridge will be located at approximate CH 947km on the Sydney to Brisbane Railway Line, to be confirmed during the detailed design process.

The ARTC railway line is located approximately central in an existing 30m wide railway corridor. To allow for the future passenger railway, the corridor is to be widened by an additional 30m to the west. The proposed bridge is to span over the proposed and existing corridors, with a pier to be provided located on the current boundary. This will provide for the required horizontal clearances and allow maximum flexibility in the location of the future railway as well as allowing for maintenance tracks, drainage channels and any other services that are required.

A general Locality plan is shown in Figure 1.

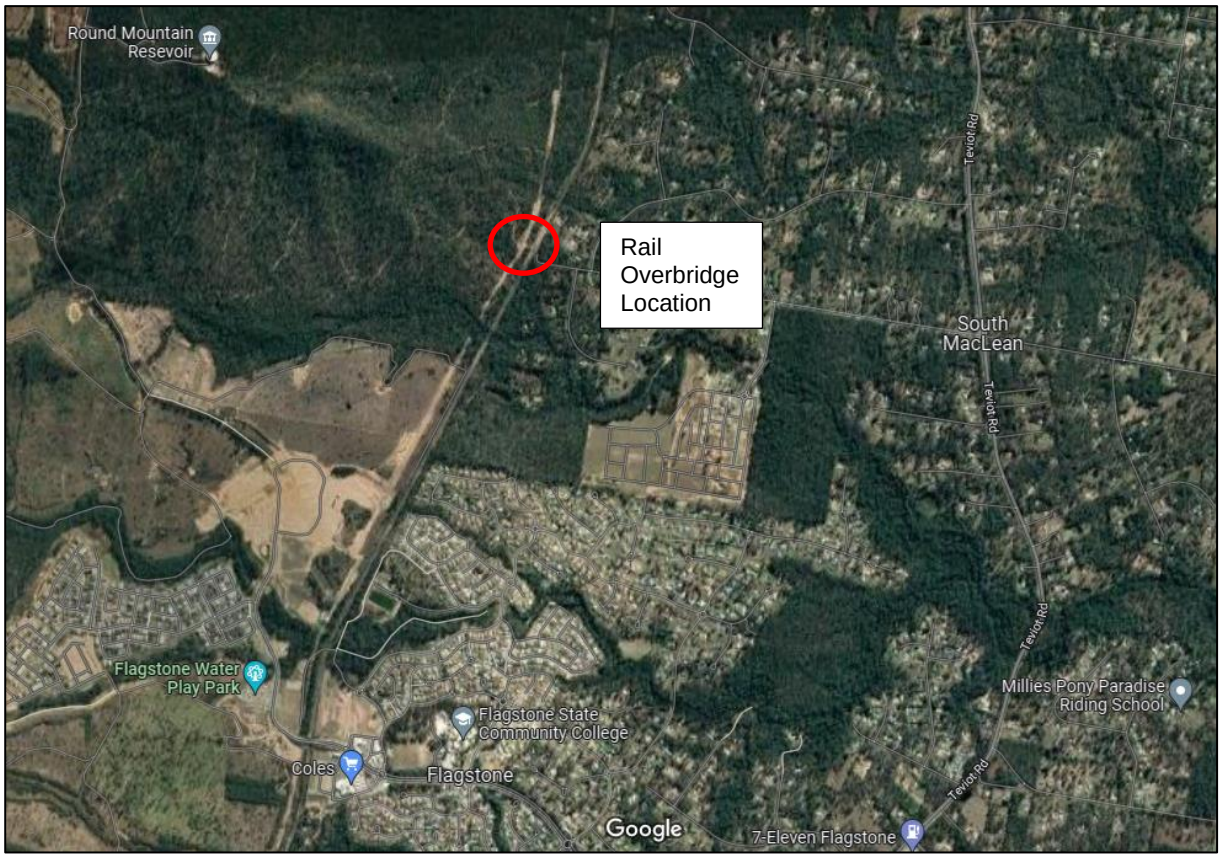



*Figure 1: Locality Plan*

# 2. Relevant Standards and Guidelines

The key standards and guidelines used in the design of this bridge include:

- TMR Design Criteria for Bridges and Other Structures (February 2021)
- ARTC Track & Civil Code of Practice
- QR Specifications
- AS5100:2017 Bridge Design
- AS1170.2:2021 Part 2: Wind Loads
- AS1170.4:2007 Part 4: Earthquake Loads; and
- AS2159:2009 Piling – Design and Installation.

# 3. Relevant Design Documentation

The key design documentation referenced in the design of this bridge include the following:

- New Beith Bridge Feature Screen Shop Drawings (NEW-BEITH-BRIDGE_SHOP-DRAWINGS_REV-A) (November 2024) (refer Appendix C)
- Geotechnical Investigation Report Rail Bridge Crossing Mountain Ridge Road, New Beith (J001800-003-R-Rev0) (March 2023) (refer Appendix D); and
- Additional Geotechnical Investigation Rail Bridge Crossing Mount Ridge Road, New Beith (J002267-001-L-Rev0) (June 2024) (refer Appendix D).

# 4. DTMR Standard Specifications

The works shall be in accordance with the DTMR for Roadworks and Bridgeworks, where required. These documents can be downloaded from the DTMR website:

https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Specifications

Relevant specifications applicable to this Contract are outlined below.

- MRTS01 Introduction to Technical Specifications (March 2024)
- MRTS04 General Earthworks (June 2023)
- MRTS06 Reinforced Soil Walls (July 2024)
- MRTS14 Road Furniture (July 2024)
- MRTS16 Landscape and Revegetation Works (July 2017)
- MRTS27 Geotextiles (Separation and Filtration) (November 2020)
- MRTS28 Contractor's Site Facilities and Camp (November 2019)
- MRTS45 Road Surface Delineation (July 2023)
- MRTS50 Specific Quality System Requirements (November 2022)
- MRTS51 Environmental Management (July 2024)
- MRTS52 Erosion and Sediment Control (November 2021)
- MRTS56 Construction Surveying (March 2022)

- MRTS62 Bridge Substructure (November 2023)
- MRTS70 Concrete (July 2022)
- MRTS71 Reinforcing Steel (March 2023)
- MRTS72 Manufacture of Precast Concrete Elements (July 2019)
- MRTS73 Manufacture of Prestressed Concrete Members and Stressing Units (July 2019)
- MRTS75 Supply and Erection of Prestressed Concrete Girders (November 2018)
- MRTS77 Bridge Deck (July 2019)
- MRTS78 Fabrication of Structural Steelwork (November 2020)
- MRTS78A Fabrication of Structural Stainless Steelwork (November 2020)
- MRTS81 Bridge Bearings (November 2020)
- MRTS82 Bridge Deck Expansion Joints (July 2021)
- MRTS83 Anti-Graffiti Protection (November 2019)
- MRTS84 Deck Wearing Surface (July 2019)
- MRTS170 Public Utilities in Road Projects Site Works (July 2023); and
- MRTS171 Public Utilities in Road Projects Principal Contractor Responsibilities (July 2023).

# 5. Design Description

## 5.1 Design Development

The design was developed during discussions with Frasers, the civil designers PeakUrban with input from ARTC, LCC and DTMR. It was determined that the ultimate solution would be a bridge that spanned over the current and future railway corridors, with a pier support that straddled the existing railway corridor boundary. The resultant spans of over 30m required use of Super-T girders.

## 5.2 Structural Description

The structure is a 2 span Super-T bridge with an overall length of 66.1m. The superstructure consists of seven (7) 2400mm wide x 1825mm deep Super-T girders with a 200mm deep reinforced concrete deck. The carriageway is 10m wide and carries a single 3.5m wide lane of traffic in each direction, with 1.5m wide shoulders on each side. 1500mm high barriers separate the road carriageway from a 3.15m shared user path provided on the northern side of the bridge, and a 1.5m footway provided on the southern side of the bridge. 345mm wide kerbs with 3000mm high screens are provided on each side of the structure. There is a two-way crossfall (3%) on the carriageway, a one-way (2.5%) crossfall towards the carriageway on the northern shared user path, and a one-way (2%) crossfall towards the carriage on the southern footway. The deck wearing surface is a minimum of 70mm (60mm DWS + 10mm waterproof membrane).

The substructure consists of a 1m wide pier integral with the superstructure. The pier wall is located at the midspan of the bridge and is founded on a pad footing. The abutments consist of an abutment headstock supported on seven (7) columns founded on a pad footing. Reinforced earth walls will retain the abutment fill material. The girders are simply supported by laminated elastomeric bearings at the abutments.

### 5.2.1 Provision for Services

Two (2) 125mm diameter (nominal) HV conduits have been shown in the northern shared user path for power, lighting, and communications. One (1) water service and eight (8) additional 125mm nominal service conduits have also been allowed for in the northern shared user path.

With regards to existing services in the vicinity of the bridge, an existing Telstra service has been identified. This is expected to be relocated prior to construction of the bridge. An existing sewer has also been identified within close proximity of the Abutment A footing. The location of the Abutment A pad footing was designed to prevent any new loading from the bridge structure acting on the existing sewer service.

## 5.3 Design Changes

Changes between Fixing and Concept (15%) Design are as shown in Table 1.

*Table 1: Changes between Fixing and Concept (15%) Design*

| Item | Details |
|---|---|
| Bridge deck width | The original proposal included a separate 3.0m wide cycleway and 2.0m wide footway. These has been replaced by a 2.5m wide shared path |
| Bridge deck live load | HLP320 has been included as a design live load following comments from LCC |

Changes between Concept (15%) and Preliminary Design (50%) are as shown in Table 2.

*Table 2: Changes between Concept (15%) and Preliminary (50%) Design*

| Item | Details |
|---|---|
| Southern footway | A footway was added to the southern side of the bridge following comments from LCC. The overall bridge deck width was increased to 16.34m and a seventh Super-T girder was added |
| Barrier and kerb configuration | The barriers have been relocated in order to separate the northern shared user path and southern footway from the road carriageway. A kerb and electrification screen have been provided along the sides of the bridge for pedestrian/cyclist safety |
| Abutment & pier pad footings | The founding level of the pad footings at the abutments and pier have been updated based on this information provided in the geotechnical report. The assumed level of the sandstone is 2m deeper than initially assumed. It is noted that the supplied geotechnical investigation report does not provide the information directly at the bridge and therefore the foundation levels have been placed on hold. |
| Abutment A pad footing | The geometry of the Abutment A pad footing has been updated in order to avoid an existing sewer main that was identified as part of the Preliminary (50%) Design |

Changes between Preliminary Design (50%) and Substantial Design (85%) are as shown in Table 3. It should be noted that pitt&sherry have not received review comments on the Preliminary Design (50%) stage to date.

*Table 3: Changes between Preliminary (50%) and Substantial (85%) Design*

| Item | Details |
|---|---|
| Abutment & pier pad footings | Updated geotechnical information has been provided to confirm the founding levels of the pad footings at the abutments and pier |
| Electrification screens | Electrification screen panels have been changed to HDG steel instead of powder coated aluminium due to capacity issues with the aluminium panels |
| RSS Walls | Alignment and extent of RSS walls has been confirmed by the civil designers. |
| Abutment columns sleeve | A 900mm diameter nominal sleeve around the abutment columns has been provided to eliminate the transfer of loads through the ground material being resisted by the RSS walls |
| Footpath & SUP surfacing levels | The surface level for the footpath and the SUP have been raised to bring the barrier down to the required minimum value and reduce the tunnelling effect of having a barrier that is too high. This has resulted in an increase of the dead load on the structure so to minimise this effect polystyrene void former is now shown. |

Changes between Substantial Design (85%) and Final Design (100%) are as shown in Table 4. It should be noted that pitt&sherry received PE review comments following the submission of the Detailed Design (85%).

*Table 4: Changes between Substantial (85%) and Final (100%) Design*

| Item | Details |
|---|---|
| Abutment footings | Additional geotechnical investigations (i.e. test pits) were conducted to confirm the depth of the very low strength sandstone across the width of the proposed bridge location, in order for the pad footings to be raised to reduce the construction footprint. Also, additional survey on the existing sewer main was conducted to locate the service.<br>The survey information found that the sewer main intersected the Abutment A pad footing based on the location proposed in the 85% Detailed Design. As a result, the pad footing was slightly raised (noting the underside of the pad footing remains below the existing sewer main) and was shifted forward longitudinally to avoid the existing sewer main.<br>Likewise, the Abutment B footing was shifted to match this configuration. The footing was also raised based on the additional geotechnical information. |
| Pier footing | Additional geotechnical investigations (i.e. test pits) were conducted to confirm the depth of the very low strength sandstone across the width of the proposed pier location. It was found that the height of the very low strength sandstone varied along its length. In order to reduce the construction footprint, the footing was raised and stepped in the middle. The footing remains buried in the very low strength sandstone. |
| Pier headstock | The width of the pier headstock has increased from 1500mm to 2000mm as a SiD consideration to improve safety as well as the ease of constructability. The width proposed in the 85% Detailed Design only allowed a 100mm ledge to temporarily land the girders on the pier headstock and would have required temporary props or supports until the insitu stitch pour is completed. The increased width allows a 350mm ledge and removes the requirements for temporary propping during construction. |
| Electrification screen | The height of the screens on the outside bridge kerbs has been increased from 2400mm to 3000mm from the highest level of the SUP slab / footpath slab. The screen openings remain as 25mm x 25mm, which classifies the screen as an anti-throw screen. Given that the existing rail line does not have any electrical lines, an anti-throw screen will be adequate at this stage. However, should the future QR passenger railway line be constructed, the screens will need to be replaced with electrification screens with 8mm x 8mm openings. |
| Train impact risk assessment | Following an update in the ARTC design requirements, a risk assessment has been carried out for potential train impact on the centre pier in particular and to confirm the impact loads and requirements. |
| Earthquake design requirements | Following an update in the ARTC design requirements for earthquake effects, the design of the bridge was checked and updated per the latest requirements. The abutment columns were increased from 750mm to 1000mm diameter, and the width of the pier footing was increased from 4000mm to 4500mm. Additional changes to the reinforcement were also incorporated as appropriate. |
| Bridge feature screen | The Landscape Architect (Urbis) provided details around the bridge feature screen along the Shared User Path (SUP) and footpath on the bridge. The feature screen consists of stainless steel 48.3ø CHS sections, powder coated to have a similar appearance to weathering steel. The CHS sections are spaced with a 28mm clear gap and vary in height (1000mm to 3000mm) along the bridge to create a wave effect. The anti-throw screen will be retained, with the CHS sections installed in front to cover it.<br>Due to the CHS sections being installed on the inside face of the anti-throw screen, the overall width of the footpath (between the traffic barrier and the pedestrian rail) is reduced from 1500mm to 1400mm, to allow for the 80mm clearance between the pedestrian railing and screen in accordance with the requirements in AS5100:2017. |

# 6. Design Parameters

## 6.1 Design Loading

All design loads for the design of the bridge are in accordance with Australian Standard AS5100.2:2017 Bridge Design and are summarised in the following sections.

### 6.1.1 Dead Load and Superimposed Dead Load

Dead loads and superimposed dead loads are applied in accordance with AS5100.2:2017 Section 6. Unit weights are summarised in the table below.

*Table 5: Dead Load and Superimposed Dead Load Unit Weights*

| Element | Unit Weight |
|---|---|
| Reinforced Concrete | 25kN/m$^3$ |
| Prestressed Concrete | 26kN/m$^3$ |
| Structural Steel | 77kN/m$^3$ |
| Deck Wearing Surface | 22kN/m$^3$ |
| Soils and Fills | 22kN/m$^3$ |

The dead load unit weights are nominal and generally slightly conservative. The concrete rate allows for up to 300kg/m$^3$ of cast-in reinforcement.

Structure dead loads and superimposed dead loads are treated separately in accordance with AS5100.2:2017 Clauses 6.2 and 6.3. The applied load factors are in accordance with AS5100.2:2017 Tables 6.2, 6.3 and 6.4.

### 6.1.2 Road Traffic

**Road traffic design vehicles**

Road traffic design vehicles are W80, A160, SM1600 and HLP320 in accordance with AS5100.2:2017 Clauses 7.2 and 7.3.

**Lane Configurations and Factors**

Three (3) standard design lanes of 3.2m width have been assessed in accordance with AS5100.2:2017, based on a road carriageway of 10m width. A 3.15m shared user path provided on the northern side of the structure and a 1.5m footway provided on the southern side of the structure are both separated from the road carriageway by a 1500mm high x 500mm wide barrier.

Design lane configurations and lane factors have been applied in accordance with AS5100.2:2017.

**Dynamic Load Allowance**

Dynamic loads for the design vehicles are calculated in accordance with AS5100.2:2017 Clause 7.7.

**Horizontal Forces**

Braking loads are in accordance with AS5100.2:2017 Clause 7.8. Centrifugal loads are omitted from the design as the bridge has a straight carriageway.

**Fatigue Load**

Fatigue loading is in accordance with AS5100.2:2017 Clause 7.9.

### 6.1.3 Pedestrian Traffic

As the pedestrian and cyclist paths are attached to the road bridge superstructure, a load intensity of 2kPa has been adopted for both the northern shared user path and southern footway for a loaded area of greater than 100m$^2$, in accordance with AS5100.2:2017 Clause 8.1(a).

Provision will be made for a light vehicle to access the footpath and cycleway in accordance with AS5100.2:2017 Clause 8.1(c). The light vehicle load consists of a concentrated load of at least 20kN on an area 200mm x 200mm, with no dynamic allowance.

### 6.1.4 Minimum Restraint Load

Minimum lateral restraint of 500kN is applied to the centreline of the bridge superstructure in accordance with AS5100.2:2017 Section 10.

### 6.1.5 Collision Load on Superstructure

The requirements of ETS-09-00 stipulate that for a new bridge over a rail track carrying double stacked rolling stock the superstructure is to be designed for a load of 500kN for any portion of the structure within 7m vertically, with this value proportionately reduced between 7 and 12m height. Minimum lateral restraint of 500kN is applied to the centreline of the bridge superstructure in accordance with AS5100.2:2017 Section 10.

Given that the minimum clearance to the structure is 7.9m for the future QR railway provisions, this has been used to calculate an impact load of 410kN.

### 6.1.6 Collision Load to Supporting Elements

Collision load requirements to the abutment and pier are derived in accordance with in QR Civil Engineering Technical Requirement CIVIL-SR-012. As the exact location of the future QR passenger railway line has not been defined, the bridge supports, including the abutments and the pier will be designed to allow for the centreline of the track to be at least 5m away from the support.

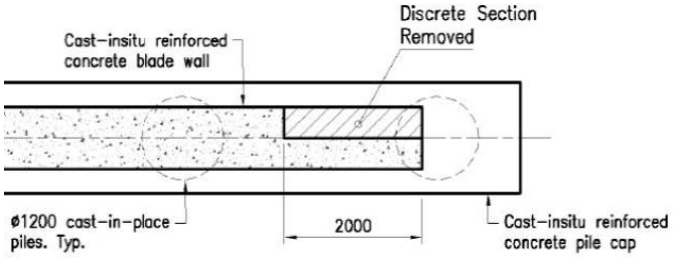
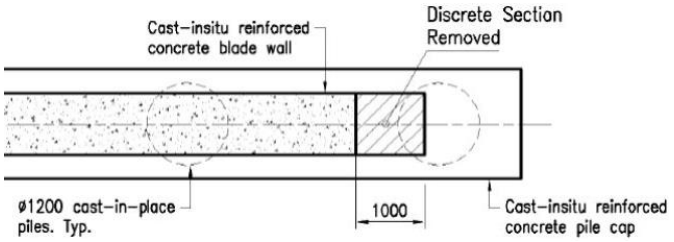
The following parameters from CIVIL-SR-012 are used for deriving the collision loads:

- Clause 4.1 Class of Structure: Class B (road overbridge)
- Clause 4.2 Zone of Structure: Zone 3 (support is more than 3.0m and less than 5.0m from the track centreline)
- Clause 4.3 Speed Category: Speed Category 1 (51km/hr to 160km/hr – for passenger trains as the operating speed cannot be defined at this stage)
- From Clause 5.2.3, for Class B structure in Zone 3 speed category 1:
    - From CIVIL-SR-012 Clause 5.2.3, for a Class B structure in Zone 3 and Speed Category 1, collision loads provided in CIVIL-SR-012 are relevant for AS5100.2:2004. Collision loading shall be designed in accordance with the requirements of AS5100.2:2017 Clause 11, with the following load summary:
        - Designed to withstand equivalent collision loads of 4,000kN parallel to the track and 1,500kN perpendicular to the track, applied horizontally at 2.0m above top of rail over a length of 2.0m by 0.5m

- Any part of the structure specified in AS5100.2:2017 Clause 11.4.1, including the superstructure, within 10m horizontally and 5m vertically of the centreline of the nearest rail track, shall be designed to resist as minimum collision load of 500kN.

QR document CIVIL-SR-012 Section 5.0 states “All supports must be able to carry the permanent and applied loads from the superstructure with half of their cross-section rendered ineffective at the collision point.” The following table documents how this clause has been applied to the blade wall design.

*Table 6: Blade Wall Design*

| Option | Diagram | Discrete Section Length | Application Location |
|---|---|---|---|
| Half section removed over discrete section length |  | 2.0m or 2 times the width of the blade wall. (2.0m adopted) | Anywhere along the blade wall |
| Full section removed over discrete section length |  | 1.0m or the width of the blade wall. (1.0m adopted) | Either end of the blade wall |

### 6.1.7 ARTC Design Requirements

ATRC's CoP – Structures Section 9 (Version 3.7 2019) was current at the project's initiation. The CoP includes detailed collision loading requirements that relate to the project.

Clause 9.2.1 refers to AS5100 for bridge design and design of structures required to resist rail traffic loads.

In April 2023, during detailed design of the project, ARTC approved a new Engineering Standard; ETS-09-00 – Section 9. ETS-09-00 replaces the CoP (Structures Section 9). Following the release of ETS-09-00, ARTC provided guidance on the calculation of collision loading to the industry through various ARTC workshops.

Clause 9.2.4.1 item 2 outlines the following with respect to calculation of head on collision loading:

2. A risk assessment acceptable to ARTC shall be carried out to determine the requirements for protection of bridge piers, abutments and the ends of the through girder, arch or truss.

   The head-on collision loads on a deflection wall can be much higher than minimum collision loads of 4,000kN parallel to rails and 1,500kN normal to rails specified in AS 5100.2. Designer shall use rational method, taking into consideration train axle configuration, train mass, train speed, car stiffness (K = 1200kN/m [Note]), track alignment, etc. for determination of collision loads. These loads shall not be less than minimum collision loads specified in AS 5100.2.

Using this method and assessing for the current configuration it was shown that there is no substantial risk of a head on collision with the pier. With the track located approximately 15m away from the pier, at the prescribed angle of derailment and rate of deceleration the assessment shows that a derailed train would stop before colliding with the pier itself. Utilising this assessment, the load on the pier would be in accordance with AS5100.2 for supports greater than 10 but less than 20m from the rail track centreline, which results in a design collision load of 1,500kN. As this figure is less than the requirements under the QR provisions listed above, the QR design loads are the critical loads and have been used in designing the pier.

The Rail Derailment and Collision Risk Assessment Memo (Ref: T-P.22.0175-STR-MEM-0001) is included in Appendix H.

Clause 15.3 of AS5100.1 requires that a pier be either frangible or protected from a head on impact from a train by provision of a collision wall, in addition to the requirement for the pier to be designed for rail impact loads as defined above. The requirements shown above for the allowance of the pier to be able to accommodate an impact with a discrete section of wall removed is intended to replicate a frangible pier, i.e. the pier being able to partially break away under a train impact.

This is considered to be acceptable for this location as the risk of impact is low due to the following factors:

- Single track
- Minimal train movements with current Master Train Plan showing 14XPT's and 54 freight trains per week. Applying a growth rate of 1.4% per year in 100 years' time this would grow to approximately 220 freight trains per week
- Track is straight for at least 500m in either direction of the bridge location
- Track is not high speed in this location (speed at this location has not been confirmed)
- Track is well maintained in good condition; and
- No history of derailments at this location.

Taking consideration of the above, the risk of derailment is low to negligible. This assessment would have to be revisited should the future QR passenger railway lines be installed and if required deflection walls can be provided during construction of the future railway lines.

### 6.1.8 Barrier Load

Traffic barriers have been defined following the procedure in Queensland Rail Official Specification: Civil – Road/Rail Interface Barriers (MD-20-40) Clause 2.5 (previously CIVIL-SR-007 Clause 7) to the following requirements:

- Rail Status HFP (high frequency passenger lines with >100 passenger trains per week) (ref: Table 1); and
- Road Status 2C (Trunk roads or Collector roads; 60-80km/h design speed; 1,000-15,000 vehicles/day) (ref: Table 4).

This results in 1.5m high medium containment barrier (ref: Table 7).

As per MD-20-40 Table 8, the barrier is to be designed for a transverse load of 600kN at an effective height of 1.5m. These design parameters align with AS5100.2:2017 Clause 12.2.2.

A summary of the traffic barrier loading is presented below.

*Table 7: Traffic Barrier Design Load and Contact Length*

| Barrier Performance Level | Ultimate Transverse Outward Load | Ultimate Longitudinal or Transverse Inward Load | Vehicle Contact Length for Transverse and Longitudinal Load | Ultimate Vertical Downward Load | Vehicle Contact Length for Vertical Load | MASH Test Level |
|---|---|---|---|---|---|---|
| Medium | 600kN | 200kN | 2.4m | 300kN | 12m | TL5 |

### 6.1.9 Lateral Earth Pressures and Surcharge

Lateral earth pressures have been calculated in accordance with AS1597.2:2013 Clause 3.3. At-rest pressure ($K_o$) has been used for the design of the abutment walls and wingwalls, where small movements are anticipated.

Surcharge loads from road traffic have been calculated in accordance with AS5100.2:2017 Clause 14.2.

### 6.1.10 Earthquake Effects

ARTC ETS-09-00 Clause 9.3.5 specifies that the Bridge Earthquake Design Category (BEDC) of a new bridge shall be BEDC-4 (bridges that are essential to post-earthquake recovery), unless otherwise approved by ARTC based on a site-specific cost benefit analysis. A summary of the adopted earthquake effect parameters is presented below.

*Table 8: Earthquake Load Summary*

| Earthquake Design Parameter | Design Value | Standard Reference |
|---|---|---|
| Annual Probability of Exceedance | 1/2000 | AS5100.2:2017 Table 15.6 |
| Probability Factor ($k_p$) | 1.70 | AS1170.4:2007 Table 3.1 |
| Hazard Factor (Z) | 0.09 | AS1170.4:2007 Figure 3.2(F) |
| Design Ductility Factor (μ) | 2.00 | AS5100.2:2017 Table 15.9.2 |

### 6.1.11 Flood Load

The bridge is considered to be outside the $Q_{2000}$ flood level. Hence, no assessment has been made for flood loading.

### 6.1.12 Wind Load

Wind loads are calculated in accordance with AS5100.2:2017 Clause 17 and AS1170.2:2021. Relevant wind parameters are presented below.

*Table 9: Wind Load Summary*

| Parameter | ULS Value | SLS Value |
|---|---|---|
| Average Return Interval | 2000 years | 20 years |
| Geographical Location | Region B | Region B |
| Terrain Category | 2 | 2 |
| Shielding | N/A | N/A |
| Design Wind Speed | 63 m/s | 38 m/s |
| $C_L$ | 0.75 | 0.75 |

### 6.1.13 Thermal Effects

Thermal effects are applied in accordance with AS5100.2:2017 Clause 18. Information used in determining the thermal effects applied to the bridge superstructure are listed in the table below.

*Table 10: Thermal Effect Summary*

| Parameter | Value |
|---|---|
| Location | Inland (>20 km from the coast) |
| Height Above Sea Level | ≤1000m |
| Region | Region II – South of 22.5°S |
| Shade Air Temperature | 45°C to -5°C (including adjustments) |
| Average Bridge Temperature | 49°C to 3°C |

### 6.1.14 Shrinkage and Creep

The influence of shrinkage and creep effects in the substructure are calculated after a minimum of 60 days has elapsed after casting the girders.

### 6.1.15 Earthing, Bonding and Stray Current Measures for Future Electrification of Rail Lines

It is understood that electrified rail lines may be added in the future and that equipotential bonding of the bridge structural elements and barriers is required in accordance with the relevant Australian Standards (particularly AS/NZS 3000) and TMR design guidance.

A review of the TMR Design Criteria for Bridges and Other Structures has been undertaken and no specific earthing and bonding requirements were identified. Other sources of information regarding earthing and bonding were referenced in order to progress the design.

MTM Engineering Standard L1-CHE-STD-0011 1500VDC Overhead Wiring System references that all overhead support installations where applicable shall require a detailed earthing and bonding report which identifies safety risks, and their mitigations as far as is reasonably practicable (refer Section 10.19). As such the drawings note that OHW wiring shall not be attached to any overbridge. If so, there is no structural requirement as per MTM standard L1-CHE-STD-010 Appendix B.

Clearance to overbridge is proposed to be a minimum of 7.9m in accordance with QR requirements, which is expected to be sufficient for future Overhead Line Equipment (OLE) to pass underneath the overbridge without requiring a structural connection to the bridge.

Given that the New Beith Rail Overbridge design satisfies all above conditions, the Overhead Wiring can be free running under the bridge without any contact to the bridge itself.

For stray current corrosion mitigation, reinforcing in concrete adjacent to the future electrified track (i.e. Span 1 only) is to be made electrically continuous by welding at a minimum of 2 metre square grid points in the overbridge superstructure & substructure for electrical continuity as per AS 2832.5 Cathodic protection of metals, Part 5: Steel in concrete structures.

The cast in-situ diaphragm at the pier headstock will connect the beams with the central pier, and this connection shall be made electrically continuous through the piles to earth.

Stray current testing points (LPI EP2M12 Earth-bridge or similar), are required at designated locations on the bridge (refer to the design drawings) with adequate accessibility for routine inspection and maintenance.

The fence/handrail can be assessed in the future when the railway and OHLE is constructed, and mitigating measures can be implemented at that point in time.

The bridge configuration allows 7.9 m clearance; therefore, no structural connections are anticipated to be required between the future OLE and the bridge. With regards to stray current mitigation measures, electrical continuity will be provided through welded connections to reinforcement. Similarly, electrical continuity between the superstructure and substructure will be provided through the reinforcing bar connections in cast in situ diaphragms.

## 6.2 Load Combinations

Load combinations are in accordance with AS5100.2:2017 Clause 23 for the ultimate and serviceability limit states.

## 6.3 Matters for Resolution

A number of matters in AS5100:2017 requires resolution. This table has been reproduced in Appendix A with statements inserted for each item. A summary of the key matters that will affect this design are outlined in the table below for acceptance:

*Table 11: Matters for Resolution*

| Item No. | Issue | Statement |
|---|---|---|
| **AS5100.1:2017 Scope and general principles** | | |
| 2 | Acceptance of the bridge experience of a Professional Engineer (see Clause 4.6) | RPEQ or equivalent requirement<br>ARTC Accreditation for Bridge Design under RIW system |
| 9 | Approval of the process for risk ranking and risk reduction (see Clause 9) | SiD to be added in Appendix F |
| 18 | Specification of road bridge carriageway widths (see Clause 13.4) | Road bridge carriageway widths to be in accordance with Austroads Guide to Road Design |

| Item No. | Issue | Statement |
|---|---|---|
| 19 | Determination of horizontal clearances to substructure components (see Clause 13.6 and 13.8) | Horizontal clearances to substructure components to be 3.5m minimum setback from the railway track centrelines, in accordance with QR Standard Drawing QR-C-S3306. |
| 20 | Specification of minimum vertical clearance (see Clause 13.7, 13.8 and Table 13.7) | Department of Transport and Main Roads (TMR) Guide for Development in a Railway Corridor and QR Standard Drawing QR-C-S3306 outlines that the vertical clearance of a proposed development is to be a minimum 7.9m above the railway track. The clearance of the bridge has been set to mee this requirement, noting that it is more onerous than the requirements for clearance of ARTC Rollingstock Outline F for double stacked freight trains. The rail level for the future QR railway is based on the existing ARTC railway as no further information is available at this time. |
| 22 | Specification of the clear walkway width on road bridges (see Clause 13.10) | Clear walkway width available for use by pedestrians shall be 1.8m minimum. The minimum width of the pathway on the northern side of the bridge is 2.5m |
| 26 | Requirement for traffic barrier where the posted speed is 60 kph or less with a 300 mm min. height non-mountable kerb (see Clause 14.2) | Not Applicable. AS5100 provisions utilised for LCC controlled road over the bridge deck. |
| 30 | Approval or nomination of traffic barrier performance levels [see Clause 14.5.1, Items (b) and (c)] | In accordance with QR Civil Engineering Technical Requirement CIVIL-SR-007 “Design and Selection Criteria for Road/Rail Interface Barriers”, the nominated traffic barrier performance level is ‘Medium’ and the barrier height on the proposed bridge design is 1500mm |
| 34 | Determination of the maximum height of the top of the sloping barrier face (see Clause 14.6.1) | In accordance with QR Civil Engineering Technical Requirement CIVIL-SR-007 “Design and Selection Criteria for Road/Rail Interface Barriers”, the nominated traffic barrier performance level is ‘Medium’ and the barrier height on the proposed bridge design is 1500mm |

| Item No. | Issue | Statement |
|---|---|---|
| 39 | Approval for other than clear span between abutments for structures over rail (see Clause 15.3.2) | Clear span has been provided over existing railway corridor between Abutment B and central pier.<br>Clear span has been provided over future railway corridor between Abutment A and central pier.<br>DTMR Pre-Lodgement Advice TMR Reference TMR22-035974 (refer Appendix G) Item 7 provides support in principle for location of pier between existing and future railway corridors:<br>“advice is provided that a central bridge pier at the common boundary between the existing and future railway corridor, is supported in-principle, subject to meeting the requirements of the relevant railway managers (Queensland Rail and ARTC), including their standards, and so as to not compromise the future railway corridor. In relation to Queensland Rail please contact the SEQ Asset Manager Richard Nettleton on telephone number 3072 7117 or at 0408 163 392 in relation to this matter. A Queensland Rail project manager may need to be assigned to this task in which case you may need to enter into an agreement with Queensland Rail. TMR's Rail Planning Team will undertake a detailed review of the exact location of the bridge and its supporting infrastructure once the applicant has undertaken a detailed survey and provided more detailed RPEQ certified bridge designs.” |
| 46 | Approval not to use deflection walls in the specified locations (see Clause 15.3.6) | Awaiting TMR/QR/ARTC advice<br>Refer to Paragraph 4.1.6 above for justification of not providing a deflection wall |
| 47 | Specification of the length of a deflection wall (see Clause 15.3.6) | Not applicable subject to acceptance of not using a deflection wall |
| 52 | Requirements for pedestrian protection barriers over electrified rail (see Clause 16.3) | Design of protection screens to be in accordance with QR specification CIVIL-SR-008 |
| 53 | Requirements for protection screens (see Clause 16.4) | Design of protection screens to be in accordance with QR specification CIVIL-SR-008 |
| 54 | Minimum height of a protection screen [see Clause 16.4(c)(i)) | Electrification screens are required on all footbridges over electrified track. The screens are required to extend a minimum 1.8m above the highest standing surface<br>Height of protection screens to be in accordance with QR specification CIVIL-SR-008<br>Height of the screens has been increased to 3m above the adjacent surface.<br>To be approved by relevant authority |
| 57 | Requirement for drainage of road and rail bridges (see Clause 18.1) | A two-way crossfall (grade 3%) from the centreline of the bridge will permit drainage of the structure. Longitudinal fall will allow water to drain off structure. Overland flow will be carried by the shoulders. |

| Item No. | Issue | Statement |
|---|---|---|
| **AS5100.2:2017 Design Loads** | | |
| 14 | Specification of the ultimate design load, load distribution length and minimum effective height for special barrier performance levels (Clause 12.2.2 and 12.2.3) | The nominated traffic barrier performance level is 'Medium'. Minimum effective height of traffic barrier is 1500mm |
| 18 | Bridge earthquake design category classification (Clause 15.4.1) | BEDC-4 – Bridges and associated structures that are essential to post-earthquake recovery, as specified by the relevant authority, and major bridges whose operation is essential to economic viability at state or national levels |
| **AS5100.3:2017 Foundation and Soil-Supporting Structures** | | |
| 3 | Supervision of site investigation (see Clause 1.6) | In accordance with AS1726 |
| 4 | Extent and coverage of preliminary and design investigation (see Clause 1.6) | In accordance with AS5100.3:2017 |
| 5 | Minimum number of boreholes (see Clause 1.6.2) | 2 bores per pier, 2 per abutment (i.e. 6 total bores) |
| 6 | Selection of the geotechnical strength reduction factors (see Clause 2.3.5) | In accordance with AS5100.3:2017 |
| 11 | Requirements for prevention of corrosion of reinforcement (see Clause 4.3) | The requirements for design for durability of concrete components of foundations and soil-supporting structures given in AS5100.5 shall apply |
| 17 | Requirements for material and construction for shallow foundations (see Clause 5.5) | Structural design and detailing for pad foundations shall be in accordance with AS5100.3 and AS5100.5 |
| 24 | Design requirements for durability of anchorages and anchorage components (see Clause 6.4) | In accordance with AS5100.3 |
| 25 | Requirements for material and construction for anchorages (see Clause 7.4) | In accordance with AS5100.3 |
| 26 | Requirements for method of installation and on-site assessment tests for anchorages (see Clause 7.6.1) | In accordance with AS5100.3 |
| 27 | Requirements for anchorage suitability tests (see Clause 7.6.3) | 2% of anchorages to be tested in accordance with AS5100.3 |
| 28 | Requirements for anchorage suitability tests (see Clause 7.6.3) | Refer Item 27 |

| Item No. | Issue | Statement |
|---|---|---|
| 29 | Requirements for anchorage acceptance tests (see Clause 7.6.3) | In accordance with AS5100.3 |
| 30 | Requirements for the design of retaining walls and abutments (see Clause 8.1) | In accordance with AS5100.3 |
| 31 | Acceptance of geotechnical strength reduction factor for retaining walls and abutments (see Clause 8.3.5) | In accordance with AS5100.3 |
| 32 | Design requirements for durability or retaining walls and abutments (see Clause 8.3.5) | In accordance with AS5100.3 |
| 33 | Requirements for structural design and detailing for retaining walls and abutments (see Clause 8.4) | In accordance with AS5100.3 |
| 34 | Requirements for materials and construction for retaining walls and abutments (see Clause 8.5) | In accordance with AS5100.3 |
| 35 | Approval of drainage systems for retaining walls and abutments (see Clause 8.6) | Drainage systems for abutments and wingwalls will be detailed on design drawings |

# 7. Verification and Reviews

## 7.1 Analysis Software

The analysis software used for the design of this bridge are outlined below. At the time of design, the latest version of each individual software was used as applicable.

