Carmichael Coal Mine and Rail Project
Supplementary Environmental Impact Statement

Volume 4, Appendix C3e – Waterway Barrier Works Application for SP1

Containing

- IDAS Form 1 – Application details
- IDAS Form 27 – Waterway Barrier Works (52 Logan Creek crossing detail)
- IDAS Form 27 – Section 6 for 69b Mistake Creek
- IDAS Form 27 – Section 6 for 78b Belyando River
- Waterway Barrier Works Assessment Report

IDAS form 1—Application details

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for **ALL** development applications.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications, you must:

- complete this form (*IDAS form 1—Application details)*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the *Sustainable Planning Act 2009* (SPA) or the Sustainable Planning Regulation 2009.

This form and any other IDAS form relevant to your application must be used for development applications relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994* and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*. Whenever a planning scheme is mentioned, take it to mean land use plan for the strategic port land, Brisbane core port land or airport land.

PLEASE NOTE: This form is not required to accompany requests for compliance assessment.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

Applicant details (Note: the applicant is the person responsible for making the application and need not be the owner of the land. The applicant is responsible for ensuring the information provided on all IDAS application forms is correct. Any development permit or preliminary approval that may be issued as a consequence of this application will be issued to the applicant.)

Name/s (individual or company name in full)	Hamish Manzi			
For companies, contact name	Adani Mining Pty Ltd			
Postal address	GPO Box 2569 Brisbane			
	Suburb			
	State	Queensland	Postcode	4001
	Country	Australia		
Contact phone number	(07) 3223 4800			
Mobile number (non-mandatory requirement)	0407 340 125			
Fax number (non-mandatory requirement)	-			

Email address (non-mandatory requirement)	hamish.manzi @ adani.com
Applicant's reference number (non-mandatory requirement)	

1. What is the nature of the development proposed and what type of approval is being sought?

Table A—Aspect 1 of the application (If there are additional aspects to the application please list in Table B—Aspect 2.)

a) What is the nature of the development? (Please only tick one box.)

☐ Material change of use ☐ Reconfiguring a lot ☐ Building work ☑ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☑ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

Construction of three (3) permanent bridges defined as waterway barrier works along the proposed Separable Portion 1 (SP1) rail alignment (part of Carmichael Coal Mine and Rail Project).

d) What is the level of assessment? (Please only tick one box.)

☐ Impact assessment ☑ Code assessment

Table B—Aspect 2 of the application (If there are additional aspects to the application please list in Table C—Additional aspects of the application.)

a) What is the nature of development? (Please only tick one box.)

☐ Material change of use ☐ Reconfiguring a lot ☐ Building work ☐ Operational work

b) What is the approval type? (Please only tick one box.)

☐ Preliminary approval under s241 of SPA ☐ Preliminary approval under s241 and s242 of SPA ☐ Development permit

c) Provide a brief description of the proposal, including use definition and number of buildings or structures where applicable (e.g. six unit apartment building defined as a *multi-unit dwelling*, 30 lot residential subdivision etc.)

d) What is the level of assessment?

☐ Impact assessment ☐ Code assessment

Table C—Additional aspects of the application (If there are additional aspects to the application please list in a separate table on an extra page and attach to this form.)

☐ Refer attached schedule ☐ Not required

2. Location of the premises (Complete Table D and/or Table E as applicable. Identify each lot in a separate row.)

Table D—Street address and lot on plan for the premises or street address and lot on plan for the land adjoining or adjacent to the premises (Note: this table is to be used for applications involving taking or interfering with water). (Attach a separate schedule if there is insufficient space in this table.)

☑ Street address **and** lot on plan (All lots must be listed.)

☐ Street address **and** lot on plan for the land adjoining or adjacent to the premises (Appropriate for development in water but adjoining or adjacent to land, e.g. jetty, pontoon. All lots must be listed.)

Street address					**Lot on plan description**		**Local government area** (e.g. Logan, Cairns)
Lot	Unit no.	Street no.	Street name and official suburb/ locality name	Post-code	Lot no.	Plan type and plan no.	
i)		3950	Elgin Road, Clermont	4721	3	BL26	Isaac Regional Council
ii)		472	Twin Hills Road, Clermont	4721	1	SP147546	Isaac Regional Council
iii)		1954	Stratford Road, Mount Coolon	4804	10	BL49	Isaac Regional Council

Planning scheme details (If the premises involves multiple zones, clearly identify the relevant zone/s for each lot in a separate row in the below table. Non-mandatory)

Lot	Applicable zone / precinct	Applicable local plan / precinct	Applicable overlay/s
i)			
ii)			
iii)			

Table E—Premises coordinates (Appropriate for development in remote areas, over part of a lot or in water not adjoining or adjacent to land e.g. channel dredging in Moreton Bay.) (Attach a separate schedule if there is insufficient space in this table.)

Coordinates (Note: place each set of coordinates in a separate row)				**Zone reference**	**Datum**	**Local government area (if applicable)**
Easting	Northing	Latitude	Longitude			
					☐ GDA94 ☐ WGS84 ☐ other	

3. Total area of the premises on which the development is proposed (indicate square metres)

Total for three bridges: 22,000 m2

4. Current use/s of the premises (e.g. vacant land, house, apartment building, cane farm etc.)

Agricultural land

5. Are there any current approvals (e.g. a preliminary approval) associated with this application? (Non-mandatory requirement)

☑ No ☐ Yes—provide details below

List of approval reference/s	Date approved (dd/mm/yy)	Date approval lapses (dd/mm/yy)

6. Is owner's consent required for this application? (Refer to notes at the end of this form for more information.)

☐ No

☑ Yes—complete either Table F, Table G or Table H as applicable

Table F	
Name of owner/s of the land	
I/We, the above-mentioned owner/s of the land, consent to the making of this application.	
Signature of owner/s of the land	
Date	

Table G	
Name of owner/s of the land	
☐ The owner's written consent is attached or will be provided separately to the assessment manager.	

Table H	
Name of owner/s of the land	
☐ By making this application, I, the applicant, declare that the owner has given written consent to the making of the application.	

7. Identify if any of the following apply to the premises (Tick applicable box/es.)

☑ Adjacent to a water body, watercourse or aquifer (e.g. creek, river, lake, canal)—complete Table I

☐ On strategic port land under the *Transport Infrastructure Act 1994*—complete Table J

☐ In a tidal water area—complete Table K

☐ On Brisbane core port land under the *Transport Infrastructure Act 1994* (No table requires completion.)

☐ On airport land under the *Airport Assets (Restructuring and Disposal) Act 2008* (no table requires completion)

Table I
Name of water body, watercourse or aquifer
Belyando River (Crossing 78b), Mistake Creek (Crossing 69b) and Logan Creek (Cross 52). Refer to attached map.

Table J	
Lot on plan description for strategic port land	Port authority for the lot

Table K	
Name of local government for the tidal area (if applicable)	Port authority for the tidal area (if applicable)

8. Are there any existing easements on the premises? (e.g. for vehicular access, electricity, overland flow, water etc)

☑ No ☐ Yes—ensure the type, location and dimension of each easement is included in the plans submitted

9. Does the proposal include new building work or operational work on the premises? (Including any services)

☐ No ☑ Yes—ensure the nature, location and dimension of proposed works are included in plans submitted

10. Is the payment of a portable long service leave levy applicable to this application? (Refer to notes at the end of this form for more information.)

☐ No—go to question 12 ☑ Yes

11. Has the portable long service leave levy been paid? (Refer to notes at the end of this form for more information.)

☑ No

☐ Yes—complete Table L and submit with this application the yellow local government/private certifier's copy of the receipted QLeave form

Table L		
Amount paid	Date paid (dd/mm/yy)	QLeave project number (6 digit number starting with A, B, E, L or P)

12. Has the local government agreed to apply a superseded planning scheme to this application under section 96 of the *Sustainable Planning Act 2009*?

☑ No

☐ Yes—please provide details below

Name of local government	Date of written notice given by local government (dd/mm/yy)	Reference number of written notice given by local government (if applicable)

13.	**List below all of the forms and supporting information that accompany this application** (Include all IDAS forms, checklists, mandatory supporting information etc. that will be submitted as part of this application. Note: this question does not apply for applications made online using MyDAS)

Description of attachment or title of attachment	**Method of lodgement to assessment manager**
IDAS Form 27 Waterway Barrier Works	
Carmichael Coal Project (Rail) Separable Portion 1 Fisheries Act 1994 - Waterway Ba	
Map with chainages and coordinates	

14.	**Applicant's declaration**

☐ By making this application, I declare that all information in this application is true and correct (Note: it is unlawful to provide false or misleading information)

Notes for completing this form

- Section 261 of the *Sustainable Planning Act 2009* prescribes when an application is a properly-made application. Note, the assessment manager has discretion to accept an application as properly made despite any non-compliance with the requirement to provide mandatory supporting information under section 260(1)(c) of the *Sustainable Planning Act 2009*

Applicant details

- Where the applicant is not a natural person, ensure the applicant entity is a real legal entity.

Question 1

- Schedule 3 of the Sustainable Planning Regulation 2009 identifies assessable development and the type of assessment. Where schedule 3 identifies assessable development as "various aspects of development" the applicant must identify each aspect of the development on Tables A, B and C respectively and as required.

Question 6

- Section 263 of the *Sustainable Planning Act 2009* sets out when the consent of the owner of the land is required for an application. Section 260(1)(e) of the *Sustainable Planning Act 2009* provides that if the owner's consent is required under section 263, then an application must contain, or be accompanied by, the written consent of the owner, or include a declaration by the applicant that the owner has given written consent to the making of the application. If a development application relates to a state resource, the application is not required to be supported by evidence of an allocation or entitlement to a state resource. However, where the state is the owner of the subject land, the written consent of the state, as landowner, may be required. Allocation or entitlement to the state resource is a separate process and will need to be obtained before development commences.

Question 11

- The *Building and Construction Industry (Portable Long Service Leave) Act 1991* prescribes when the portable long service leave levy is payable.
- The portable long service leave levy amount and other prescribed percentages and rates for calculating the levy are prescribed in the Building and Construction Industry (Portable Long Service Leave) Regulation 2002.

Question 12

- The portable long service leave levy need not be paid when the application is made, but the *Building and Construction Industry (Portable Long Service Leave) Act 1991* requires the levy to be paid before a development permit is issued.
- Building and construction industry notification and payment forms are available from any Queensland post office or agency, on request from QLeave, or can be completed on the QLeave website at www.qleave.qld.gov.au. For further information contact QLeave on 1800 803 481 or visit www.qleave.qld.gov.au.

Privacy—The information collected in this form will be used by the Department of State Development, Infrastructure and Planning (DSDIP), assessment manager, referral agency and/or building certifier in accordance with the processing and assessment of your application. Your personal details should not be disclosed for a purpose outside of the IDAS process or the provisions about public access to planning and development information in the *Sustainable Planning Act 2009*, except where required by legislation (including the *Right to Information Act 2009*) or as required by Parliament. This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002*.

OFFICE USE ONLY

Date received		Reference numbers	

NOTIFICATION OF ENGAGEMENT OF A PRIVATE CERTIFIER

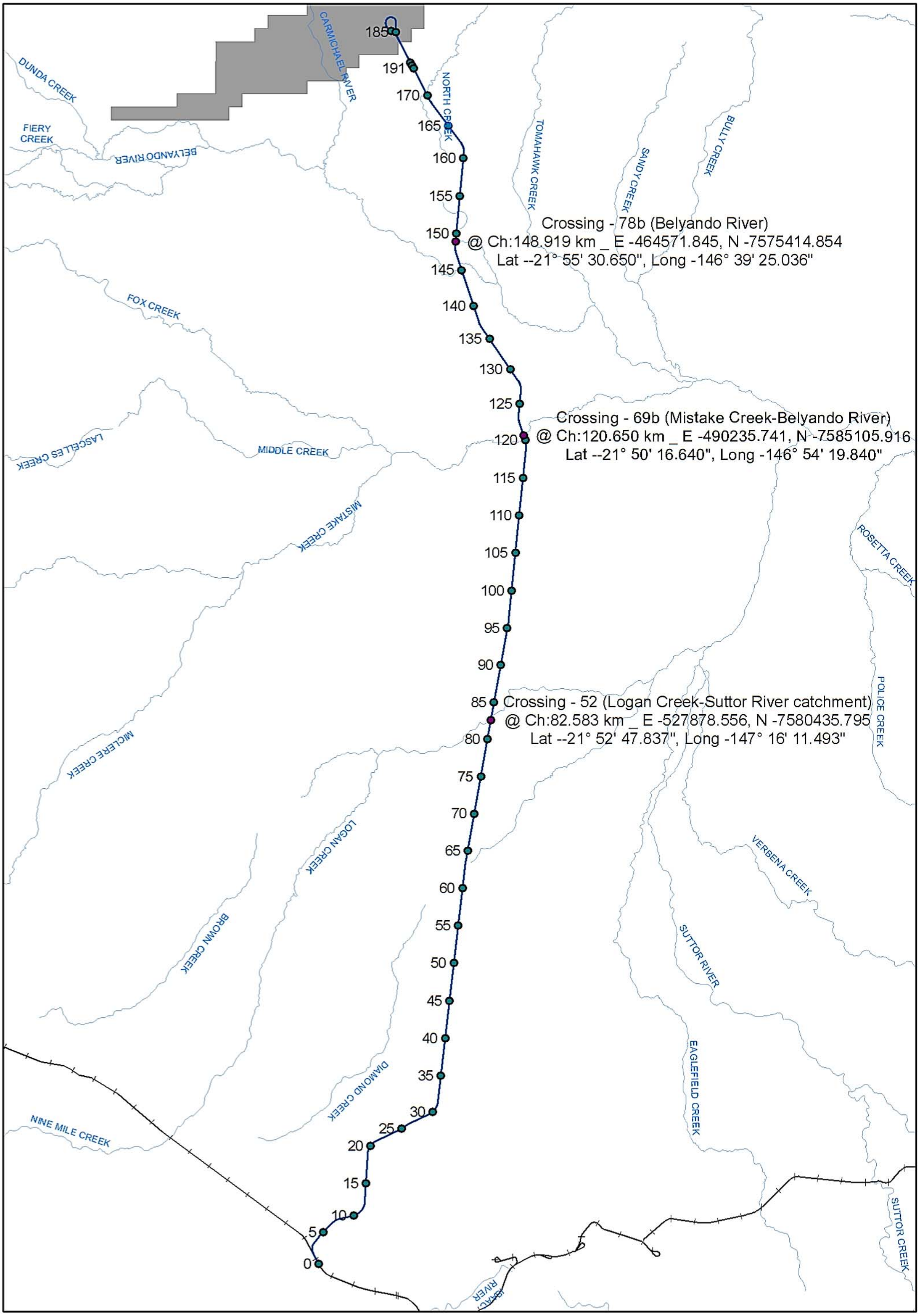
To _____ Council. I have been engaged as the private certifier for the building work referred to in this application

Date of engagement	Name	BSA Certification license number	Building classification/s

QLEAVE NOTIFICATION AND PAYMENT (For completion by assessment manager or private certifier if applicable.)

Description of the work	QLeave project number	Amount paid ($)	Date paid	Date receipted form sighted by assessment manager	Name of officer who sighted the form

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.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Crossing - 78b (Belyando River)
@ Ch:148.919 km _ E -464571.845, N -7575414.854
Lat --21° 55' 30.650", Long -146° 39' 25.036"
Crossing - 69b (Mistake Creek-Belyando River)
@ Ch:120.650 km _ E -490235.741, N -7585105.916
Lat --21° 50' 16.640", Long -146° 54' 19.840"
Crossing - 52 (Logan Creek-Suttor River catchment)
@ Ch:82.583 km _ E -527878.556, N -7580435.795
Lat --21° 52' 47.837", Long -147° 16' 11.493"
CARMICHAEL RIVER
NORTH CREEK
TOMAHAWK CREEK
SANDY CREEK
BULLY CREEK
DUNDA CREEK
FIERY CREEK
BELYANDO RIVER
FOX CREEK
LASCELLES CREEK
MIDDLE CREEK
MISTAKE CREEK
MCLEERE CREEK
LOGAN CREEK
BROWN CREEK
DIAMOND CREEK
NINE MILE CREEK
ROSETTA CREEK
POLICE CREEK
VERBENA CREEK
SUTTOR RIVER
EAGLEFIELD CREEK
SUTTOR CREEK

IDAS form 27—Waterway barrier works

(*Sustainable Planning Act 2009* version 3.0 effective 1 July 2013)

This form must be used for development applications for operational work that is the constructing or raising of waterway barrier works.

You **MUST** complete **ALL** questions that are stated to be a mandatory requirement unless otherwise identified on this form.

For all development applications you must:

- complete *IDAS form 1—Application details*
- complete any other forms relevant to your application
- provide any mandatory supporting information identified on the forms as being required to accompany your application.

Attach extra pages if there is insufficient space on this form.

All terms used on this form have the meaning given in the *Sustainable Planning Act 2009* (SPA), the Sustainable Planning Regulation 2009, the *Fisheries Act 1994* or the Fisheries Regulation 2008.

This form can also be completed online using MyDAS at www.dsdip.qld.gov.au/MyDAS

Mandatory requirements

1. Has a Fish Movement Exemption Notice been issued for the proposed work?

☐ Yes – submit with this application, a copy of the Fish Movement Exemption Notice for the proposed work.

☑ No – submit with this application, details of how the proposed work provides for adequate fish movement.

2. What is the nature of the proposed work? (Tick all applicable boxes.)

☑ Construction of a new waterway barrier/s

☐ Raising an existing waterway barrier/s

☐ Temporary waterway barrier/s

☐ Permanent waterway barrier/s

☐ Partial waterway barrier/s

☐ Bank to bank waterway barrier/s

3. What is the type of the proposed work? (Tick all applicable boxes.)

	Number of barriers
☐ Dam, weir or a barrage (complete section 4)	
☐ Culvert (complete section 5)	
☐ Causeway (complete section 6)	
☑ Bridge pylon (abutments or pile foundations) (complete section 6)	3
☐ Flow control structure such as a floodgate (complete section 6)	
☐ Pollution control device such as trash rack or a boom gate (complete section 6)	
☐ Levee bank across a waterway (complete section 6)	

☐ Other—please specify (e.g. groyne, construction platform, sediment curtain, causeway) (complete section 6)	Number of barriers

4. Constructing a new or raising an existing dam, weir, barrage, bund wall, coffer dam or other similar structures

The application is seeking approval for: ☐ new barrier ☐ raising of an existing barrier

Briefly describe the type of barrier proposed (i.e. dam, weir, tidal barrage, etc.)

For a temporary barrier (i.e. in place less than 12 months), how many days will the barrier be in place? ____ days

Will the barrier extend across the waterway from bank to bank?

☐ Yes

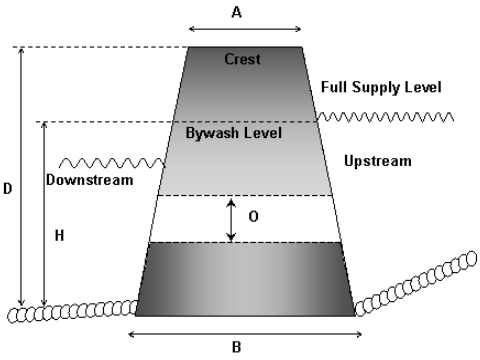
☐ No – how long is the proposed barrier (across the waterway)? ____ metres

– how wide is the waterway (bank to bank)? ____ metres

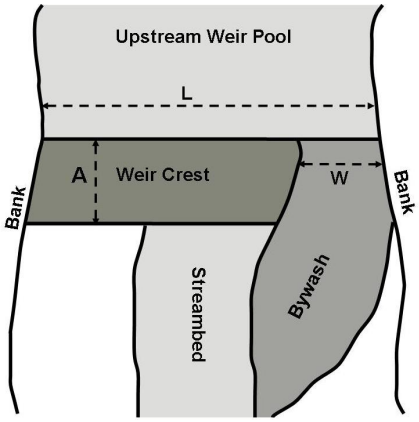
What is the purpose of the proposed barrier? (E.g. creating a new or increasing the capacity of the existing water storage, maintenance work, etc.)

What are the details of the proposed construction materials? (E.g. earth, concrete, rock fill, steel, timber, sand, etc.)

In reference to the diagrams below, provide the following details of the proposed barrier:



Cross section of barrier



Aerial view of waterway

• total crest height (D)		metres
• thickness (A) of crest		metres
• height of spillway / bywash (H)		metres
• width of spillway / bywash inlet (W)		metres
• base width (B)		metres
• internal diameter (O) of outlet pipe/works and discharge capacity		milli-metres
• length of wall (L)		metres
• distance of backup from barrier wall at full supply level		metres
• volume of storage.		mega-litres
• If raising an existing waterway barrier:		
- additional height above existing crest		metres
- method of raising (e.g. capping crest, inflatable bag, gates etc.).		

Does the application involve more than one barrier addressed by this section?

☐ Yes - generate another section 4 response for each barrier and submit with the application.

☐ No - if the application involves another type of barrier identified in section 3, go to the relevant section identified.

- if the application does not involve another type of barrier identified in section 3, go to section 7.

5. Constructing a new or modifying (including maintenance and replacement of) an existing culvert

What is the nature of the proposed work?

- ☐ Construction of a new culvert
- ☐ Maintenance of an existing culvert
- ☐ Replacement of an existing culvert

What is the purpose of the proposed culvert?

For a temporary barrier (i.e. in place less than 12 months), how many days will the culvert be in place? _____ days

Will the culvert extend across the waterway from bank to bank?

- ☐ Yes
- ☐ No
  - how long is the proposed culvert (across the waterway)? _____ metres
  - how wide is the waterway (bank to bank)? _____ metres

What type of culvert is proposed?

- ☐ Box culvert
- ☐ Arch culvert
- ☐ Pipe culvert
- ☐ Combination culvert
- ☐ Other—please specify: _____

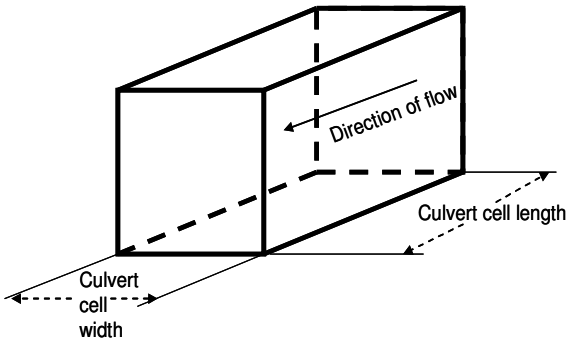
In reference to the diagrams below, provide the following details of the proposed culvert.