- MIDAS Civil
- SpaceGass
- Concise Beam
- Structural Toolkit; and
- CHECKSTEEL.

## 7.2 Internal Reviews

All internal reviews relevant to this issue have been carried out.

### 7.2.1 Designer Accreditation

The Design Documents have been prepared by suitably qualified and experienced personnel and have been reviewed and verified by the following personnel complying with ARTC competencies.

*Table 12: ARTC Designer Accreditation*

| Personnel | Project Role | ARTC Competency | RIW Number |
|---|---|---|---|
| David Crowe<br>RPEQ 09250 | Project Verifier/Approver (Structures) | Designer (Structures) | 20-00131229 |
| Reza Salamy<br>RPEQ 13816 | Project Verifier (Structures) | Designer (Structures) | 20- 00014595 |

## 7.3 Reviews

It should be noted that pitt&sherry did not receive review comments on the Preliminary Design (50%) stage. ARTC review comments were provided for the Substantial Design (85%) stage and Final Design (100%) stage.

Responses by pitt&sherry to the review comments received from ARTC and the PE (BG&E) are included in Appendix E. The Design Comment Sheet includes the findings of any assessment or review conducted between parties, comment status and/or reviewer acceptance of final outcome (i.e. reviewer final comments, if any).

# 8. Safety in Design

## 8.1 Safety in Design and Constructability Review (SIDR)

A Safety in Design assessment has been carried out and the register is included in Appendix F.

A Safety in Design workshop was held on 15th June 2023 and was facilitated by Adam Porter of Frasers Property Australian (FPA) and attended by Richard Sefton of FPA, David Crowe of pitt&sherry and Paul Kranitis of Pure Rail.

## 8.2 Design to Facilitate Safe Use and Maintenance

The principal method to address safety during maintenance is to reduce or eliminate maintenance requirements. This was a consideration during the Fixing Stage and continues to be in Detailed Design, and to date has resulted in the following design outcomes:

- Integral pier reduces maintenance requirements at the pier due to elimination of bearings and expansion joint; and
- Reinforced and precast concrete bridge components provide a superior structure from a maintenance perspective in comparison to other dominant materials used in bridge construction (e.g. steel).

# 9. Design Coordination

## 9.1 Design Integration

The design involves the integration of requirements incorporating civil design of the roadway, development requirements, urban design and requirements of the railway passing underneath.

### 9.1.1 Geometric and Roadworks

In general, the approach when developing the structural configuration has been to satisfy horizontal and vertical alignment requirements by providing sufficient structure width to incorporate road geometry, lane, and shoulder requirements. The structural levels have also been developed to account for the alignment requirements, which include crossfalls and longitudinal falls on the superstructure and substructure. Minimum clearance requirements have also been achieved. The end result is as shown on the Design Drawings.

### 9.1.2 Geotechnical

The substructure design has been developed for vertical and horizontal stability based on the information provided in the geotechnical report (J001800-003-R-Rev0) by Core Consultants Pty Ltd. The geotechnical report has been included in Appendix D.

Based on the three (3) boreholes taken as part of the geotechnical investigation, an assumed level for the very low strength sandstone has been adopted for the design. Further geotechnical investigations were undertaken by Core Consultants Pty Ltd to confirm the top of the very low strength sandstone below ground level (BGL). The test pit information is provided in the geotechnical report (J002267-001-L-Rev0).

The boreholes found very low strength sandstone 0.80m BGL, 1.10m BGL and 1.20m BGL at BHA (Abutment A), BHB (Pier 1) and BHC (Abutment B), respectively. Likewise, the test pits experienced refusal at 0.7m BGL, 1.3m BGL and 1.30m BGL at TPA (Abutment A), TPB (Pier 1) and TPC (Abutment B), respectively.

Therefore, the reduced levels (RL) for the very low strength sandstone are RL 44.4 at Abutment A and RL 46.6 at Abutment B. At Pier 1, the very low strength sandstone is at RL 47.4 on the northern side of the bridge, and RL 46.3 on the southern side of the bridge.

For the geotechnical assessment, the maximum ultimate (unfactored) bearing capacity is taken as 1.5MPa in accordance with recommendations provided in the geotechnical report. A geotechnical reduction factor ($\phi_g$) of 0.55 and 0.60 has been adopted for the abutment and pier foundations, respectively, based on inspection of the founding material by a suitably experienced geotechnical engineer prior to pouring blinding.

### 9.1.3 Hydraulics

There are no hydraulic considerations for this structure.

### 9.1.4 Landscape Design

The landscape design was completed by others (Urbis). The extent of the landscape design on the bridge includes the feature screen, which has been incorporated with the structural design, based on the information provided in the shop drawings (NEW-BEITH-BRIDGE_SHOP-DRAWINGS_REV-A). The shop drawings have been included in Appendix C.

The feature screen consists of stainless steel 48.3ø CHS sections, powder coated to have a similar appearance to weathering steel. The CHS sections are spaced with a 28mm clear gap and vary in height (1000mm to 3000mm) along the bridge to create a wave effect. The anti-throw screen will be retained.

An initial allowance of 2.0kN/m was allowed for the anti-throw screen in the bridge design. This allowance has been increased by 0.5kN/m to accommodate the additional weight of the feature screen.

### 9.1.5 Road & Footpath Lighting

There are no road and footpath lighting considerations for this structure.

## 9.2 Whole of Life Considerations

### 9.2.1 Design Life and Durability

The design life is defined in AS5100.1:2017 as: *"the period adopted in design for which a structure or structural element is required to perform its intended purpose with periodic maintenance and without replacement or major structural repairs."* The design life for the structures as per TMR Design Criteria for Bridges and Other Structures is outlined below.

*Table 13: Structure Design Life*

| Element | Design Life (years) |
|---|---|
| Bridge deck | 100 |
| Bridge girders | 100 |
| Bridge abutments & pier | 100 |
| Expansion joints | 40 |
| Rubber in expansion joints | 20 |
| Steel bridge traffic barrier, safety (electrification) screen and fencing | 50 |
| Bearings with provision for simple replacement | 40 |

The structure is located approximately 35km from the coast in the Logan City Council LGA, over the ARTC railway line. The project is thus located in a climatic zone classed in accordance with AS5100.5:2017 as temperate.

Therefore, a B2 exposure classification has been adopted for all structural elements above ground except for the underside (bottom face) of the deck slab. Since the deck slab is cast directly onto the Super-T girders and not subsequently exposed, a B1 exposure classification has been adopted in accordance with DTMR Design Criteria for Bridges and Other Structures Clause 3.12.3.1.

The structural members with surfaces in contact with the ground require a determination of the soil aggressiveness. Based on the information provided in the geotechnical report (J001800-003-R-Rev0) by Core Consultants Pty Ltd, 'mild' soil conditions have been suggested for buried concrete. Therefore, a B2 exposure classification has been adopted for all elements with surfaces in contact with the ground.

### 9.2.2 Maintenance Minimisation

Maintenance minimisation principles have been integrated throughout the design of the project, so that the ongoing maintenance of the designed elements will minimise lifecycle costs. Other whole of life considerations has included selection of materials for structural elements, detailing of bearings, structural form, and materials for protection screens.

The design consists of a new structure with a design life of 100 years with periodic maintenance and without replacement or major structural repairs. Given that the proposed location of the bridge crosses an existing ARTC railway corridor and a future QR railway corridor, the design intent was to minimise any replacement of structural elements to avoid future disruptions to the rail network. This has been achieved by incorporating an integral bridge pier which eliminates the need for bearings at the pier. Utilisation of reinforced and precast concrete bridge components provide a superior structure from a maintenance perspective in comparison to other dominant materials used in bridge construction (e.g. steel).

### 9.2.3 Maintenance and Access

Provisions for safe and efficient access to bridge abutments have been considered and implemented as follows:

- An inspection path outside of the railway corridor is provided in front of the abutment. Protection against falling will be provided by either extending the RE wall panels minimum 900mm above the path surface or provision of a handrail; and
- Access to the inspection path will be via walking up the batter slopes which are graded at maximum 1:3.

### 9.2.4 Future Provisions

The following future provisions have been considered in the design:

- Following the construction of the future QR passenger railway, the screens over span 1 will need to be replaced with suitable electrification screens. Electrification screens of 3000mm height and 8mm x 8mm openings have been considered
- Further assessment will be required during design of the future QR railway lines, particularly for their proximity to the pier and abutment A. This assessment will determine if collision walls are required to be installed; and
- Allowance has been made for electrical continuity of Span 1 girders and Pier 1 structural elements for future provision of an electrified QR railway that is to be located under Span 1.

# AS5100 – Matters for Resolution

Appendix A

pitt&sherry

| Item No. | Issue | Statement |
|---|---|---|
| **AS5100.1:2017 Scope and general principles** | | |
| 1 | Requirements for assessment of a bridge due to change in use (See Clause 2) | Not Applicable |
| 2 | Acceptance of the bridge experience of a Professional Engineer (see Clause 4.6) | RPEQ or equivalent requirement<br>ARTC Accreditation for Bridge Design under RIW system |
| 3 | Specification of a rail track as underground rail (see Clause 4.10) | Not Applicable |
| 4 | Approval of the use of alternative design methods and materials (see Clause 7) | Not Applicable |
| 5 | Specification of a shorter design life for ancillary elements (see Clause 8.2) | Not Applicable |
| 6 | Approval of non-linear method of analysis (see Clause 8.4) | Not Applicable |
| 7 | Approval to use post-installed fasteners in new construction (see Clause 8.8) | Not Applicable |
| 8 | Specification of special conditions and requirements for design (see Clause 8.9) | Not Applicable |
| 9 | Approval of the process for risk ranking and risk reduction (see Clause 9) | SiD to be added in Appendix F |
| 10 | Specification of bridge waterway requirements (see Clause 11.1) | Not Applicable |
| 11 | Specification of span and vertical clearances for watercraft (see Clause 11.1) | Not Applicable |
| 12 | Specification of alternative ARI for flood immunity and SLSs (see Clause 11.1 and Table 11.1) | Not Applicable |
| 13 | Specification of soffit level of the bridge relative to the flood immunity level (see Clause 11.1) | Not Applicable |
| 14 | Specification of the afflux and corresponding ARI (see Clause 11.1) | Not Applicable |
| 15 | Determination of the environmental requirements (see Clause 12) | Not Applicable |
| 16 | Specification of geometric requirements (see Clause 13.1 and 13.2) | Not Applicable |
| 17 | Specification of minimum dimensional clearance for bridges over navigable waterways (see Clause 13.3) | Not Applicable |
| 18 | Specification of road bridge carriageway widths (see Clause 13.4) | Road bridge carriageway widths to be in accordance with Austroads Guide to Road Design |

| Item No. | Issue | Statement |
|---|---|---|
| 19 | Determination of horizontal clearances to substructure components (see Clause 13.6 and 13.8) | Horizontal clearances to substructure components to be 3.5m minimum setback from the railway track centrelines, in accordance with QR Standard Drawing QR-C-S3306. |
| 20 | Specification of minimum vertical clearance (see Clause 13.7, 13.8 and Table 13.7) | Department of Transport and Main Roads (TMR) Guide for Development in a Railway Corridor and QR Standard Drawing QR-C-S3306 outlines that the vertical clearance of a proposed development is to be a minimum 7.9m above the railway track. The clearance of the bridge has been set to meet this requirement, noting that it is more onerous than the requirements for clearance of ARTC Rollingstock Outline F for double stacked freight trains. The rail level for the future QR railway is based on the existing ARTC railway as no further information is available at this time. |
| 21 | Superelevation and widening of the deck surface of a bridge on a horizontal curve (see Clause 13.9) | Not Applicable |
| 22 | Specification of the clear walkway width on road bridges (see Clause 13.10) | Clear walkway width available for use by pedestrians shall be 1.8m minimum. The minimum width of the pathway on the northern side of the bridge is 2.5m |
| 23 | Additional requirements for stairways (see Clause 13.11 and Table 13.11) | Not Applicable |
| 24 | Specification of ramp gradient for pedestrian only subways (see Clause 13.10) | Not Applicable |
| 25 | Approval of cyclist path width and ramp gradients (see Clause 13.13) | Not Applicable |
| 25 | Approval of cyclist path width and ramp gradients (see Clause 13.13) | Not Applicable |
| 26 | Requirement for traffic barrier where the posted speed is 60 kph or less with a 300 mm min. height non-mountable kerb (see Clause 14.2) | Not Applicable. AS5100 provisions utilised for LCC controlled road over the bridge deck. |
| 27 | Approval of bridge traffic barrier based on performance evaluation of an existing barrier [see Clause 14.4(d)] | Not Applicable |
| 28 | Criteria for special performance barriers (see Clause 14.4) | Not Applicable |
| 29 | Alternative crash testing standards (see Clause 14.4). | Not Applicable |
| 30 | Approval or nomination of traffic barrier performance levels [see Clause 14.5.1, Items (b) and (c)] | In accordance with QR Civil Engineering Technical Requirement CIVIL-SR-007 “Design and Selection Criteria for Road/Rail Interface Barriers”, the nominated traffic barrier performance level is ‘Medium’ and the barrier height on the proposed bridge design is 1500mm |
| 31 | Necessity or appropriateness of upgrading of barriers for bridge rehabilitation (see Clause 14.5.1) | Not Applicable |

| Item No. | Issue | Statement |
|---|---|---|
| 32 | Specification of the provision of special performance barriers (see Clause 14.5.6) | Not Applicable |
| 33 | Approval of alternative barrier profiles (see Clause 14.6.1) | Not Applicable |
| 34 | Determination of the maximum height of the top of the sloping barrier face (see Clause 14.6.1) | In accordance with QR Civil Engineering Technical Requirement CIVIL-SR-007 “Design and Selection Criteria for Road/Rail Interface Barriers”, the nominated traffic barrier performance level is ‘Medium’ and the barrier height on the proposed bridge design is 1500mm |
| 35 | Approval alternative barrier post setback [see Clause 14.6.2(c)] | Not Applicable |
| 36 | Approval of crashworthy traffic barrier or impact attenuation device (see Clause 14.6.4) | Not Applicable |
| 37 | Assessment of risk and determination of the level and form of collision protection (see Clause 15.1) | Not Applicable |
| 38 | Determination of the minimum clearance of a pier or column from the roadway beyond which road traffic barrier protection will not be required (see Clause 15.2) | Not Applicable |
| 39 | Approval for other than clear span between abutments for structures over rail (see Clause 15.3.2) | Clear span has been provided over existing railway corridor between Abutment B and central pier.<br>Clear span has been provided over future railway corridor between Abutment A and central pier.<br>DTMR Pre-Lodgement Advice TMR Reference TMR22-035974 (refer Appendix G) Item 7 provides support in principle for location of pier between existing and future railway corridors:<br>“advice is provided that a central bridge pier at the common boundary between the existing and future railway corridor, is supported in-principle, subject to meeting the requirements of the relevant railway managers (Queensland Rail and ARTC), including their standards, and so as to not compromise the future railway corridor. In relation to Queensland Rail please contact the SEQ Asset Manager Richard Nettleton on telephone number 3072 7117 or at 0408 163 392 in relation to this matter. A Queensland Rail project manager may need to be assigned to this task in which case you may need to enter into an agreement with Queensland Rail. TMR's Rail Planning Team will undertake a detailed review of the exact location of the bridge and its supporting infrastructure once the applicant has undertaken a detailed survey and provided more detailed RPEQ certified bridge designs.” |
| 40 | Approval of a risk assessment and risk assessment methodology (see Clause 15.3.2) | Not Applicable |
| 41 | Approval of the failure mode of frangible piers and the maximum deflection (see Clause 15.3.3) | Not Applicable |

| Item No. | Issue | Statement |
|---|---|---|
| 42 | Approval to not protect piers using deflection walls (see Clause 15.3.4) | Not Applicable |
| 43 | Requirement to design abutments beyond 20m from the centreline of the nearest track for derailment collision protection (see Clause 15.3.5) | Not applicable |
| 44 | Approval of risk assessment for abutments located beyond 10m and within 30m from the centreline of the nearest track (see Clause 15.3.5) | Not applicable |
| 45 | Approval of alternative thickness for abutments located within 10m from the centreline of the nearest track (see Clause 15.3.5) | Not Applicable |
| 46 | Approval not to use deflection walls in the specified locations (see Clause 15.3.6) | Awaiting TMR/QR/ARTC advice<br>Refer to Paragraph 4.1.6 above for justification of not providing a deflection wall |
| 47 | Specification of the length of a deflection wall (see Clause 15.3.6) | Not applicable subject to acceptance of not using a deflection wall |
| 48 | Determination of the requirements for concrete wall support in rail tunnels (see Clause 15.3.7) | Not Applicable |
| 49 | Required level of protection for structures on platforms (see Clause 15.3.7) | Not Applicable |
| 50 | Determination of the watercraft to be used for pier collision forces, pier protection, or pier-redundant superstructures (see Clause 15.4) | Not Applicable |
| 52 | Requirements for pedestrian protection barriers over electrified rail (see Clause 16.3) | Design of protection screens to be in accordance with QR specification CIVIL-SR-008 |
| 53 | Requirements for protection screens (see Clause 16.4) | Design of protection screens to be in accordance with QR specification CIVIL-SR-008 |
| 54 | Minimum height of a protection screen [see Clause 16.4(c)(i)) | Electrification screens are required on all footbridges over electrified track. The screens are required to extend a minimum 1.8m above the highest standing surface<br>3m high anti-throw screens have been detailed<br>To be approved by relevant authority |
| 55 | Alternative vertical clearances for a protection screen [see Clause 16.4(c)(iv)] | Not Applicable |
| 56 | Requirement for noise barriers (see Clause 17) | Not Applicable |

| Item No. | Issue | Statement |
|---|---|---|
| 57 | Requirement for drainage of road and rail bridges (see Clause 18.1) | A two-way crossfall (grade 3%) from the centreline of the bridge will permit drainage of the structure. Longitudinal fall will allow water to drain off structure. Overland flow will be carried by the shoulders. |
| 58 | Permission for water to run onto the bridge (see Clause 18.1) | Not Applicable |
| 59 | Waterproofing of rail bridges (see Cause 18.3) | Not Applicable |
| 60 | Permission to attach utility services (see Clause 20) | Not Applicable |
| 61 | Approval and provisions for method of attachment of utility services [see Clause 20(a)] | Not Applicable |
| 62 | Determination that a bridge shall be designed for the effects of fire (see Clause 22(a)] | Not Applicable |
| 63 | Determination of the fire time-temperature curve [see Clause 22(a)] | Not Applicable |
| 64 | Approval of the design life for a sign or light structure (see Clause 23.2) | Not Applicable |
| **AS5100.2:2017 Design Loads** | | |
| 1 | Approval to vary any of the loads set out in this Standard, provided the provisions of AS5100.1 are complied with (Clause 1.2) | Not Applicable |
| 2 | Design loads and factors for road bridges carrying rail traffic (Clause 7.4) | Not Applicable |
| 3 | Load factors for centrifugal and braking loads from heavy load platforms, when applicable (Clause 7.10) | Not Applicable |
| 4 | Approval of an analytical procedure for the distribution of road traffic loads through fill (Clause 7.12) | Not Applicable |
| 5 | Design load for a pedestrian or cyclist path bridge that is also used for maintenance, inspections, or emergency vehicle access (Clause 8.1) | Not Applicable |
| 6 | Design loads for rail bridges carry crane rail traffic and/or other special applications (Clause 9.1) | Not Applicable |
| 7 | Approval to use that rational method for braking traction forces (Clause 9.7.2 and 9.7.2.3) | Not Applicable |

| Item No. | Issue | Statement |
|---|---|---|
| 8 | Bridge-specific design parameters to be used in applying the rational method for braking and traction forces (Clause 9.7.2.3) | Not Applicable |
| 9 | Approval of a risk analysis for bridge supports located between 10m and 20m from the centreline of a rail track | Not applicable |
| 10 | Approval of a risk analysis for road bridges designed with an alternative load path under collision load (Clause 11.1) | Not Applicable |
| 11 | Approval of a dynamic collision analysis (Clause 11.4.4.2) | Not Applicable |
| 12 | Recommendation of the type of vessel, weight of vessel and speed of impact on a bridge for collision from waterway traffic, approval of the proposed design vessel and speed (Clause 11.6) | Not Applicable |
| 13 | Approval of the minimum equivalent static ship impact force applicable to piers in navigable waterways (Clause 11.6) | Not Applicable |
| 14 | Specification of the ultimate design load, load distribution length and minimum effective height for special barrier performance levels (Clause 12.2.2 and 12.2.3) | The nominated traffic barrier performance level is 'Medium'. Minimum effective height of traffic barrier is 1500mm |
| 15 | Approval of a load transfer mechanism across a movement joint in a ridged barrier (Clause 12.4.2) | Not Applicable |
| 16 | Approval of a detailed dynamic analysis (clause 13.2.3) | Not Applicable |
| 17 | Approval of a vibration assessment of a rail bridge, when required (Clause 13.3) | Not Applicable |
| 18 | Bridge earthquake design category classification (Clause 15.4.1) | BEDC-4 – Bridges and associated structures that are essential to post-earthquake recovery, as specified by the relevant authority, and major bridges whose operation is essential to economic viability at state or national levels |
| 19 | Approval of large items for floor impact (Clause 16.7.3) | Not Applicable |
| 20 | Construction design load criteria for other types of bridge construction (Table 22.2.2) | Not Applicable |
| 21 | Approval of the average recurrence interval for wind load on noise barriers and protection screens (Clause 25.3.2) | Not Applicable |
| **AS5100.3:2017 Foundation and Soil-Supporting Structures** | | |

| Item No. | Issue | Statement |
|---|---|---|
| 1 | Design requirements for foundations for overhead wiring structures (see Clause 1.2) | Not Applicable |
| 2 | Detailing method and formulae to be used for the design of geotechnical or structural elements (see Clause 1.2) | Not Applicable |
| 3 | Supervision of site investigation (see Clause 1.6) | In accordance with AS1726 |
| 4 | Extent and coverage of preliminary and design investigation (see Clause 1.6) | In accordance with AS5100.3:2017 |
| 5 | Minimum number of boreholes (see Clause 1.6.2) | 2 bores per pier, 2 per abutment (i.e. 6 total bores) |
| 6 | Selection of the geotechnical strength reduction factors (see Clause 2.3.5) | In accordance with AS5100.3:2017 |
| 7 | Testing requirements if design by porotype testing (see Clause 2.6) | Not Applicable |
| 8 | Requirement for consideration of future development (see Clause 2.8) | Not Applicable |
| 9 | Other durability criteria (see Clause 4.1) | Not Applicable |
| 10 | Use of treated and untreated timber (see Clause 4.2) | Not Applicable |
| 11 | Requirements for prevention of corrosion of reinforcement (see Clause 4.3) | The requirements for design for durability of concrete components of foundations and soil-supporting structures given in AS5100.5 shall apply |
| 12 | Acceptance of rates of corrosion for steel surface (see Clause 4.4) | Not Applicable |
| 13 | Requirements to minimise corrosion effects on stray currents (see Clause 4.4) | Not Applicable |
| 14 | Durability requirements of other materials (see Clause 4.5) | Not Applicable |
| 15 | Design requirements for durability of materials used in shallow foundations (see Clause 5.3.6) | Not Applicable |
| 16 | Requirements for structural design and detailing for shallow footings (see Clause 5.4) | Not Applicable |
| 17 | Requirements for material and construction for shallow foundations (see Clause 5.5) | Structural design and detailing for pad foundations shall be in accordance with AS5100.3 and AS5100.5 |
| 18 | Bridges essential for post-disaster recovery (see Clause 6.3.2) | Not Applicable |
| 19 | Use of timber piles (see Clause 6.3.2) | Not Applicable |
| 20 | Requirements for structural design and detailing for construction of piles (see Clause 6.4) | Not Applicable |
| 21 | Requirements for structural design and detailing for construction of piles (see Clause 6.4) | Not Applicable |
| 22 | Requirements for materials and construction for piles (see Clause 6.5.1) | Not Applicable |

| Item No. | Issue | Statement |
|---|---|---|
| 23 | Requirements for testing of piles (see Clause 6.6) | Not Applicable |
| 24 | Design requirements for durability of anchorages and anchorage components (see Clause 6.4) | In accordance with AS5100.3 |
| 25 | Requirements for material and construction for anchorages (see Clause 7.4) | In accordance with AS5100.3 |
| 26 | Requirements for method of installation and on-site assessment tests for anchorages (see Clause 7.6.1) | In accordance with AS5100.3 |
| 27 | Requirements for anchorage suitability tests (see Clause 7.6.3) | 2% of anchorages to be tested in accordance with AS5100.3 |
| 28 | Requirements for anchorage suitability tests (see Clause 7.6.3) | Refer Item 27 |
| 29 | Requirements for anchorage acceptance tests (see Clause 7.6.3) | In accordance with AS5100.3 |
| 30 | Requirements for the design of retaining walls and abutments (see Clause 8.1) | In accordance with AS5100.3 |
| 31 | Acceptance of geotechnical strength reduction factor for retaining walls and abutments (see Clause 8.3.5) | In accordance with AS5100.3 |
| 32 | Design requirements for durability or retaining walls and abutments (see Clause 8.3.5) | In accordance with AS5100.3 |
| 33 | Requirements for structural design and detailing for retaining walls and abutments (see Clause 8.4) | In accordance with AS5100.3 |
| 34 | Requirements for materials and construction for retaining walls and abutments (see Clause 8.5) | In accordance with AS5100.3 |
| 35 | Approval of drainage systems for retaining walls and abutments (see Clause 8.6) | Drainage systems for abutments and wingwalls will be detailed on design drawings |
| 36 | Requirements for the design of buried structures (see Clause 9.1) | Not Applicable |
| 37 | Design requirements for the durability of materials (see Clause 9.3.3) | Not Applicable |
| 38 | Requirements for materials and construction for buried structures (see Clause 9.4) | Not Applicable |
| 39 | Requirements for materials and construction for buried structures (see Clause 9.5) | Not Applicable |
| **AS5100.4:2017 Bearing and Deck Joints** | | No Entries |
| **AS5100.5:2017 Concrete** | | No Entries |
| **AS5100.6:2017 Steel & Composite Design** | | Not Required |
| **AS5100.7:2017 Rating of Existing Bridges** | | Not Required |

# Fixing Report

Appendix B

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Specialist Knowledge.
Practical Solutions.

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Hobart
Launceston
Newcastle
Devonport

# Bridge Fixing Form

| | | | |
|---|---|---|---|
| **Project No.** | P.22.0175 | **Date** | 07/07/2022 |
| **Project Name** | New Beith Rail Overbridge | | |
| **Status** | Concept Rev B | | |
| **Bridge** | New Beith Rail Overbridge | **Bridge Reference** | |
| **Road** | Mountain Ridge Road | **Chainage** | |
| **Crossing Type/Name** | Road bridge over rail corridor | | |
| **Stakeholders** | Frasers Property Australia, ARTC, TMR, Logan City Council | | |

## Development of design

**Concept Design**

Frasers Property Group (Frasers) has recently acquired a parcel of land to the west of South McLean adjacent to the Flagstone development. The parcel of land is to be developed into residential blocks but is currently landlocked with restrictions to access to the east created by the Brisbane-Sydney railway line and to the south by Flagstone Creek. In order to unlock access to enable development of the land to proceed, a new rail overbridge is required to provide an extension of Mountain Ridge Road to cross the railway line. Refer to Figure 1 for location.

The current railway line is a single non-electrified track managed by ARTC. There is currently ongoing work on planning for a future passenger rail connection to the west of the existing railway line. This will comprise two electrified railway tracks. This arrangement is similar to that allowed for on the recently constructed Homestead Drive Railway Overpass at Flagstone, to the south of the proposed new structure. This will have to be taken into consideration during the design process.

The bridge will be located at approximate CH947km on the Sydney to Brisbane Railway Line, to be confirmed during the detailed design process.

The ARTC railway line is located approximately centrally in an existing 30m wide railway corridor. To allow for the future passenger railway, the corridor is to be widened by an additional 30m to the west. The proposed bridge is to span over the proposed and existing corridors, with a pier to be provided located on the current boundary. This will provide for the required horizontal clearances and allow maximum flexibility in the location of the future railway as well as allowing for maintenance tracks, drainage channels and any other services that are required.

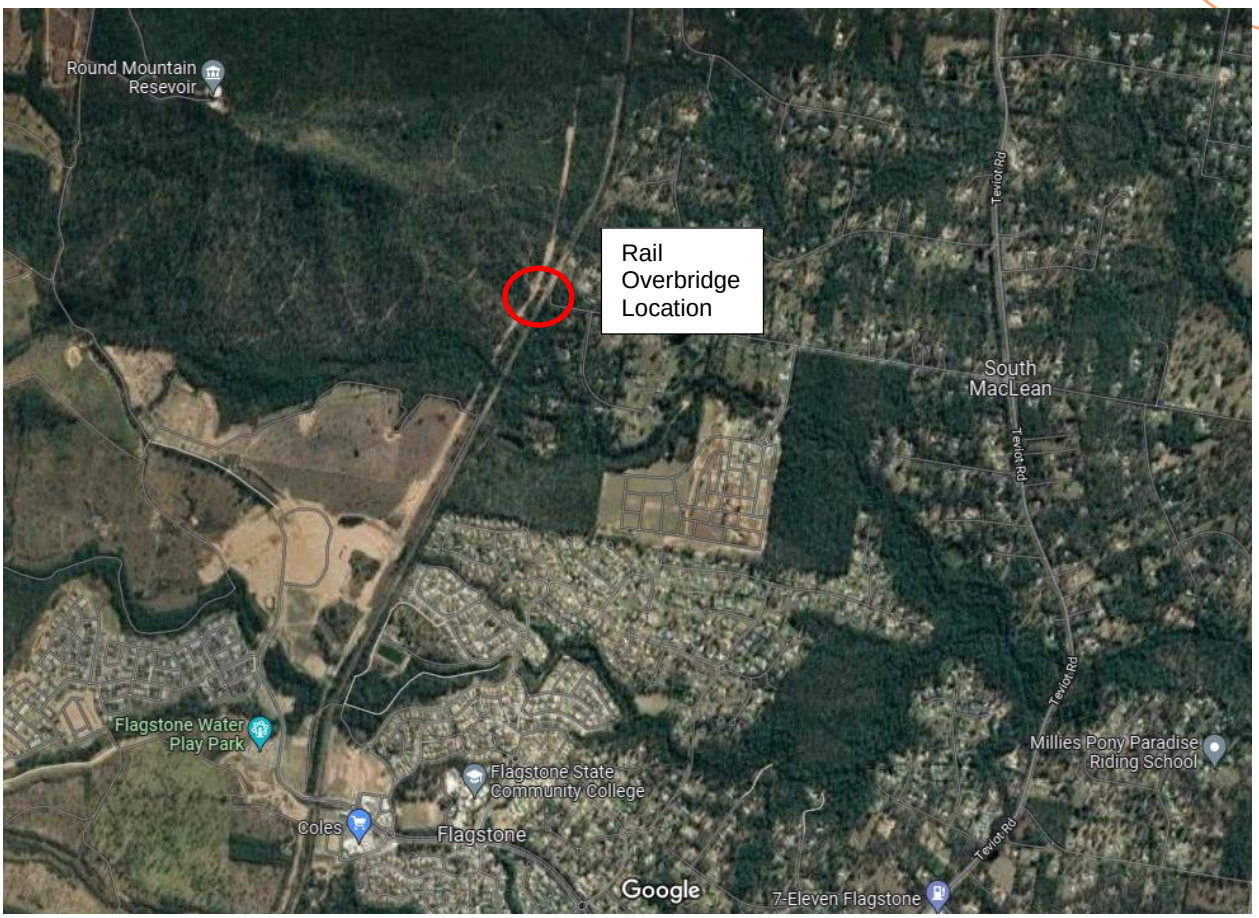



*Figure 1: New Beith Rail Overbridge Location*

**Design Changes following Rev A issue of Concept**

The bridge width was reduced following a review of the development requirements. The separated footpath and cycleway have been replaced with a single 2.5m wide shared path.

HLP320 vehicles have been added to the design vehicle requirements.

| **Proposed bridge** | |
|---|---|
| **Drawings** | Refer to attached sketches:<br>• Plan – PeakUrban Sketch SK-25<br>• Section & Elevation – pitt&sherry<br>Sketch No. S-P.22.0175-00-STR-DWG-001 |
| **Skew** | Bridge abutments and pier are to be parallel to the existing railway boundary. Skew is 1°57'. |

| Proposed bridge | | |
|---|---|---|
| **Overall Length** | 65.6m measured centreline of abutment to centreline of abutment.<br>Approximately 60m clear measured from face of RE Wall to face of RE Wall. Note that the abutment bearing shelf will be situated approximately 1200mm behind the abutment face in order to provide access to the bearings for inspection and maintenance. | |
| **Number & Length of Spans (between abutment/pier centres)** | 2 span | Both spans: 32.8m (pier CL to abutment CL) |
| **Carriageway Width (between traffic barriers)** | 13.5m, comprising:<br>– 1.5m shoulder<br>– 2 No. 3.5m traffic lanes<br>– 1.5m shoulder<br>– 1m verge<br>– 2.50m shared path | |
| **Footways** | As per the above, a shared path is provided on the north verge of the bridge. The 2.5m wide shared path is separated from the carriageway by a 1m verge with raised barrier kerbs. | |
| **Crossfall** | Two-way crossfall (3%) on the carriageway, with a 2% crossfall towards the carriageway on the shared path. | |
| **Wearing Surface Type** | 70mm minimum thick asphalt DWS (60mm DWS + 10mm waterproof membrane) | |
| **Superstructure** | The proposed bridge will consist of 1800mm deep Super-T girders with an insitu concrete deck and concrete barriers | |
| **Substructure** | The proposed substructure will consist of reinforced concrete abutments and reinforced concrete pier. Abutments and pier are expected to be supported on pad foundations due to the very high rock level at the site. Rock anchors may be provided if required (TBC) | |
| **Vertical Clearances** | TMR Guide for Development in a Railway Corridor and QR Standard Drawing 02754 outlines that the vertical clearance of a structure is to be a minimum 7.9m above the railway track.<br>ARTC Track & Civil Code of Practice Section 7 Clearances includes several structure outline clearances. The exact clearance requirement is yet to be confirmed by ARTC, however at this stage we have assumed Rollingstock Outline F for double stacked rail, which has a vertical clearance requirement of 7.1m over the rail level. Note that the Homestead Drive Rail Overbridge nearby nominated a clearance envelope of 7.4m for the ARTC rail line.<br>The proposed bridge design has a minimum vertical clearance of 7.9m from the top of the railway track to the bridge soffit to meet the QR requirements. | |

| Proposed bridge | |
|---|---|
| **Horizontal Clearances** | Horizontal clearances to substructure components are to be 3.5m minimum setback from the railway track centrelines, in accordance with TMR Guide for Development in a Railway Corridor.<br>The horizontal clearances are as per the sketches attached, noting that the QR passenger railway line is a future proposed line and is shown central in the railway corridor extension as an estimate of the location. The actual location of the railway track will need to be cognisant of the pier and abutment locations. The pier will be designed to allow for the impact load from a track located greater than 5m from the face of the pier in accordance with QR design guidelines CIVIL-SR-012. |
| **Special Features & Requirements** | N/A |
| **Abutment Detailing** | The proposed abutments will consist of reinforced concrete abutments, supported on a pad foundation. The abutment wall and wingwalls will be reinforced concrete. To be confirmed pending the findings of the geotechnical investigation |
| **Pier Detailing** | The proposed pier will consist of a reinforced concrete pier wall founded on a pad foundation, to be confirmed pending the findings of the geotechnical investigation. The top of the pier will have a reinforced concrete headstock that the girders will sit on top of and will be cast in integrally. |
| **Traffic Barriers** | Traffic barriers have been defined following the procedure in QR Civil Engineering Technical Requirement CIVIL-SR-007 Clause 7 to the following parameters:<br>• Rail Status MPE (main line electrified for future QR passenger service) (ref: Table 3)<br>• Road Status 2C (urban road design speed 70km/hr, 10,000 vehicles/day) (ref: Table 4)<br>This results in a 1.5m high medium containment barrier (ref: Table 5).<br>As per table 6, the barrier is to be designed for a transverse load of 500kN at an effective height of 1.45m. However as CIVIL-SR-007 refers to AS5100:2004, the values from the latest code will be used. i.e. the barrier will be designed in accordance with Clause 12.2.2, Table 12.2.2 as AS5100.2:2017 for a transverse load of 600kN at an effective height of 1.45m (as per CIVIL-SR-007) over a contact length of 2.4m.<br>Steel anti-throw screens will be provided up to a height of 2.4m, an additional 900mm on top of the concrete barrier in accordance with Clauses 5.2 and 4.2 of QR Civil Engineering Technical Requirement CIVIL-SR-008. This will consist of galvanised steel posts with a steel mesh with aperture sizes not greater than 25x25mm. The anti-throw screens will be provided along the entire length of the bridge superstructure (60m). |
| **Superstructure Restraint** | The girders will be integral with the pier headstock to provide a fixed support, positive lateral and vertical restraint and to remove maintenance requirements in the future. The girders at the abutment will be provided with a restraint block with dowels to prevent any transverse movement. |
| **Bearings** | Bearings at the abutments will be elastomeric bearings in accordance with AS5100.4:2017 |

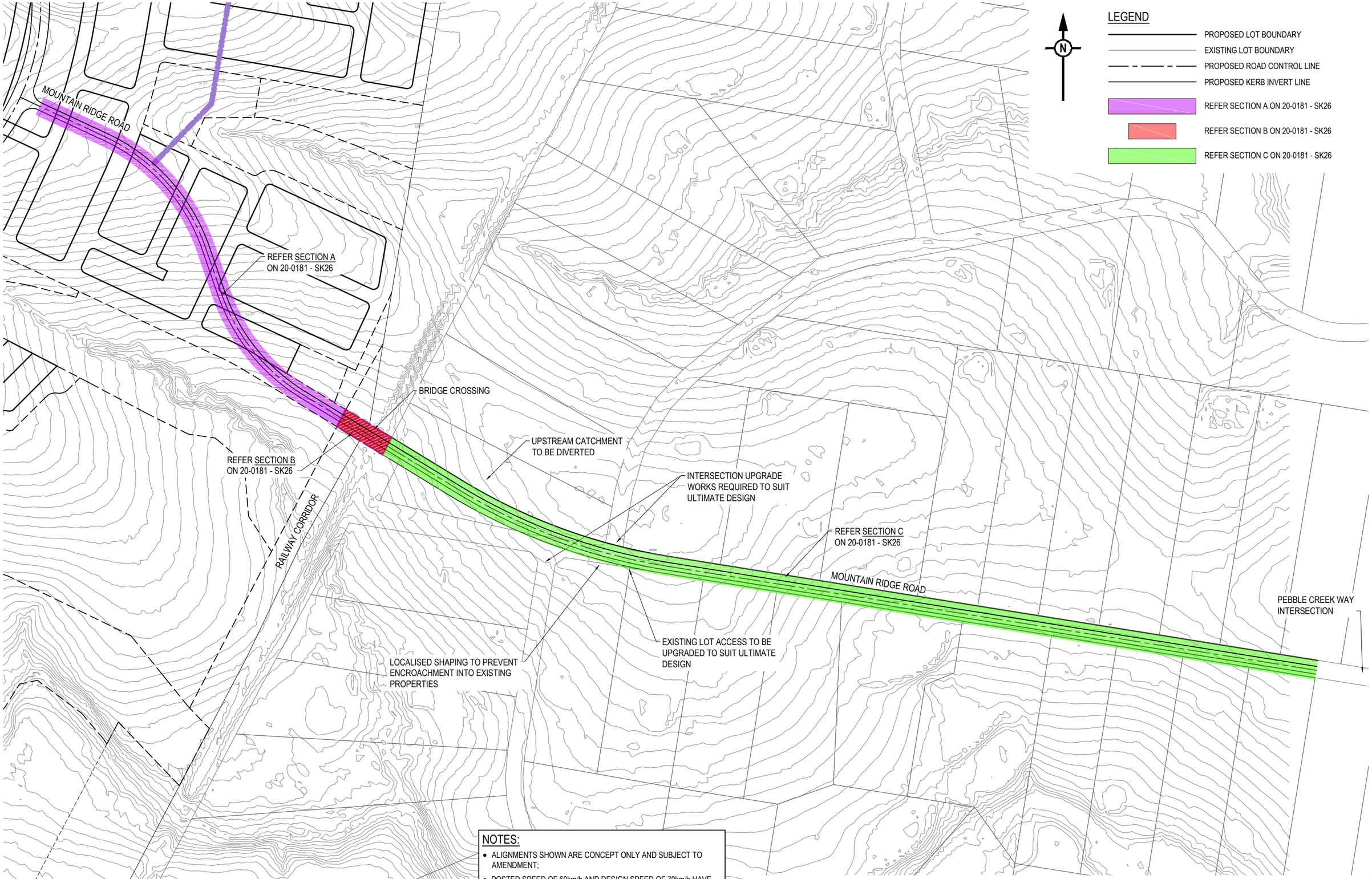
| | |
|---|---|
| **Proposed bridge** | |
| **Bearing Replacement** | A walkway will be provided in front of the abutment in order to access the bearings for inspection and maintenance. Jacking of the abutments to replace bearings will be via cross girders over the abutment bearing shelf. |
| **Articulation** | The superstructure will be fixed at the pier, with a fully integral connection provided. Expansion joints will be provided at each abutment. The supports have allowed for all irreversible movements and ambient conditions, including instantaneous movements (movements due to braking and earthquake), and avoid damage to the structure. |
| **Deck Drainage** | Deck drainage is not required. Flow will be taken in the shoulders along the kerb or barrier line. |
| **Service Provisions** | TBC – provision for services to be provided in concrete barriers and in footpath construction. |
| **Existing Services** | N/A |
| **Lighting** | TBC |
| **Design parameters** | |
| **Superimposed Dead Loads** | Allowance for 70mm minimum thick asphalt DWS (22kN/$m^3$) placed at two way crossfall of 3% on a flat bridge deck. Maximum thickness approximately 330mm. |
| **Design Road Traffic** | W80 wheel load, A160 axle load, M1600 moving load and S1600 stationary load, in accordance with AS5100.2:2017 Section 7<br>HLP320 |
| **Number of Design lanes** | 3 |
| **HLP Travel Restrictions** | N/A |
| **Pedestrian Loads** | A load intensity of 2kPa has been adopted for a loaded area of greater than 100$m^2$, in accordance with AS5100.2:2017 Clause 8.1(a). This load will be applied to the shared path. Provision will be made for a light vehicle to access the shared path in accordance with AS5100.2:2017 Clause 8.1 (c). |
| **Barrier Design Loads** | 1500mm high 'Medium' performance level barrier, with transverse load of 600kN at an effective height of 1.45m (as per CIVIL-SR-007) over a contact length of 2.4m as detailed above. |
| **Earthquake Effects** | BEDC-3 – bridges that are designed to carry high volumes of road, rail or pedestrian traffic, or bridges over high traffic volume roadways, railways, or buildings<br><br>Annual Probability of Exceedance = 1/100<br>Probability Factor ($k_p$) = 1.30<br>Hazard Factor (Z) = 0.09<br>Design Ductility Factor (μ) = 2.00 |

| | |
|---|---|
| **Proposed bridge** | |
| **Wind Loads** | Average Return Interval = 2000 years (ULS), 20 years (SLS)<br>Geographical Location = B<br>Terrain Category = 2<br>Shielding = N/A<br>Design Wind Speed = 63m/s (ULS), 38m/s (SLS)<br>$C_L$ = 0.75 |
| **Thermal Effects** | Location = Inland (>20km from the coast)<br>Height Above Sea Level = ≤1000m<br>Region = Region II – South of 22.5°S<br>Shade Air Temperature = 50°C to -10°C (including adjustments)<br>Average Bridge Temperature = 54°C to 2°C |
| **Collision Loads** | |
| **Collision Design Parameters** | Collision load requirements to the abutment and pier are derived in accordance with in QR Civil Engineering Technical Requirement CIVIL-SR-012. As the exact location of the future QR passenger railway line has not been defined, the bridge supports, including the abutments and the pier will be designed to allow for the centreline of the track to be at least 5m away from the support.<br>The following parameters from CIVIL-SR-012 are used for deriving the collision loads:<br>Clause 4.1 Class of Structure: Class B (road overbridge)<br>Clause 4.2 Zone of Structure: Zone 3 (support is more than 5m from the track centreline)<br>Clause 4.3 Speed Category: Speed category 1 (51 km/hr to 160 km/hr - for passenger trains as the operating speed cannot be defined at this stage)<br>From Clause 5.2.3, for Class B structure in Zone 3 speed category 1:<br>Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:<br>• Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail. |
| **Durability** | |
| **Climatic Zone** | The structure is located approximately 37km from the coast. Exterior member surfaces above-ground are considered to be in a near-coastal (within 1km to 50km from coastline) exposure environment<br>The structural members with surfaces in contact with the ground require a determination of the soil aggressiveness. A search of the bridge site was conducted using the Australian Soil Resource Information System (ASRIS), where a C4 classification (extremely low probability / very low confidence) for acid sulphates (ASS) was found. A mild exposure classification has been assumed when determining the minimum cover requirements for the piles which will be confirmed during detailed design stage. |
| **Design Life** | 100 years for bridge structure |

| | |
|---|---|
| **Proposed bridge** | |
| **Exposure Classification** | B2 minimum for durability and cover for slab and abutments (cast-insitu) in accordance with DTMR Design Guidelines for Bridges and Other Structures (noting that the exposure classification in accordance with AS5100.5 would be B1).<br>Mild soil aggressivity minimum for durability and cover for cast in place piles |
| **Geotechnical Conditions** | |
| **Geotechnical report** | To be completed during detailed design stage.<br>Based on the locality and observations on site, the rock level is very high and is essentially at or within 1m of the current natural surface level. The existing railway is cut into the bedrock. The rock at the surface is expected to be Extremely to Highly Weathered Sandstone and is likely to be suitable for pad foundations, which will be confirmed during the detailed design stage. |

Prepared by:

David Crowe
**Principal Engineer**




NOTES:

- ALIGNMENTS SHOWN ARE CONCEPT ONLY AND SUBJECT TO AMENDMENT;
- POSTED SPEED OF 60km/h AND DESIGN SPEED OF 70km/h HAVE BEEN ADOPTED DUE TO EXISTING POSTED SPEED ON MOUNTAIN RIDGE ROAD AND CONSTRAINED TOPOGRAPHY - THIS IS SUBJECT TO TRAFFIC ADVICE AND COUNCIL ENDORSEMENT;
- DESIGN SUBJECT TO BULK EARTHWORKS MODELLING ACROSS THE WHOLE SITE TO CONFIRM LEVELS.

| REV | DATE |
|---|---|
| 1 | 16.03.22 |
| 2 | |
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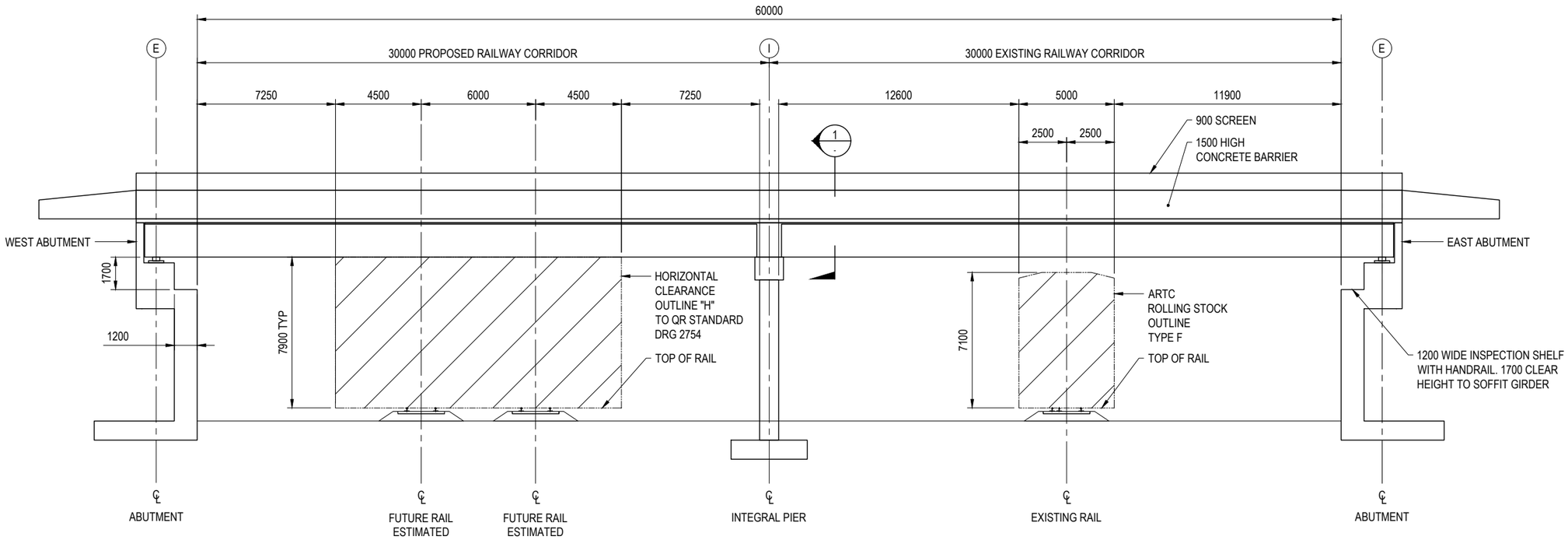
SCALE
1:2000 20 0 20 40 60 80 100 A1
1:4000 A3

CLIENT
FRASERS PROPERTY AUSTRALIA

PROJECT NAME
NEW BEITH

DRAWING TITLE
MOUNTAIN RIDGE ROAD BRIDGE CROSSING SKETCH PLAN

| PROJECT No. | DRAWING No. | REVISION |
|---|---|---|
| 20-0181 | SK25 | 1 |




SOUTHERN ELEVATION
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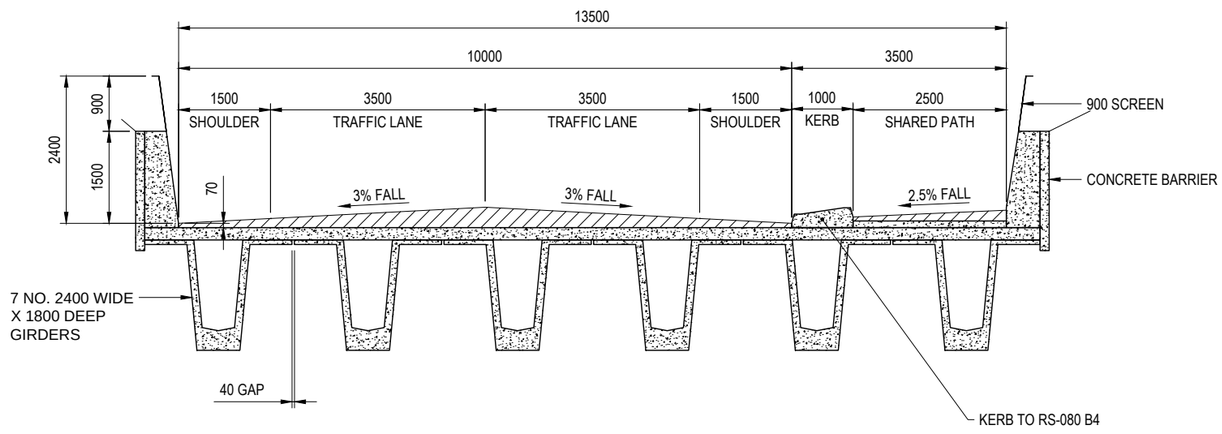


SECTION A
SCALE 1:100

NOTES
1. CLEARANCES ESTIMATED ONLY TO BE CONFIRMED.
2. RAIL HEIGHT TO BE CONFIRMED.

LEGEND
(E) DENOTES EXPANSION JOINT
(I) DENOTES INTEGRAL PIER

REFERENCE FILES ATTACHED:

DRAWING REVISION HISTORY

| No. | DESCRIPTION | DRAWN | DESIGNED | REVIEWED | DATE |
|---|---|---|---|---|---|
| | | | | | |
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| | | DRB | DLC | | 13-04-2022 |

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SIGNED
DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN (A3)
SHEET SIZE A3

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SCALE IN MILLIMETRES - 1:250
1000 0 1000 2000 3000 4000
SCALE IN MILLIMETRES - 1:100

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CLIENT FRASERS PROPERTY NEW BEITH TRUST
PROJECT NEW BEITH RAIL BRIDGE
STATUS CONCEPT

DRAWING TITLE NEW BEITH RAIL OVERBRIDGE CONCEPT
DATUMS: AHD / MGA
CLIENT No. -
DRAWING No. S-P.22.0175-00-STR-DWG-001
REVISION A
May. 23, 22 - 08:20:22 Name: S-P.22.0175-00-STR-DWG-001.dwg Updated By: David Branch

P&S FORM DRG-A3 REV - 8

# Urban Design Draft

Appendix C

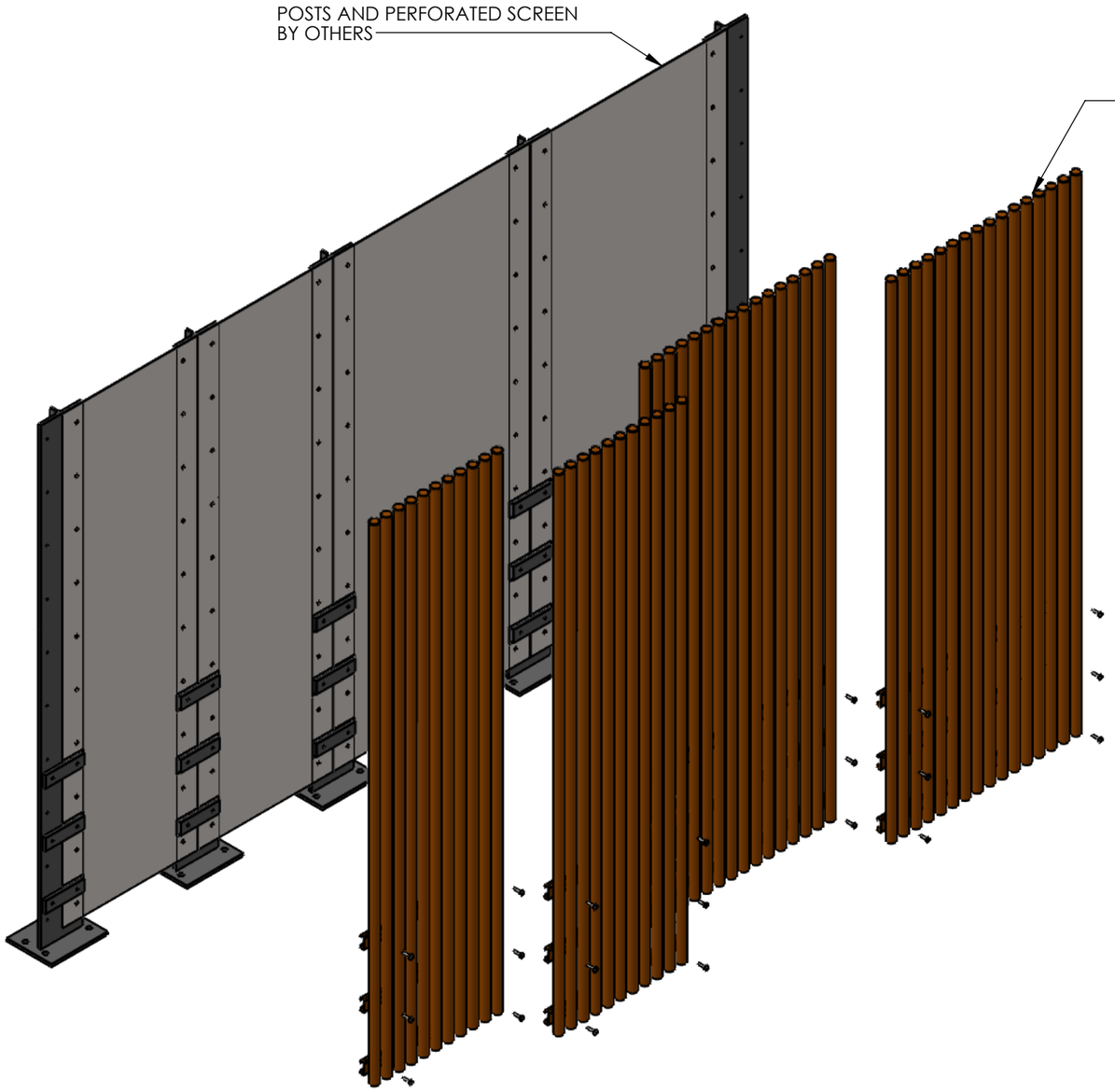
pitt&sherry

**PROJECT:** NEW BEITH
**PRODUCT:** BRIDGE FEATURE SCREEN

## SAMPLE ASSEMBLY

**SUBJECT TO STRUCTURAL CERTIFICATION**

**MATERIAL:** G304 STAINLESS STEEL
**FINISH:** EPOXY PRIMED AND POWDER COATED
*DULUX DURATEC ELEMENTS WEATHERED STEEL FLAT (9E28340F)*

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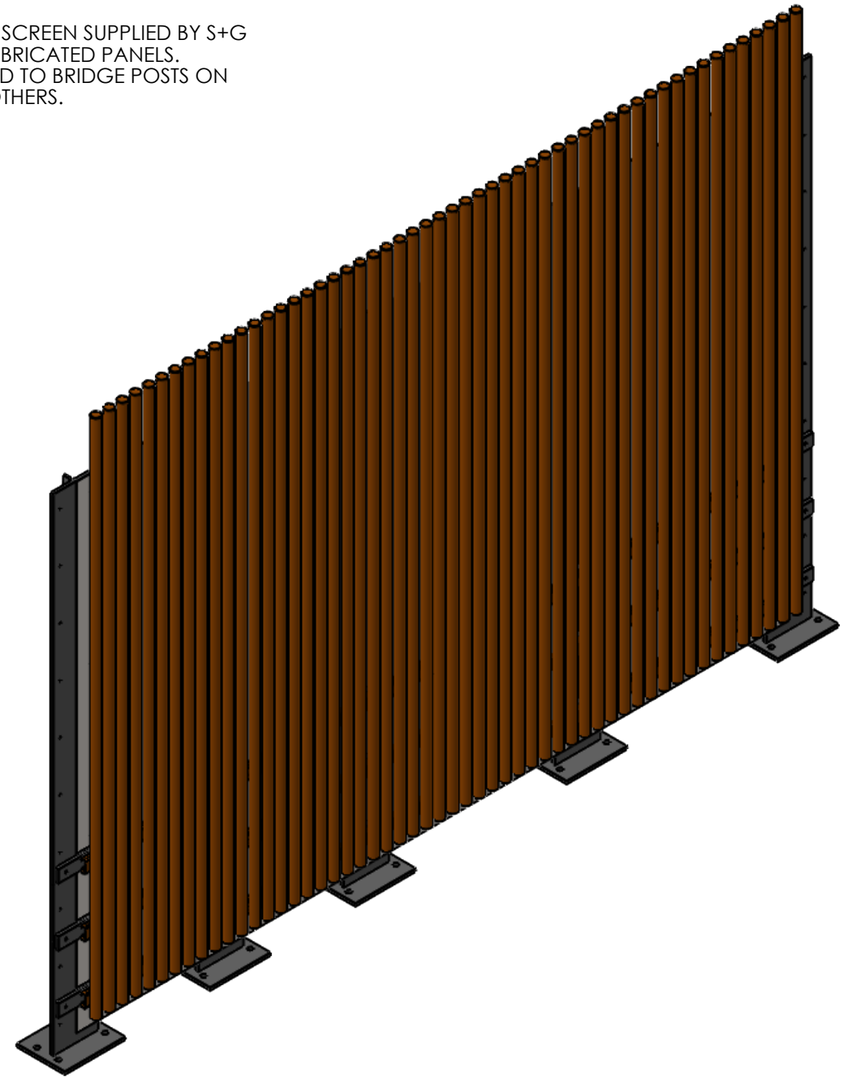


**ISOMETRIC (ASSEMBLED)**
SCALE = 1:25

Street + Garden

23 balaclava street woolloongabba
po box 3662 south brisbane qld 4101
www.streetandgarden.com
p +61 07 3844 1951
f +61 07 3844 9337

PART NO. / NAME :
NB-BF

MATERIAL :
REFER PART

PROCESS :
REFER NOTE

FINISH :
REFER NOTE

QTY :
REFER PO

| REV | SUBJECT | DATE |
|---|---|---|
| E | RFQ | 21/11/2024 |

**SHOP DRAWINGS FOR APPROVAL**



DRAWING
All dimensions in millimetres unless otherwise stated.
Do not scale from drawing.