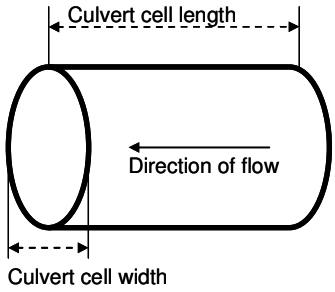
How many culvert cells are there? _____

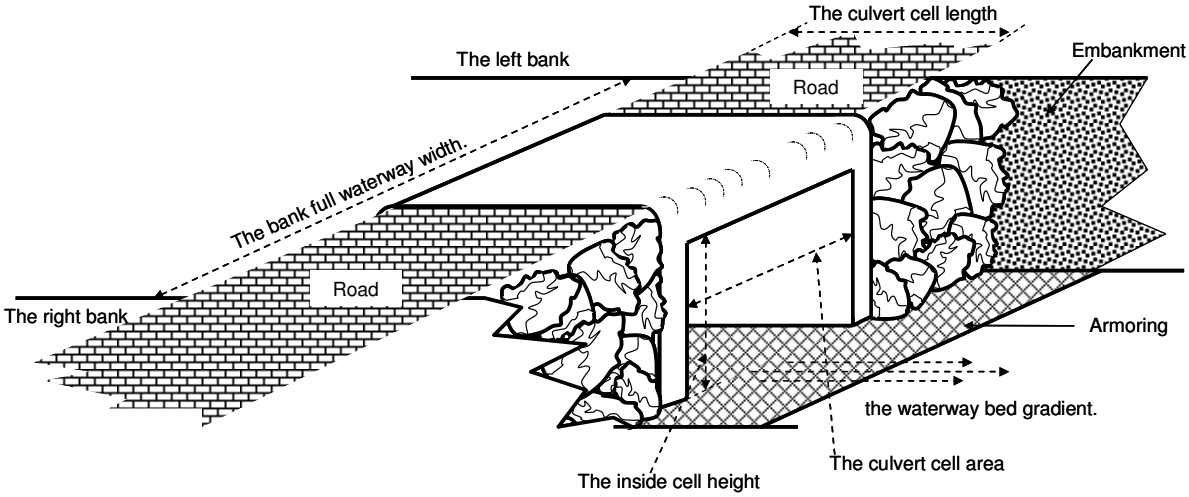
What is the upstream downstream culvert cell length? _____ metres

What is the inside cell width of each culvert (or diameter of pipe culvert)? _____ metres

What is the internal height within the culvert cell? _____ metres







Does the application involve more than one culvert?

☐ Yes - generate another section 5 response for each culvert and submit with the application.

☐ No - if the application involves another type of barrier identified in section 3, go to the relevant section identified.

- if the application does not involve another type of barrier identified in section 3, go to section 7.

6. Constructing a new or modifying (including maintenance and replacement) an existing waterway barrier except those listed in sections 4 and 5.

What is the nature of the proposed work?

☐ Construction of a new barrier

☐ Replacement of an existing barrier

☐ Maintenance of an existing barrier

Briefly describe the proposed barrier.

Construction of three permanent bridge structures, namely one (1) across Belyando River (Cross 78b), one (1) across Mistake Creek (Crossing 69b) and one (1) across the Logan Creek (Crossing 52). The works require the establishment of piles toward the top of each bank and further piles and a pile platform within the centre of the flow channel. Refer to excerpts of Question 6 regarding the detail for crossings 78b Belyando River and 69b Mistake Creek. The below details are only for crossing 52 Logan Creek.

For a temporary barrier (i.e. in place less than 12 months), how many days will the barrier be in place? [ ] days

Will the barrier extend across the waterway from bank to bank?

- [x] Yes
- [ ] No - how long is the proposed barrier (across the waterway)? [ ] metres
  - how wide is the waterway (bank to bank)? [ ] metres

What is the purpose of the proposed barrier?

The purpose of the three bridges is to allow for waterway crossing by the SP 1 rail alignment.

What is the maximum height of the proposed barrier above the existing bed level? [7.26] metres

What are the proposed construction materials? (E.g. earth, concrete, rock fill, steel, timber, sand, etc.)?

Proposed construction materials include concrete, steel, geo-fabric and scour protection.

Does the barrier follow the natural gradient of the bed level?

- [ ] Yes
- [x] No

Does the application involve more than one barrier under this section?

- [x] Yes - generate another section 6 response for each barrier and submit with the application.
- [ ] No - go to section 7.

Mandatory supporting information

7. Confirm the following mandatory supporting information accompanies this application.

Mandatory supporting information	Confirmation of lodgement	Method of lodgement
Location details for all applications		
A scale map/sketch plan of the site and the neighbouring area identifying: • the site of the proposed works on the waterway • the names of the waterway and the catchment in which the waterway is located • stream order • where the (site) waterway joins with another, more major waterway (or coastal waters) downstream • other easily identifiable geographical features adjacent to the proposed works • the limit and area of impounded waters (upstream weir pool) at full supply level (if relevant).	☐ Confirmed	
GPS coordinates and zone references of the works site (GDA94 preferred).	☐ Confirmed	
Photographs of the site and the waterway upstream and downstream of the works site.	☐ Confirmed	
A scale plan showing the limit of and area of impounded waters at full supply level.	☐ Confirmed	
Details of the proposed development for all applications		
Justification and the benefits of the proposed waterway barrier works.	☐ Confirmed	
Assessment of lesser impact alternatives and reasons for the proposed waterway barrier.	☐ Confirmed	
Details of the proposed waterway barrier.	☐ Confirmed	
Details of the structure and management of the impoundments.	☐ Confirmed	
Details of the proposed maintenance program on the waterway barrier after construction.	☐ Confirmed	
A statement addressing the relevant part(s) of the State Development Assessment Provisions (SDAP).	☐ Confirmed ☐ Not applicable	
Details of the waterway for all applications		
A scaled plan showing a cross-section of the stream profile at the proposed location.	☐ Confirmed	
Description of the stream morphology at the proposed location, and up to 1 km upstream and downstream (e.g. width and depth of stream, stream bed substrate types, bank stability, presence of pools, rifle runs, sand bars, etc.).	☐ Confirmed	
Description of the riparian habitats at and adjacent to the proposed location (e.g. Intact native vegetation, presence of weeds and other disturbances).	☐ Confirmed	

Description of the stream hydrology (e.g. flood frequency and height, altered flow regimes due to existing waterway barriers) • *Note: for most applications involving permanent waterway barriers on larger waterways, specific data on stream hydrology and flood levels will be required.*	☐ Confirmed	
Description of likely changes to stream hydrology resulting from construction of the proposed barrier. • *Note: for most applications involving permanent waterway barriers on larger waterways, the results of hydrological modelling will be required to show expected changes to flow characteristics, particularly velocity, at different water levels, expected headwater/tail water differences at different water levels, and frequency, timing and duration of drown-out of the proposed structure.*	☐ Confirmed	
Aquatic ecology details for all applications		
Description of the aquatic ecology at, and adjacent to, the proposed location, including instream fauna and flora, fish assemblages, and endangered or vulnerable fish species.	☐ Confirmed	
Description of likely impacts on fish movements as a result of construction of the waterway barrier, with reference to expected changes instream hydrology.	☐ Confirmed	
Description of likely impacts on both riparian and aquatic habitats as a result of construction of the waterway barrier, including impacts due to the expected changes instream hydrology.	☐ Confirmed	
Description of any proposed disturbances to riparian and aquatic habitats associated with construction activities (e.g. site access for machinery and personnel, material laydown areas, potential turbidity or other water quality impacts).	☐ Confirmed	
Details of the construction for all applications		
Scaled drawings of the proposed waterway barrier works.	☐ Confirmed	
If a fishway is proposed, scaled drawings of the fishway and details of proposed operation and maintenance of the fishway.	☐ Confirmed ☐ Not applicable	
Time frame for construction of the proposed barrier.	☐ Confirmed	
Mitigation details for all applications		
Description of any design features of the proposed waterway barrier that will help to mitigate the impacts of the structure on fish movements.	☐ Confirmed ☐ Not applicable	
Description of all measures that will be implemented during the construction period to mitigate the impacts of construction on aquatic habitats.	☐ Confirmed	
Description of all measures that will be undertaken at the completion of construction activities to restore the site to its previous condition or better.	☐ Confirmed	

For applications relating to section 5 of this form (separate information to be provided for each barrier)		
Culvert design information including: • whether the invert of the culvert is above, at or below waterway bed levels • size, angle, numbers and position of any baffles along the inner walls of the culverts	☐ Confirmed	

• details of the culvert cell bed (bed material, rocks to aid fish passage, riffle, smooth concrete or roughness, baffles, etc) • whether there will be a low flow channel culvert in any multi-cell culverts • detail on whether the culvert base gradient is less than, the same as or more than the natural gradient of the waterway bed.		
For applications relating to section 6 of this form (separate information to be provided for each barrier)		
All dimensions of the barrier	☐ Confirmed	
Detailed drawings of the barrier design	☐ Confirmed	
The operational requirements of the barrier	☐ Confirmed	
Details of any aprons, embankments or other erosion control methods	☐ Confirmed	
The specific structural inclusions to improve fish passage across the barrier	☐ Confirmed	
For an application involving assessable development in a wild river area		
Documentation that: • describes how the development to which the application relates is not prohibited development and • demonstrates how the proposed development will meet the requirements set out in the relevant wild river declaration and any applicable code mentioned in the relevant wild river declaration under the *Wild Rivers Act 2005*.	☐ Confirmed ☐ Not applicable	
A map showing the proposed location of the development in relation to any nominated waterways under the *Wild Rivers Act 2005* and wild river management areas. (a map may be produced digitally at www.ehp.qld.gov.au/wildrivers/wildrivers-map.php). Wild river management area means any of the following areas under the *Wild Rivers Act 2005*: • special floodplain management area • preservation area • high preservation area • floodplain management area • subartesian management area • designated urban area. Editor's note: A floodplain management area, subartesian management area or designated urban area may be over all or part of a high preservation area or preservation area. A subartesian management area or designated urban area may be over all or part of a special floodplain management area.	☐ Confirmed ☐ Not applicable	

Privacy—please refer to your assessment manager, referral agency and/or building certifier for further details on the use of information recorded in this form.

OFFICE USE ONLY

Date received | Reference numbers

The *Sustainable Planning Act 2009* is administered by the Department of State Development, Infrastructure and Planning. This form and all other required application materials should be sent to your assessment manager and any referral agency.

Department of State Development, Infrastructure and Planning
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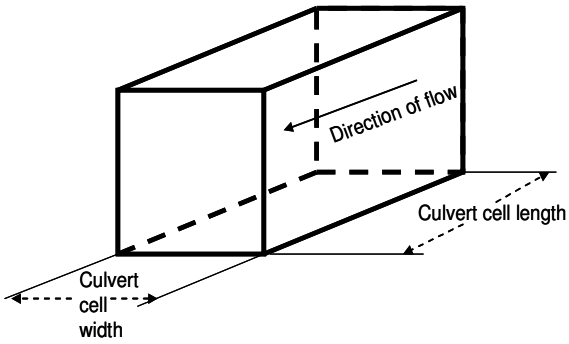
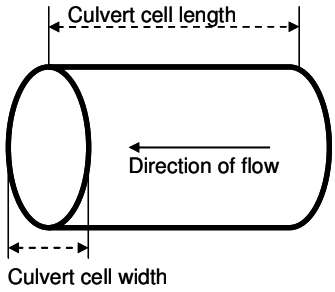
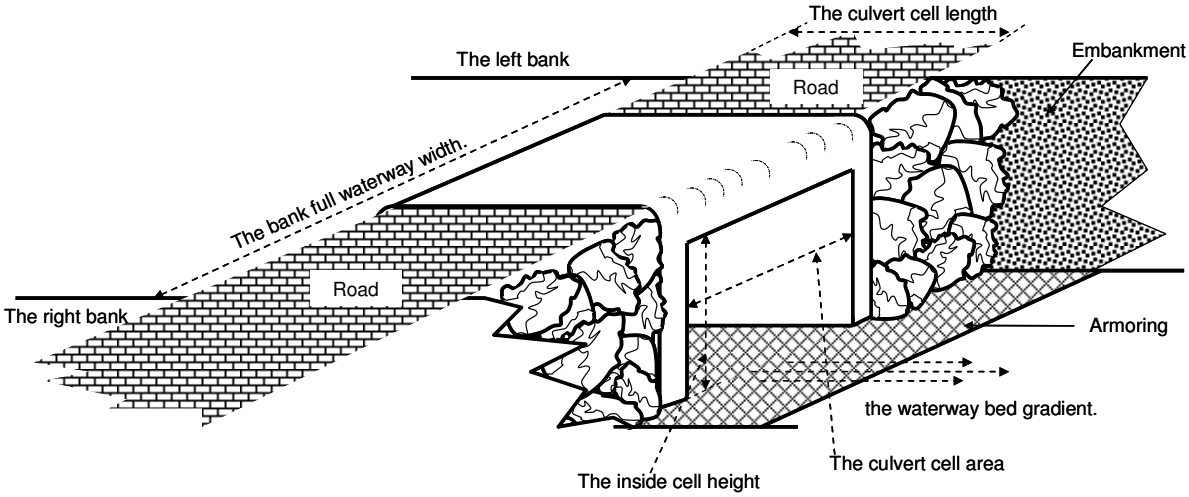






Does the application involve more than one culvert?