Scale (A3)
AS SHOWN

Drafted
CW

Checked
CW

Date
21/11/2024

Project
NEW BEITH, BRIDGE FEATURE SCREEN

Client
URBIS

Title
NB-BF
/ DETAILS

A3

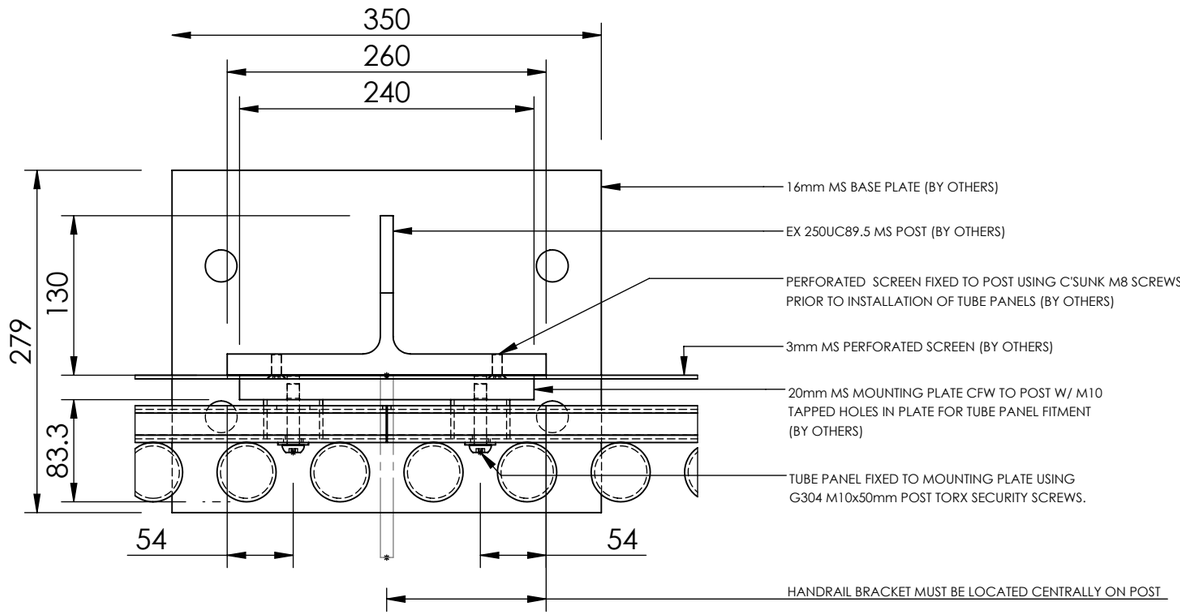
Revision REV-E

**PROJECT:** NEW BEITH
**PRODUCT:** BRIDGE FEATURE SCREEN

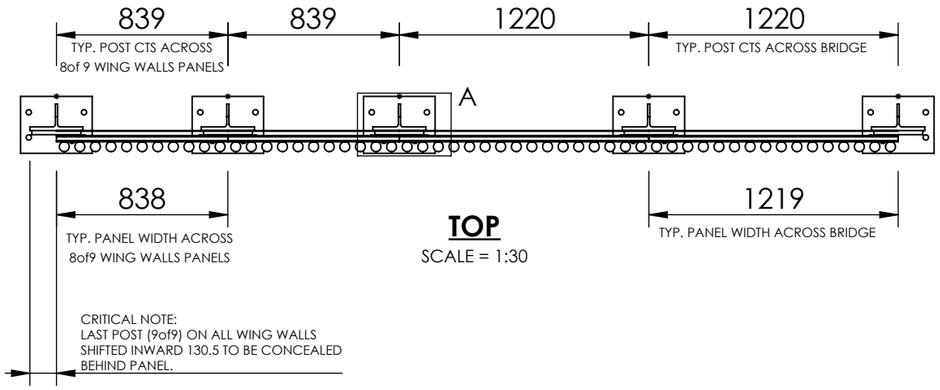
# SAMPLE ASSEMBLY

**SUBJECT TO STRUCTURAL CERTIFICATION**

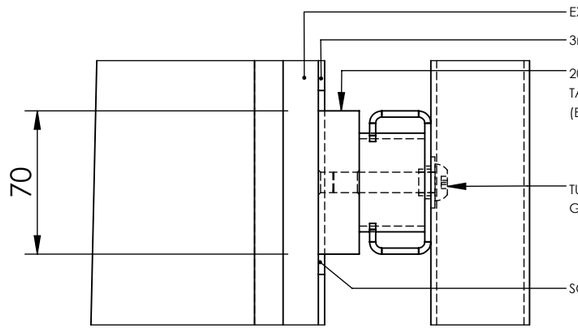
**MATERIAL:** G304 STAINLESS STEEL
**FINISH:** EPOXY PRIMED AND POWDER COATED
*DULUX DURATEC ELEMENTS WEATHERED STEEL FLAT (9E28340F)*




## DETAIL-A
SCALE = 1:5




## TOP
SCALE = 1:30

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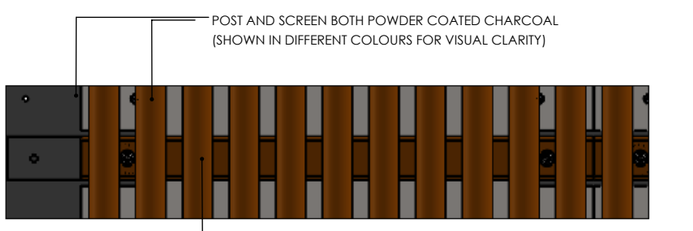


## DETAIL-C
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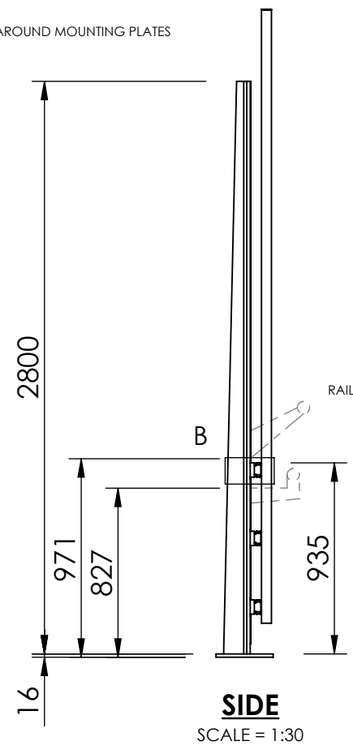
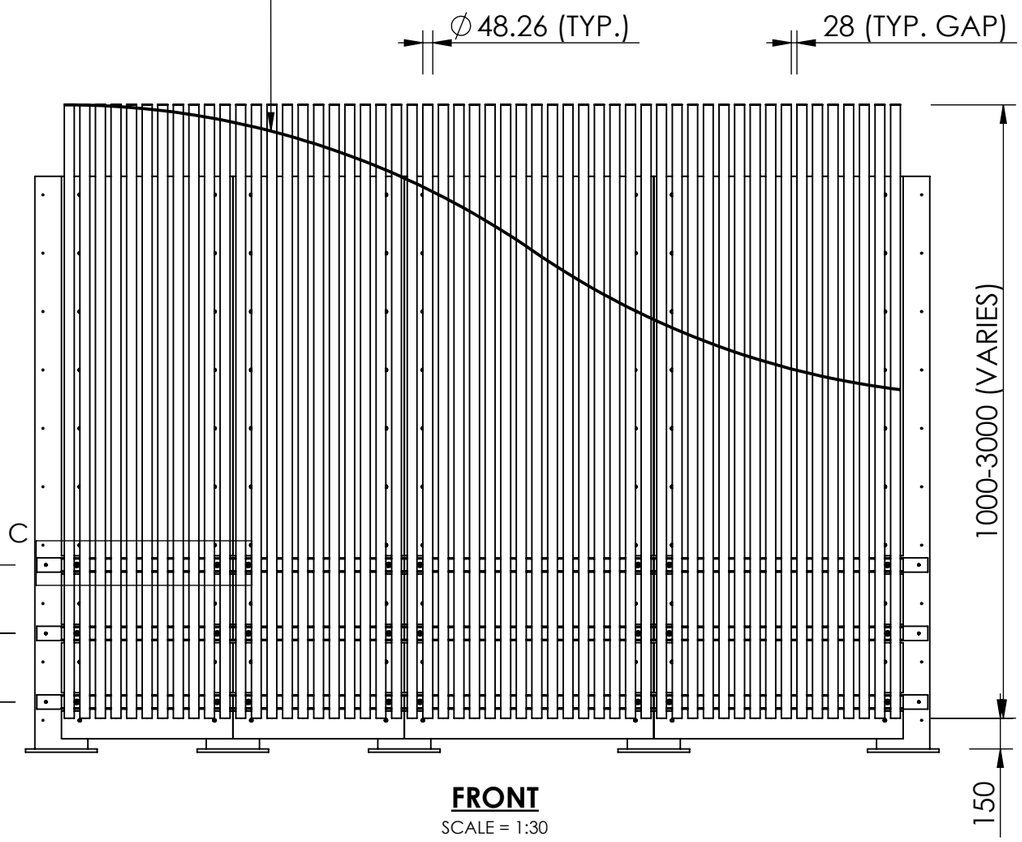



## SIDE
SCALE = 1:30

**CRITICAL NOTE:**
HEIGH OF TUBE VARIES BETWEEN 1000mm AND 3000mm.
REFER LANDSCAPE ARCHITECT ELEVATIONS.




## FRONT
SCALE = 1:30

Street + Garden
23 balaclava street woolloongabba
po box 3662 south brisbane qld 4101
www.streetandgarden.com
p +61 07 3844 1951
f +61 07 3844 9337

PART NO. / NAME :
NB-BF

MATERIAL :
REFER PART

PROCESS :
REFER NOTE

FINISH :
REFER NOTE

QTY :
REFER PO

| REV | SUBJECT | DATE |
|---|---|---|
| E | RFQ | 21/11/2024 |

**SHOP DRAWINGS FOR APPROVAL**



DRAWING
All dimensions in millimetres unless otherwise stated.
Do not scale from drawing.

Scale (A3)
AS SHOWN

Drafted
CW

Checked
CW

Date
21/11/2024

Project
NEW BEITH, BRIDGE FEATURE SCREEN

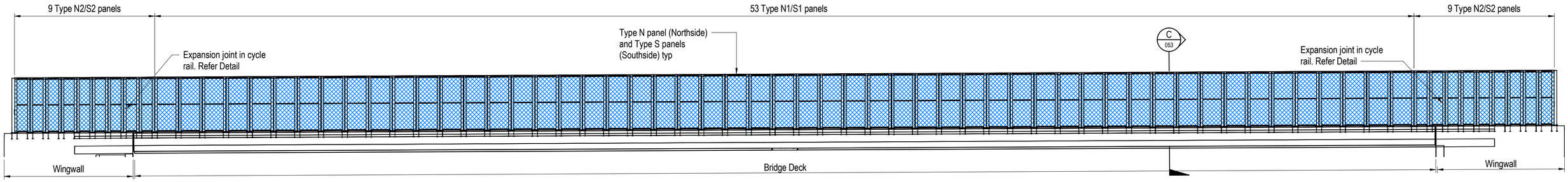
Client
URBIS

Title
NB-BF
/ DETAILS

A3

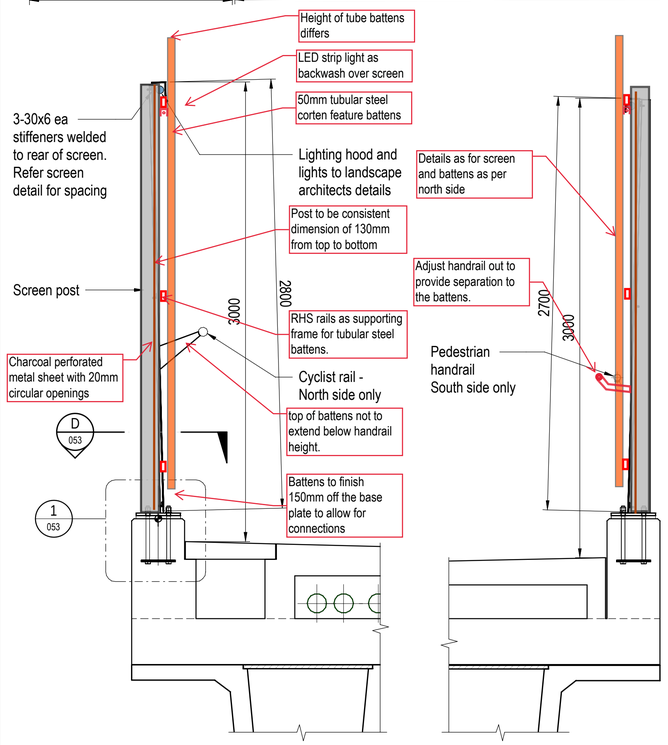
Revision
REV-E

SHEET 2 OF 2

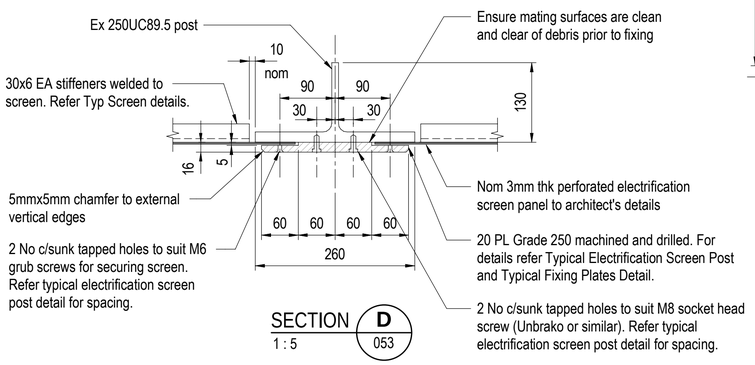



## ELEVATION LOOKING NORTH - LOOKING SOUTH SIMILAR OPP HAND

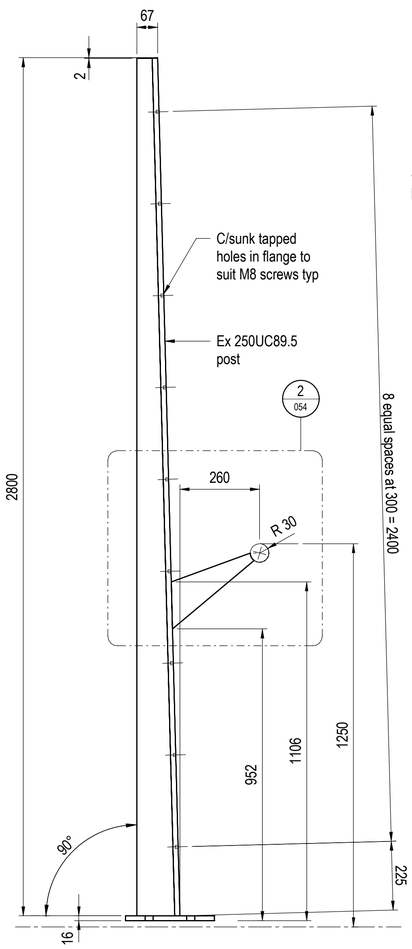
Scale J



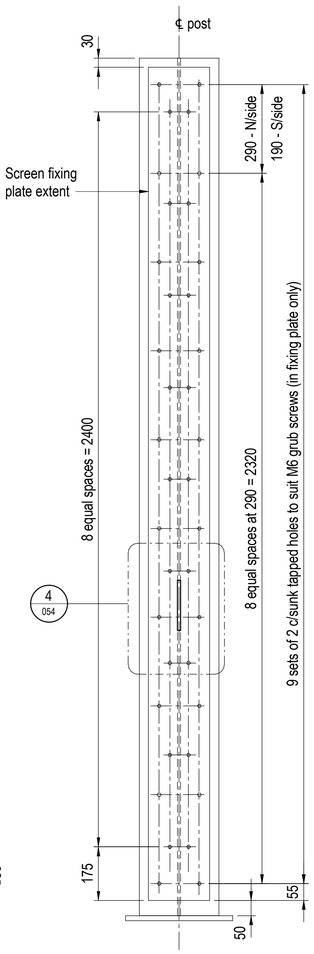

SECTION C 053
Scale Q




SECTION D 053
1 : 5



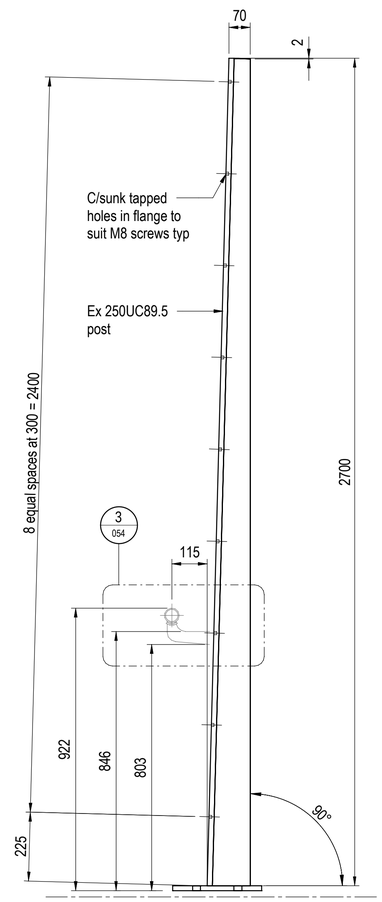

SIDE ELEVATION - NORTHSIDE
Screen fixing plates not shown for clarity



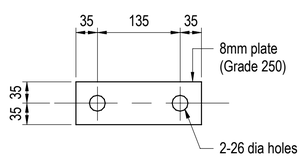

FRONT ELEVATION
Northside as shown, southside as noted

## TYPICAL ELECTRIFICATION SCREEN POST

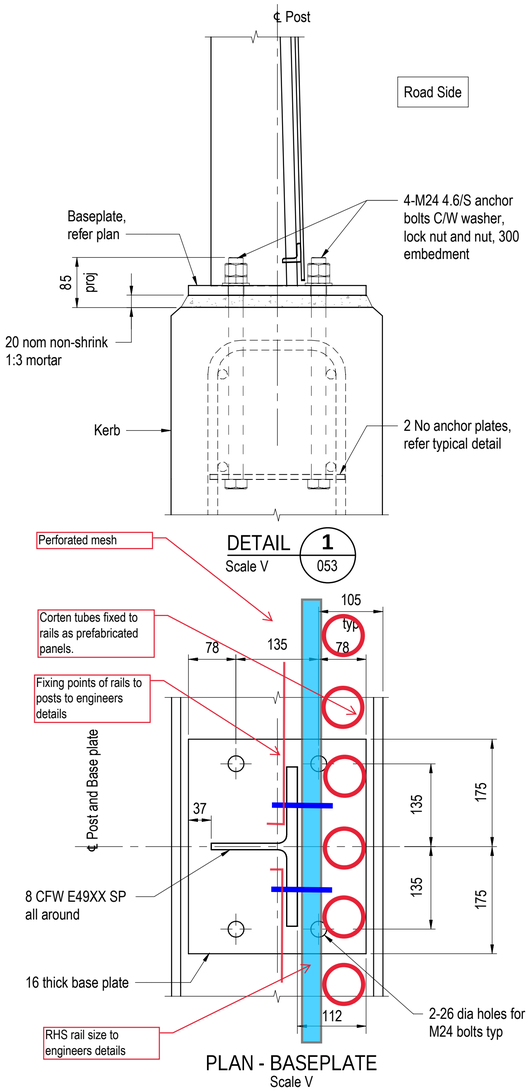
Scale T




SIDE ELEVATION - SOUTHSIDE
Screen fixing plates not shown for clarity




TYPICAL ANCHOR PLATE DETAIL
Scale V




DETAIL 1 053
Scale V

PLAN - BASEPLATE
Scale V

## NOTES

1. For NOTES refer to Drg No 051.

| DRAWING REVISION HISTORY | | | | | | |
|---|---|---|---|---|---|---|
| No. | DESCRIPTION | DRAWN | DESIGNED | REVIEWED | DATE | |
| D | 100% Issue | S.Lemon | J.Marshall | D.Crowe | 21/08/2024 | APPROVED ORIGINAL COPY ON FILE "E" SIGNED BY |
| C | 85% Issue | D.Branch | J.Marshall | D.Crowe | 10/11/2023 | |
| B | 85% Issue | D.Branch | J.Marshall | D.Crowe | 06/10/2023 | SIGNED |
| A | 85% Issue | S.Lemon | J.Marshall | D.Crowe | 07/07/2023 | |
| | | D.Branch | J.Marshall | D.Crowe | | DATE |

SCALE (PLOTTED FULL SIZE): As indicated
SHEET SIZE: A1

J 0 1 2 3 4m (1:100@A1) Q 0 200 400 600 800mm (1:20@A1)
T 0 100 200 300 400mm (1:10 @ A1) V 0 50 100 150 200mm (1:5 @A1)

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pittsh.com.au Phone 1300 748 874 ABN 67 140 184 309

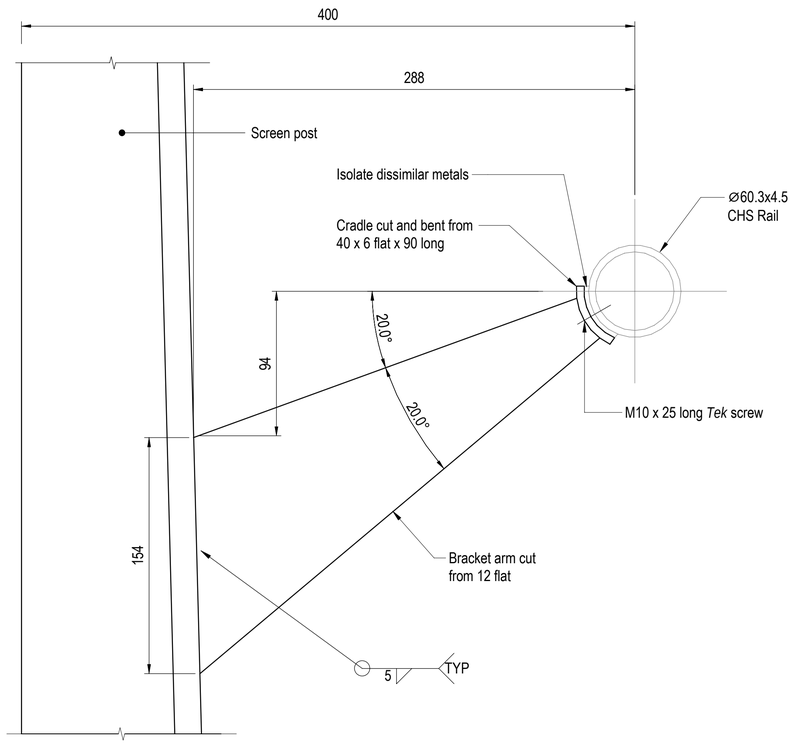


CLIENT: FRASERS PROPERTY NEW BEITH TRUST
PROJECT: NEW BEITH ROAD OVER RAIL BRIDGE MOUNTAIN RIDGE ROAD, NEW BEITH
STATUS: PRELIMINARY

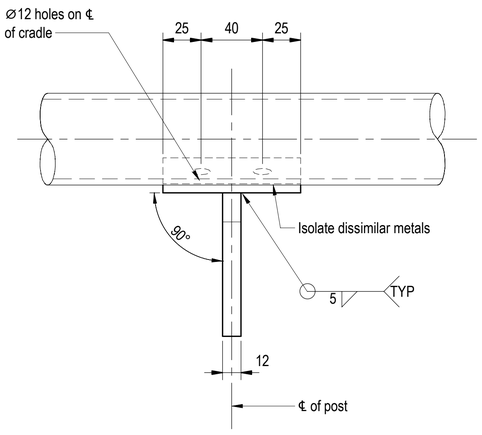
DRAWING TITLE: MISCELLANEOUS DETAILS SHEET 3 OF 4

| | | | |
|---|---|---|---|
| VERT. DATUM: AHD | HEIGHT ORIGIN: PM 126832 | CLIENT No. | - |
| HORIZ. GRID: MGA2020 Z56 | HORIZ. ORIGIN: PM 186068 | | |
| DRAWING No. P.22.0175-00-STR-DRG-053 | | REVISION | D |
| 23/08/2024 5:00:38 PM | P.22.0175-00-STR-DRG-053 | | |

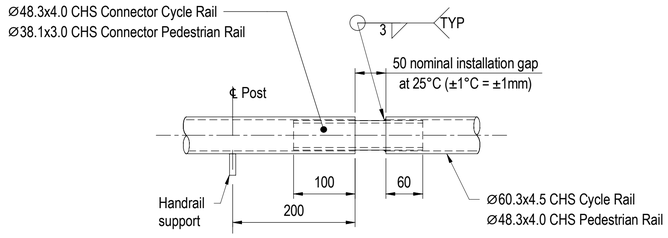
Autodesk Docs://P.22.0175/B-P.22.0175-STR-MDL-001_NEW BEITH BRIDGE_V22.rvt



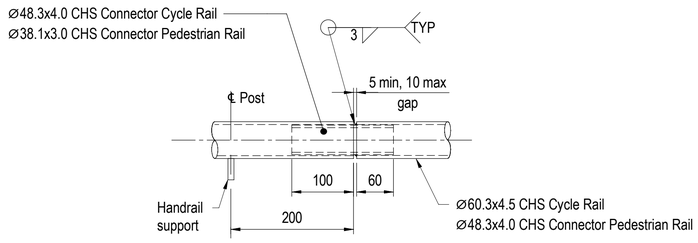

DETAIL 2
Scale X
053



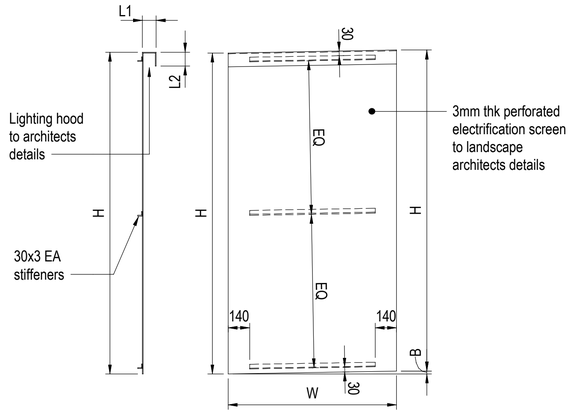

CYCLE RAIL - TYPICAL CRADLE BRACKET
Scale X



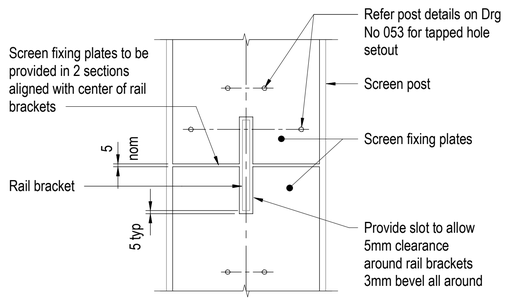

ELEVATION
TYPICAL RAIL EXPANSION JOINT 'Y'
Scale V




ELEVATION
TYPICAL RAIL JOINT ASSEMBLY 'Z'
Scale V




TYPICAL ELECTRIFICATION SCREEN
Scale T

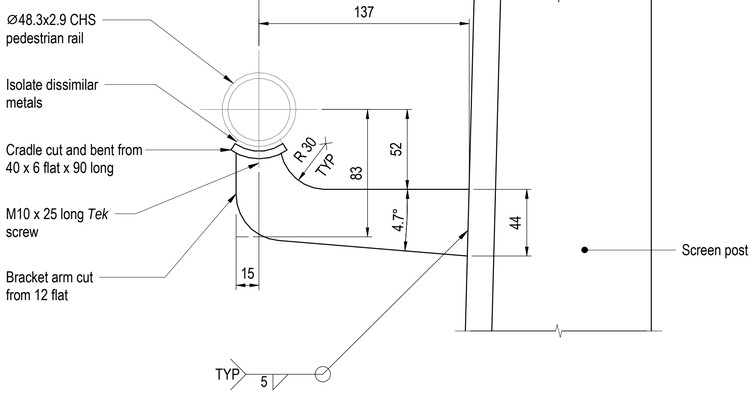



Screen not shown

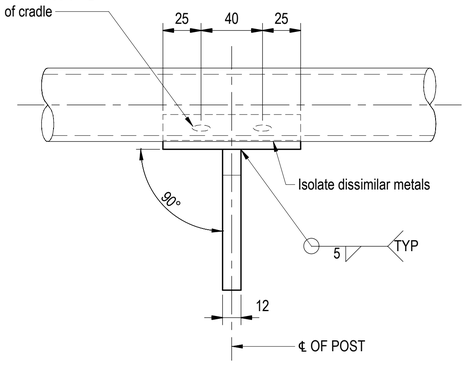
TYPICAL SCREEN FIXING PLATES DETAIL
Scale V

DETAIL 4
1 : 5
053

| SCREEN SCHEDULE | | | | |
|---|---|---|---|---|
| MARK No | SCREEN HEIGHT (H) mm | SCREEN WIDTH (W) mm | SCREEN OFFSET (B) mm | No OF |
| N-1 | 2800 | 1200 | 6.0 | 53 |
| N-2 | 2800 | 780 | 3.9 | 18 |
| S-1 | 2700 | 1200 | 6.0 | 53 |
| S-2 | 2700 | 780 | 3.9 | 18 |




DETAIL 3
Scale X
053




PEDESTRIAN RAIL - TYPICAL CRADLE BRACKET
Scale X

DRAWING REVISION HISTORY

| No. | DESCRIPTION | DRAWN | DESIGNED | REVIEWED | DATE |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| C | 100% Issue | S.Lemon | J.Marshall | D.Crowe | 21/08/2024 |
| B | 85% Issue | D.Branch | J.Marshall | D.Crowe | 10/11/2023 |
| A | 85% Issue | D.Branch | J.Marshall | D.Crowe | 06/10/2023 |
| | | D.Branch | J.Marshall | D.Crowe | |

APPROVED
ORIGINAL COPY ON FILE
"E" SIGNED BY
SIGNED
DATE

SCALE (PLOTTED FULL SIZE) AS SHOWN (A1)
SHEET SIZE A1
Q 0 200 400 600 800mm (1:20@A1)
X 0 20 40 60 80mm (1:2 @A1)
V 0 50 100 150 200mm (1:5 @A1)

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CLIENT FRASERS PROPERTY NEW BEITH TRUST
PROJECT NEW BEITH ROAD OVER RAIL BRIDGE
STATUS PRELIMINARY

DRAWING TITLE
MISCELLANEOUS DETAILS
SHEET 4 OF 4

VERT. DATUM: AHD | HEIGHT ORIGIN: PM 126832 | CLIENT No. -
HORIZ. GRID: MGA2020 Z56 | HORIZ. ORIGIN: PM 186068
DRAWING No. P.22.0175-00-STR-DRG-054 | REVISION C
23/08/2024 5:00:39 PM | P.22.0175-00-STR-DRG-054
Autodesk Docs://P.22.0175/B-P.22.0175-STR-MDL-001_NEW BEITH BRIDGE_V22.rvt

# Geotechnical Investigation Report

Appendix D

pitt&sherry

MAKING COMPLEX EASY

A TETRA TECH COMPANY

# Note

## Geotechnical Report is submitted separately to respond to other items of the information requests for DEV2024/1449 and DEV2024/1551

# Review Comment Responses

Appendix E

pitt&sherry

Review File: Appendix E - Review Comment Responses

| | |
|---|---|
| **Project Title** | **New Beith Rail Overbridge** |
| | |
| **Document Title** | **Concept Design T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** |
| | |
| **Document Ver** | **Rev A** |

| Comment Category | | |
|---|---|---|
| 4 | Critical Issue | Critical to functionality, safety and RAM. Must be addressed and closed prior to proceeding to next stage. |
| 3 | Immediate Issue | Major concern for functionality, safety and RAM. Should be addressed at this stage, but can be addressed at next stage if Reviewer is provided with sufficient supporting evidence that requirements can be met. |
| 2 | Discussion Item | Not a concern for functionality, safety and RAM however should be addressed for accuracy or completeness of the package. |
| 1 | Suggestion | Reviewer suggestion that may improve the package but is not mandatory. |

| Comment Summary | |
|---|---|
| Open | 0 |
| Closed | 51 |
| Deferred | 0 |
| Elevate | 0 |

ARTC

| REVIEWER SECTION | | | | | | | | | | DOCUMENT ORIGINATOR | | | DISCUSSION ACTIONS | REVIEWER ACCEPTANCE OF FINAL OUTCOME | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Comment ID | Document Number | Doc Rev | Document Reference Clause / Section / Page | Reviewer Name | Reviewer Organisation | Reviewer Comment | Requirement Reference(s) | Comment Date | Comment Category | Respondent's Name | Document Originator Response / Disposition | Response Date | Who, What and When | Comment Status | Status Date | Reviewer Final Comments, if any. |
| **<REVIEWER ORGANISATION> COMMENTS:** | | | | | | | | | | | | | | | | |
| **1** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | P4 | Daniel Lee | ARTC | Traffic Barrier: Anti throw screen should be min 3m high (refer to ARTC ETS-09-00 Section 9.2.8) | | 05-May-22 | 3 | David Crowe (pitt&sherry) | Response: Anti Throw screens as a part of the barrier system are 2.4m high in accordance with QR design requirements from CIVIL-SR-008. These are similar to the ones that are provided on the nearby Flagstone Bridge which would have a higher risk as on the east side of the bridge there is a shopping centre including a McDonalds and on the west is a waterpark and a Rugby League club. The pedestrian demand therefore on the New Beith bridge will be much lower and would therefore be a lower risk.<br><br>Proposed Change: Retain as 2.4m high to meet QR requirements<br><br>Update 23/08/2024:<br>Screens updated for 100% FDD issue to be 3m high. | 1/07/22 | | Daniel Lee's comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, P4, Traffic Barrier: Anti throw screen should be min 3m high (refer to ARTC ETS-09-00 Section 9.2.8) |
| **2** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | P5 | Daniel Lee | ARTC | Drainage – please ensure no water draining into the track/corridor | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Bridge deck drains to end of bridge into roadside drainage system<br><br>Proposed Change: No change. Civil design to accommodate overflow from bridge deck. | 1/07/22 | | Daniel Lee's comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, P5, Drainage – please ensure no water draining into the track/corridor |
| **3** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | P6 | Daniel Lee | ARTC | Collision Design Parameters –Please note that the MINIMUM collision loads (4000kN parallel & 1500kN perpendicular) specified in the Bridge Code AS 5100.2 are only minimum, thus the applied design train collision loads could be higher and they should be determined by risk assessment considering train speed, train loads, track etc). Also, the designer needs to adhere to ARTC's requirements for double stacked container lines. Although AS 5100 is silent on the double stacked rolling stock, higher impact point > 5m should be considered accordingly to meet SFAIRP requirements. (Please refer to ARTC ETS-09-00 Section 9.2.4) | | 05-May-22 | 2 | Reza Salamy / David Crowe (pitt&sherry) | Response: Response to comment as follows:<br>1. The heaviest part of a train that may cause most serious damage is locomotives (generally RAS210 with some corridors with RAS270). The locomotives are much heavier than the double stack wagons therefore, even the load point is higher but the intensity is much lower so the locomotive is still the governing load therefore current loading stipulated by AS5100 is still applicable and double stack will not change the loading condition.<br>2. The same comparison can be made between ARTC Steel Wagons (100t+) and double stack wagon. Double stack wagons are usually carrying goods containers that are still much lighter than heavy steel wagons therefore the higher load point for double stack will still produce less bending moment and shear.<br>3. If a risk assessment is still considered necessary then we will need to obtain actual data about the heaviest double stack wagons from ARTC to allow us to do a comparison.<br>Proposed Change: None. Continue to use impact loads as defined by AS5100/QR design requirements.<br><br>Update 23/08/2024:<br>Further to BG&E comment below and updated ARTC Bridge design requirements (ETS-09-00) a risk assessment has been carried out which confirms the probablility of impact to pier is very low for current rail track which is approx 15m away from pier. Impact loads to AS5100 for future QR tracks to be 5m from pier.<br>Superstructure impact load taken from ETS-09-00 and applied. | 1/07/22 | | Daniel Lee's comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, P6, Collision Design Parameters –Please note that the MINIMUM collision loads (4000kN parallel & 1500kN perpendicular) specified in the Bridge Code AS 5100.2 are only minimum, thus the applied design train collision loads could be higher and they should be determined by risk assessment considering train speed, train loads, track etc). Also, the designer needs to adhere to ARTC's requirements for double stacked container lines. Although AS 5100 is silent on the double stacked rolling stock, higher impact point > 5m should be considered accordingly to meet SFAIRP requirements. (Please refer to ARTC ETS-09-00 Section 9.2.4) |
| **4** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Tyler Warren | ARTC | Proponent will need to ensure all relevant planning and environmental legislative requirements are met for their works within the ARTC railway corridor. | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Planning and environmental requirements are in progress in parralel to but separately from the bridge design process.<br><br>Proposed Change: NA | 1/07/22 | | Tyler Warren's comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, General, Proponent will need to ensure all relevant planning and environmental legislative requirements are met for their works within the ARTC railway corridor. |
| **5** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Nick Orange | ARTC | Allowance for future rail line | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Bridge spans over the railway corridor, with separate span to accommodate future QR passenger rail line.<br><br>Proposed Change: NA | 1/07/22 | | | | Closed |
| **6** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Nick Orange | ARTC | Allowance for sufficient clearance to allow for double stacking of containers | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Clearance envelop is to ARTC Rolling Stock Type F which accommodates double stacked containers. Note that QR passenger railway clearance of 7.9m is critical (Type F has clearance of 7.1m)<br><br>Proposed Change: Nil required | 1/07/22 | | | | Closed |
| **7** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Tim Neville | ARTC | Drainage is an issue that will need to be addressed (change in overland flows, drainage from the road/bridge, cess/top drains, culverts, etc). Water should not be directed into the rail corridor, and any changes to existing flow regimes must not adversely impact ARTC. | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Overland flow drainage will be accommodated in the Civil design for the road and subdivision. The bridge deck will drain to the approach road and be taken up by the road drainage system. The bridge deck will not drain into the rail corridor (i.e. there will not be drainage scuppers along the bridge)<br><br>Proposed Change: None to bridge design | 1/07/22 | | Tim Neville's comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, General, Drainage is an issue that will need to be addressed (change in overland flows, drainage from the road/bridge, cess/top drains, culverts, etc). Water should not be directed into the rail corridor, and any changes to existing flow regimes must not adversely impact ARTC. |
| **8** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Jacques Heymans | ARTC | Railway maintenance access would need to be considered | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: Access to rail corridor to be provided as part of civil design.<br><br>Proposed Change: None to bridge design. Rail corridor access to be shown on civil drawings and will be reflected in bridge GA drawings for future submissions (50% submission) | 1/07/22 | | Jacques Heymans' comments retained | 30-Apr-24 | With regards to T-P.22.0175-BRG-INS-001.docx-RevA/DLC/, General, Railway maintenance access would need to be considered |
| **9** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Jacques Heymans | ARTC | Signal Sighting and line of sight would need to be considered | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: No visible signals on this length of track. Track relatively straight along this section so line of sight should not be impeded given bridge spans completely over the rail corridor<br><br>Proposed Change: None | 1/07/22 | | | | Closed |
| **10** | **T-P.22.0175-BRG-INS-001.docx-RevA/DLC/** | A | General | Jacques Heymans | ARTC | ARTC standards will apply to any infrastructure build within the Rail corridor https://extranet.artc.com.au/ | | 05-May-22 | 2 | David Crowe (pitt&sherry) | Response: ARTC Code of Practice for Track and Civil included as requirement in Design Documentation<br><br>Proposed Change: None. ARTC code already included and accommodated in design<br><br>Update 23/08/2024: Updated ARTC design requirements (ETS-09-00) have been incorporated | 1/07/22 | | | | Closed |
| **85% Design Review - May 2024 (ARTC Comments)** | | | | | | | | | | | | | | | | |
| **ARTC 11** | | | | Nick Orange | | Rail RLs below proposed double span bridge required to confirm adequate clearances from Ch 520 to Ch 580. A minimum clearance for double stacked rail of 7.9m needs to be confirmed. | | | 3 | | Response: ARTC Section 7 (ETS-07-00) shows 7.1m clearance for Structure Outline D H F2 which incorporates double stacked rail. The bridge clearance has allowed for future QR rail clearance of 7.9m on the assumtion that the future QR rail will be at the same level as the current ARTC track. pitt&sherry to provide confirmation of minimum 7.9m clearance under both spans from CH 520-580, noting that ARTC requirements are only 7.1m.<br><br>Proposed Change: Information to be provided. | 13/06/24 | | | | #REF! |

| Comment ID | Document Number | Doc Rev | Document Reference Clause / Section / Page | Reviewer Name | Reviewer Organisation | Reviewer Comment | Requirement Reference(s) | Comment Date | Comment Category | Respondent's Name | Document Originator Response / Disposition | Response Date | Who, What and When | Comment Status | Status Date | Reviewer Final Comments, if any. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ARTC 12** | | | | Tim Neville/Jason Olivo | | Basin spillway adjacent to the corridor boundary fence and basin pipe culvert (they both spill/direct concentrated water flows towards the Rail Corridor / Track between (Ch 520km - 580km). Also, drainage design appears to be incomplete from Ch 0 to Ch 520 relative to the rail. Drainage water being directed into the rail corridor needs to be clarified, as water ponding may seep into track formation. | | | 3 | | Response: Details to be provided as part of the civil design package.<br><br>Proposed Change: N/A. | 13/06/24 | | | | |
| **ARTC 13** | | | | Jason Olivo | | Level crossing relocatiom to be clarified in GA sheet 1/6 - Dwg P.22.0175-00-STR-DRG-002, as it could have negative impact on ARTC operations. New location to be confirmed. | | | 3 | | Response: Information will not fit on the current GA of the bridge. Diagram to be provided to show the relocated level crossing.<br><br>Proposed Change: Information to be provided.<br><br>Update 23/08/2024:<br>Exact relocated crossing location to be confirmed. | 13/06/24 | | | | |
| **ARTC 14** | | | | Jason Olivo | | Existing 500 x 400 RCP drainage culvert relocatiom to be clarified in GA Sheet 1/6 - Dwg P.22.0175-00-STR-DRG-002, as it could cause a negative hydraulic impact on ARTC operations | | | 3 | | Response: RCP drainage culvert relocated with the level crossing as noted on GA drawing.<br><br>Proposed Change: N/A | 13/06/24 | | | | |
| **ARTC 15** | | | | Jason Olivo | | RE Wall design and foundations (including the walkway) in GA Sheet 5/6 - Dwg P.22.0175-00-STR-DRG-006 appears to encroach the rail corridor boundary. Wall distance past rail corridor boundary is to be clarified | | | 3 | | Response: Section to be fixed. Plan shows face of wall along edge of rail corridor (REVIT drafting issue).<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Drawings have been updated to show the wall location relevant to the rail corridor boundary. Previous location was not correct (section taken using Revit showed wall incorrectly). Refer to plan arrangement for more accurate location of wall against rail corridor boundary. | 13/06/24 | | | | |
| **ARTC 16** | | | | Jason Olivo | | Pier design - As the girders are simply supported by the bridge pier, and the pier being designed to breakaway partially under train collision load, there is the risk that pier may not be adequately designed to withstand the superstructure loading post impact to prevent a bridge collapse. Clarification is required whether this risk has been assessed, as the pier is without a deflection wallor piles foundation. Section 4.1.6 of Design Report (Rev D), Dwg P.22.0175-00-STR-DRG-016.Rev C refers. | | | 3 | | Response: The girders are fully integral with the pier headstock and are not simply supported and the pier has been assessed for partial removal of the pier wall following a collision.<br><br>Proposed Change: Design to be reviewed under the updated ARTC Bridge Design Requirements ETS-09-00.<br><br>Update 23/08/2024:<br>Risk assessment has been carried out and show that likley head on impact to pier is very low risk. Pier has been designed to allow for potential impact from future QR railway. Acceptance is conditional on QR agreement which is pending. | 13/06/24 | | | | |
| **85% Design Review - May 2024 (ARTC Comments)** | | | | | | | | | | | | | | | | |
| **BG&E 1** | **T-P.22.0175-STR-REP-001** | RevD | Section 1 | RP | BG&E | It is stated that the future railway tracks are electrified, however, there is no electricity continuity provision in reinforcement drawings for earthing and bonding. Please clarify if/how the earthing and bonding requirements are satisfied. | TfNSW, Technical Note - TN 016: 2015. Queensland Rail, MD-11-1213. | 17-May-24 | 3 | | Response: Earthing and bonding shall be added to the next stage of design under Span 2.<br><br>Proposed Change: Earthing and bonding details to be added.<br><br>Update 23/08/2024:<br>Earthing and bonding notes have been added.<br><br>Update 8/11/2024:<br>Section added to design report. | 13/06/24 | | Closed | 02-Sep-24 | Design method/consideration shall be noted in Design Report. |
| **BG&E 2** | **T-P.22.0175-STR-REP-001** | RevD | Section 4.1.5 and Section 4.1.6 | RP | BG&E | It is understood that in accordance with Cl15.1 AS5100.1, a risk assessment based on future track located 5m away from the pier covering the following aspects shall be approved by ARTC - the relevant authority:<br>1. Required protection and head on collision load as per ARTC ETS-09-00.<br>2. Adopt middle pier in/between rail corridor as per Cl15.3.2, AS5100.1.<br>3. Deflection walls as per Cl15.3.5, AS5100.1. | AS5100.1 ETS-09-00, ARTC | 17-May-24 | 3 | | Response: Risk assessment is now required under the updated ARTC Bridge Design Requirements ETS-09-00. P&S will need to get further information from ARTC on the number of trains and track speed in order to carry out this risk assessment. The future railway cannot be defined at this stage, and a risk assessment will need to be carried out as part of future track design.<br><br>Proposed Change: Undertake a risk assessment based on the additional information to be provided by ARTC. | 13/06/24 | | Closed | 02-Sep-24 | Risk Assessment is subject to approval from ARTC. |
| **BG&E 3** | **T-P.22.0175-STR-REP-001** | RevD | Section 4.1.8 | RP | BG&E | Ka was used in original design, please note Ko shall be used for new bridge abutment. | Cl8.3.2 AS5100.3:2017. | 17-May-24 | 3 | | Response: Updated to Ko and design to be checked.<br><br>Proposed Change: Design to be checked for Ko.<br><br>Update 23/08/2024:<br>Design has been checked and updated based on Ko. | 13/06/24 | | Closed | 02-Sep-24 | |
| **BG&E 4** | **P.22.0175-00-STR-DRG-002** | G | Plan | RP | BG&E | Coordinates of BH2 doesn't seem to be consistent with boreholes included in Geotechnical Investigation Report. | T-P.22.0175-STR-REP-001 | 17-May-24 | 2 | | Response: Review the coordinates of BH2.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Coordinates for BH2 have been reviewed and updated on the drawings. | 13/06/24 | | Closed | 02-Sep-24 | |
| **BG&E 5** | **P.22.0175-00-STR-DRG-002** | G | Vehicle loading | RP | BG&E | 1. Suggest note 'between traffic barriers' after 'Number design lanes:3".<br>2. Suggest remove 'with 50% SM1600 loading' as no space is available for SM1600 once the HLP320 is position as shown in the diagram. | AS5100.2 | 17-May-24 | 1 | | Response: Note to be updated on drawings.<br><br>Proposed Change: Update drawings as per the suggestions made.<br><br>Update 23/08/2024:<br>Notes have been updated on drawings per the suggestions made. | 13/06/24 | | Closed | 03-Sep-24 | |
| **BG&E 6** | **P.22.0175-00-STR-DRG-002** | G | Impact Loads | RP | BG&E | 1. It is understood that 'Collision loads from rail traffic…' is subject to approval from ARTC.<br>2. Impact load on superstructure in accordance with Cl9.2.4.3, ETS-09-00, ARTC shall be specified. | Cl9.2.4, ETS-09-00, ARTC | 17-May-24 | 3 | | Response: ARTC ETS-09-00 has been updated and reissued since design commenced on this structure. pitt&sherry to update the design to accommodate these new requirements in accordance with Clause 9.3.4.3. Impact loads shall be specified on drawings.<br><br>Proposed Change: Design to be checked for new requirements. Update drawings to include impact loads.<br><br>Update 23/08/2024:<br>Rail Derailment and Collision Risk Assessment has been completed and discussed with ARTC. ARTC are generally in acceptance of the findings of the RA subject to acceptance from QR which is pending.<br>Impact load on Superstructure from ETS-09-00 has been added to the report and is included in the design.<br><br>Update 8/11/2024:<br>Impact load note added. | 13/06/24 | | Closed | 03-Sep-24 | Impact load of 410kN on superstructure in accordance with Cl9.2.4.3, ETS-09-00, ARTC, shall be specified on Drawing. |
| **BG&E 7** | **P.22.0175-00-STR-DRG-002** | G | Earthquake loading | RP | BG&E | BEDC-3 is specified on the drawing. Please note the following ARTC requirement: The classification of a new bridge shall be BEDC-4 unless otherwise approved by ARTC based on a site-specific cost benefit analysis. | Cl9.2.5, ETS-09-00, ARTC | 17-May-24 | 3 | | Response: ARTC ETS-09-00 has been updated and reissued since design commenced on this structure. pitt&sherry to update the design to accommodate these new requirements in accordance with Clause 9.3.5.<br><br>Proposed Change: Design to be checked for new requirements (BEDC-4).<br><br>Update 23/08/2024:<br>Design has been checked for BEDC-4 earthquake effects following the change in the design requirements from ARTC. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 04-Sep-24 | |

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| **BG&E 8** | **P.22.0175-00-STR-DRG-004** | F | Typical deck section | RP | BG&E | 1. Height of protection/anti-throw screen not less than 3m shall be dimensioned.<br>2. A screen with opening size of 25mmx25mm cannot be classified as 'electrification screen'. | CI9.2.8, ETS-09-00, ARTC CI5.1, Civil-SR-008, Queensland Rail | 17-May-24 | 3 | | Response: Frasers Property and urban designer to confirm if the 25mm x 25mm openings shall remain and whether to proceed with an 'anti-throw screen' or an 'electrification screen'. Requirements to be clarified by ARTC.<br><br>Proposed Change: ARTC to confirm the requirements for type of screen. Design to be updated as required.<br><br>Update 23/08/2024:<br>Given that the existing rail line does not have any OHLEs, 25mm x 25mm openings in the screen have been adopted at this stage. It is a requirement for future works that the mesh is updated to 8mm x 8mm openings when the future rail is constructed.<br><br>Update 8/11/2024:<br>Notation changed on multiple drgs. | 13/06/24 | | Closed | 04-Sep-24 | "Electrification Screen" on drawings shall be udpated to "Protection Screen" |
| **BG&E 9** | **P.22.0175-00-STR-DRG-008** | B | Notes | RP | BG&E | Note No.8 specifies 'handrail', but no handrail shown on any elevation. | | 17-May-24 | 2 | | Response: Handrail to be added.<br><br>Proposed Change: Update drawings to include handrail.<br>Update 23/08/2024:<br>Handrail not required as precast concrete wall panels extend 900mm above the groundlevel. Handrail note has been removed. | 13/06/24 | | Closed | 04-Sep-24 | |
| **BG&E 10** | **P.22.0175-00-STR-DRG-009** | B | Typical section at abutment | RP | BG&E | Adequate gap and compressible filler between abutment and slab on access path shall be specified to accommodate deflection of abutment. | | 17-May-24 | 3 | | Response: Compressible filler to be added to detail.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Drawings have been updated to include compressible filler between the abutment headstocks and the footpath, and the footpath and RSS walls. | 13/06/24 | Compressible filler has been added to the detail in the drawings. | Closed | 05-Sep-24 | |
| **BG&E 11** | **P.22.0175-00-STR-DRG-018** | C | Plan - Pier 1 | RP | BG&E | Extent of CJ shall be specified with allowance for a flat surface receiving compressible filler shown on DRG-043 | | 17-May-24 | 3 | | Response: Pier headstock is proposed to be widened to improve constructability and Safety in Design.<br><br>Proposed Change: Update pier headstock design.<br><br>Update 23/08/2024:<br>Extent of CJ shown hatched in pier plan. | 13/06/24 | | Closed | 06-Sep-24 | |
| **BG&E 12** | **P.22.0175-00-STR-DRG-028** | B | Typical coupler setout plan | RP | BG&E | Spacing between the middle couplers is greater than 300mm. | Cl8.6.1(b), AS5100.5:2017 | 17-May-24 | 3 | | Response: Detail to be updated to show bars/couplers equally spaced as shown in DRG-045.<br><br>Proposed Change: Updated drawings as required.<br><br>Update 23/08/2024:<br>Coupler locations and spacing revised. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 13** | **P.22.0175-00-STR-DRG-032** | B | All sections | RP | BG&E | Strands layout to be consistent with DRG-029. | | 17-May-24 | 1 | | Response: Strand configuration to be updated to remain consistent with DRG-029.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Strand layouts revised for consistency. Note layout has revised slightly to allow for drainage conduit to exit through soffit of girder. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 13** | **P.22.0175-00-STR-DRG-033** | B | Typical girder protruding reinforcement detail at pier end | RP | BG&E | The reinforcement arrangement is inconsistent with other drawings. | | 17-May-24 | 2 | | Response: Review and update details.<br><br>Proposed Change: Update drawings as required.<br>Update 23/08/2024:<br>Reo arrangement has been reviewed and corrected where required. Note that some sections omit some of the bars for clarity. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 14** | **P.22.0175-00-STR-DRG-042** | D | Deck and relieving slab layout plan | RP | BG&E | Sections through relieving slab at SUP and footpath shall be provided to show transition from deck to slab and to approach pavement. | | 17-May-24 | 2 | | Response: Detail to be added showing the interface between the SUP/footpath and the respective relieving slabs.<br><br>Proposed Change: Update drawings to include new detail.<br><br>Update 23/08/2024:<br>Sections and details for SUP and footpath added to Drg 049 to show treatment of surfacing and conduits. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 15** | **P.22.0175-00-STR-DRG-043** | C | Conduit joint details at expansion and fixed joints | RP | BG&E | It doesn't seem this detail is applicable. Also note the 200 dia conduits could clash as the spacing between 125 dia conduits is less than 200. | | 17-May-24 | 2 | | Response: 200mm diameter conduits to be reduced to 150mm diameter.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Drawing has been updated to show ø150 enveloper conduit. This detail is applied at expansion joints at each abutment. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 16** | **P.22.0175-00-STR-DRG-043** | C | Section A | RP | BG&E | Adopting 100mm wide filler will reduce the starter bar (shown on Section D/E on DRG-022) cover to be less than 20mm. | | 17-May-24 | 2 | | Response: Detail to be revised as the pier headstock is proposed to be widened. Detail E on DRG-022 will not significantly change, but the cover issue will be addressed.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Pier headstock has been revised. Cover to starter bars confirmed to be more than sufficient. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 17** | **P.22.0175-00-STR-DRG-046** | B | Section F | RP | BG&E | Our calculated abutment movement under earth pressure and surcharge with Ka is ~30mm, with means the nominated 50mm could be reduced to 20mm after completing backfill behind abutment. This will affect the installation of the expansion joint and reduce the joint capacity. How is this being accommodated in the design? | | 17-May-24 | 2 | | Response: To be reviewed.<br><br>Proposed Change: To be reviewed.<br><br>Update 23/08/2024:<br>Our calculations do not result in such a large movement. Allowing for the weight of the wingwalls reduces the deflection due to backfill significantly, noting that the deflection is due to backfill against the abutment headstock only. The construction sequence of the abutments will involve constructing the wingwalls before backfilling. A precamber has also been specified for the construction of the abutments so that when the earth pressure is finally applied, the gap is not compromised. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 18** | **P.22.0175-00-STR-DRG-047** | B | Pier diaphragm reinforcement and Section J | RP | BG&E | It seems the reinforcement in the stitch pour between outer flanges of edge girders is missing. | | 17-May-24 | 2 | | Response: Review and update details.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Reinforcement in the stitch pour between outer flanges of the edge girders has been added. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 07-Sep-24 | |

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| **BG&E 19** | **P.22.0175-00-STR-DRG-055** | C | Typical traffic barrier detail | RP | BG&E | The sloping surface of the barrier has an angle of 79 degrees, which does not comply with Cl14.6.1. | | 17-May-24 | 2 | | Response: Review and update detail.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>The sloping surface of the barrier has been updated to comply with the 80 degree requirement. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 07-Sep-24 | |
| **BG&E 20** | **P.22.0175-00-STR-DRG-012** | B | Elevation - Wingwall W2, W3, W6 and W7 | RP | BG&E | The medium performance barrier is terminated at end of bridge deck, which does not comply with Length of Need detailed in Austroads Report AP-R445-13 Standardised Bridge Barrier Design. Please clarify the approach barrier complies with Cl14.6.3 in AS5100.1:2017.<br><br>Update 07/09/2024:<br>Refer to Thrie Beam Connection on DRG-011, the traffic barrier is 1.5m high at deck end, and 0.86m high at approach end. The Traffic barrier performance level is changed to Low from Medium. Please clarify change of the performance level comply with Cl14.6.3, AS5100.1:2017. | Cl14.6.3, AS5100.1:2017 | 20-May-24 | 2 | | Response: Approach barriers are part of the civil design by others. pitt&sherry to back check the length of the approach barriers as shown in the civil package and update the bridge drawings accordingly.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Approach barriers are detailed in the civil design package as noted above. The barriers are shown on the bridge package indicatively only with a reference to the civil drawing. The barriers have not been udpated at this stage but can be for IFC.<br><br>Update 23/09/2024:<br>The approach barriers have been assessed against AS5100.1. Using traffic figures of 1000 to 15000 vehicles per day and an RT factor or 1.5 for two way undivided road and using the top end of the traffic range (exact figures are not currently available) which requires a Regular level barrier, noting that the 1.5m height is a QR requirement over the structure only. A thrie beam would meet the regular containment level on the approaches. | 13/06/24 | | Closed | 30-Oct-24 | |
| **BG&E 21** | **P.22.0175-00-STR-DRG-002** | B | Shear Detailing | CH | BG&E | Helix Reinforcement extent should be positioned 50mm from face rather than 80mm documented | AS5100.5: 2017 Clause 8.3.2.3 | 22-May-24 | 2 | | Response: Dimension shall be adjusted to 50mm.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Helix reinforcement extent is now positioned 50mm from the headstock and footing faces. Drawings have been updated. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 22** | **P.22.0175-00-STR-DRG-029** | B | Strand pattern | CH | BG&E | Debonding Table inconsistent with strand pattern layout on drawing and on plan<br><br>Update 09/09/2024:<br>If strand pattern type 1 is used for both spans, there is a clash at the stitch where the protruding strands will clash with each other.<br><br>Update 30/10/2024:<br>Table titles to be updated to Span 1 and Span 2 from Span 2 and Span 2. Plan titles to be updates to Row A and Row B respectively from Row B and Row C.<br>DRG-033 detail E indicates that cover to the top N28 bars are increased within Span 2 girders. BG&E do not believe that this is good practice and recommend maintaining cover for all N28 bars and to use cranked bars within the stitch to prevent clashes. | | 22-May-24 | 2 | | Response: Review and update debonding table.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Debonding table has been reviewed and updated.<br><br>Update 23/09/2024:<br>Review undertaken. Additional strand pattern added to avoid clash.<br><br>Update 23/10/2024:<br>DRG-029 updated to include separate strand patterns at the pier for Span 1 and Span 2 girders.<br><br>Update 19/12/2024:<br>Incorrect notation for strand pattern on Drg 029 corrected | 13/06/24 | | Closed | 20-Dec-24 | |
| **BG&E 23** | **T-P.22.0175-STR-REP-001** | RevD | Section 4.1.12 Thermal Effects | CH | BG&E | Shade Air Temperature and Average Air Temperature are not consistent with values from the standard | AS5100.2: 2017 Table 18.2(A) | 22-May-24 | 2 | | Response: Design Report to be updated with the correct Shade Air Temperature and Average Air Temperature, in accordance with AS5100.2:2017.<br><br>Proposed Change: Update Design Report as required.<br><br>Update 23/08/2024:<br>Design Report has been updated to show the correct shade air temperature and average air temperature in accordance with AS5100.2:2017. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 24** | **T-P.22.0175-STR-REP-001** | RevD | Section 4.1.7 Barrier Load | CH | BG&E | Rail Status and table references in CIVIL-SR-007 and AS5100.2:2017 are not consistent with bridge configuration. | AS5100.2:2017 Clause 12.2.2 | 23-May-24 | 3 | | Response: CIVIL-SR-007 has been updated and reissued since design was commenced on this structure. pitt&sherry to update the design to accommodate a HFP Rail Status (Table 1). Requirements remain the same.<br><br>Proposed Change: Update Design Report as required.<br><br>Update 23/08/2024:<br>Barrier loads in the Design Report has been updated following the change in the CIVIL-SR-007 documentation. Rail status was identified as HFP, and road status was identified as 2C. This does not result in any changes to the design requirements for barrier loads. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 25** | **P.22.0175-00-STR-DRG-014** | B | Reinforcement | CH | BG&E | Abutment columns may have insufficient Bending + axial combined capacity under PE + Traffic Loads<br>Combined action of 1185 kNm and 3000 kN compression required.<br>1109 kNm and 2809 kN provided. | | 24-May-24 | 3 | | Response: Abutment columns to be checked for the new requirements in the relevant updated ARTC/QR documents. Columns are proposed to be updated to 900mm diameter (minimum), depending on outcomes of design checks.<br><br>Proposed Change: Design to be checked for new requirements.<br><br>Update 23/08/2024:<br>Abutment column diameter has been increased from 750mm to 1000mm and concrete strength increased from 40MPa to 50MPa to account for the new earthquake design effects. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 26** | **P.22.0175-00-STR-DRG-021** | B | Reinforcement | CH | BG&E | Pier Blade wall primary axis bending insufficient for seismic loads<br>2603 kNm/m was required at the top of the 1m pier wall. 1123 kNm/m was provided. | | 24-May-24 | 3 | | Response: Pier blade wall to be checked for the new requirements in the relevant ARTC documents (BEDC-4 seismic loading).<br><br>Proposed Change: Design to be checked for new requirements.<br><br>Update 23/08/2024:<br>Design has been checked for BEDC-4 earthquake effects following the change in the design requirements from ARTC. Our assessment is showing much lower moments with max moment of approximately 700kNm/m. Capacity is derived based on an interaction curve taking into account the vertical load in the member resulting in a moment capacity of around 2000kNm/m based on the vertical loads applied. 1100kNm/m would be applicable for no vertical loads which isnt the case. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 27** | **P.22.0175-00-STR-DRG-021** | B | Reinforcement | CH | BG&E | Bridge deflected 57mm under seismic action which is more than the 50mm nominal gap between cross girder and curtain wall and more than allowed for by the strip seal. | | 24-May-24 | 3 | | Response: Bridge to be assessed for the new requirements in the relevant ARTC documents (BEDC-4 seismic loading).<br><br>Proposed Change: Design to be checked for new requirements.<br><br>Update 23/08/2024:<br>Design has been checked for BEDC-4 earthquake effects following the change in the design requirements from ARTC. Drawings have been updated as appropriate. Our analysis is showing a much lower deflection under seismic loads. Note that strip seal expansion joints are not required to accommodate seismic movements. | 13/06/24 | | Closed | 09-Sep-24 | |

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| **BG&E 28** | **P.22.0175-00-STR-DRG-021** | B | Reinforcement | CH | BG&E | Pier footing Reinforcement Section A 20E and corresponding 24E at the ends is insufficient<br>Bending in the longitudinal direction of the bridge required 1496 kNm/m at the edge and 1125 kNm/m centrally.<br>Reinforcement provided 1246 kNm/m at the edge and 880 kNm/m centrally. | | 24-May-24 | 3 | | Response: Pier footing to be checked for the new requirements in the relevant ARTC documents (BEDC-4 seismic loading).<br><br>Proposed Change: Design to be checked for new requirements.<br><br>Update 23/08/2024:<br>Pier footing configuration has changed based on the additional geotechnical investigations, which includes stepping the footing in the middle to account for the sloping sandstone level. Pier footing has been checked for BEDC-4 earthquake effects following the change in the design requirements from ARTC. Reinforcement in the footing has increased to accommodate the higher loads due to the BEDC-4 seismic loading. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 29** | **P.22.0175-00-STR-DRG-033** | B | Reinforcement | CH | BG&E | Insufficient reinforcement for crack control protruding from girder ends into the pier stitch at the base of the girder<br><br>Update 09/09/2024:<br>Beam is considered monolithic construction and require a maximum spacing of 300mm between reinforcement along the soffit of the beam as per AS5100.5:2017 Clause 8.6.1 (b). Also under jacking of abutments of 20mm with a 10mm settlement of the pier, the SLS stress in the N28 bars exceed that allowed for under crack control. | AS5100.5:2017 Clause 8.6.1 (b) | 24-May-24 | 3 | | Response: Crack control is not relevant at this location as it is adjacent to a construction joint.<br><br>Proposed Change: N/A.<br><br>23/09/2024:<br>To be confirmed if this is related to the beam only and not the pier headstock. Checks to be done for jacking at abutments.<br><br>03/10/2024:<br>Agreed, limiting SLS stress allowed for crack control is 200MPa and this is exceeded assuming only 2-N28 bars. Propose to move protruding strands to the bottom layer and extend strands so stresses are shared between 2-N28 bars and 2-15.2 diameter strands.<br><br>Update 23/10/2024:<br>DRG-029 updated to include protruding strands in addition to the 2-N28 bars on the bottom layer of reinforcement at the pier. | 13/06/24 | | Closed | 30-Oct-24 | |
| **BG&E 30** | **P.22.0175-00-STR-DRG-045** | B | Reinforcement | CH | BG&E | 30mm bottom cover insufficient to meet minimum 45mm cover for regular formwork for B1 exposure classification. | AS5100.5:2017 Clause 4.14.3 | 27-May-24 | 3 | | Response: Minimum cover to be updated to 45mm to meet B1 exposure classification requirements for the soffit of the bridge deck insitu concrete slab. Drawing notes to be updated to reflect this change, as appropriate.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Minimum cover in deck slab has been updated to 45mm to meet B1 exposure classification requirements. Notes have been updated on the drawings. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 31** | **P.22.0175-00-STR-DRG-055** | B | Detailing | CH | BG&E | Detail 1/053 cast in bolts has duplicate tags and conflicting details.<br><br>Update 09/09/2024:<br>Base plate drawing refers to 2-26 holes rather than 4. | | 27-May-24 | 2 | | Response: Detail to be updated.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Detail 1/053 has been updated to remove conflicting details. Drawings have been updated as appropriate.<br><br>Update 23/09/2024:<br>Baseplate detail on Drg 053 to be updated.<br><br>Update 23/10/2024:<br>4-26 holes specified on baseplate detail on DRG-053. | 13/06/24 | | Closed | 30-Oct-24 | |
| **BG&E 32** | **P.22.0175-00-STR-DRG-033** | B | Typical girder protruding reinforcement detail at pier end | CH | BG&E | The protruding reinforcement are not long enough to be developed within the cover zone of the pier stitch. | | 27-May-24 | 3 | | Response: Reinforcement to be reviewed to confirm if the development length provided is sufficient at this location and under the anticipated loads.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>The protruding reinforcement at the pier end of the girders has been reviewed and sufficient development length has been specified. Where there is not sufficient space to fully develop the bars Ancon BT anchors have been specified. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 33** | **P.22.0175-00-STR-DRG-011** | B | Dowel Design | CH | BG&E | Minimum restraint load of 500 kN cannot be resisted by the two dowels provided<br><br>Update 09/09/2024:<br>Due to compressible rubber filling the gap, there is a 20mm eccentricity minimum between the crossgirder and the restraint block. The lateral seismic force of 1130kN * 20mm = 22.6kNm exceeds the bending capacity of 14.4kNm of the combined pins.<br><br>Update 30/10/2024:<br>Cellular polystyrene sheet still shown as 20 thick. Ht of Lateral restraint block would need to be raised to reduce the gap. | AS5100.2: 2017 Clause 10 | 27-May-24 | 3 | | Response: Design requirements to be reviewed and updated as appropriate.<br><br>Proposed Change: Update design as required.<br><br>Update 23/08/2024:<br>The shear connectors at the restraint block have been updated to 2 No. x 65mm diameter HDG dowels, which has sufficient capacity for the 500kN minimum restraint load as well as the railway impact on the superstructure. Drawings have been updated as appropriate.<br><br>Update 23/09/2024:<br>To be reviewed and confirmed.<br>Load seems high cw our analysis. For a 20mm gap and ø65 pin there doesnt seem to be a bending failure plane - pin would be treated as a deep beam however this may depend on support conditions in the top section.<br><br>Update 03/10/2024:<br>It is noted that we are getting a capacity of 21.2kNm for the combined pins based on a 65mm diameter pin. A capacity of 14.4kNm is equivalent to the original 57mm diameter pins.<br>Similarly, we are getting 1184kN of lateral seismic force for the span, which we have assumed is shared evenly between the abutment and pier (conservative given the fixity of the superstructure at the pier). We are finding the capacity of the combined pins are sufficient under these assumptions. However, if the gap is reduced to 10mm, this would satisfy checks from both parties.<br><br>Update: 23/10/2024:<br>Gap reduced to 10mm and details on DRG-011 updated.<br><br>Update: 8/11/2024:<br>DRG-011 updated. | 13/06/24 | | Closed | 10/10/2024<br>10/12/2024 | |

| Comment ID | Document Number | Doc Rev | Document Reference Clause / Section / Page | Reviewer Name | Reviewer Organisation | Reviewer Comment | Requirement Reference(s) | Comment Date | Comment Category | Respondent's Name | Document Originator Response / Disposition | Response Date | Who, What and When | Comment Status | Status Date | Reviewer Final Comments, if any. |
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| **BG&E 34** | **P.22.0175-00-STR-DRG-045** | B | Reinforcement | CH | BG&E | B1 Exposure Classification does not match report which states "B2 minimum for durability and cover for slab and abutments" | | 27-May-24 | 3 | | Response: B1 exposure classification will be added for reinforcement in the bottom of the bridge deck concrete. Note will be added and cover requirements reviewed and updated as required.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Drawing No. 042 notes have been updated to specify a B1 exposure classification for the underside (bottom face) of the deck slab, in accordance with DTMR Design Criteria for Bridges and Other Structures Clause 3.12.3.1. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 09-Sep-24 | |
| **BG&E 35** | **P.22.0175-00-STR-DRG-009** | B | Reinforced earth walls | MS | FSG | Is the stablised sand of sufficient permeability to allow for free drainage of the RSW? Or has the potential lag been considered in the design calculations for external wall stability? No wall geometry widths have been provided for checking. | | 28-May-24 | 3 | | Response: Drainage detail to be updated so the pipe drain is provided behind the cement stabilised sand.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Drainage detail has been updated to show the pipe drain behind the cement stabilised sand. Drawings have been updated as appropriate. | 13/06/24 | | Closed | 12-Sep-24 | |
| **BG&E 36** | **P.22.0175-00-STR-DRG-009** | B | Reinforced earth walls | MS | FSG | Minimum reinforced soil wall width does not appear to be documented on the drawings. Please provide this information. | | 28-May-24 | 3 | | Response: Information to be added to the drawings.<br><br>Proposed Change: Update drawings as required.<br><br>Update 23/08/2024:<br>Min soil block length has been added to Drg 09. | 13/06/24 | | Closed | 12-Sep-24 | It is noted that minimum RSS width is not varied with wall height. |
| **BG&E 37** | **P.22.0175-00-STR-DRG-008** | B | Reinforced earth walls | MS | FSG | Has MRTS06.1 been completed? If so please provided. Else, no founding criteria (bearing capacity or remove and replacement requirements) for the walls has been nominated on the drawings. | | 28-May-24 | 2 | | Response: MRTS06.1 has not been completed. Specifications to be completed as part of the next design stage.<br><br>Proposed Change: MRTS06.1 to be completed in the next design stage.<br><br>Update 23/08/2024:<br>Founding criteria has been added to the drawings as notes. MRTS06.1 has not been completed at this stage. | 13/06/24 | | Closed | 12-Sep-24 | 11 c. should read Minimum undrained... |
| **BG&E 38** | **P.22.0175-00-STR-DRG-008** | B | Reinforced earth walls | MS | FSG | Global stability checks do not appear to have been undertaken for the RSS walls. Please confirm and provide further information. | | 28-May-24 | 2 | | Response: Information to be provided.<br><br>Proposed Change: Information to be provided.<br><br>Update 23/08/2024:<br>Global stability checks have been completed and soil block lengths have been added to the drawings. | 13/06/24 | | Closed | 12-Sep-24 | |
| **BG&E 39** | **P.22.0175-00-STR-DRG-006** | B | General arrangement | MS | FSG | How is the footng to be constructed below the existing sewer, has the impact of the loading on the sewer been assessed? | | 28-May-24 | 3 | | Response: Since submission of the last design stage, better advice has been provided on the location of the sewer. The Abutment A footing configuration will need to be updated to avoid the sewer and ensure that excavation does not undermine it.<br><br>Proposed Change: Update design as required.<br><br>Update 23/08/2024:<br>Abutment A footing has been raised to avoid the sewer. The invert of the footing at the lowest point of the sewer is slightly below the level of the sewer invert and therefore the Abutment A footing will not impact on the sewer<br><br>Update 23/09/2024:<br>Confirmation of scope required - this should be part of the embankment design. Are there QUU requirements?<br><br>Update 02/12/2024:<br>Checks on the existing sewer form part of the civil design scope. The Civil Designer is currently in discussions with the asset owner to confirm pipe properties to determine the requirements during/after the construction of the bridge.<br><br>Update 19/12/2024:<br>Confirming discussion in meeting that horizontal loads on abutment footing will be towards the railway and away from the sewer. | 13/06/24 | No information is provided on the sewer pipe diameter and pipe material type. The vertical loads from the RSS fill and lateral loads from the footing will impact the sewer. The designer is to confirm whether protection measrements are required for the sewer. | Closed | 20-Dec-24 | |
| **BG&E 40** | **T-P.22.0175-STR-REP-001** | D | Report | MS | FSG | No geotechnical calculations have been provided for the bearing or sliding resistance of the proposed pad footings and design assumptions adopted for the design including geotechnical strength reduction factors adopted. Please provide these details. | | 28-May-24 | 3 | | Response: Geotechnical information to be provided.<br><br>Proposed Change: Geotechnical information to be provided.<br><br>Update 23/08/2024:<br>Geotechnical information is provided in Section 7.1.2 of the design report. Capacity is based on Ultimate Bearing Capacity of 1.5MPa for Very Low strength sandstone with øg of0.6. Sliding capacity is based on friction value of 0.45.<br>Calculations are not provided.<br><br>Update 03/10/2024:<br>ϕg of 0.55 will be adopted for the abutment footings in bearing in accordance with AS5100.3 Table 8.3.1(A). The abutments are less critical in bearing than the pier, with the maximum ultimate bearing pressure less than the 825kPa ultimate beairng capacity. Drawings to be updated. Refer comments below for justtification on selection of the upper bound reduction factor.<br><br>Update 23/10/2024:<br>Notes updated on DRG-010 to specify 825kPa ultimate bearing capacity based on ϕg of 0.55. | 13/06/24 | Please review AS 5100.3 Table 8.3.3.3(A) and 8.3.3.3(B). Please provide justification for selection of the upper bound of the range, or update the drawings to specify measures that justify selection fo the upper bound of the range. | Closed | 30-Oct-24 | |