☐ Yes - generate another section 5 response for each culvert and submit with the application.

☐ No - if the application involves another type of barrier identified in section 3, go to the relevant section identified.

- if the application does not involve another type of barrier identified in section 3, go to section 7.

6. Constructing a new or modifying (including maintenance and replacement) an existing waterway barrier except those listed in sections 4 and 5.

What is the nature of the proposed work?

☐ Construction of a new barrier

☐ Replacement of an existing barrier

☐ Maintenance of an existing barrier

Briefly describe the proposed barrier.

Construction of three permanent bridge structures, namely one (1) across Belyando River (Cross 78b), one (1) across Mistake Creek (Crossing 69b) and one (1) across the Logan Creek (Crossing 52). The works require the establishment of piles toward the top of each bank and further piles and a pile platform within the centre of the flow channel. Refer to excerpts of Question 6 regarding the detail for crossings 78b Belyando River and 69b Mistake Creek. The below details are only for crossing 52 Logan Creek.

For a temporary barrier (i.e. in place less than 12 months), how many days will the barrier be in place? [ ] days

Will the barrier extend across the waterway from bank to bank?

- [x] Yes
- [ ] No - how long is the proposed barrier (across the waterway)? [ ] metres
  - how wide is the waterway (bank to bank)? [ ] metres

What is the purpose of the proposed barrier?

The purpose of the three bridges is to allow for waterway crossing by the SP 1 rail alignment.

What is the maximum height of the proposed barrier above the existing bed level? [7.26] metres

What are the proposed construction materials? (E.g. earth, concrete, rock fill, steel, timber, sand, etc.)?

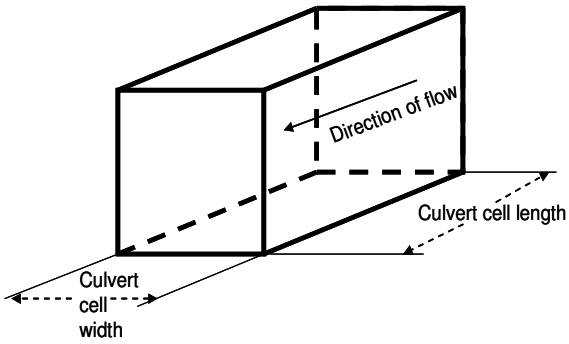
Proposed construction materials include concrete, steel, geo-fabric and scour protection.

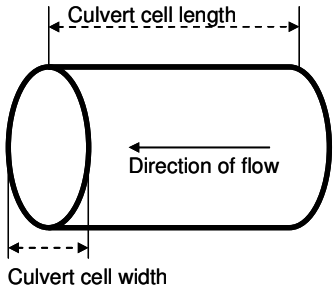
Does the barrier follow the natural gradient of the bed level?

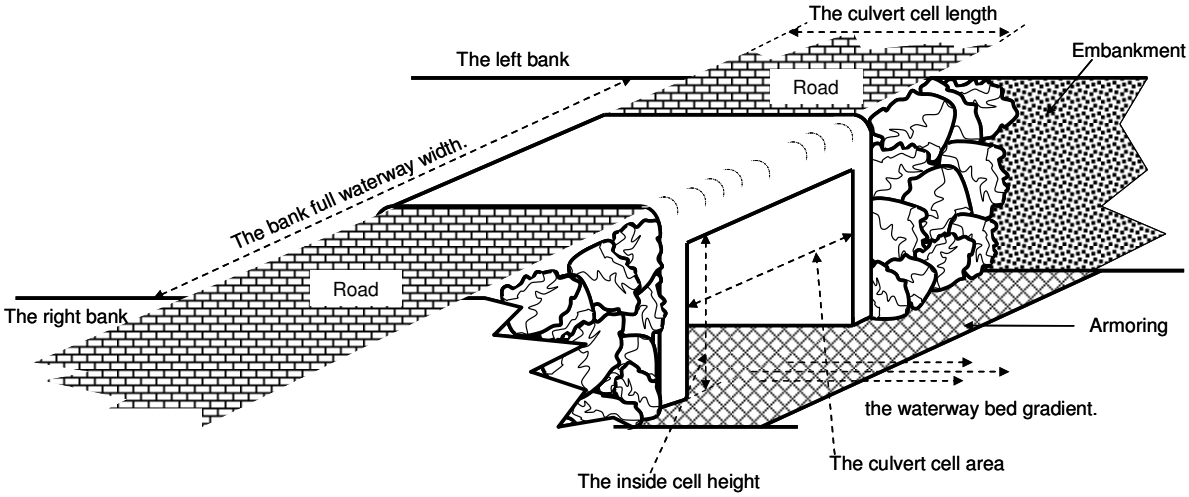
- [ ] Yes
- [x] No

Does the application involve more than one barrier under this section?

- [x] Yes - generate another section 6 response for each barrier and submit with the application.
- [ ] No - go to section 7.







Does the application involve more than one culvert?

☐ Yes - generate another section 5 response for each culvert and submit with the application.

☐ No - if the application involves another type of barrier identified in section 3, go to the relevant section identified.

- if the application does not involve another type of barrier identified in section 3, go to section 7.

6. Constructing a new or modifying (including maintenance and replacement) an existing waterway barrier except those listed in sections 4 and 5.

What is the nature of the proposed work?

☐ Construction of a new barrier

☐ Replacement of an existing barrier

☐ Maintenance of an existing barrier

Briefly describe the proposed barrier.

Construction of three permanent bridge structures, namely one (1) across Belyando River (Cross 78b), one (1) across Mistake Creek (Crossing 69b) and one (1) across the Logan Creek (Crossing 52). The works require the establishment of piles toward the top of each bank and further piles and a pile platform within the centre of the flow channel. Refer to excerpts of Question 6 regarding the detail for crossings 78b Belyando River and 69b Mistake Creek. The below details are only for crossing 52 Logan Creek.

For a temporary barrier (i.e. in place less than 12 months), how many days will the barrier be in place? [ ] days

Will the barrier extend across the waterway from bank to bank?

- [x] Yes
- [ ] No - how long is the proposed barrier (across the waterway)? [ ] metres
  - how wide is the waterway (bank to bank)? [ ] metres

What is the purpose of the proposed barrier?

The purpose of the three bridges is to allow for waterway crossing by the SP 1 rail alignment.

What is the maximum height of the proposed barrier above the existing bed level? [7.26] metres

What are the proposed construction materials? (E.g. earth, concrete, rock fill, steel, timber, sand, etc.)?

Proposed construction materials include concrete, steel, geo-fabric and scour protection.

Does the barrier follow the natural gradient of the bed level?

- [ ] Yes
- [x] No

Does the application involve more than one barrier under this section?

- [x] Yes - generate another section 6 response for each barrier and submit with the application.
- [ ] No - go to section 7.

environmental management

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Carmichael Coal Project (Rail)
Separable Portion 1

Fisheries Act 1994
Waterway Barrier Works

6396
21 March 2013
Adani Mining Pty Ltd

adani™

surveying · town planning · urban design · environmental management · landscape architecture

Document Control

Title	Carmichael Coal Project (Rail) - Separable Portion1 Waterway Determination (upstream limit) under the *Fisheries Act 1994*
Job Number	**6396**
Client	Adani Mining Pty Ltd

Document Issue

Issue	Date	Prepared By	Checked By
Draft	18.10.2012	Angela Little	Ross Marshall
Final	20.03.2013	Ross Marshall	Dr Andrew Davies

Disclaimer

This report has been prepared for **Adani Mining Pty Ltd**. **Saunders Havill Group** cannot accept responsibility for any use of or reliance upon the contents of this report by any third party.

Reports and/or Plans by Others

Reports and/or plans by others may be included within this Environmental Management report to support the document.

Table of Contents

Figures

Tables

Plans

I. Introduction

I.I. Project Summary

Adani Mining Pty Ltd has proposed the development of a Galilee Basin coal mine with projected output capacity of 60 million tonnes per annum. Rail transport of output coal is proposed via an alignment connecting the mine site with the existing Goonyella and Newlands rail systems to facilitate export via the Port of Hay Point / Abbot Point.

This report examines the potential for Waterway Barrier Works (WWBW) associated with Separable Portion 1 (SP-1) of the alignment, known as the 'west rail', which traverses approximately 120 km from the Mine site eastward to Moranbah (refer to **Plan 1**).

The Rail component of the Mine proposal has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such, an Environmental Impact Statement (EIS) is required. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 1: Project Summary

Location	95 m wide corridor from terminal facilities within the Mine site to the termination of SP-1 ('west rail')
RPD	• Lot 662 on PH1491 • Lot 3 on BL26 • Lot 637 on PH1980 • Lot 1 on SP147546 • Lot 4 on SP116046 • Lot 3235 on PH752 • Lot 10 on BL49 • Lot 1 on SP118814 • Lot 6 on SP125740
Local Government	Isaac Regional Council