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| **BG&E 41** | **T-P.22.0175-STR-REP-001** | D | Report | MS | FSG | Very low strength according to AS1726 covers a range of UCS values. Confirmation of the design UCS and stiffness shall be provided in subsequent design stages and furthermore to allow validation during construction. Independent checks indicate that the differential settlement of the foundations is towards the upper allowable limit, if founding material varies from very low to high strength from abutment to piers. | | 28-May-24 | 3 | | Response: To be reviewed.<br><br>Proposed Change: To be reviewed.<br><br>Update 23/08/2024:<br>Notification of bearing capacity has been added to the drawings along with øg value for verification during construction.<br><br>Update 03/10/2024:<br>Per the advice of the Geotechnical Report, the upper bound limit for the geotechnical capacity reduction factor can be adopted if supervision and certification of the foundation construction is carried out by a geotechnical engineer. Note that DTMR specifications are being used for cosntruction, which require these conditions during construction.<br><br>Update 23/10/2024:<br>In addition to the above, DRG-010 and DRG-018 specifies that the completed excavation shall be inspected by the geotechnical assessor to map the encounter rock types, weathering, intact strength, presence of any rock mass defects, and to confirm that the minimum ultimate bearing capacity is met prior to construction of each foundation.<br><br>Update 02/12/2024:<br>Requirements for testing parameters to confirm the geotechnical reduction factor (ϕg) have been added to DRG-010 and DRG-018. | 13/06/24 | Similar to comment above. The designer should recommend rigorous site verification requirements if the upper end of the Geotechncial Reduction Factor range is adopted. | Closed | 12-Sep-24 | |
| **BG&E 42** | **T-P.22.0175-STR-REP-001** | D | Report | MS | FSG | We have calculated that the unfactored resistance of the footing subject to horizontal loads to be approximately 2200 kN/m in the longitudinal direction, when founded in very low strength rock, and assuming the excavation for the footing is backfill with high quality compacted granular fill. The factored capacities therefore range is in the order of 10600 kN if a Geotechnical Strength Reduction Factor of 0.5 is applied. We have calculated that the applied longitudinal horizontal load is a maximum of 11,700KN at the abutments which is exceeding the allowable capacity. Please confirm the deisgn assumptions adopted. The horizontal load resistance at the pier is adequate. | AS5100.3 Clause 5.3.3.4 | 28-May-24 | 4 | | Response: Longitudinal loads fall under the earthquake provisions, and the structure will need to be checked for the new requirements in the updated ARTC bridge design guide ETS-09-00 for BEDC-4 seismic loading. Abutment A footing configuration will also need to be updated to avoid undermining the sewer.<br><br>Proposed Change: Design to be checked for new requirements.<br><br>Update 23/08/2024:<br>Geotechnical strength reduction factor has been taken as 0.6 which provides adequate capacity, noting that the abutment footing has been updated in the design process. Loads for sliding at the abutment does not take into account the loads applied to the RSS soil block as this is independent of the abutment columns.<br><br>Update 03/10/2024:<br>As per the above comments. | 13/06/24 | Designer may need to check footing sizing is adequate if the geotechnical reduction factor has been revised in accordance with AS5100.3. | Closed | 12/09/2024<br>12/12/24 | To be closed pending adequate justification of geotechnical strength reduction factor. |
| **100% Design Review - September 2024 (BG&E Comments)** | | | | | | | | | | | | | | | | |
| **BG&E 43** | **P.22.0175-00-STR-DRG-009** | C | Detailing | CH | BG&E | Minimum clear spacing of abutment column to sleeve to be specified. | | 10-Sep-24 | 3 | | 1100mm diameter sleeves around the abutment columns is nominated on DRG-009, allowing 50mm either side of the column for SLS movements. Detail to be added to show this more clearly.<br><br>Update 23/10/2024:<br>Detail of abutment column to sleeve added to DRG-009. | | | Closed | 30-Oct-24 | |
| **BG&E 44** | **P.22.0175-00-STR-DRG-010** | D | Detailing | CH | BG&E | Setout information for abutment B not provided for construction. | | 10-Sep-24 | 4 | | Detail to be added. SOP Co-ordinates for Abut A and pier not provided either<br><br>Update 23/10/2024:<br>SOP coordinates added to Abutment A, Abutment B and Pier 1 in DRG-010, DRG-013 and DRG-018, respectively. | | | Closed | 30-Oct-24 | |
| **BG&E 45** | **P.22.0175-00-STR-DRG-010** | D | Detailing | CH | BG&E | Refer to Note 7, we understand the 900kPa is $\Phi_{gRug}$, but the note reads as Rug= 900kPa, please clarify.<br>Same for Pier. | | 10-Sep-24 | 4 | | Note to be clarified - noting previous comments regarding Φg to be reviewed and justified<br><br>Update 23/10/2024:<br>Notes on DRG-010 and DRG-018 updated to read ϕgRug for clarification. | | | Closed | 30-Oct-24 | |
| **BG&E 46** | **P.22.0175-00-STR-DRG-011** | C | Detailing | CH | BG&E | Fill material between vertical face of pad footing and excavated rock not specified. Material shall be specified to provide required lateral resistance. | | 10-Sep-24 | 4 | | Confirm if lateral resistance is required from fill material and if so specify fill material (lean mix concrete?)<br><br>No lateral resistance required for design. In order to minimise excavation size we recommend filling it with stabilised sand.<br><br>Update 23/10/2024:<br>Indicative excavation envelopes and backfill instructions added to the General Arrangement Drg (Drg 006). | | | Closed | 30-Oct-24 | |
| **BG&E 47** | **P.22.0175-00-STR-DRG-014** | D | Detailing | CH | BG&E | Earthing and bonding notes shall be added to abutment and pier elements. | | 10-Sep-24 | 4 | | Drgs to be updated to include E&B notes<br><br>Update 23/10/2024:<br>Earthing and bonding notes added to DRG-021 for pier, 029 for girders and 042 for the deck. Earthing and bonding is required at abutments. | | | Closed | 30-Oct-24 | |
| **BG&E 48** | **P.22.0175-00-STR-DRG-022** | C | Detailing | CH | BG&E | N28 Stitch vertical starter bar has hooks which face towards the centre of the pier. Would a different coupler such as type C be easier for installation purposes? | | 10-Sep-24 | 2 | | Type C would be easier, but may defeat the purpose. It may be easier to just install the bars without couplers. To be reviewed<br><br>Update 23/10/2024:<br>Coupler bars have been removed and continuous N28 bars detailed at the pier stitch. | | | Closed | 30-Oct-24 | |
| **BG&E 49** | **P.22.0175-00-STR-DRG-025** | D | Detailing | CH | BG&E | 5 M12 Grade 4.6 marginally fails for shear under longitudinal seismic action.<br><br>Update 30/10/2024:<br>Holes shown only on one side. | | 10-Sep-24 | 3 | | 6-M12 Gr 4.6/S bolts shall be used for bearing restraint plate, reducing c/c spacing to 80mm instead of 100mm. Detail to be updated.<br><br>Update 23/10/2024:<br>Bearing restraint plate detail has been updated with 6-M12 Gr 4.6/S bolts on DRG-025.<br><br>Update 8/11/2024:<br>Drg-025 updated. | | | Closed | 10-Dec-24 | |
| **BG&E 50** | **P.22.0175-00-STR-DRG-025** | D | Detailing | CH | BG&E | Please clarify how the deck thickness is maintained for different measured girder hog values.<br><br>Update 30/10/2024:<br>P.22.0175-00-STR-DRG-026 only specifies "Where the actual hogs at the time of pouring the deck vary from this value, the Ht's shall be adjusted to suit", but does not provide guidance on how to adjust the Ht's dependent on the measured hog. | | 10-Sep-24 | 4 | | This will be managed during construction as per usual practice. Girder hogs should be established prior to finalising plinths at abutments and mortar pads can be adjusted to suit actual hogs.<br><br>Update 8/11/24:<br>Notes provided are standard TMR notes. This will be managed during construction and dealt with through an RFI. | | | Closed | 10-Dec-24 | |
| **BG&E 51** | **P.22.0175-00-STR-DRG-049** | C | Detailing | CH | BG&E | Drainage trench appears to be sealed off with walls at each end. If water ingresses, is there a release path? | | 10-Sep-24 | 2 | | Section D on Drg 046 shows no end wall for watermain trench. Should water collect this will drain to abutment shelf and will drain through end walls at the side of the bridge. Note that the watermain trench is at the top edge of the footpath so water ingress should be minimal. | | | Closed | 30-Oct-24 | |
| **BG&E 52** | **P.22.0175-00-STR-DRG-025** | D | Detailing | CH | BG&E | Taper plate based on 108mm residual hog (117mm-9mm) and 0.5% longitudinal grade should be 24 and 19mm at abutment A and B respectively. | | 10-Sep-24 | 4 | | Update 23/10/2024:<br>Dimension 'A' has been updated based on a review of the residual hog and longitudinal grade. | | | Closed | 30-Oct-24 | |

## Review File: Appendix E - Review Comment Responses

| Comment ID | Document Number | Doc Rev | Document Reference Clause / Section / Page | Reviewer Name | Reviewer Organisation | Reviewer Comment | Requirement Reference(s) | Comment Date | Comment Category | Respondent's Name | Document Originator Response / Disposition | Response Date | Who, What and When | Comment Status | Status Date | Reviewer Final Comments, if any. |
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| **BG&E 53** | **P.22.0175-00-STR-DRG-043** | D | Detailing | CH | BG&E | Packer plate should be tapered to the girder hog and longitudinal grade, and guidance shall be given to maintain the deck thickness given a change in hog. | | 10-Sep-24 | 3 | | Update 23/10/2024:<br>Girder installation procedure notes added to DRG-043. | | | Closed | 30-Oct-24 | |
| **BG&E 54** | **P.22.0175-00-STR-DRG-026** | D | Detailing | CH | BG&E | It is understood the girders will be sitting on packers on pier, details still show props for the girder and prop support point.<br><br>Update 30/10/2024:<br>Props still being shown | | 10-Sep-24 | 3 | | Update 23/10/2024:<br>Details have been removed from DRG-026.<br><br>Update 8/11/2024:<br>Temporary support schedule deleted.<br>Update 19/12/2024:<br>Diagram showing locations of temporary supports deleted. | | 12/12/24 - Detail still not deleted | Closed | 20-Dec-24 | |
| **BG&E 55** | **P.22.0175-00-STR-DRG-046** | C | Detailing | CH | BG&E | Calculations show a +2 degree has a closing of -1mm and -2 degree a +1mm opening. Please confirm sign and magnitude for pouring of the expansion joint | | 10-Sep-24 | 2 | | Update 23/10/2024:<br>Notes have been updated for clarification on DRG-046. | | | Closed | 30-Oct-24 | |
| **BG&E 56** | **T-P.22.0175-STR-REP-001** | E | Report | CH | BG&E | As per ARTC License for works R6.24 Design Reports contains a list of requirements for the report. We note non-conformance with regards to the clause. | R6.24 C to H | 10-Sep-24 | 2 | | Update 23/10/2024:<br>Sections for relevant design documentation, relevant specifications and analysis software were identified as missing from the ARTC requirements. Sections have been added to the latest revision of the Design Report. | | | Closed | 30-Oct-24 | |

# SiD Register

Appendix F

pitt&sherry

| Ref # | Source | R- Risk O - Opportunity | Status Open or Closed | Risk Location | Risk Category | Project Section | Discipline | Life Cycle Phase | Safety in Design Hazard/Issue | Cause | Consequences | Responsibility | Existing Controls (Implementation Commenced or Complete) | Existing Control Owner | Safety | Assets | Financial | Environmental | Regulatory | Reputational | Budget | Performance | Schedule | Max Current Consequence | Current Likelihood | Current Level of Risk | Planned Future Controls (Planned but implementation not yet commenced) | Action Owner | By When | Residual Consequence | Residual Likelihood | Residual Level of Risk | Comments |
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| 1 | | R | Open | | | Bridges - General | | Construction | Workers falling from heights during construction activities | - Installation of abutment embankment protection<br>- Installation of bridge girders<br>- Casting of bridge substructure, deck and barriers | Physical injury/death to worker | Contractor | - Provide appropriate exclusion zones during works<br>- Workers to be suitably harnessed<br>- Workers to be trained and ticketed for working at heights<br>- Use appropriate temporary handrails<br>- Form part of SWMS by Contractor<br>- Access to individual work areas to be planned, delineated and provided with edge protection where required | Contractor | Major | Major | Minor | Not Significant | Major | Major | Moderate | Moderate | Moderate | Major | Rare | R L-4E | | | | | | NA | |
| 2 | | R | Open | | | Bridges - General | | Construction | Workers falling into bridge girder | Girder has open top design | Physical injury to worker | Contractor | - Wider recess allowance in girder for placement of permanent formwork prior to bridge being accessed by workers<br>- Provision for works to close open top during construction<br>- Form part of SWMS by Contractor | Contractor | Moderate | Minor | Minor | Not Significant | Moderate | Minor | Minor | Minor | Minor | Moderate | Rare | R L-3E | | | | | | NA | |
| 3 | | R | Open | | | Bridges - General | | Construction | Workers falling into excavation works | Open excavations | Physical injury/death to worker | Contractor | - Isolate hazard with temporary fencing<br>- Form part of SWMS by Contractor"<br>- Suitable safe Access points, (e.g. ladder or stair system etc) and method of recovery. | Contractor | Major | Major | Minor | Not Significant | Major | Major | Moderate | Moderate | Moderate | Major | Rare | R L-4E | | | | | | NA | |
| 4 | | R | Open | | | Bridges - General | | Construction | Equipment/tools/plant falling from height onto railway<br>Temporary construction haul road directly adjacent to bridge work area | - Loose equipment/tools<br>- Working close to edge | Physical injury/death to worker | Contractor | - Solid temporary barriers to edge of bridge deck<br>- Equipment/tools to be attached where practical<br>- Provide appropriate exclusion zones during works<br>- Form part of SWMS by Contractor | Contractor | Major | Major | Moderate | Not Significant | Major | Major | Moderate | Moderate | Moderate | Major | Rare | R L-4E | | | | | | NA | |
| 5 | | R | Open | | | Bridges - General | | Construction | Bridge girders or electrification screens falling from crane over railway | Heavy lifting of bridge girders over railway<br>Lifting of multiple large items over railway at the structure edge | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Girder / lifting loops/points to be designed for lifting in accordance with AS3850<br>- Contractor to follow lifting arrangements on drawings<br>- Provide appropriate exclusion zones during works<br>- Lifting to be undertaken under TOA<br>- Lifting plan to be provided by Crane Operator<br>- Screens to consider fixing from inside the deck<br>- Form part of SWMS by Contractor | Contractor | Extreme | Extreme | Major | Not Significant | Extreme | Extreme | Major | Major | Major | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 6 | | R | Open | | | Bridges - General | | Construction | Overturning or collapse of bridge girders during installation | Inadequate temporary works | - Workers trapped/impacted<br>- Girder falls onto railway resulting in physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Temporary works to be designed by RPEQ Engineer<br>- Show indicative restraint on drawings<br>- Installation to be performed under rail closure<br>- Temporary restraints during installation<br>- Form part of SWMS by Contractor | Contractor | Extreme | Extreme | Major | Not Significant | Extreme | Extreme | Major | Major | Major | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 7 | | R | Open | | | Bridges - General | | Construction | Installation of pier and headstock reinforcement cages and and formwork close to railway | Loss of control of reinforcement / formwork | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Provide suitable splice detail on design drawings<br>- Reinforcement cages and formwork to be certified for lifting where required<br>- No lifting over Danger Zone<br>- Lifts to be undertaken during TOA - Track Occupancy Authority<br>- Provide appropriate exclusion zones during works<br>- Form part of SWMS by Contractor' | Contractor | Major | Major | Moderate | Not Significant | Major | Major | Moderate | Moderate | Moderate | Major | Possible | R H-4C | | | | | | NA | |
| 8 | | R | Open | | | Bridges - General | | Construction | Plant becoming imbalanced and overtopping | Inadequate design of crane pads | Physical injury/death to worker | Contractor | - Temporary works/pads to be designed and inspected by RPEQ Engineer<br>- Form part of SWMS by Contractor | Contractor | Extreme | Extreme | Moderate | Not Significant | Major | Major | Major | Major | Major | Extreme | Rare | R M-5E | | | | | | NA | |
| 9 | | R | Open | | | Bridges - General | | Construction | Services / public utility plant strike during construction activities | Unknown services / public utility plant | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Services to be identified in the design stage<br>- Services to be diverted where necessary<br>- Service location to be confirmed onsite prior to excavation<br>- Clear identification markers to delineate<br>- Excavation permits to be obtained | Contractor | Extreme | Extreme | Major | Moderate | Extreme | Extreme | Major | Extreme | Extreme | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 10 | | R | Open | | | Bridges - General | | Construction | Failure of existing services / public utilities during construction activities | Inadequate design of temporary supports | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Services to be identified in the design stage<br>- Temporary works to be designed and inspected by RPEQ Engineer<br>- Form part of SWMS by Contractor | Contractor | Extreme | Extreme | Major | Moderate | Extreme | Extreme | Major | Extreme | Extreme | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 11 | | R | Open | | | Bridges - General | | Construction | Construction activities undertaken at night | Poor visibility of workers at night | Physical injury/death to worker | Contractor | - Construction activities designed to take place during the day wherever possible<br>- Form part of SWMS by Contractor | Contractor | Moderate | Minor | Minor | Not Significant | Moderate | Minor | Minor | Minor | Minor | Moderate | Unlikely | R L-3D | | | | | | NA | |
| 12 | | R | Open | | | Bridges - General | | Construction | Noise, vibration and dust | Bridge construction near private properties | Discomfort to local residents and businesses | Contractor | - Local community to be informed of upcoming works<br>- Construction methodology to be reviewed to ensure least disturbance' | Contractor | Minor | Minor | Minor | Moderate | Moderate | Moderate | Minor | Minor | Minor | Moderate | Possible | R M-3C | | | | | | NA | |
| 13 | | R | Open | | | Bridges - General | | Construction | Worker struck by rail traffic | Working within rail corridor | Physical injury/death to worker | Contractor | - Workers to undertake RIW induction training<br>- Works to be carried out during TOA<br>- Work site Protection Plan and Pos<br>- Install approved controls to reduce potential for inadvertant encroachment<br>- Form part of SWMS by Contractor | Contractor | Major | Major | Moderate | Not Significant | Major | Major | Moderate | Moderate | Moderate | Major | Unlikely | R M-4D | | | | | | NA | |
| 14 | | R | Open | | | Bridges - General | | Construction | Failure of RSS walls during construction activities | Unexpected ground conditions | Structural collapse causing injury/death | Contractor | - RSS walls shall consider worst case scenarios for robust geotechnical design (designed by others)<br>- Construction methodology shall be submitted as part of design<br>- Hold point during construction for RSS walls to be inspected by RPEQ engineer | Contractor | Extreme | Extreme | Major | Major | Extreme | Extreme | Major | Major | Major | Extreme | Rare | R M-5E | | | | | | NA | |
| 15 | | R | Open | | | Bridges - General | | Operation | Rail collision with new bridge | Proximity of bridge to railway | Structural collapse causing injury/death | Designer | - Clearance envelopes to structure as per QR/ARTC Standards<br>- Bridge piers adjacent to rail design for rail collision load | Designer | Extreme | Extreme | Extreme | Major | Major | Major | Extreme | Extreme | Not Significant | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 16 | | R | Open | | | Bridges - General | | Operation | Errant vehicle overtops bridge barrier | Barrier performance level not adequate | - Physical injury/death to member of public<br>- Damage to infrastructure | Designer | - Risk assessment to AS5100 to be undertaken<br>- Bridge barrier designed as per QR/ARTC and TMR Standards | Designer | Major | Moderate | Moderate | Not Significant | Major | Major | Minor | Major | Not Significant | Major | Rare | R L-4E | | | | | | NA | |
| 17 | | R | Open | | | Bridges - General | | Operation | Pedestrian on bridge throws object on to rail below | No anti-throw screens on bridge | - Object impacts plant/person(s)<br>- Physical injuries/death to person(s) | Designer | Electrification screens included as per QR/ARTC and TMR Standards | Designer | Major | Moderate | Moderate | Not Significant | Major | Major | Minor | Major | Not Significant | Major | Rare | R L-4E | | | | | | NA | |
| 18 | | R | Open | | | Bridges - General | | Operation | Cyclist/pedestrian slipping or tripping on expansion joint | Expansion joints on share path | Physical injury to member of public | Designer | Expansion joins to be designed as per TMR specifications | Designer | Moderate | Minor | Moderate | Not Significant | Moderate | Moderate | Minor | Minor | Not Significant | Moderate | Unlikely | R L-3D | | | | | | NA | |
| 19 | | R | Open | | | Bridges - General | | Operation | Future installation of services/construction work on operating bridges | Inadequate provision for future PUP on bridge | Physical injury to worker / member of public | Designer | Service conduits running underneath SUP<br>Provision for future water main included | Designer | Minor | Minor | Minor | Minor | Moderate | Moderate | Minor | Minor | Minor | Moderate | Unlikely | R L-3D | | | | | | NA | |
| 20 | | R | Open | | | Bridges - General | | Maintenance and Operations | Workers falling from height during maintenance and inspection activities | - Inspection of bridge elements above ground<br>- Cleaning of components<br>- Cleaning of vermin nesting around bridge<br>- Replacing electrification screens / handrails to barriers | Physical injury/death to worker | Asset Owner | - Provide inspection walkways to new bridge abutments<br>- Provide handrailing/fencing adjacent to inspection walkways<br>- Workers to follow safe work procedures for working at heights | Asset Owner | Major | Major | Minor | Not Significant | Major | Major | Minor | Minor | Moderate | Major | Rare | R L-4E | | | | | | NA | |
| 21 | | R | Open | | | Bridges - General | | Maintenance and Operations | Worker struck by road traffic | Maintenance and inspection activities adjacent to live traffic on bridge barriers | Physical injury/death to worker | Asset Owner | - Temporary traffic management to be put in place<br>- Access to be provided off road wherever possible<br>- Workers to follow safe work procedures | Asset Owner | Major | Major | Minor | Not Significant | Major | Major | Minor | Minor | Moderate | Major | Possible | R H-4C | | | | | | NA | |
| 22 | | R | Open | | | Bridges - General | | Maintenance and Operations | Vermin bites-stings while maintaining/inspecitng bridge | Vermin nesting around bridge | Physical injury to worker | Asset Owner | - PPE must be worn/used<br>- Periodic cleaning of vermin nesting around bridge<br>- Workers to follow safe work procedures | Asset Owner | Moderate | Minor | Minor | Not Significant | Moderate | Moderate | Minor | Minor | Not Significant | Moderate | Possible | R M-3C | | | | | | NA | |
| 23 | | R | Open | | | Bridges - General | | Maintenance and Operations | Localised damage to structure causing jack failure | Replacement of bearings | - Sudden movement of jack or structure causing physical injury<br>- Damage to infrastructure | Asset Owner | - Headstocks designed to facilitate bearing replacement<br>- Work carried out under restricted loading per TMR requirements | Asset Owner | Moderate | Major | Major | Not Significant | Major | Major | Major | Major | Major | Major | Unlikely | R M-4D | | | | | | NA | |
| 24 | | R | Open | | | Bridges - General | | Maintenance and Operations | Failure of electrification screens | Failure of connections | - Physical injury/death to member of public<br>- Traffic accident<br>- Damage to plant/infrastucture | Asset Owner | - Design of connections to AS5100<br>- Routine inspections"<br>- Detailing of the screens to consider maintenance from the bridge deck | Asset Owner | Moderate | Moderate | Moderate | Not Significant | Moderate | Major | Moderate | Moderate | Minor | Major | Unlikely | R M-4D | | | | | | NA | |
| 25 | | R | Open | | | Bridges - General | | Maintenance and Operations | Fall from height or traffic collision | Maintenance and inspection of electrification screens | - Physical injury/death to member of public<br>- Traffic accident<br>- Damage to plant/infrastucture | Asset Owner | - Routine inspections<br>- Tempoarary traffic management if required | Asset Owner | Moderate | Moderate | Moderate | Not Significant | Moderate | Major | Moderate | Moderate | Minor | Major | Rare | R L-4E | | | | | | NA | |
| 26 | | R | Open | | | Bridges - General | | Construction | Access to pier and headstock during construction and girder installation | - Instability of temporary access scaffolding | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Scaffold design to be provided by supplier and certified<br>- Scaffold foundations to be properly prepared, designed and inspected prior to installation | Contractor | Extreme | Moderate | Moderate | Not Significant | Not Significant | Minor | Minor | Moderate | Moderate | Extreme | Possible | R H-5C | | | | | | NA | |
| 27 | | R | Open | | | Bridges - General | | Construction | Access over railway during construction works | - Access required for vehicles over railway during construction<br>- Relocation of existing railway crossing point | - Impact by train on crossing vehicles<br>- Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Crossing to be supervised by Protection Officer<br>- Crossing during designated times only<br>- Open communications with Network Control to be fully aware of train schedule and when trains are due<br>- Form part of SWMS by Contractor | Contractor | Extreme | Extreme | Extreme | Minor | Not Significant | Major | Major | Major | Major | Extreme | Unlikely | R M-5D | | | | | | NA | |
| 28 | | R | Open | | | Bridges - General | | Construction | General Site Safety | Poor housekeeping and maintenance of site and plant | - Physical injury/death to worker<br>- Damage to plant/infrastructure | Contractor | - Ensure Contractor has ISO Certification<br>- Daily Site Inspections and Toolbox talks | Contractor | Moderate | Not Significant | Not Significant | Not Significant | Extreme | Moderate | Major | Minor | Not Significant | Extreme | Unlikely | R M-5D | | | | | | NA | |

Cell: G5
Note: To facilitate importing this register into the master register we need the section name to be repreated in each row.

# DTMR Pre-Lodgement Advice

TMR Reference TMR22-035974

Appendix G

pitt&sherry

# Department of Transport and Main Roads – Pre-lodgement advice - New Beith road over rail bridge - Bridge Fixing Report

| | |
|---|---|
| **TMR reference:** | TMR22-035974 |
| **Street address:** | 345 Mountain Ridge Road, New Beith QLD 4124 |
| **Real property description:** | 4RP45728 |

## 1.0 Assessment

*Proposed Development*

- The site is located within the Flagstone Priority Development Area (PDA).
- The development relates to Mountain Ridge Road, a bridge and road upgrade works. Mountain Ridge Road currently terminates at the railway corridor boundary, is proposed to be realigned through Lot 31 on RP143361 and extended over the existing (Brisbane to Sydney Line) and future railway corridor (Salisbury to Beaudesert).
- The Salisbury to Beaudesert project is classified as Category B within PRISM.
- On 15 April 2022, Pitt & Sherry (Operations) Pty Ltd prepared a Bridge Fixing Form (project no. P.22.0175) on behalf of Frasers Property Australia.

*Concept Design*

- The Bridge Fixing Form states that the proposed bridge will have an overall length of 60m measured from face of abutment to face of abutment and will include two (2) spans.
- Pitt & Sherry advise that that bridge is to span over the existing and proposed corridors, with a pier to be located on the current boundary between the existing and future railway corridors.
- The Mountain Ridge Road Bridge Crossing Sketch Plan (drawing no. SK25, revision 1) and New Beith Rail Overbridge Concept (drawing no. S-P.22.0175-00-STR-DWG-001) illustrate the proposed design concept.

## 2.0 Recommendations

### 2.1 Pre-lodgement Advice

(a) TMR provides the following prelodgement advice:

| Item | Pre-lodgement advice |
|---|---|
| **Existing Railway Corridor** | |
| 1. | **Works in a Railway Corridor**<br>The proposed development is for a road bridge over the railway corridor (Lot 201 on SP130089), with a central pier located on the western boundary of the existing railway corridor.<br><br>Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations. Please contact the ARTC at development@artc.com.au or alternatively Derek Rogers on 0423 563 344 in relation to this matter.<br><br>Please be advised that a development approval does not constitute an approval under section 255 of the *Transport Infrastructure Act 1994* and that such approvals need to be separately obtained from the relevant railway manager. |
| 2. | **Extending Roads Over Rail Corridor Land** |

| Item | Pre-lodgement advice |
|---|---|
| | Under section 253 of the *Transport Infrastructure Act 1994*, Logan City Council must seek permission from the Chief Executive of the Department of Transport and Main Roads in relation to relevant infrastructure associated with constructing, maintaining and operating a road on rail corridor land or non-rail corridor land by way of a bridge. The permission may be subject to conditions and the railway manager will be consulted as part of this process. After the permission is granted, the permission will be recorded on the relevant lease for the rail corridor land.<br><br>For assistance in relation to this process, please contact Patrick Leys of TMR's Rail Corridor Management team at: RCM@tmr.qld.gov.au or at 3066 7430. |
| 3. | **Interface Agreement**<br>Logan City Council will be required to enter into an interface agreement with the railway manager (ARTC) in relation to the road bridge over the railway corridor. |
| **Development Adjacent to the Existing Railway Corridor** | |
| 4. | The applicant is advised that the lodgement of reconfiguration and operational works applications will be assessed in relation to the impacts of proposed development situated outside the existing railway corridor on the existing railway corridor. Further guidance in relation to this matter is provided in State Code 2 - Development in a Railway Environment of the State Development Assessment Provisions and the Guide to Development in a Transport Environment: Rail which is available at: Guide to development in a transport environment: Rail (Department of Transport and Main Roads) (tmr.qld.gov.au)<br><br>This advice is preliminary only and does not further articulate all the matters addressed in the aforementioned documents. |
| **Access to Existing and Future Railway Corridors** | |
| 5. | Mountain Ridge Road currently provides access to the existing railway corridor from the east for emergency and maintenance access. As such, the development design will need to maintain this access from the east via a new access track. A nominal 6m wide, 1:20 maximum grade access track is suggested, with further design requirements to be specified and confirmed by ARTC.<br><br>It is also recommended that a future railway corridor access track is provided from the west, nominally 6m wide and 1:20 maximum grade. This would support future Queensland Rail corridor access and/or shared path access between the Mountain Ridge Road shared path and proposed railway corridor shared path.<br><br>Mountain Ridge Road is of appropriate road hierarchy for heavy vehicle access to the corridor for maintenance and emergency purposes and should be prioritised for this use as opposed to using local access streets. |
| **Development within the Future Railway Corridor** | |
| 6. | **General Guidance**<br>The applicant is advised that the lodgement of reconfiguration and operational work applications will be assessed for their impacts on the future railway corridor. Further guidance in relation to this matter is provided in State Code 2 - Table 2.5: Development in a Future Railway Corridor of the State Development Assessment Provisions and the Approved Planning Policy (https://www.tmr.qld.gov.au/Community-and-environment/Planning-and-development/Planning-and-development-assessment-under-the-Planning-Act/Approved-Planning-Policy). |
| 7. | **Future Railway Corridor** |

| Item | Pre-lodgement advice |
|---|---|
| | When lodging a formal development application for the road bridge, the applicant is required to submit RPEQ certified drawings and supporting technical documentation addressing the following:<br><br>• The alignment of the future railway corridor and existing railway corridor clearly shown on all drawings. The existing railway corridor boundary should be confirmed by registered survey. Please contact TMR at RAPTTA@tmr.qld.gov.au should you wish to have the boundary of the future railway corridor reviewed for accuracy.<br><br>• demonstrate that all permanent development (earthworks, bridge structure, retaining and supporting structures, foundation structures, infrastructure services/utilities, drainage works and any other works) at or below ground level are not located in the future railway corridor. The development's interface with the future railway corridor should be clearly illustrated through elevations, sections, cross sections and longitudinal sections. All drawings should be fully dimensioned/scaled, sufficiently labelled and include existing and proposed RLs. The applicant is advised that the bridge span may need to be adjusted to ensure that all bridge abutments and supporting structures are located outside the existing and future railway corridors.<br><br>• demonstrate that the vertical clearance of the bridge is adequate to ensure that the future railway corridor is not compromised. Clearances above the future railway corridor will need to consider matters such as adequate separation from the rail transport infrastructure (including overhead line equipment) and other rail infrastructure for the operation of the railway corridor and for emergency and maintenance access to the underside of the bridge, amongst other relevant factors. Advice is provided that Queensland Rail standard drawing QR-C-S3306 – Structure Clearances (electrified lines) now supersedes drawing 2754 and provides guidance on height clearance.<br><br>• advice is provided that a central bridge pier at the common boundary between the existing and future railway corridor, is supported in-principle, subject to meeting the requirements of the relevant railway managers (Queensland Rail and ARTC), including their standards, and so as to not compromise the future railway corridor. In relation to Queensland Rail please contact the SEQ Asset Manager Richard Nettleton on telephone number 3072 7117 or at 0408 163 392 in relation to this matter. A Queensland Rail project manager may need to be assigned to this task in which case you may need to enter into an agreement with Queensland Rail. TMR's Rail Planning Team will undertake a detailed review of the exact location of the bridge and its supporting infrastructure once the applicant has undertaken a detailed survey and provided more detailed RPEQ certified bridge designs. |
| 8. | **Bridge Design, Earthworks and Retaining Structures**<br>When lodging a formal development application, the applicant should provide the following, amongst other relevant information:-<br><br>(a) <u>Preliminary Geotechnical Investigation</u><br>A RPEQ certified preliminary geotechnical investigation of the site. This should:<br>• encompass a sufficient number and depth of borehole investigations, to determine the sub-surface characteristics of the site from a preliminary perspective. In particular, the borehole investigations should be appropriate to the depth of any piling, foundation structures and examine the sub-surface conditions in proximity to the future transport corridor; and<br>• provide preliminary geotechnical design information on the following, amongst other relevant considerations, to inform the structural engineering design and construction management of the development: |