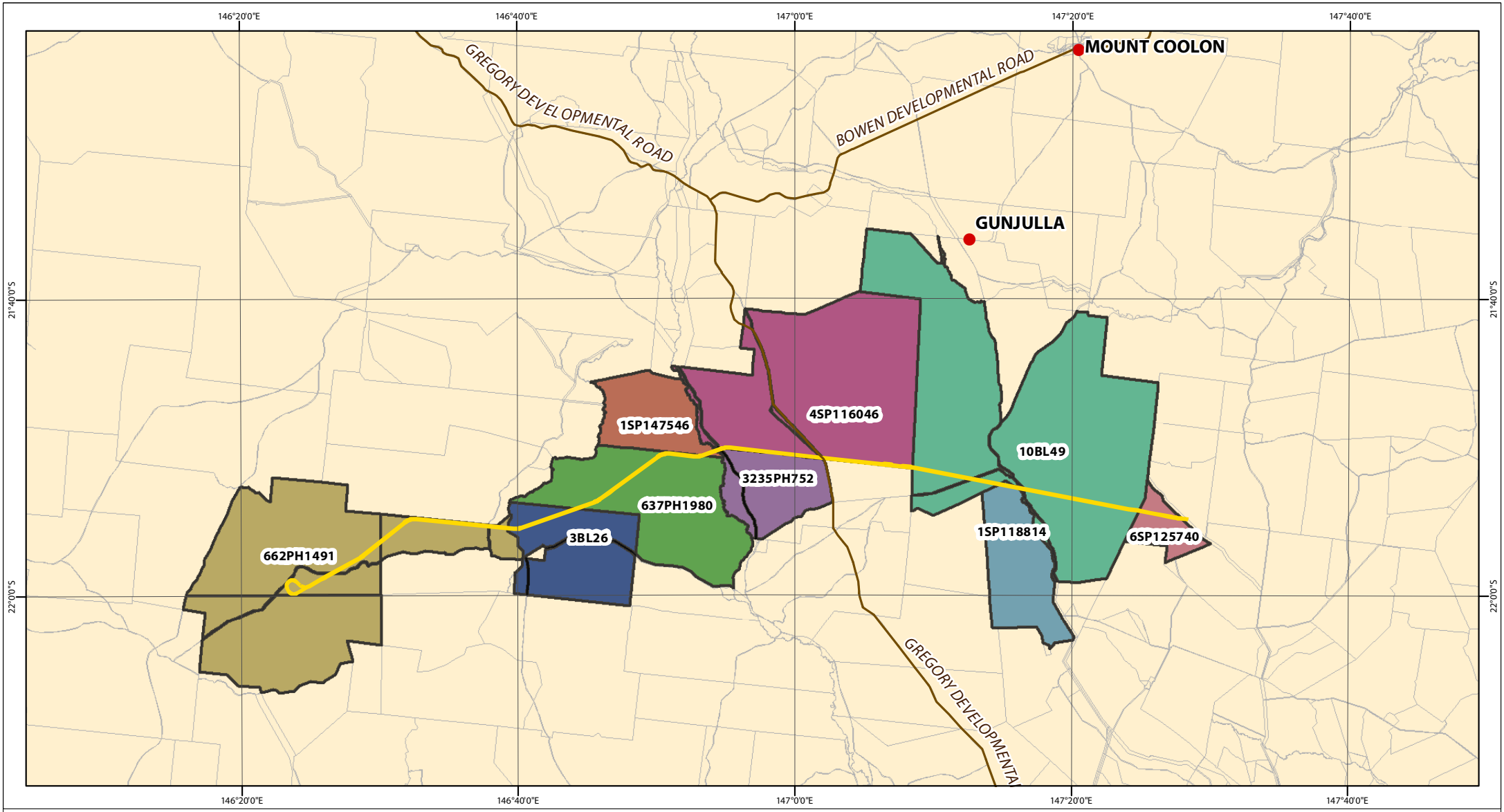
I.2. Purpose

This WWBW application report has been prepared following review of proposed bridge and culvert crossings along the SP-1 alignment. Permanent works that trigger assessment for WWBW are identified and information necessary for their assessment by the **Department of Agriculture, Fisheries and Forestry** (DAFF) in accordance with the *Fish Habitat Management Operational Policy 008* (FHMOP8) is provided.

Further information is provided for additional crossing locations that either:

1. Do not trigger WWBW; or
2. Are minor WWBW that will be conducted in accordance with self-assessable codes

The purpose of this report is to seek approval for those works considered assessable WWBW and to provide DAFF with background information regarding self-assessable and non-assessable crossings. **Adani** will notify DAFF of their intent to undertake minor self-assessable WWBW as per the requirements of the relevant code.



Legend

- Place Name
- Major Roads
- Rail Alignment Corridor (SP-1)
- QLD DCBD

Plan 1 *Rail Project Overview (SP-1)*

File ref. *6396 E 01 Rail Project Overview A*
Date *20/03/2013*
Project *Carmichael Coal Rail Project*

0 2 4 6 8 10 20 *km*

Scale (A4): 1:650,000 [GDA 1994 MGA Z55]

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Layer Sources SP-1 Corridor, Crossing Locations (Adani Mining Pty Ltd 2012), DCDB, Major Roads, Towns (DNRM 2012), WWBW Waterways (DEHP 2013)

I.3. Application Summaries

Belyando River

Site	Crossing 78b
Catchment	Belyando River Catchment
RPD	Lot 3 on BL26
Crossing Type	Bridge
Potential impediment	Piles in low flow channel
Operational Works	Waterway Barrier Works
Timeframe	TBD

Mistake Creek

Site	Crossing 69b
Catchment	Belyando River Catchment
RPD	Lot 1 on SP147546 Unallocated State Land (Mistake Creek) Lot 3235 on PH752
Crossing Type	Bridge
Potential impediment	Piles in low flow channel
Operational Works	Waterway Barrier Works
Timeframe	TBD

Logan Creek

Site	Crossing 52
Catchment	Suttor River Catchment
RPD	Lot 1 on SP118814 Unallocated State Land (Logan Creek) Lot 10 on BL49
Crossing Type	Bridge
Potential impediment	Piles in low flow channel
Operational Works	Waterway Barrier Works
Timeframe	TBD

2. Fisheries Act 1994

The *Fisheries Act 1994* (FA) deals with the use, conservation and improvement of Queensland's fisheries resources and fish habitats. The FA seeks to ensure adequate provision for fish movement and habitat access during development processes that include:

- Building work in a declared fish habitat area;
- Carrying out operational work completely or partly within a declared fish habitat area;
- Carrying out operational work that is the removal, destruction or damage of marine plants; and
- Carrying out Waterway Barrier Works.

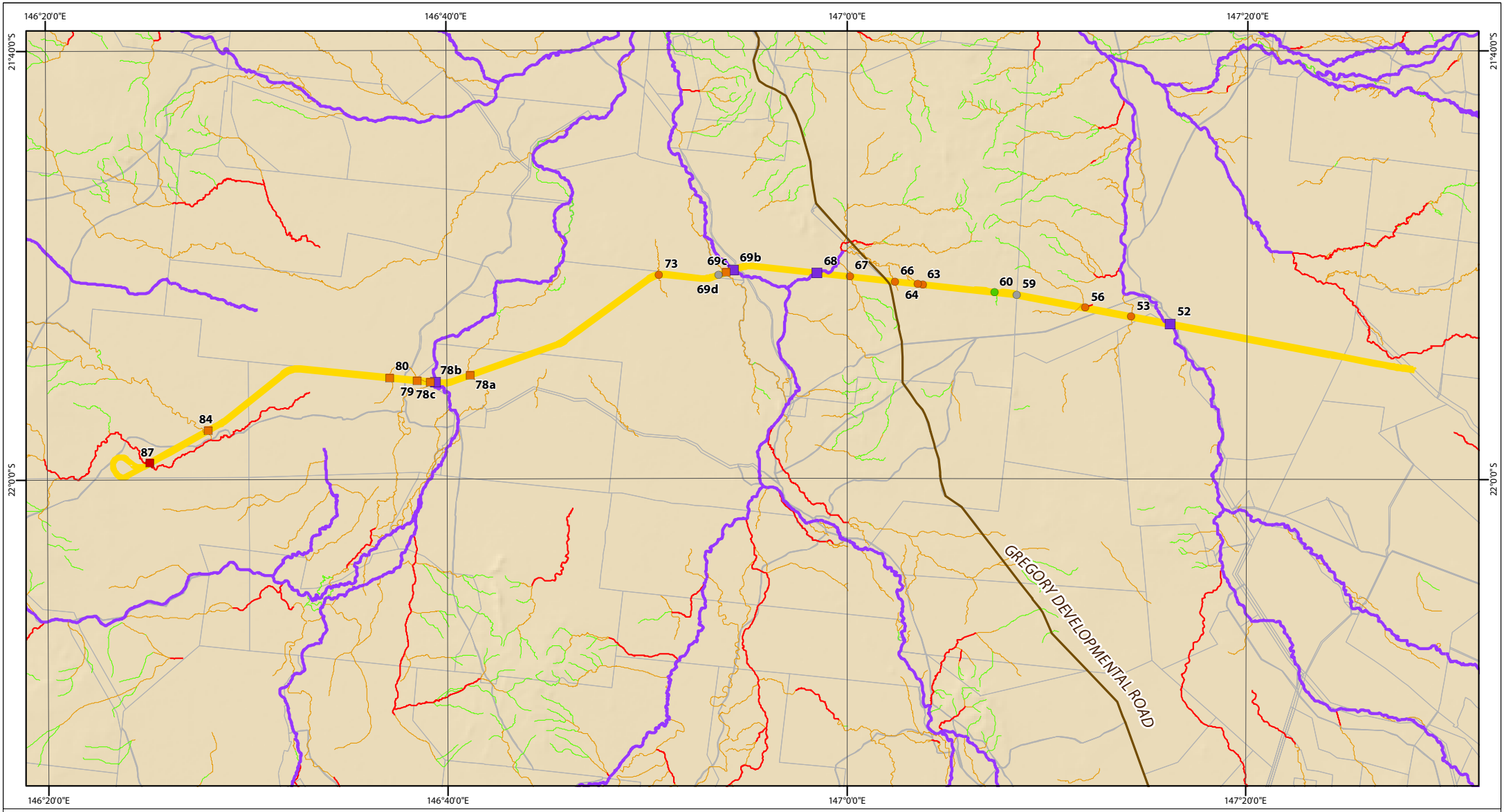
2.1. Waterways – Guide for determination of waterways using the spatial data layer

The definition of a waterway under the FA is broad, and to better delineate this, a state-wide spatial data layer; *Guide for the determination of waterways using the spatial data layer (Queensland Waterways for Waterway Barrier Works, 2013)*, hereafter, the *Guide ;* has been developed. This spatial layer projects the furthest extent of FA interest in barrier works on waterways. Drainage features not shown as waterways on the Spatial Data Layer do not require consideration in relation to the FA.

The *Guide* recognises that the Spatial Data Layer may not be entirely accurate in every circumstance. As such, it provides details for the registration of detected inconsistencies. **Section 2.2**, below, describes the suggested method for determining the presence of a waterway in the field.

In addition, the *Guide* and the associated Spatial Data Layer categorise waterways based on the combination of their fish movement potential and the risk associated with various development types (bed-level crossings, culvert crossing temporary works etc.). Colour-codes indicate whether proposed works can potentially proceed under the relevant self-assessable code or if they require a development approval.

Plan 2, next page, details the location of FA categorised (colour-coded) waterways along the SP-1 alignment.



Legend

- Major Roads
- Rail Alignment Corridor (SP-1)
- QLD DCBD

Waterway Barrier Works Waterways Risk of Impact

- 4 - Major
- 3 - High
- 2 - Moderate
- 1 - Low

Waterway / Drainage Feature Crossing Type

- Bridge / WWBW Major Risk
- Bridge / WWBW High Risk
- Bridge / WWBW Moderate Risk
- Culvert / WWBW Moderate Risk
- Culvert / WWBW Low Risk
- Culvert / Unmapped Water Feature

Layer Sources SP-1 Corridor, Crossing Locations (Adani Mining Pty Ltd 2012), DCDB, Major Roads, Towns (DNRM 2012), WWBW Waterways (DEHP 2013)

Plan 2 *F.A. Categorised Waterways and Crossing Types Along The SP-1 Rail Alignment*

File ref. *6396 E 02 FA Waterways A*
Date *20/03/2013*
Project *Carmichael Coal Rail Project*

0 2 4 6 8 10 20 *km*

Scale (A4): 1:450,000 [GDA 1994 MGA Z55]

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2.2. Waterways – Field determination

As described previously, the *Guide* is not entirely accurate. Here we outline the process for mapping inaccuracies observed in the field to be confirmed by DAFF.

The determination of waterways in the field utilises the definition of the upstream limit as presented within the *Fish Habitat Management Operational Policy (Waterway Barrier Works Development Approvals)*. To determine whether a site is above or below that upstream limit, features relevant to fisheries resources, such as the physical and hydrological attributes, are considered. These include:

1. Defined bed and banks
The bed and banks need to be continuous upstream and downstream of the site rather than isolated and broken sections of a depression

2. An extended, if non-permanent, period of flow
Flow must continue beyond the duration of a rain event and have some reliability commensurate with rainfall. Distinguish between channels just funnelling immediate localized rainfall and waterways that have flow arising from an upstream catchment.

3. Flow adequacy
The flow needs to be sufficient to sustain basic ecological processes and habitats and to maintain biodiversity within or across the feature. Adequacy depends on the ecological function of the channel e.g. waterways that connect to fish habitat like a wetland or waterhole may only need infrequent and short-duration flows to provide connectivity for fish.

4. Fish habitat at, or upstream of, the site
Most in-stream features would provide habitat for fish under adequate flow conditions or, in the case of pools, during dry periods, so it is important to have some knowledge of the fish species for the site and their habitat usage, particularly in headwater streams. Periodic connectivity to upstream, off-stream fish habitat would also count.

3. Proposed Works

The construction of the SP-1 alignment will require the crossing of multiple waterways as described by the *Guide*. The following proposed works are relevant to the project:

- Bridges
- Culverts
- Bed-level crossings
- Temporary works required for construction

This application only deals with permanent bridge and culvert structures along SP-1. At this stage it is anticipated that any requirement for bed-level crossings will be conducted in accordance with the *Self Assessable Code for Construction and Maintenance of Bed Level Crossings (WWBW01 - Part 4)*. In addition, all requirements for temporary works will be conducted in accordance with the self-assessable code *Temporary Waterway Barrier Works (WWBW02)*.

3.1. Bridges

The FHMOP8 details what type of works are considered, and not considered, WWBW. As such, the potential for bridges along the SP-1 alignment to trigger the need for a WWBW approval is subject to the width of the waterway and the location of pile and abutment structures and associated bank revetment works, as follows;

A bridge is not considered WWBW where:

- The pile and/or pile platform are completely outside the low flow channel, and
- The bankful width of the waterway where the bridge is constructed is more than 25 metres, and
- The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks, and also
- Single span bridges with abutment and/or bank revetment works that do not extend into the waterway.

3.2. Culverts

The construction of a culvert crossing through a waterway is classified as WWBW, and therefore development approval needs to be considered. Culverts along the SP-1 alignment are generally planned within relatively small (minor) waterways colour-coded 'Amber' or 'Green' by the *Guide*. These waterways have a low to moderate risk of impact and will be constructed in accordance with the *Code for Self Assessable Development - Minor Waterway Barrier Works Part 3: Culvert Crossings*.

4. Waterway Barrier Works Summary

The proposed SP-1 alignment crosses 20 waterways as mapped by the *Guide's* Spatial Data Layer. Each location was considered in relation to:

- Waterway Classification (Spatial Data Layer)
- Proposed Structure

Of the 20 locations, we consider that only 3 involve works that trigger assessment and approval by DAFF, below:

- Crossing Location 78b - Belyando River - Bridge Structure (Refer to **Section 6**).
- Crossing Location 69b - Mistake Creek -Bridge Structure (Refer to **Section 7**).
- Crossing Location 52 - Logan Creek - Bridge Structure (Refer to **Section 8**).

Proposed works at each of these locations is not considered likely to have a significant impact on fish movement due to local fish species characteristics (see **Section 5**) and the minor nature of bridge support structure impacts in relation to the low flow channel.

Table 2, page 14, summarises the requirements at each crossing location for WWBW assessment. As stated previously, all culverts spanning mapped waterways will be designed and constructed in accordance with the *Code for Self Assessable Development – Minor Waterway Barrier Works Part 3: Culvert Crossings*. Culvert crossings and bridge structures that do not require DAFF assessment are summarised in **Appendix A**.

On-ground proofing identified that the majority of waterways overlayed by the Fisheries Spatial Layer are incorrectly mapped. These inaccuracies are summarised in **Table 2** and **Appendix A**.

Photo: Example of an incorrectly mapped waterway

Table 2: Summary of Waterway Determinations and Waterway Barrier Works

Crossing Number	Name	Fisheries Waterway classification	Proposed Structure	Waterway Barrier Works
87	Eight Mile Creek	Red	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect for Eight Mile Creek with this drainage feature considered above the upstream limit of a waterway. • Proposed bridge structure does not trigger WWBW in accordance with the FHMOP8.
84	North Creek	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect for North Creek with this drainage feature considered above the upstream limit of a waterway. • Proposed bridge structure does not trigger WWBW in accordance with the FHMOP8.
80	Ogenbeena Creek	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect for Ogenbeena Creek as this drainage depression is clearly not a waterway. • Proposed bridge structure does not trigger WWBW in accordance with the FHMOP8.
79	Ogenbeena Creek (lower crossing)	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect for Ogenbeena Creek as this drainage depression is clearly not a waterway. • Proposed bridge structure does not trigger WWBW in accordance with the FHMOP8.
78c	Belyando River Tributary	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment confirmed the presence of a waterway. • The proposed bridge structure does not trigger WWBW as determined using FHMOP8.
78b	Belyando River	Purple	Bridge	**Assessable WWBW – Refer to Section 6.** • Field assessment confirmed the presence of a waterway. • The bridge structure involves a pile and pile platform within the low flow channel.
78a	Belyando River (East Tributary)	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment confirmed the presence of a waterway. • The Bridge does not involve the construction of pile or pile capes within the low flow channel. The abutment and bank revetment works are limited to the toe of the bank and do not extend beyond it.
73	Unnamed Flow Path (Crossing 73)	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping layer for this location is incorrect. The drainage feature forms an isolated depression. • Regardless, works will be considered in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*

Crossing Number	Name	Fisheries Waterway classification	Proposed Structure	Waterway Barrier Works
69d	Water body next to Mistake Creek	Not identified	Culvert	**Not Assessable - Refer to Appendix A** • This location is not triggered by the Fisheries waterway classification spatial layer. • Regardless, works will be considered in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
69c	Mistake Creek Anabranch	Amber	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment confirmed the presence of a waterway. • The proposed bridge structure does not trigger WWBW as determined using FHMOP008.
69b	Mistake Creek	Purple	Bridge	**Assessable WWBW – Refer to Section 7** • Field assessment confirmed the presence of a waterway. • The bridge structure involves minor works toward the low flow channel associated with the pile platform
68	Gowrie Creek	Purple	Bridge	**Not Assessable – Refer to Appendix A** • Field assessment identified this mapped waterway is above or near to the upstream limit of a waterway. • The Bridge does not involve the construction of pile or pile capes within the low flow channel. The abutment and bank revetment works are limited to the toe of the bank and do not extend beyond it.
67	Gowrie Creek Tributary (Crossing 60)	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with this drainage feature considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
66	Gowrie Creek Tributary (Crossing 66)	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with this drainage feature considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
63 & 64	Gowrie Creek Tributaries (63 & 64)	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with these drainage features considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
60	Unnamed Flow Path (Crossing 60)	Green	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with this drainage feature considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
59	Unmapped Flow Path	Not identified	Culvert	**Not Assessable – Refer to Appendix A**

Crossing Number	Name	Fisheries Waterway classification	Proposed Structure	Waterway Barrier Works
	(Crossing 59)			• This location is not triggered by the Fisheries waterway classification spatial layer. • Regardless, works will be considered in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
56	Unnamed Flow Path (Crossing 56)	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with this drainage feature considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
53	Logan Creek Tributary	Amber	Culvert	**Not Assessable – Refer to Appendix A** • Field assessment identified the waterway spatial mapping data is incorrect with this drainage feature considered above the upstream limit of a waterway. • Regardless, works will be undertaken in accordance with the *Self Assessable Guideline for WWBW01 – Part 3*
52	Logan Creek	Purple	Bridge	**Assessable WWBB – Refer to Section 8** • Field assessment confirmed the presence of a waterway. • The bridge structure involves numerous piles within this expansive waterbody.

5. Aquatic Fauna

Information regarding aquatic fauna within the project area is summarised within the *Carmichael Coal Mine and Rail EIS*. Desktop investigations within the project EIS found 51 and 47 fish species known to occur within the Burdekin and Fitzroy Basins, respectively (see EIS **Section 2.6.2.3**, page 2-97). Forty of the identified species are common to both catchments. Based on distributions, 17 of the freshwater fish species known from the Burdekin and Fitzroy Basins have the potential to occur in waterways intersected by, or of relevance to, the Study Area. None of these species are listed under the EPBC or Nature Conservation Acts.

Field investigations for the project EIS undertaken at the nearby Mine Site for the Project (Mine) recorded 11 of the species detailed in **Table 2**. All are common freshwater species which have been previously recorded in the upper Burdekin Catchment.

All 17 fish species with the potential to occur in the study area are potamodromous, and so, do not require passage beyond their freshwater habitat for migratory purposes. Maximum dispersal rates for most of these species are likely to occur following flood peak as waters recede. It is therefore important that natural flood flows are maintained by water passage structures along the SP-1 alignment.

Table 2: Fish species recorded at and potentially inhabiting waterways in the study site

Status*	Family	Common name	Size†	Habitat§
Present	Atherinidae	Fly-specked hardyhead	S	All
	Chandidae	Agassiz's glassfish	S	All
	Eloteridae	Midgley's carp gudgeon	S	All
		Southern Purple-spotted gudgeon	M	All
			L	Slow
	Melanotaeniidae	Sleepy cod	M	All
	Plotosidae	Eastern rainbowfish	L	All
	Terapontidae	Hyrtl's tandan	L	All
		Spangled perch		
Possible	Clupeidae	Bony bream	M	All
	Eloteridae	Western carp gudgeon	S	All
		Flathead gudgeon	S	Slow
	Percichthyidae	Golden perch	L	Slow
	Plotosidae	Black catfish	L	Fast
		Soft-spined catfish	M	Slow
		Rendahl's catfish	M	Slow
	Terapontidae	Small-headed grunter	L	Fast
	Toxotidae	Seven-spotted archerfish	L	Slow

*Present = recorded as present at either the mine or rail site within the project EIS, Possible = Project EIS desktop search predicted. †Size as adult, S = small (<10 cm), M = medium (10-20 cm), L = large (>20 cm). §Slow = relatively still and slow waters, Fast = relatively swift moving waters.

6. WWBW Belyando River (Crossing 78b)

6.1. Description

The proposed bridge crossing of the Belyando River (Crossing 78b) traverses a relatively straight part of the waterway that forms part of the Belyando River catchment (**Figure 1**). This Stream Order 8 watercourse forms the main tributary of the Belyando River and is colour-coded by the Spatial Data Layer as a 'Purple (WWBW Major)' waterway (**Plan 2**). Vegetation associated with the Belyando River is characterised by fringing *Eucalyptus camaldulensis* with *Eucalyptus coolabah* dominant throughout the adjoining floodplain. Other riparian species, including *Melaleuca bracteata* and *Acacia salicina*, occur within the sub canopy layer. Ground layer species adjoining the banks of the Belyando River are dominated by introduced species with associated native species, including *Lomandra longifolia* and *Muehlenbeckia florulenta*, also present.

The condition assessment of the Belyando River described a permanent to semi-permanent waterway characterised by sandy substrates and eroded moderate to steep bank structures. Debris along the banks of the river and within the adjoining floodplain indicates significant flows during the wet season. Woody debris and some overhanging vegetation provide habitat opportunities for aquatic fauna.

This part of the Belyando River is characterised by extended pools and runs with sandy bars established on, and following, waterway bends. Due to the bank structure and sandy substrate, the low flow channel within these waterways typically varies following flood flows and deposition of materials.

Photo: Belyando River

Legend

- Watercourse Crossing Location
- Rail Alignment Corridor (SP-1)
- Mapped Watercourse (Belyando River)
- Isaac RC DCBD

Figure 1 *Belyando River (Crossing 78b) Location*

File ref. *6198 Figure 1 - Belyando River Crossing A*
Date *20/03/2013*
Project *Carmichael Coal Rail Project*

0 5 10 20 30 40 50 *m*
Scale (A4): 1:3,000 *[GDA 1994 MGA Z55]*

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Layer Sources *Crossing Structure Locations (Calibre 2013), Watercourses (EHP 2012), Aerial (Vekta 2011, Google, 2013)*

Photo: Belyando River

6.2. Proposed works

Engineering details associated with Belyando River Crossing 78b are provided in **Appendix B** and summarised in the figure below. The works require the establishment of piles toward the top of each bank and further piles and a pile platform situated within the centre of the low flow channel (**Figure 2**).