| Item | Pre-lodgement advice |
|---|---|
| | ▪ earthworks, including methods for the excavation, the excavation and drilling of rock, the stability of open excavations, and filling/back filling and compaction;<br>▪ permanent and temporary retention options, design loads and geotechnical design parameters;<br>▪ suitable options for foundation structures, design loads and geotechnical design parameters;<br>▪ vibration impacts from drilling, boring and excavation;<br>▪ groundwater conditions and temporary and permanent groundwater control options; and<br>▪ advice on effects on existing and future State transport infrastructure and relevant construction issues.<br><br>Alternatively, please provide any existing geotechnical investigations previously undertaken for the site.<br><br>(b) <u>Earthworks</u><br>A RPEQ certified earthworks plan, including cross sections/sections, and required supporting technical details clearing showing:<br>• the location and extent of proposed excavation and filling (earthworks), including likely volumes of cut and fill in proximity to the existing and future railway corridor;<br>• the maximum depth of any excavation and the gradient and height of any proposed temporary or permanent batters in proximity to the existing and future railway corridor;<br>• the maximum height and intended form/design of any proposed retaining walls or structures in relation to the existing and future railway corridor;<br>• the temporary and permanent retention systems in relation to the existing and future railway corridor.<br><br>Scaled cross sections, sections and elevations should clearly show the interface with the existing and future railway corridor as a result of the proposed earthworks, retaining structures and building foundation structures (outermost projections). The difference between existing site levels and finished/design levels should be clearly shown.<br><br>(c) <u>Preliminary structural engineering design of bridge</u><br>RPEQ certified preliminary structural engineering design plans for the development, including cross sections/sections/elevations and any required supporting technical details showing the following in relation to the existing and future railway corridor:<br><br>*i.* *Building Foundation Structures*<br>The type, spacing, location and depth of foundation structures (including any proposed structures such as footings, piles, piers and associated columns/supports).<br><br>*ii.* *Retaining Structures*<br>The proposed retention system for the development, including the location, length, depth and angle of insertion of any proposed shoring, rock anchors and/or soil nails.<br><br>*iii.* *Loading Implications of the Development*<br>The loading configuration of the development and how this will ensure that the existing and future railway corridor will not be adversely affected by the addition or removal of loading, both during construction and upon completion of works. The loading implications of all aspects of the development should be considered such as earthworks, building, structures, retention systems and the like. |

| Item | Pre-lodgement advice |
|---|---|
| 9. | **Stormwater and Flooding**<br>When lodging a formal development application, the application should provide a Stormwater Management Plan demonstrating that the management of stormwater and flooding post development can achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exceedance Probability (AEP). This should include at least the following flood and stormwater events: 63.2%, 50%, 20%, 10%, 5%, 2% and 1% AEP. Stormwater management for the proposed development must ensure no worsening or actionable nuisance to the future railway corridor and railway corridor, including rail transport infrastructure, caused by peak discharges, flow velocities, water quality, sedimentation and scour effects. The report should also demonstrate that flood storage capacity is maintained on the site with the development. Overland flow paths/ hydraulic conveyance should be maintained on the site as part of the proposed development.<br><br>In particular, the following should be addressed:<br><br>(i) *Site Detail and Contour Survey.* A site detail and contour survey is required to verify the existing drainage characteristics of the site, particularly in relation to the railway corridor. All relevant legal points of discharge for the development site are identified.<br><br>(i) *Catchment Analysis.* Provide pre-development and post-development catchment plans that clearly identify all internal catchments on the site, external catchments draining into the site, the flow paths (direction of flow) within each catchment, the size of each catchment and the legal point of discharge for each catchment.<br><br>(ii) *Maintain the pre-development condition.* The pre-development flow scenario will need to be replicated in the post development condition. The proposed development should not impede or interfere with any drainage, stormwater or floodwater flows, including sheet flows, from the railway corridor or vice versa. Retaining structures, filling/excavation, landscaping, buildings and structures or any other works to the land should be designed to include provision for drainage so as not to adversely impact on the railway corridor. The development design will need to address any concentration of flows, potential for back-up/ponding and scour/erosion which may undermine the railway corridor.<br><br>(iii) *Water quantity assessment.* The peak discharge analysis should provide adequate details of the pre and post development impervious area of the site and give adequate consideration to the detention basin requirements of the QUDM, Fourth Edition.<br><br>(iv) *Conceptual drainage layout.* Provide a conceptual stormwater drainage layout plan for the development demonstrating how all runoff will be collected and conveyed to the legal points of discharge.<br><br>(v) *Mitigation measures.* include details of the mitigation measures proposed to address any potential stormwater and flooding impacts of the proposed development. The design flood peak discharges should be shown for the mitigated case to demonstrate there is no worsening impact on the railway corridor. All mitigation measures must be located on the site and not in the railway corridor or future railway corridor. |

| Item | Pre-lodgement advice |
|---|---|
| 10. | **Reconfiguring a Lot**<br>When lodging a formal development application, the applicant is required to provide scaled and sufficiently detailed plans and supporting documentation which clearly identify all aspects of the proposed development in relation to the existing and future railway corridors.<br><br>In particular, this should include the following amongst other relevant considerations:<br>• A site detail and contour survey, prepared by a registered surveyor, clearly showing the existing topography and features of the site and existing property boundaries;<br>• A reconfiguration proposal plan, prepared by a registered surveyor, showing:<br>o the proposed new road configuration and dimensions;<br>o the existing and future railway corridor boundaries;<br>o the existing or proposed fencing along the site boundary with the railway corridor;<br>o the location of existing and proposed utility and service connections in relation to the existing and future railway corridor;<br>• existing and proposed stormwater drainage infrastructure.<br><br>The applicant is advised that all permanent development, including reconfiguration boundaries, services and utilities, drainage and the like should be located outside the future railway corridor, particularly at and below ground level. In particular, the new road boundary for the bridge should terminate at the western alignment of the future railway corridor and not sever the future railway corridor. |
| 11. | **New Bridge Over Future Railway Corridor Land**<br>Advice is provided that a new bridge over the future railway corridor would be managed by Logan City Council but would require an appropriate property arrangement until such time as the land was resumed for the future railway corridor. A licence between Council and the lot owner could be considered one way to achieve this that would not incumber the property title at the time of a land take for the future railway corridor. Please contact Patrick Leys of TMR's Rail Corridor Management team should you wish to discuss this matter further. |

AND

- recommends the following advice be provided to the applicant:

| | |
|---|---|
| 1. | This pre-lodgement advice has been prepared on 24 May 2022 and is subject to change at the time of lodgement of a formal development application. |
| 2. | This pre-lodgement advice provides initial advice on nominated major issues relevant to a development proposal to assist in the timely processing of applications. It cannot replace the in-depth investigation normally associated with the formal assessment of an application. While the advice is given in good faith, it in no way binds the Department of Transport and Main Roads. |

**3.0 Endorsement**

| Officer | Approver |
|---|---|
| Jake Morrison | Gregory Wyatt |
| Senior Planner | Manager |
| 3066 5777 | 3066 1738 |
| 24 May 2022 | 24 May 2022 |

# Rail Derailment and Collision Risk Assessment Memo

Appendix H

pitt&sherry

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Specialist Knowledge.
Practical Solutions.

**Pitt & Sherry (Operations) Pty Ltd**
ABN 67 140 184 309

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info@pittsh.com.au
pittsh.com.au

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# Memo

**To** Peter Read, Frasers Property New Beith

**From** David Crowe

**Date** 19 July 2024

**Subject:** New Beith Rail Overpass – Rail Derailment and collision – Risk Assessment

**Revision:** 00

**Document Number:** T-P.22.0175-STR-MEM-0001

## 1. Document purpose

The purpose of this memorandum is to:

a) Document the process followed for the train derailment risk assessment and assessment of available mitigations to minimise the likelihood and consequence of a train derailment; and

b) Provide recommendations for derailment mitigations for endorsement and approval by ARTC.

## 2. Background

Frasers Property Australia (FPA) is planning to develop land to the west of the Brisbane to Sydney Railway Line at Flagstone in Queensland. In order to gain access to the land, FPA has to build a bridge over the railway line which is operated by ARTC. The bridge will form an extension of Mountain Ridge Road and will cross the railway line at CH 947.791 km.

The current ARTC rail line is a single track and is positioned under span 2 of the rail overbridge. The rail overbridge also allows for the future construction of additional passenger rail lines which will be operated by Queensland Rail (QR) and will be positioned under Span 1 of the structure.

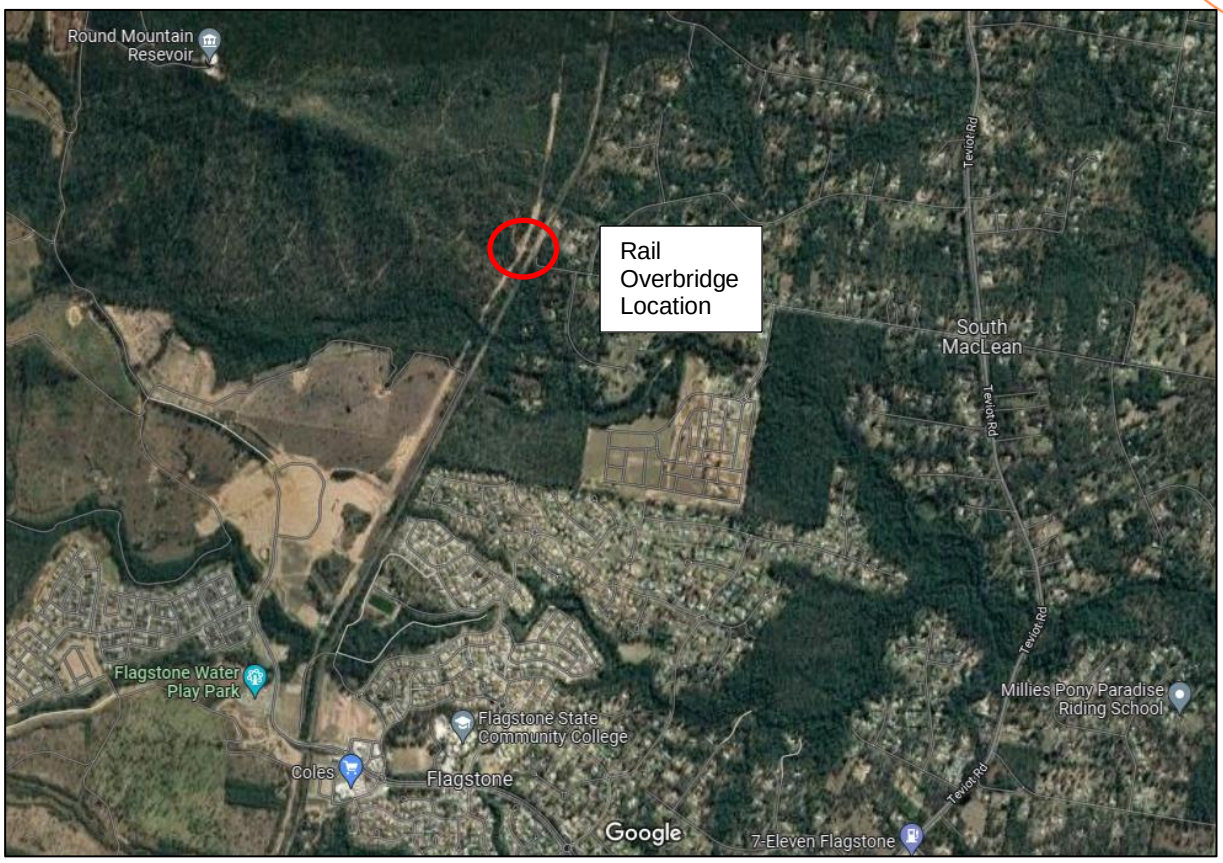


*Figure 1: Locality plan*

# 3. Design overview

The structure is a 2 span Super-T bridge with an overall length of 66.1m. The superstructure consists of seven (7) 2400mm wide x 1825mm deep Super-T girders with a 200mm deep reinforced concrete deck. The carriageway is 10m wide and carries a single 3.5m wide lane of traffic in each direction, with 1.5m wide shoulders on each side. 1500mm high barriers separate the road carriageway from a 3.15m shared user path provided on the northern side of the bridge, and a 1.5m footway provided on the southern side of the bridge. 345mm wide kerbs with 3000mm high anti-throw screens are provided on each side of the structure. There is a two-way crossfall (3%) on the carriageway, a one-way (2.5%) crossfall towards the carriageway on the northern shared user path, and a one-way (2%) crossfall towards the carriage on the southern footway. The deck wearing surface is a minimum of 70mm (60mm DWS + 10mm waterproof membrane).

The substructure consists of a 1m wide pier integral with the superstructure. The pier wall straddles the current railway corridor boundary, with half of it inside the boundary. The pier wall is founded on a pad footing which bears directly onto the underlying rock. The abutments consist of an abutment headstock supported on seven (7) columns founded on a pad footing. Reinforced earth walls will retain the abutment fill material. The girders are simply supported by laminated elastomeric bearings at the abutments.

The existing rail corridor arrangement is comprised of a single track which is located under the eastern span of the proposed bridge (Span 2). The track is operated by ARTC as previously noted. There are no works proposed to occur to the track as part of this Project, with the exception of ultimately removing the adjacent private level crossing. Allowance has been made for the future provision of two QR passenger railway lines to pass under Span 1. The allowance for the future passenger railway line is limited to the span length to span over a future additional 30m wide railway corridor, and the clearance of the structure has been set to accommodate 7900mm clearance based on Clearance Outline H to QR Standard Drawing 2754. As no actual planning has been carried out for the future passenger railway, it has been assumed that the rail track will be at the same level as the current ARTC railway. This risk assessment does not include the future passenger railway line as information on speeds and proximity to the pier are not available. An additional risk assessment will have to be carried out in the future when the passenger railway is designed.

# 4. Design configuration

The design package is currently in the Final Design (100%) phase. The design has adopted the controls discussed in this document. The figures below show the proposed bridge arrangement as it was at Substantial Design Stage (85%), noting that this configuration has not changed at FDD stage. The offset to the existing track is approximately 14.9m.

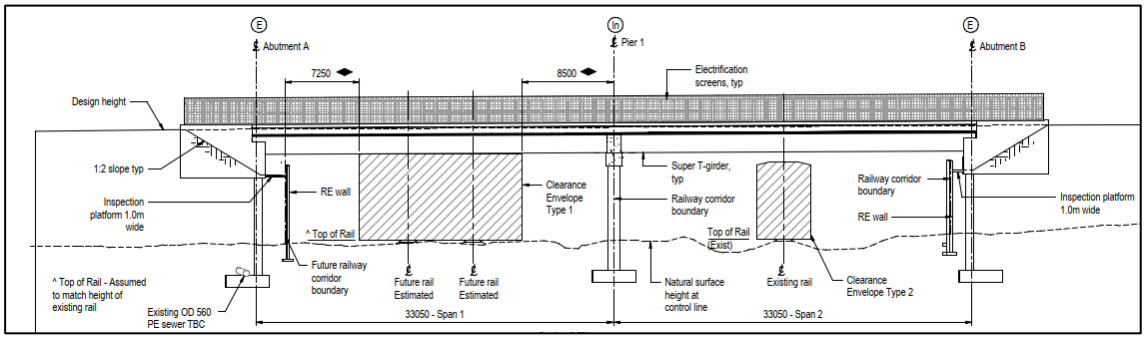


*Figure 2 – Substantial Design- Elevation*

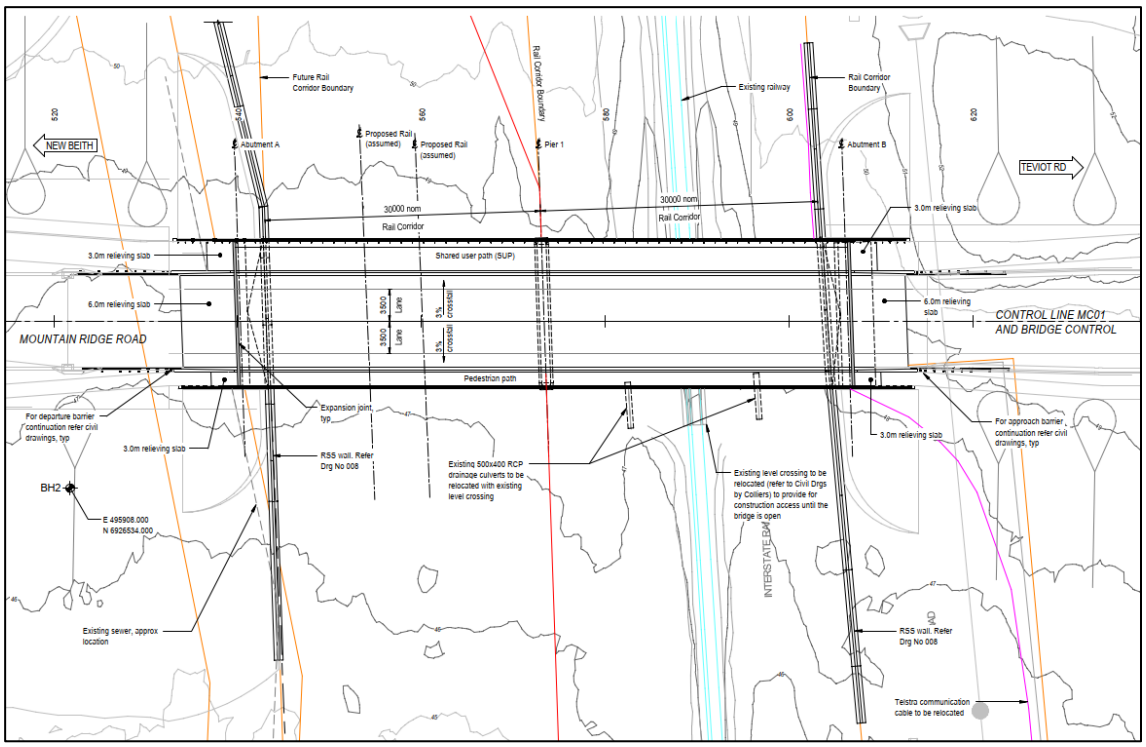

*Figure 3 – Substantial Design- Plan*

# 5. Train derailment – risk assessment

## 5.1 Design requirements

AS5100.1 Clause 15.3.1 requires that designers "*consider design options to prevent or limit derailments… such as rail geometry, clearances, location of switching pints and crossings*".

> The prescriptive provisions in this Standard shall be considered as minimum requirements. Design solutions shall comply with the intent of this Standard and shall also—
>
> (i) consider design options to prevent or limit derailments that would impact the structure, such as rail geometry, clearances, location of switching points and crossings as well as track/train type;
>
> (ii) adopt, so far as is reasonably practicable, bridging options that avoid potential collisions with a derailed train or that are least vulnerable to impact;
>
> (iii) refer to technical papers and data dealing with past incidents in order to predict the likely impact scenarios from a derailed train, and consider those scenarios; and
>
> (iv) consider derailment as a safety in design issue, and consider the effect of a derailment treating the bridge as a whole system, including both superstructure and substructure.

*Figure 4 – AS5100.2: 2004 Supplement Clause C10.4.1*

## 5.2 Risk assessment process

A risk assessment of a train derailment event has been undertaken to:

- Identify risks that contribute to a train derailment
- Establish the consequence and likelihood of the risk event occurring, to derive the associated risk rating
- Establish suitable control measures to either eliminate the risk where possible or reduce the probability of its occurrence So Far As Is Reasonably Practicable (SFAIRP); and
- Incorporate the agreed controls within the detail design phase of the project.

## 5.3 Risks contributing to derailment events.

Derailments are normally controlled by adhering to process and protocols for design, maintenance, and operational procedures. Reducing the likelihood of derailment will always be achieved through a regular maintenance program along the railway corridor as a predominant control, along with best design and construction practices. Derailments can be caused by several factors categorised into the following:

- Track/Infrastructure fault – track buckle, signalling failure (S&C not set/detected correctly)
- Rolling stock fault: wheel break, suspension/brake failure/hot axle
- Operational error: over speed, unbalanced loading
- Natural Causes – embankment slip, earthquake; and
- Trespass / Vandalism.

## 5.4 Contributing factors to likelihood of derailment

The contributing factors for derailments should be taken into consideration to determine the likelihood and consequence of derailment on the broad-gauge tracks beneath the overpass. These factors are outlined below.

### 5.4.1 Existing Track Factors

- **ARTC Line Speed:** 125km/h

*Note:*

- *Maximum value for speed taken from information provided by ARTC. The maximum speed is for the express trains however that has been taken for all trains in the assessment.*
- *Information provided by ARTC:*

Around the 947km mark, the speeds are

| Direction | **Down** | **Down** | **Down** | **Up** | **Up** | **Up** |
|---|---|---|---|---|---|---|
| Type | Normal | Express | EP | Normal | Express | EP |
| 945.606km | 115 kmph | 125 kmph | 115 kmph | | | |
| 952.452km | | | | 115 kmph | 125 kmph | 115 kmph |

- **Grade:** Inclined (travel north towards Brisbane is up the incline)
- **Direction:** Signalled for bi-directional running
- **Geometry**: Straight
- **Features that have the potential to contribute to derailment:**
    - **Switches and crossings**: No nearby switches and crossings (noting that current private level crossing will be removed after completion of the bridge)
    - **Underbridges/underlying structures (Culverts):** An existing underbridge is located approx. 500m south of the Overpass and another approximately 1100m north
- Volume of traffic (provided by ARTC):
    - Current Master Train plan shows 14 XPTs and 54 freight trains per week (excludes ad hoc services)
    - Future growth of freight trains expected to be 1.4% (Compound Annual Growth Rate from TfNSW 2016 report titled “NSW Freight Commodity Demand Forecasts, 2016-2056”). Applying this rate of growth results in approx. 220 freight trains per week in 100 years time; and
    - Take 250 trains per week or 40 trains per day (rounded off values)

### 5.4.2 New Beith Rail Overbridge Arrangement:

- **Offset to Overpass:**
    - **Eastern Abutment (Abutment B):**
        - The existing track has an offset of approximately 15.1m from track centreline to face of RSS wall
    - **Central Pier:**
        - The existing track has an offset of 14.9m from centre of track to face of pier wall; and
    - **Soffit Height:**
        - The proposed bridge has been designed to accommodate the future QR passenger rail clearance envelope with a minimum vertical clearance of 7.9m, assuming the future passenger rail top of rail matches the existing ARTC rail. The grade of the bridge increases the clearance under Span 2 where the ARTC rail line is located, however for simplicity a clearance of 7.9m will be used.

### 5.4.3 Published data

The latest published data on train derailments are provided in the ONRSR-Rail Safety Report 2020-2021. The five-year rolling average of train derailments across Australia were recorded at 0.44 per million Freight Train (km), indicating an extremely low likelihood of derailment.

### 5.4.4 Likelihood of a train becoming derailed on the approach to a bridge

Appendix F.1 in UIC 777-2R provides guidance for calculating the likelihood of train derailment on bridge approaches. The following inputs have been used for the calculation.

*Table 5-1 UIC 777-22 Appendix F.1 calculation inputs*

| Parameter | Value |
|---|---|
| Average No. freight trains per day (allowing for 1.4% growth) | 40 |
| Train speed (km/h) (V) | 125 |
| Longest derailment path in m (taken as $V^2/80$) | 195 |
| Derailment rate (per train km) (Freight train, track without switches) | $2.5 \times 10^{-8}$ |

Based on this assessment, a likelihood of **$7.13 \times 10^{-5}$** has been derived. The event recurrence interval is the inverse of this value, which translates to a recurrence interval of **14,027** years.

### 5.4.5 Likelihood of a train colliding with a bridge

Appendix F.2 in UIC 777-2R provides guidance for calculating the likelihood of a train colliding with a bridge. The following inputs have been used for the calculation.

*Table 5-2 UIC 777-22 Appendix F.2 calculation inputs*

| Parameter | Value |
|---|---|
| Predicted maximum deviation (equal to $V^{0.55}$) (m) (b) | 14.2 |
| Lateral distance between centreline of track and face of structure (m) (a) | 14.9 |
| Distance parallel to the tracks at a lateral distance 'a' exposed to the risk of impact from a derailed train (m) (taken as 0 as b < a) | 0 |

As the predicted maximum deviation is less than the lateral distance between the centreline of the track and face of the structure, the likelihood of a train colliding with the bridge based on the current arrangement is zero.

### 5.4.6 Likelihood categories

In consideration of the track geometry, context of the site geometry, published data and theoretical calculations, the likelihood of train derailments is considered to be extremely low. Comparing to the ARTC likelihood definition, this likelihood falls under the '**Rare'** category.

*Table 5-3 ARTC risk matrix*

| Likelihood | | | |
|---|---|---|---|
| **Description** | **Frequency of Occurrence** | **Percentile** | ***Descriptor*** |
| Is expected to occur in most circumstances | Once per month | >90% | *Almost Certain* |
| Will probably occur in most circumstances | Between once a month and once a year | 60%-90% | *Likely* |
| Might occur at some time | Between once a year and once in five years | 30%-<60% | *Possible* |
| Could occur at some time | Between once in 5 years and once in 20 years | 10%-<30% | *Unlikely* |
| May occur in exceptional circumstances | Once in more than 20 years | <10% | *Rare* |

# 6. Controls

Despite the very low probability of a train derailment, risk controls are needed to be considered in the event derailment does occur. The controls are considered in the context of providing protection to the train occupants as well as the bridge structure in the event of a derailed train collision. Controls are separated into track engineering controls and non-track engineering controls.

## 6.1 Track engineering controls

**Slab Track** – Guard rails are used on ballasted track. An alternative is to use concrete slab track and include an upstand in the concrete profile, also known as a derailment kerb. The upstands can be on the field side of the rail or in the 5ft. The transition from ballasted track to slab track introduces a maintenance burden. Concrete derailment upstands integrated into the track formation are typically only considered if other design requirements lead to the use of slab track. As the existing track formation is ballasted track, slab track with concrete upstands as a derailment mitigation measure has not been considered suitable for this project.

**Track componentry 53kg vs 60kg** - A track lateral misalignment (aka track buckle) can lead to a derailment. There are several factors contributing to the buckling force and the restraining force. Typically, the design standards (sleeper type, ballast quality and profile, stress free temperature, etc) provide sufficiently stable track with operational restrictions imposed on exceptionally hot days. The rail selection can improve the lateral stability (the $I_{yy}$ value of 60kg rail is greater than that of 53kg rail).

**Guard Rail** – Guard rail is a length of rail fixed to sleeper which is used to capture the wheel flange in the event of a wheel coming off the running rail. Its purpose is to assist in controlling the path of a derailed train to prevent it deviating into the path of a hazard. Guard rails are placed where the consequence of a derailment event causes unacceptable risk to third party infrastructure and non-rail land/property and personnel.

For the New Beith Rail Overbridge project, the design approach that has been adopted including a provided track offsets to pier and abutments is considered appropriate based on the following:

- The structure has been designed to account for train collision loads and to remain serviceable and operational after impact
- The likelihood of derailment is extremely low (1 in 14,000 years); and
- The derailment rate does not distinguish between tracks with or without features that contribute to derailment. The track features at the project site are straight and without crossings, further limiting likelihood of derailment.

**Consideration of Track Engineering Controls**

Implementation of the track engineering controls were considered in the risk assessment; however none have been adopted within the design of the Project. This was due to the extremely low likelihood of derailment in context of track alignment and features specific to this site, including offsets from track centres to piers/abutments.

Provision of track engineering controls to mitigate a derailment event with a recurrence interval of 1 derailment in 14,000 years, would require a significant investment, while installation would increase the inspection and maintenance requirements for the railway line.

For this project, the investment in track engineering controls to mitigate the risk is considered disproportionate to the benefits and ongoing maintenance implications.

## 6.2 Non-track engineering controls

**Elimination of pier –** A bridge design without a centre pier would eliminate the pier collision hazard in the event of a derailment. Due to the total span length of 66m being too long for precast concrete girder bridge structure, elimination of a central pier was not considered feasible without significant construction costs being incurred on the project.

**Installation of pier deflection walls** – Pier deflection walls have not been considered in the design. Due to the distance of the track to the pier wall, it has been determined that there is no need for a deflection wall at the pier as the probability of a train colliding head on with the pier is zero in theory or at the worst extremely unlikely.

**Installation of abutment deflection walls** – Abutment deflection walls have also not been considered in the design utilising the same reasoning to that applied to the pier, i.e. the probability of a train colliding head on with the abutment is zero in theory or at the worst extremely unlikely. Instead of providing a deflection wall at the abutment, a stabilised sand layer has been provided behind the panels at both abutments which will provide the necessary robustness for the RSS wall in the unlikely event of a train collision.

**Offset of bridge piers/abutments** - Australian Standard AS 5100.2 states that collision loads from rail traffic shall be considered for structures located within 20 m of rail tracks. Extension of bridge span lengths to achieve an offset of no less than 20 m between rail track and bridge support elements mitigates the need for collision loads to be considered in design. This option was not considered feasible without significant construction costs being incurred to the project. As a result, the structural supporting elements have been developed in line with the rail collision loads prescribed in AS 5100. Further commentary on how the collision loads have been established for the bridge design are provided below in Section 7.

# 7. Incorporation of collision loading - non-track controls

## 7.1 Design requirements

The rail collision design requirements for the New Beith Rail Overbridge is based on Australian Standard AS 5100 (2017) as well as relevant standards, procedures, and requirements of ARTC current at the time of the design. The following sections provide commentary on how the collision loads have been established for the bridge design.

### 7.1.1 AS 5100 Design Requirements

AS5100.1 provides rail collision requirements under Clauses 15.3.2 to Clause 15.3.4. These requirements have been used as the basis for the collision loads applied to the central pier and bridge abutments, as described below:

**Central Pier**

Cl 15.3.3 suggests where clear spans cannot be achieved, the standard's preference is to design the pier as *frangible*. In the case of New Beith, the proposed pier type is non-frangible. On this basis clause 15.3.4 has been adopted for the collision load requirements, utilising the values specified in the following clauses of AS5100:

- Design loads from AS 5100.2 cl 11.4.2.3 are adopted in the pier design for future allowance of QR passenger rail which may have a track placed within 10 m of the pier. The design loads are therefore 4000 kN parallel to the rails and 1500 kN normal to the rails; and
- Deflection walls have not been included as the current track centreline is more than 10m from the structure.

**Abutments**

Requirements for protection of abutments for structures over rail are outlined in AS 5100.1 Cl. 15.3.5. Similar to the approach taken for piers, AS 5100 distinguishes abutments based on their distance to the nearest track. Tracks within 10m are to be designed for AS 5100.2 cl 11.4.2.3, whilst tracks within 10m-20m of support structures can be risk assessed to determine the level of protection required. In the case of New Beith Rail Overbridge, while both abutments are beyond a 10m offset from existing tracks, loads from AS 5100.2 cl 11.4.2.3 have been adopted, to allow for installation of future tracks within 10m of the abutments. This has been incorporated into the RSS wall design by provision of a stabilised sand layer behind the wall panels.

### 7.1.2 ARTC Design Requirements

**Code of Practice | Structures Section 9**

ATRC's Code of Practice (CoP); Structures Section 9 (2017) was current at the project's initiation. The CoP includes collision loading requirements that relate to the project. Clause 9.2.1 specifically mandated the use of AS5100.2 loads for bridge design against rail traffic loads, specifically deflection walls.

**Engineering Standard | ETS-09-00 – Section 9: Structures**

In April 2023, during detailed design of the project, ARTC approved a new Engineering Standard; ARTC Track & Civil Section 9: Structures (ETS-09-00). ETS-09-00 replaces the CoP (Structures Section 9). The current version of ETS-09-00 is Version 1.1 dated 14th February 2024.

Clause 9.2.4.1 item 2 outlines the following with respect to calculation of head on collision loading:

2. A risk assessment acceptable to ARTC shall be carried out to determine the requirements for protection of bridge piers, abutments and the ends of the through girder, arch or truss.

   The head-on collision loads on a deflection wall can be much higher than minimum collision loads of 4,000kN parallel to rails and 1,500kN normal to rails specified in AS 5100.2. Designer shall use rational method, taking into consideration train axle configuration, train mass, train speed, car stiffness (K = 1200kN/m [Note]), track alignment, etc. for determination of collision loads. These loads shall not be less than minimum collision loads specified in AS 5100.2.

*Figure 5 ETS-09 clause 9.2.4.1*

The head on collision load has been assessed in accordance with Clause 9.3.4.1.

Track speed is taken from NIB-T0631 Bromelton - Greenbank and are defined as:

- Normal/EP: 115 km/hr; and
- Express: 125 km/hr

These speeds are the same in both directions.

Using the parameters provided in Clause 9.3.4.1 for deceleration, derailment impact angle and car stiffness, with the mass calculated in accordance with advice provided by ARTC it is concluded that a derailment will not impact the bridge structure as the deceleration will stop the train before it reaches and impacts on the structure itself.

### 7.1.3 Summary of Collision Load Design Requirements incorporated into the design

The design has been predominately informed by the requirements of AS5100.

To make provision for the future installation of additional tracks within 10m of the bridge abutments, the bridge abutments and central pier designs incorporate the following requirements:

- All supporting structural elements have been designed for 4000kN and 1500 kN respectively; and
- A deflection wall has been provided in front of all supporting structural elements, regardless of the offset to tracks.

# 8. Recommendations

## 8.1 Pier deflection wall

As outlined previously, due to the current track being approximately 15m from the pier wall, there is not expected to be any risk of train impact with the pier wall and hence a pier deflection wall has not been provided.

Should a pier deflection wall be provided at this point in time, it would have to be designed for the current situation or be based on broad assumptions as to the future configuration of the tracks, whether that includes an additional ARTC track, and/or future QR passenger railway conditions. This is considered to be unnecessary at this point in time. In the future, the structure can be re-assessed for the actual future conditions and deflection walls can be provided at that time if considered necessary. This will allow the deflection walls to be designed for the actual track configuration and will provide much greater surety at that time. Provision of deflection walls in the future is easily achieved as the deflection wall is entirely independent of the structure itself and can be added on at a later day with no impact on the current structure.