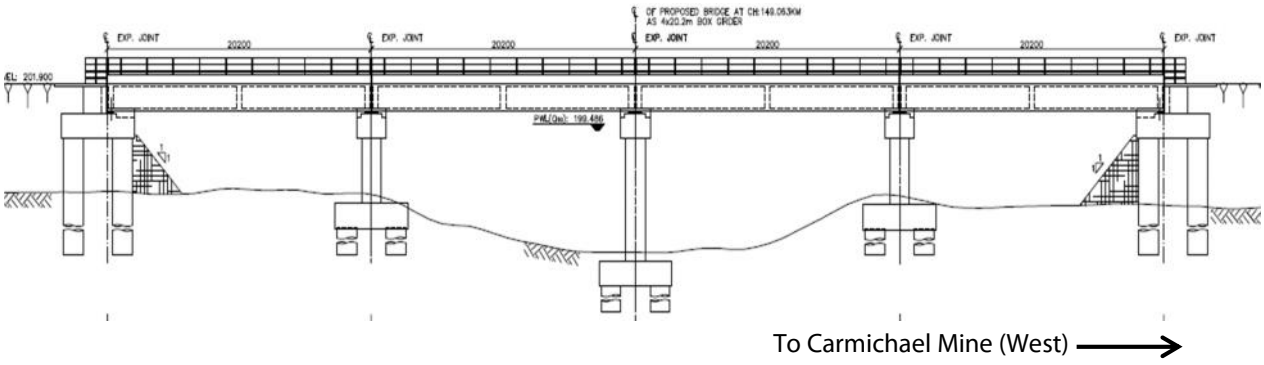


Figure 2: Belyando River (Crossing 78b) plan extract

Due to the width of the low flow channel (in excess of 10 m) and the dynamic sandy substrate typically encountered within this part of the Belyando River, it is not expected that the works will result in an impediment to fish movement. Over time and following periods of flood, it is anticipated that the low flow channel will traverse either side of the pile structure with fish passage retained. As detailed within the above photos, the Belyando River retains pooled slow moving water and therefore no restriction to upstream fish movement is expected.

It is anticipated the construction timeframe will align with the dry season. During construction, access to the Belyando River bed may be required. Where so required, these works are intended to be undertaken in accordance with the *Code for Self Assessable Development – Temporary Waterway Barrier Works (WWBW02)*. In addition, the works will follow a stringent Environmental Management Plan to ensure impacts on the environmental values of the Belyando River are minimised.

7. WWBW Mistake Creek (Crossing 69b)

7.1. Description

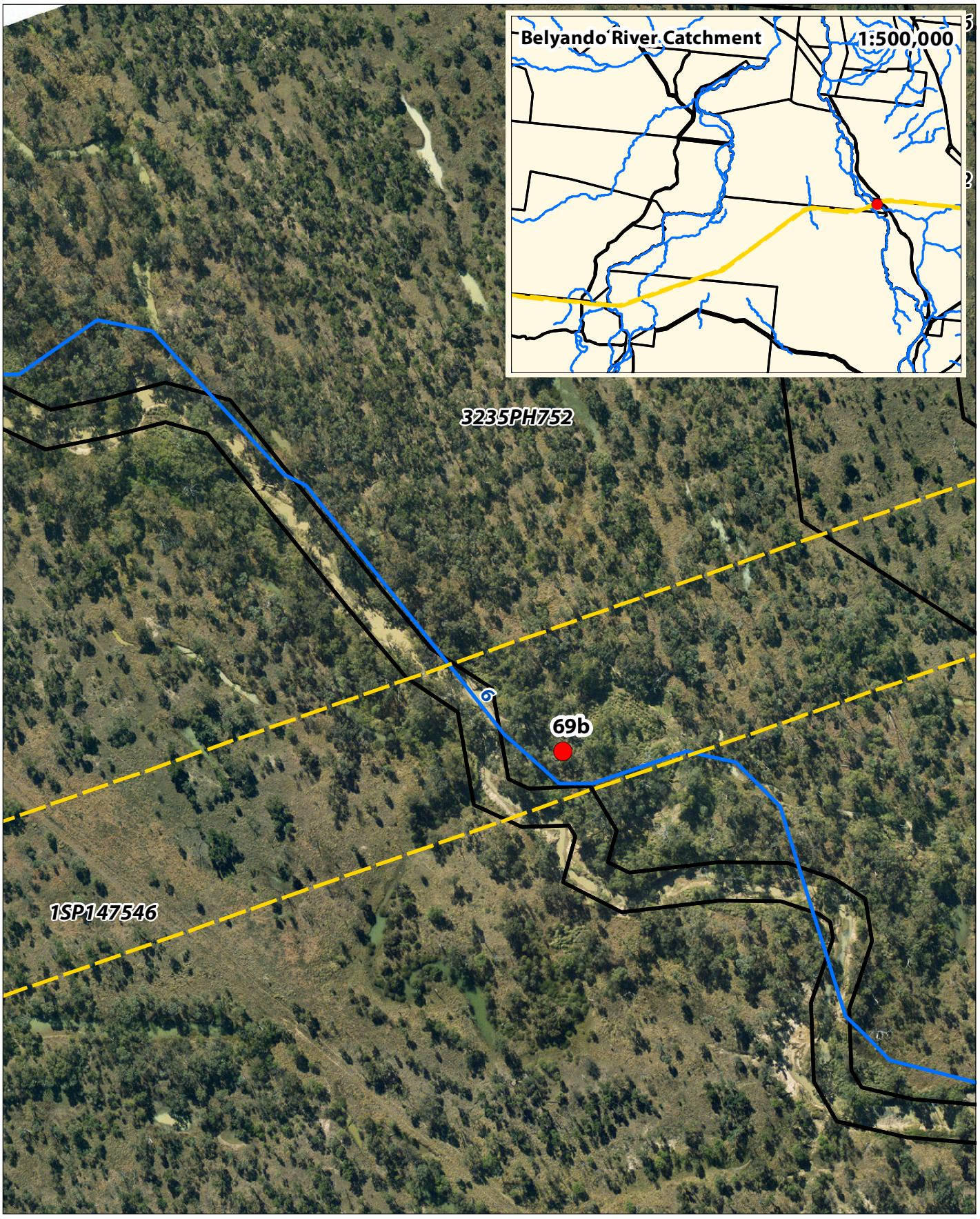
Mistake Creek is a Stream Order 6 waterway that forms part of the Belyando River catchment (**Figure 3**) and is colour-coded 'Purple (WWBW Major)' by the *Guide's* Spatial Data Layer (**Plan 2**). This watercourse runs from South to North through remnant vegetation characterised by *Eucalyptus coolabah* and *Eucalyptus camaldulensis*.

The stream bed of Mistake Creek is comprised of sands, gravel, clays and silts, with sand the dominant substrate observed within the watercourse. Erosion and slumping were observed on both banks predominantly caused by cattle accessing the watercourse and scouring from recent flood events.

Undercutting of riparian vegetation was observed along the watercourse banks, resulting in exposed roots and fallen timber within the area surveyed. Small turbid pools were occasionally observed within the stream bed, but the majority of the watercourse contained no pooled or flowing water.

The remains of freshwater molluscs, crustaceans and gastropods were observed on the watercourse beds and banks. In addition *Cyperus* and *Juncus* species were occasionally observed at soakage points.

Photo: Mistake Creek



Legend

- Watercourse Crossing Location
- Rail Alignment Corridor (SP-1)
- Mapped Watercourse (Belyando River)
- Isaac RC DCBD

Figure 3 *Mistake Creek (Crossing 69b) Location*

File ref. *6198 Figure 3 - Mistake Creek Crossing A*
Date *20/03/2013*
Project *Carmichael Coal Rail Project*

0 10 20 40 60 80 100 *m*
Scale (A4): 1:3,000 *[GDA 1994 MGA Z55]*

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Layer Sources *Crossing Structure Locations (Calibre 2013), Watercourses (EHP 2012), Aerial (Vekta 2011, Google, 2013)*

Photo: Mistake Creek

7.2. Proposed works

Engineering details associated with the Mistake Creek Crossing are provided in **Appendix B** and summarised in the figure, below. It is noted that another drainage feature is located to the East of Mistake Creek; however, this area is not mapped as a waterway by the Spatial Data Layer and therefore is not considered here. The area boxed within the diagram below indicates the proposed works mapped within the Spatial Data Layer. The works in this location will require construction of piles and a pile platform toward the low flow channel (**Figure 4**).

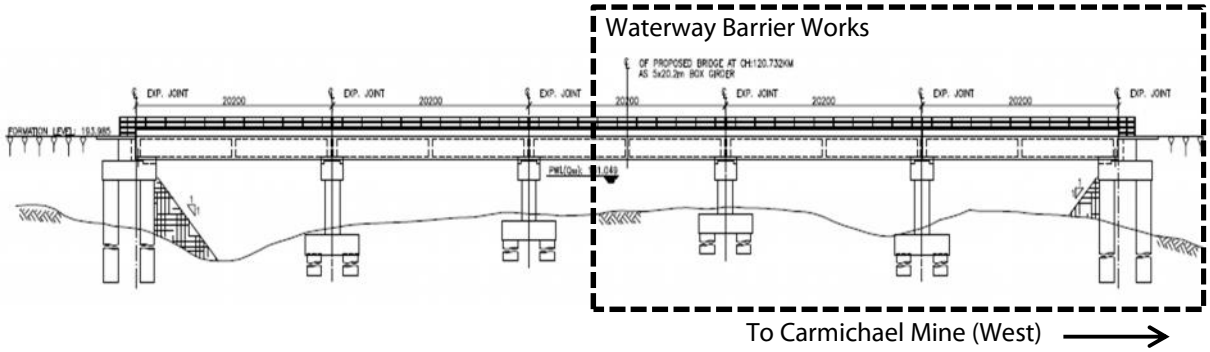


Figure 4: Mistake Creek (Crossing 69b) plan extract

As described previously, this section of Mistake Creek is ephemeral with no permanent water located within the vicinity of the proposed construction works. The substrate within the low flow channel is sandy and therefore

dynamic in nature. In the context of fish species relevant to the area, dispersal is likely to occur following flood peak as waters recede. Due to the relatively flat bed profile through the low flow channel and proximity of the permanent works toward the western bank, it is concluded that the proposed works will not impact on fish movement potential.

It is anticipated the construction timeframe will align with the dry season. During construction, access to the Mistake Creek bed may be required. Where so required, these works are intended to be undertaken in accordance with the *Code for Self Assessable Development – Temporary Waterway Barrier Works (WWBW02)* and Project (Rail) Environmental Management Plan.