In lieu of a pier deflection wall, the pier has been designed in accordance with AS5100 provisions for train impact, as well as taking into account the requirements of QR Civil Engineering Technical Requirement CIVIL-SR-012. It is noted that the requirements of ETS-09-00 for pier walls further than 10m away from the nearest track are greatly reduced from the AS5100 and CIVIL-SR-012 requirements.

QR document CIVIL-SR-012 Section 5.0 states “All supports must be able to carry the permanent and applied loads from the superstructure with half of their cross-section rendered ineffective at the collision point.” This has been incorporated into the pier design by assessment for loss of half of the depth of the pier wall over a length of 2m, or the full depth of the pier wall over a length of 1m.

## 8.2 Other mitigation measures

The assessment above demonstrates that the likelihood of a train derailment within the project vicinity to be extremely low, (recurrence interval of 14,000 years).

Consideration of track engineering controls to prevent a train from derailing and impacting the structure was assessed, however the investment required to mitigate the risk is considered disproportionate to the benefits and ongoing maintenance implications and is not considered reasonably practicable as a control nor value for money.

The assessment of probability of a train impacting a support based on the current track arrangement resulted in a zero probability. This was backed up by assessing the potential head on impact load in accordance with ETS-09-00 showing that a derailed train would be likely to come to a complete halt prior to colliding head on with the pier.

However, in the unlikely event that train derailment occurs and results in a collision with the structure, to minimise the consequence, the following mitigation measures have been incorporated into the Project:

| RISK SOURCE (Causes/Hazards/Threats | MITIGATION MEASURE |
|---|---|
| Track condition and geometry on approach to the bridge structure | Provide stabilised sand layer behind RSS wall panels to absorb any impact and mitigate against collapse of the RSS wall itself. |
| | Design the central pier for train collision loading in accordance with AS 5100.2 cl 11.4.2.3, with a structurally continuous blade wall. |

| RISK SOURCE (Causes/Hazards/Threats | MITIGATION MEASURE |
|---|---|
| | Undertake the design so as not to preclude the installation of guard rail in future, should operational conditions change or opportunities present to install in future. |
| Rolling Stock Fault | Design the central pier for train collision loading in accordance with AS 5100.2 cl 11.4.2.3 with a structurally continuous blade wall . |
| | Undertake the design so as not to preclude the installation of guard rail in future, if this is considered necessary. |

# 9. Applicable Standards and Guidelines

The applicable Standards that are of relevance to this assessment are as follows:

- NIST-2616 – Railway Structures Design Requirements
- NIST-2650 – Use and Laying of Rail
- UIC777-2 – Structures built over railway lines – Construction requirements in the track zone
- AS5100-2017 – Bridge Design
- QR Civil Engineering Technical Requirement CIVIL-SR-012
- ETS-09-00 – Section 9: Structures; and
- Rail Safety National Law 'RSNL'.

# DTMR/QR/ARTC Communications

Appendix I

pitt&sherry

## David Crowe

| | |
|---|---|
| From: | Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au> |
| Sent: | Friday, 22 November 2024 4:30 PM |
| To: | Belinda Ryan; Peter Read |
| Cc: | David Crowe; Rail Planning |
| Subject: | RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements |
| Attachments: | Prelodgement Advice - New Beith road bridge over rail.docx; P.22.0175-NEW BEITH BRIDGE-100% ISSUE_240827.pdf; Appendix H - Rail Derailment Risk Assessment.pdf; AO2800 - Frasers Property - New Beith Qld - Design Comment Sheet 85pc Review Rev 1.xlsx |



Hi Belinda and Peter,

Apologies for the delay in providing feedback on Frasers Property Australia's attached documentation regarding the proposed bridge at New Beith. As I'm sure you appreciate, I have had to consult with both Queensland Rail and appropriate sections within the Department of Transport and Main Roads (TMR).

Based on the materials you provided (attached), the following comments are provided:

There would be no objections to proposing 30m width at a bridge crossing for the passenger corridor, however, note the below items shall be considered:

a) The drawing references the old clearance drawing 2754, this should be QR-C-S3306.
b) Track centres should be dimensioned out as per Drawing QR-C-S3307.
c) The drawings are to space proof future collision barriers (pier and abutment).
d) The constructability of the crash barriers needs to be considered and explained, noting piling under an existing bridge below the span will be an issue. The relevant information needs to be stated on the drawing.
e) Attached materials indicate Pitt & Sherry has carried out risk analysis based on track engineering control and non-track engineering controls and complying to AS5100.1, AS5100.2, Civil-SR-012, ARTC EIS-09-00 and concluded that the deflection wall can be waived along span 1. TMR acknowledges your advice that this has been accepted by ARTC.

Based on item e) above, and subject to items a) and d) above being addressed in bridge drawings, there is no objection to the exclusion of a deflection wall from initial bridge construction.

The feedback above is provided as initial advice only to facilitate refinement of your bridge design and does not represent development approval under Sections 253 and 255 of the *Transport Infrastructure Act 1994*.

I trust this is of assistance, please let me know if I can provide any further assistance.

Regards,

Kent Chandler
Principal Planner (Rail Planning) | Transport Planning Projects
Transport Strategy and Planning Branch | Policy Planning and Investment Division
Department of Transport and Main Roads

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Kent.s.chandler@tmr.qld.gov.au
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From: Belinda Ryan <belinda.ryan@frasersproperty.com.au>
Sent: Friday, November 22, 2024 12:09 PM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>; Peter Read <Peter.Read@frasersproperty.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent

Just touching base on this one, how is it progressing? I've got EDQ on my case and soon to be the new minister given that there is state funding attached to the delivery of this bridge, we need to get this design approved asap and can't progress any further without your feedback.

Have you been able to get this one signed off, I'm mindful that it's been sitting with TMR for a few weeks now.

Cheers Bel

**Belinda Ryan**
Development Director
**Frasers Property Australia**

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Frasers Property acknowledges the Traditional Custodians of the land on which our business operates. We pay our respects to Aboriginal and Torres Strait Islander Elders past, present and future.

From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Tuesday, 19 November 2024 9:21 AM
To: Peter Read <Peter.Read@frasersproperty.com.au>; Belinda Ryan <belinda.ryan@frasersproperty.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements



Hi Peter,

Unfortunately, my approving officers have had to take some time away from the office, so I haven't been able to progress. I'm expecting their return later in the week.

Sorry for the delay.

Regards

Kent Chandler
Principal Planner (Rail Planning) | Transport Planning Projects
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From: Peter Read <Peter.Read@fraserspropery.com.au>
Sent: Tuesday, November 19, 2024 7:34 AM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>; Belinda Ryan <belinda.ryan@fraserspropery.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent

Have you been able to progress the below?

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Frasers Property acknowledges the Traditional Custodians of the land on which our business operates. We pay our respects to Aboriginal and Torres Strait Islander Elders past, present and future.

From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Tuesday, 12 November 2024 5:01 PM
To: Belinda Ryan <belinda.ryan@fraserspropery.com.au>; Peter Read <Peter.Read@fraserspropery.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements



Hi Belinda, thanks for following up on feedback.

Sorry that I haven't been able to provide feedback yet but I've had to seek advice from both Queensland Rail and appropriate sections within TMR regarding your bridge proposal, and this can take a little time.

As a status update, I've received feedback from QR and forwarded to TMR for any further comment. I've received comments from TMR reps but am in the process of clarifying a couple of points. I'm hoping to receive clarification and approval to provide feedback to you in the next few days.

Thanks for your understanding.

Regards

Kent Chandler
Principal Planner (Rail Planning) | Transport Planning Projects
Transport Strategy and Planning Branch | Policy Planning and Investment Division
Department of Transport and Main Roads

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From: Belinda Ryan <belinda.ryan@fraserspropertyproperty.com.au>
Sent: Tuesday, November 12, 2024 12:54 PM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>; Peter Read <Peter.Read@fraserspropertyproperty.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent

Just chiming in on the below, I'm the below. I'm the Development Director for Fraser's New Bieth project. As I'm sure you can appreciate, we are under extreme pressure to get a secondary access built into the Flagstone PDA as well as to start delivering much needed housing supply.

These issues are becoming more and more of a hot topic in the media of late and I'm aware that the previous government had PR announcements ready to go on this piece of infrastructure, no doubt as soon as the approval pathways are unlocked the new government will too as it's a positive message for the PDA & housing supply as a whole.

At the moment the pathway to construction is currently stalled with TMR & QR to sign off on the proposed design. I understand that you have formal feedback from QR that you will incorporate into a TMR response however we are yet to see this. We have really done our best to design the bridge over the future corridor that has no rail design resolved as yet, which I'm sure you can appreciate hasn't been the easiest process.

Can you please come back with an update on how this is progressing from TMR, this one has been kicking around in the system since August now.

Really hoping that you can works with us here to push this along a little faster as it has been dragging out. Albeit I understand not from yourself, I do appreciate your efforts in helping us thus far.

I look forward to hearing from you.

Cheers Bel

**Belinda Ryan**
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From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Wednesday, 6 November 2024 10:01 AM
To: Peter Read <Peter.Read@fraserspropertyproperty.com.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>; Belinda Ryan <belinda.ryan@fraserspropertyproperty.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements



Sorry Peter, nothing yet, I'll follow up today.

Regards

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---

From: Peter Read <Peter.Read@fraserspropertyaustralia.com.au>
Sent: Wednesday, November 6, 2024 8:12 AM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Cc: 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>; Belinda Ryan <belinda.ryan@fraserspropertyaustralia.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent

Any word on the below?

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From: Peter Read
Sent: Thursday, 31 October 2024 12:31 PM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Cc: dcrowe@pittsh.com.au; Belinda Ryan <belinda.ryan@fraserspropertyaustralia.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Thank Kent

**Peter Read**
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From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Thursday, 31 October 2024 9:18 AM
To: Peter Read <Peter.Read@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements



Hi Peter,

Just a quick status update: I've received comments from QR and am waiting for comments from TMR's structures area – I'll hopefully hear back over the next few days.

Regards

Kent Chandler
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From: Peter Read <Peter.Read@fraserspropery.com.au>
Sent: Monday, October 28, 2024 8:22 AM
To: strategicprojects <strategicprojects@qr.com.au>
Cc: Belinda Ryan <belinda.ryan@fraserspropery.com.au>; Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>; David Crowe <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Ashley

Can we get QR's bridge design comments over to TMR as a matter of urgency?

**Peter Read**
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From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Friday, 25 October 2024 11:49 AM
To: David Crowe <dcrowe@pittsh.com.au>; Peter Read <Peter.Read@fraserspropery.com.au>
Cc: Belinda Ryan <belinda.ryan@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements



Thanks David, much appreciated.

Peter, quick update, I'm still waiting to hear back from QR about comments

Regards

Kent Chandler
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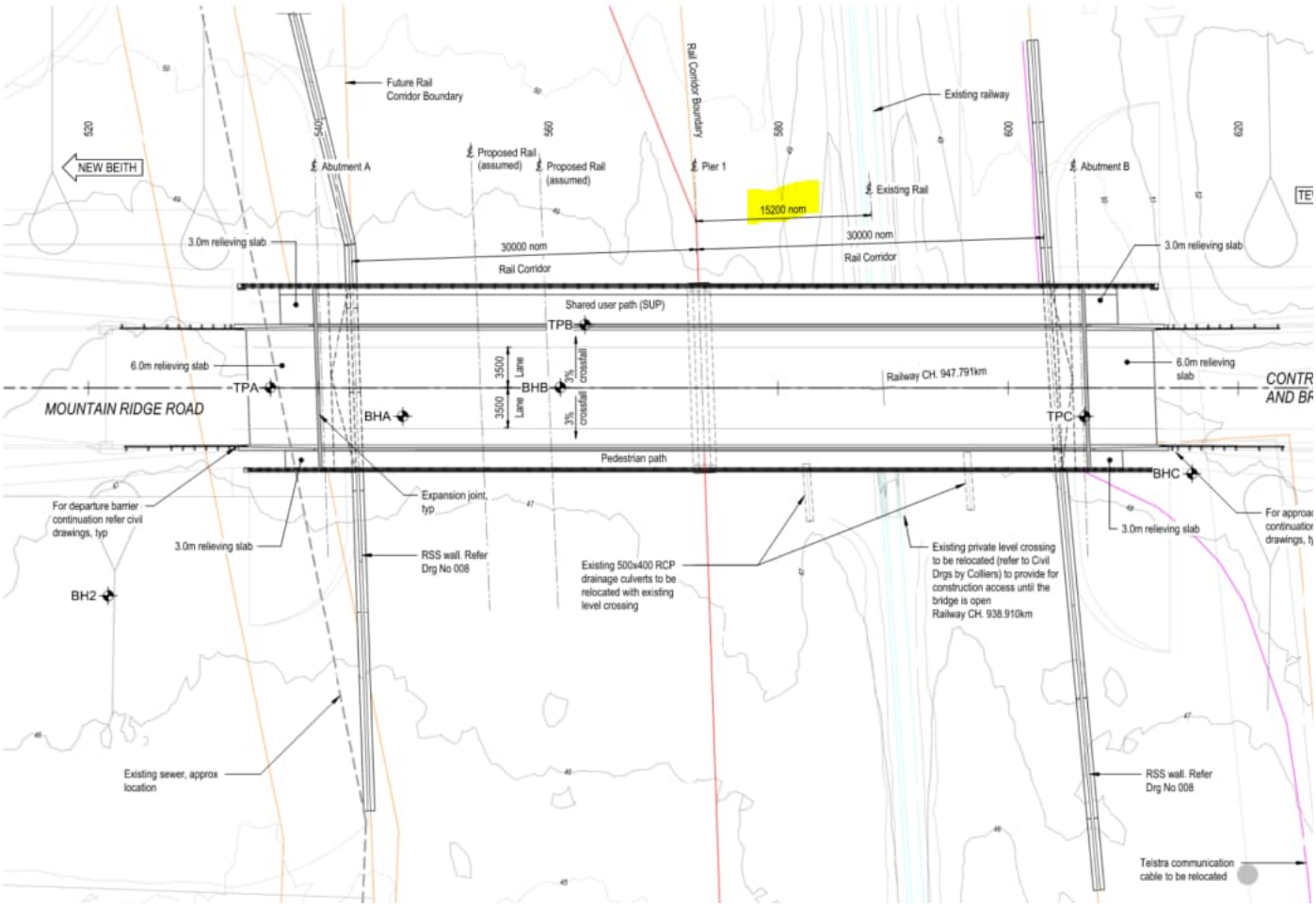
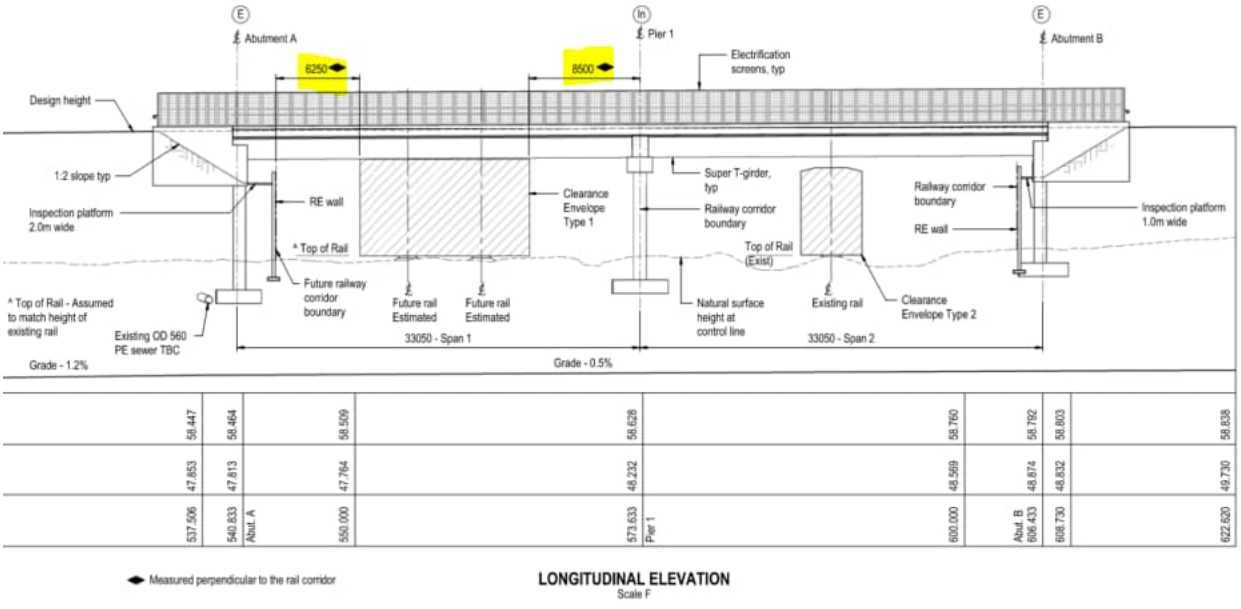
From: David Crowe <dcrowe@pittsh.com.au>
Sent: Friday, October 25, 2024 10:49 AM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>; Peter Read <Peter.Read@fraserspropery.com.au>
Cc: Belinda Ryan <belinda.ryan@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent

The horizontal clearance between the existing track centreline and the pier is shown on the plan. I have highlighted it below:




Note that we haven't specified clearances to the future QR railway on the plan as these haven't been defined at this stage. We have shown indicative dimensions for these on the elevation however:



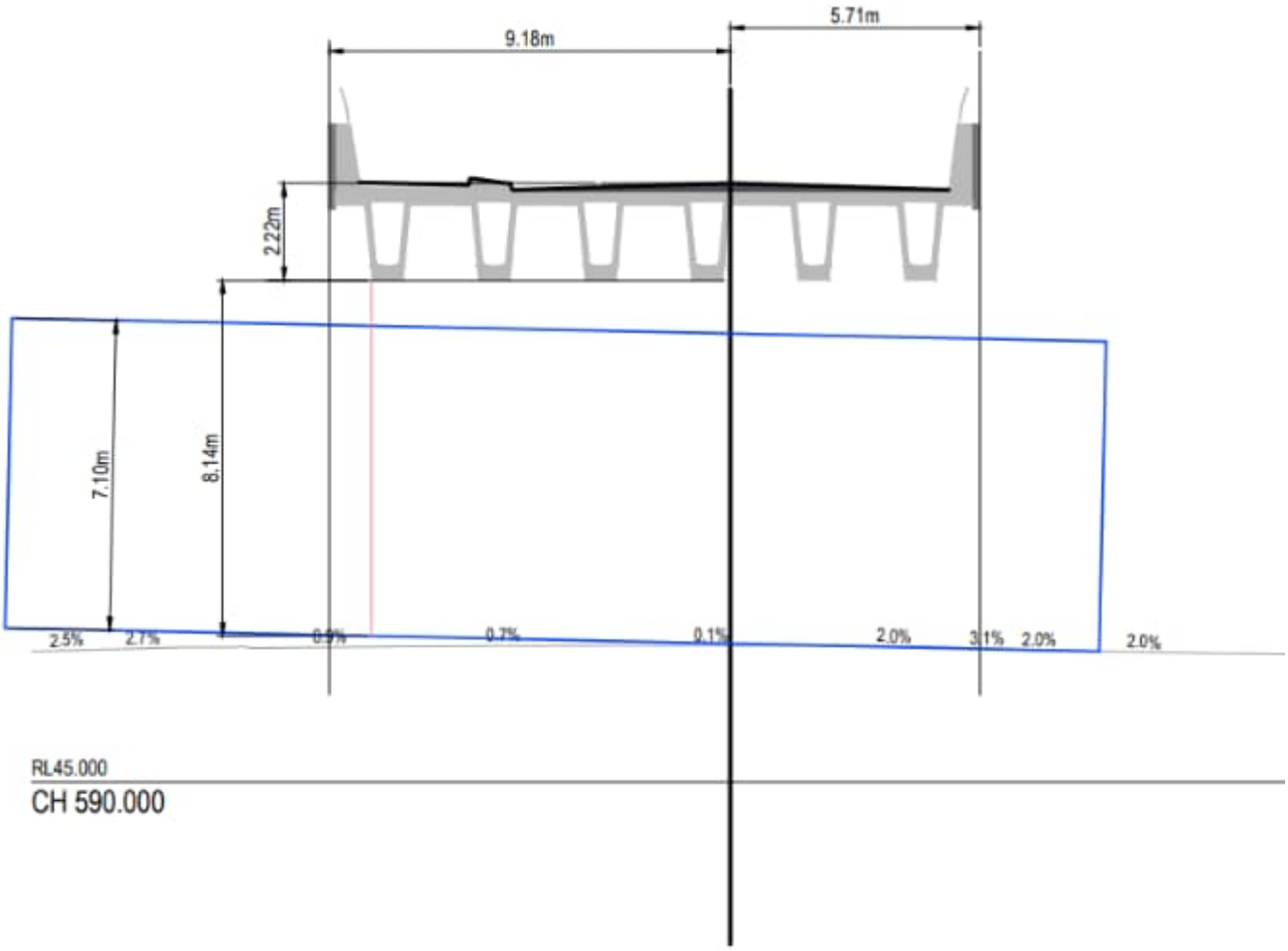

Vertical clearances are only shown by way of the clearance envelopes which are defined on the same drawing as the elevation above (Drg 003).

We have also undertaken a check for the clearances along the railway to account for the railway grade and confirm that under the assumption the QR rail track is constructed at the same height as the current rail line,

we have minimum 60mm clearance to the QR envelope. Refer diagrams below, with the ARTC envelope and clearance shown to the left and future QR envelope and clearance on the right:

Please also note that Logan City Council will be the ultimate owner of this structure.

If you have any other questions, please contact Peter or myself.




Regards

DLC

pitt&sherry | **David Crowe**

**Senior Principal Engineer – Bridges/Structural**

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---

From: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Sent: Thursday, 24 October 2024 4:36 PM
To: Peter Read <Peter.Read@fraserspropery.com.au>
Cc: Belinda Ryan <belinda.ryan@fraserspropery.com.au>; David Crowe <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Peter, nice to talk on Tuesday and thanks for your email. Are there any associated bridge elevations showing clearance from tracks to bridge that you can provide please?
thanks

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From: Peter Read <Peter.Read@fraserspropery.com.au>
Sent: Wednesday, October 23, 2024 11:33 AM
To: Kent S Chandler <Kent.S.Chandler@tmr.qld.gov.au>
Cc: Belinda Ryan <belinda.ryan@fraserspropery.com.au>; 'dcrowe@pittsh.com.au' <dcrowe@pittsh.com.au>
Subject: RE: New Beith Rail Crossing Bridge - ARTC/QR/TMR design approval - Collision Wall Requirements

Hi Kent, thanks for the chat yesterday

As you are aware we are in the process of seeking ARTC design approval on the proposed bridge. We have fielded their initial queries which are listed and responded to on the attached tracking spreadsheet. This spreadsheet also incorporates the independent design verifiers (BG&E) comments which have also been responded and design updated accordingly. Once we have your feedback on the below we intend to forward revised design to the project verifier for finalisation.

We recently met with ARTC to discuss the current proposed design, and they have stated they happy provided QR are happy particularly when it comes to leaving the collision walls out. Refer minutes relating to this discussion in string below highlighted in yellow

Within our current design we've not included collision walls as

- our risk assessment using the data available states they are not required. Refer attached
- this area is still only future rail corridor and has not formally been dedicated nor any future rail designed completed.

As the collision walls are required to be detached from the main bridge structure, therefor they are able to construction at a later stage when design parameters are more establish.

As per QR's feedback last week at present they do not have a vested interest in the corridor therefor have directed me back to TMR. Ashley had stated he would provide any QR comments to Ferdinand.

We assume that as QR have handed over to TMR, ARTC will be looking for TMR's approval on the exclusion of collision walls.

Can you please confirms TMR's position with regards to the exclusion of the collision walls from the initial bridge construction?

Thanks in advance

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---

From: Peter Read <Peter.Read@fraserspropery.com.au>
Sent: Wednesday, October 16, 2024 2:24 PM
To: Ferdinand Joeffry <Ferdinand.Z.Joeffry@tmr.qld.gov.au>
Cc: Ford, Adrian <Adrian.Ford@qr.com.au>; Belinda Ryan <belinda.ryan@fraserspropery.com.au>; Bella Macfarlane <Bella.Macfarlane@fraserspropery.com.au>; Connor Read <connor.read@fraserspropery.com.au>; David Crowe <dcrowe@pittsh.com.au>; Strategic Projects <Strategicprojects@qr.com.au>
Subject: RE: New Beith Rail Crossing Bridge - TMR design approval

Hi Ferdinand

With regards to your query below refer attached design showing the western future rail corridor maintenance access. The access is 6m wide and meets the required maximum 1:20 gradient. I hope this closes your query below out?

On another note, I spoke to Ashley Thompson of QR on Monday. He has advised that QR's current position is that at present they don't have a vested interest in the proposed future corridor and as such rather than comment on our design they will forward any comments they have to yourself.

Taking into account the above can you confirm

- if you have received the QR correspondence mentioned above?
- does TMR intend to return further comment on our design or are you happy with the current(Previously forwarded in string below) designed?

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**Frasers Property Australia**

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From: Ferdinand Joeffry <Ferdinand.Z.Joeffry@tmr.qld.gov.au>
Sent: Wednesday, 4 September 2024 5:08 PM
To: David Crowe <dcrowe@pittsh.com.au>; Strategic Projects <Strategicprojects@qr.com.au>
Cc: Ford, Adrian <adrian.ford@qr.com.au>; Belinda Ryan <belinda.ryan@fraserspropery.com.au>; Peter Read <Peter.Read@fraserspropery.com.au>; Bella Macfarlane <Bella.Macfarlane@fraserspropery.com.au>; Connor Read <connor.read@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - Request for QR contact

**EXTERNAL EMAIL:** Do not click links or open attachments unless you recognise the sender and know the content is safe.

Good day David,

Thanks for sending those designs through and I'm glad you're engaging with Queensland Rail re their standards and feedback. Just one small thing, it would be good to retain vehicle access to the rail corridor on either side, for maintenance activities and future active transport access (to a cycle facility adjacent to the rail corridor on the western side).

I believe this was requested as part of my department's prelodgement advice, but after reviewing your plans and retaining wall elevations, it's difficult to see if this has been provisioned.

Regards,

Ferdinand Joeffry

Principal Advisor (Rail Planning) | Transport Planning Projects
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From: David Crowe <dcrowe@pittsh.com.au>
Sent: Wednesday, August 28, 2024 9:45 AM
To: Strategic Projects <Strategicprojects@qr.com.au>; Ferdinand Joeffry <Ferdinand.Z.Joeffry@tmr.qld.gov.au>
Cc: Ford, Adrian <adrian.ford@qr.com.au>; Belinda Ryan <belinda.ryan@fraserspropery.com.au>; Peter.Read@fraserspropery.com.au; Bella Macfarlane <Bella.Macfarlane@fraserspropery.com.au>; Connor Read <connor.read@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - Request for QR contact

Good morning Bryce and Ferdinand

By way of introduction I am the Lead Designer for the bridge at New Beith over the current ARTC managed rail line and future QR rail corridor. If you aren't aware pitt&sherry is on QR's Engineering Consultancy Panel with one of our categories being bridge design, and are prequalified to BD3 under the TMR CFEP system.

Bear with me because there is a fair bit of information to go through. Once you have had a chance to have a look through everything we would be more than happy to have a meeting to go through it and resolve any issues.

First item: TMR Planning.

- TMR planning were involved in the early planning process for this project. We issued the Bridge Fixing Report to Jake Morrison in Transport Strategy and Planning at TMR on 14th April 2022. Following a meeting on 20th May 2022 we received TMR's written advice on 24th May 2022 (refer attached Prelodgement Advice - New Beith road bridge over rail.docx).
- One of the conditions of the Prelodgement Advice was that the design is subject to meeting the requirements of the relevant railway managers being QR and ARTC

Second: ARTC Meeting and resolution:
We recently had a meeting with ARTC where we discussed their requirements including for pier head on collision loads. The discussion was based on a risk assessment for train derailment and collision which is based on the assessment methodology in ARTC's Engineering Standard – Track and Civil Section 9: Structures

(ETS-09-00) and is attached (refer attached: Appendix H - Rail Derailment Risk Assessment.pdf). Items discussed during the meeting included:

- Collision impact from the existing ARTC railway line is very low to negligible likelihood, due to the railway line being located approximately 15m from the pier itself.
- Under the risk assessment the pier would only be designed for a 1500kN impact load at any angle, in accordance with AS5100.2 for tracks greater than 10m but less than 20m from a structural element. However the pier design has been completed to allow for the future QR rail track being up to 5m away from the pier itself.
- Under the above assessment as there is little to no risk of head on collision under the current arrangement, a collision wall has not been provided. This is under the assumption that a collision wall is not required at this stage, however can be constructed when the future QR rail tracks are installed and can be designed and detailed at that stage as a fit for purpose item as a part of the overall design for the QR railway
- ARTC had no objection to the conclusions and the current design but stated that it would require acceptance from QR

Third: Additional information relevant to QR
In addition to the above, we have included the following items in the design to accommodate the future QR railway:

- Bridge spans over the 30m wide future rail corridor, with the pier straddling the boundary between current and new corridor (pier wall intruding into the new corridor by 500mm)
- Girders and deck being cast fully integral over the pier, reducing maintenance requirements from within the railway corridor (no bearings to inspect or replace)
- RSS wall placed along the corridor boundary at the abutment, with the abutment shelf set back
- Pier collision loads in accordance with AS5100.2 and QR design guide CIVIL-SR-012, including the requirement to design for the support to have “half its cross section rendered ineffective at the collision point”.
- Provision for electrical continuity for future electrified railway under span 1
- Allowance for replacement of screens over span 1 to provide additional level of protection over electrified railway
- RSS walls at abutment provided with stabilised sand layer directly behind the panel for stability in the event of a collision

I have attached the latest drawing set for your information. I will forward the complete design report separately as it is a large file and cant be emailed.

Once you have had a chance to look over the documents, we would appreciate being able to meet up for a discussion in order to progress this as quickly as possible. If you could let us know a time that would be convenient for you it would be much appreciated.

If you have any questions in the meantime please give me a call on the number below.

Regards

DLC

pitt&sherry | **David Crowe**

**Senior Principal Engineer – Bridges/Structural**

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From: Strategic Projects <Strategicprojects@qr.com.au>
Sent: Monday, August 26, 2024 9:26 AM

To: Peter.Read@fraserspropery.com.au; Ferdinand Joeffry <Ferdinand.Z.Joeffry@tmr.qld.gov.au>
Cc: Ford, Adrian <Adrian.Ford@qr.com.au>; Strategic Projects <Strategicprojects@qr.com.au>; David Crowe <dcrowe@pittsh.com.au>; Belinda Ryan <belinda.ryan@fraserspropery.com.au>
Subject: RE: New Beith Rail Crossing Bridge - Request for QR contact



Good morning Peter,

I am an interface manager at Queensland Rail in the strategic projects team, our role is to act as the conduit between QR's broader business and external works.

I called this morning to discuss the matter raised below and left a voicemail, please feel free to call me on the contact details below, or via correspondence at this email address, and we will establish the next steps to provide inputs from the Rail Transport Operators perspective.

It is worth noting that the planning for the future rail corridor which runs through this area is the purview of the department of Transport and Main Roads (TMR) which we work very closely with, I have also copied in to this email @Ferdinand Joeffry the TMR project manager for this project.

I look forward to helping facilitate conversations going forward

Regards

QueenslandRail

**Bryce Barr**
**Portfolio Interface Manager, Strategic Projects**
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M: 0498 479 669
F: 8928447

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From: Peter Read <Peter.Read@fraserspropery.com.au>
Sent: Thursday, August 22, 2024 9:15 AM
To: Nettleton, Richard <Richard.Nettleton@qr.com.au>
Cc: dcrowe@pittsh.com.au; Belinda Ryan <belinda.ryan@fraserspropery.com.au>
Subject: New Beith Rail Crossing Bridge - Request for QR contact



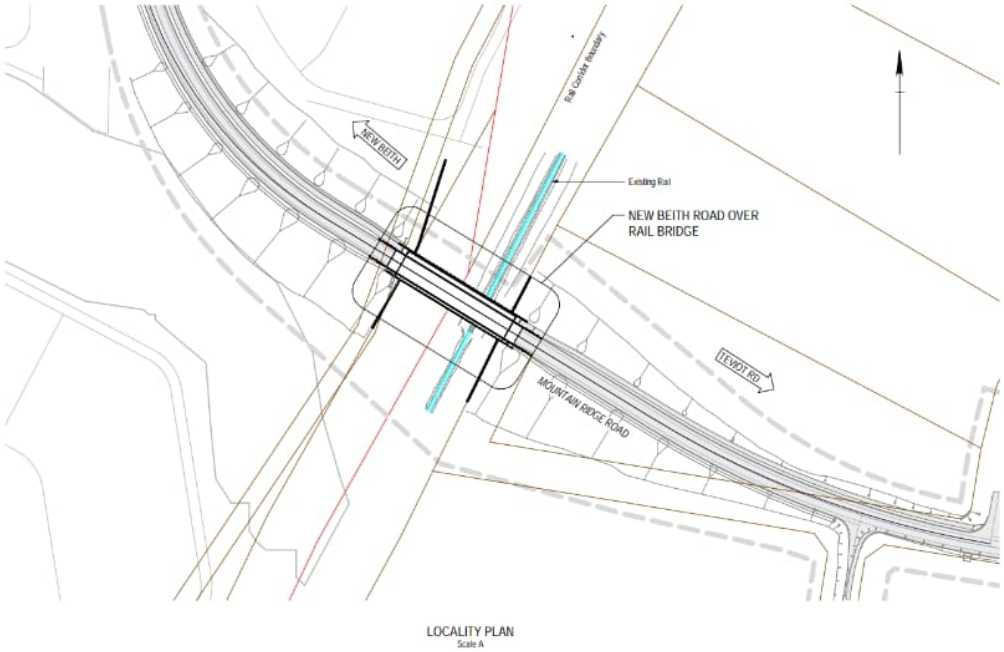
Hi Richard, thanks for taking my call yesterday.

Per our chat we are currently in the process of designing a 2 span bridge that will cross over the existing ARTC train line in South Maclean at the end of Mountain Ridge Road. The design caters for a future QR rail corridor.

As discussed, at this point in time we are looking to present elements our proposed design to QR for feedback.

Can you put us in touch with the appropriate person.

Thanks in advance.

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Frasers Property acknowledges the Traditional Custodians of the land on which our business operates. We pay our respects to Aboriginal and Torres Strait Islander Elders past, present and future.

pitt&sherry

# New Beith Rail Overbridge Design Report

**Pitt & Sherry (Operations) Pty Ltd**
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