8. WWBW Logan Creek (Crossing 52)

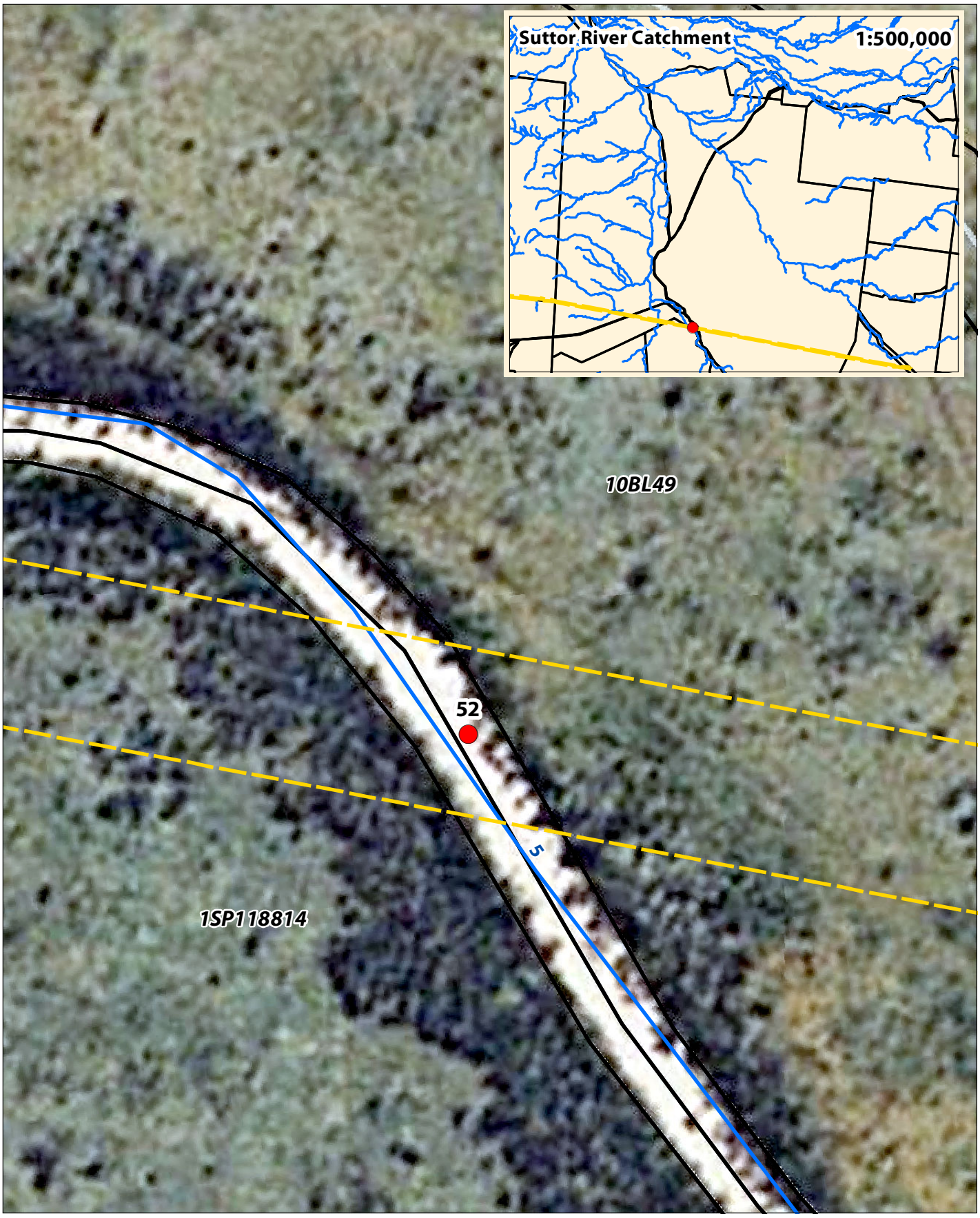
8.1. Description

Logan Creek, categorised as Stream Order 5, runs from South-East to North-West through the Suttor River catchment (**Figure 5**) and is surrounded by intensive agriculture along large sections of its banks. It is colour-coded by the Spatial Data Layer as a 'Purple (WWBW Major)' waterway (**Plan 2**). This expansive water body is formed by a weir structure that is located approximately 8 km downstream of the proposed bridge crossing.

The riparian vegetation associated with this watercourse is predominantly *Eucalyptus camaldulensis* and *Eucalyptus coolabah* with *Acacia cambagei* distant from the watercourse banks. Other species observed include *Geijera parviflora, Acacia salicina, Eremophila bigoniiflora, Eremophila mitchellii, Carissa ovata, Pennisetum ciliare, Parthenium hysterophorus, Terminalia oblongata, Dichanthium sericeum, Leptochloa digitata* and *Cyperus exaltatus.*

Substantial aquatic habitats in the form of submerged logs and aquatic macrophytes are present. Numerous avifauna were observed utilising this watercourse, including duck, cormorant, heron and ibis species.

Photo: Logan Creek



Legend

- Watercourse Crossing Location
- Rail Alignment Corridor (SP-1)
- Mapped Watercourse (Logan Creek)
- Isaac RC DCBD

Figure 5 *Logan Creek (Crossing 52) Location*

File ref. *6198 Figure 5 - Logan Creek Crossing A*
Date *20/03/2013*
Project *Carmichael Coal Rail Project*

0 10 20 40 60 80 100 *m*

Scale (A4): 1:3,000 *[GDA 1994 MGA Z55]*

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Layer Sources *Crossing Structure Locations (Calibre 2013), Watercourses (EHP 2012), Aerial (Vekta 2011, Google, 2013)*

8.2. Proposed Works

Engineering details associated with the Logan Creek Crossing are provided in **Appendix B** and summarised in the figure, below. The proposed Bridge structure through Logan Creek will require the construction of four pile and pile platforms within the creek bed (**Figure 6**). Due to the downstream weir and permanency of the relatively extensive waterbody, it is anticipated that the completed structure will not restrict or adversely impact fish movement.

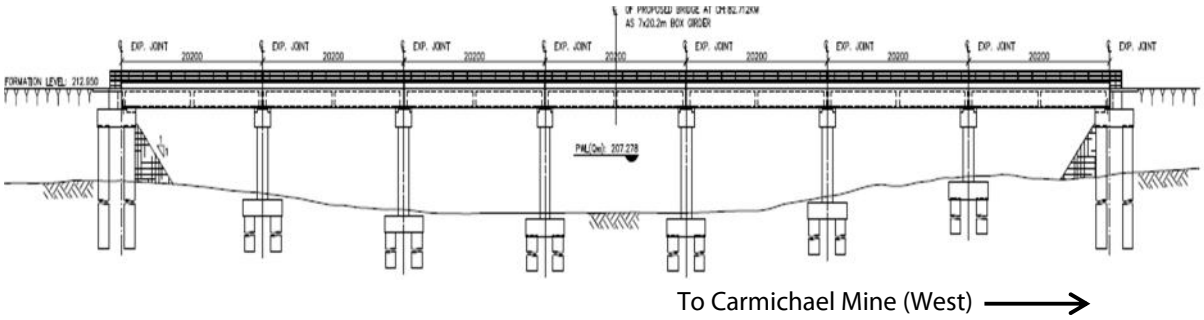

Figure 6: Logan Creek (Crossing 52) plan extract

Construction methods associated with this crossing are yet to be finalised and will be subject to the contractor and proposed machinery. Provided stringent water quality management procedures are in place, it is not anticipated that the proposed works will significantly impact on fish species. Due to the length of the water body, it is anticipated that the majority of aquatic fauna species will naturally move up or downstream during the period of proposed works.

9. Summary

Separable Portion 1 of the Carmichael Coal Project (Rail) traverses approximately 120 km from the Mine site eastward to Moranbah. This report has been prepared to provide an overview of proposed works across 'waterway' and drainage features along the SP-1 alignment. Information is provided for consideration against the *Fish Habitat Management Operational Policy 008* and associated self-assessable guidelines. Those works considered to trigger DAFF assessment for Waterway Barrier Works are highlighted. The following outcomes are sought from this application and supporting information:

1. Fisheries approval to construct bridges associated with the SP-1 rail alignment at points crossing the Belyando River, Mistake Creek and Logan Creek.

2. Review of information provided in **Appendix A** to confirm the status of incorrectly mapped waterways along the SP-1 alignment.

10. Appendices

Appendix A

Summary of Rail Crossings that Do Not Require Assessment Under Waterway Barrier Works

Appendix B

Engineering Plans for SP-1 Bridges that Cross Assessed Flow Paths

Appendix A

Summary of Rail Crossings that Do Not Require Assessment Under Waterway Barrier Works (in accordance with FHMOP8)

environmental management

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Carmichael Coal Project (Rail)
Separable Portion 1

Fisheries Act 1994
Waterway Barrier Works

Appendix A
Summary of Crossings

6396
21 March 2013
Adani Mining Pty Ltd

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surveying town planning urban design environmental management landscape architecture

I. Eight Mile Creek (Crossing 87)

I.I. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	Eight Mile Creek is identified as a 'Red waterway' by the Fisheries Spatial Data Layer
Field Determination	**Section 1.2**	Field assessment of Eight Mile Creek has identified inconsistencies within the 'waterway' classification. The crossing forms a shallow depression which appears to hold limited upstream connectivity. The area is above the upstream limit when considering the FHMOP8.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross Eight Mile Creek.
Assessment Trigger	**Section 1.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: Eight Mile Creek

1.2. Field Determination

This location was assessed following a dry period and therefore no water was present. No riverine communities were observed which, in combination with the prevailing sandy substrate, indicates this area only holds water for short periods following extensive rainfall events. The 'mapped waterway' is broadly defined as a shallow erosion channel with fringing *Eucalyptus* and *Acacia* species and best described as an ephemeral drainage feature.

Where the alignment crosses Eight Mile Creek is beyond the upstream limit when considering assessment criteria within the Fish Habitat Management Operational Policy 008 (FHMOP8). This finding is supported by the *Adani Mining Pty Ltd Report for Carmichael Coal Mine and Rail Project: Mine Technical Report – Mine Aquatic Ecology Report (GHD November 2012)* which indicates the absence of aquatic habitat values within upstream areas of Eight Mile Creek. In addition, Eight Mile Creek terminates downstream of the proposed works where it discharges into a broad floodplain.

Photo: Eight Mile Creek

I.3. Proposed Works

The crossing proposed for Eight Mile Creek is a bridge structure as detailed within **Appendix B**. Regardless of the discrepancies between the 'waterway' Spatial Data Layer and on-site findings, the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment (Refer to **Table 1** and **Figure 1**, below). This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 1: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer to Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The piles and pile platform, while near, are not located within the adjoining low flow channels. It is noted that the bed of Eight Mile Creek is relatively flat and consists of a dynamic sandy substrate.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of Eight Mile Creek is in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutment and associated scour protection is located outside of the banks of Eight Mile Creek.

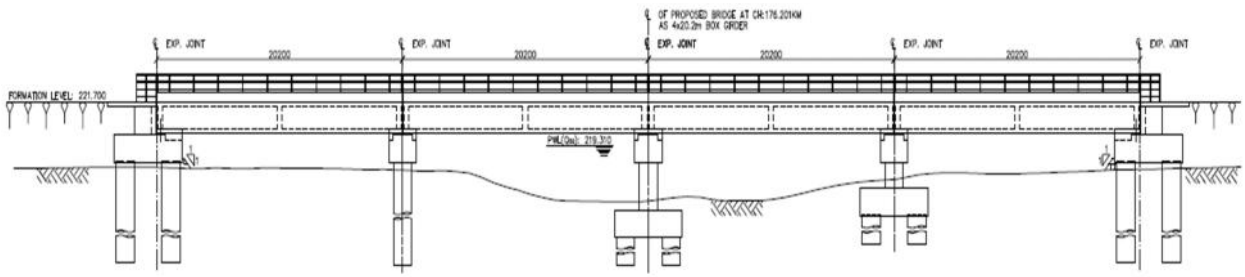


Figure 1: Eight Mile Creek (Crossing 87)

2. North Creek (Crossing 84)

2.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	North Creek is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 2.2**	Field assessment of North Creek has identified inconsistencies within the 'waterway' classification. Some potential exists for this feature to meet the definition of a 'waterway' under the *Fisheries Act*. However, connectivity may be limited when considering that this feature flows into a downstream floodplain. Fish movement is therefore only likely during extreme flood events. When considering the FHMOP8, this part of North Creek is considered to be above or near the upstream limit of the waterway.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross North Creek.
Assessment Trigger	**Section 2.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: North Creek

2.2. Field Determination

Field assessment followed a period of rainfall and therefore the location retained small standing pools of water. To the South of the alignment is a small constructed dam, which contributes to sustained saturation of the clay/sandy substrate occurring within the stream bed.

The catchment area for North Creek appears more extensive than Eight Mile Creek when viewing aerial imagery, and this flow path retains fringing vegetation and a more defined channel along the majority of its length. *Eucalyptus coolabah* is the dominant tree located on the banks. Other species identified include *Acacia harpophylla*, *Eucalyptus camaldulensis, Terminalia oblongata* and *Eremophila mitchellii*. Shrub and ground species situated on the bank include *Carissa ovata, Pennisetum ciliare*, and *Eremophila mitchellii*.

Other plants observed within the stream bed included *Juncus* and *Cyperus* species, indicating the area retains water for extended periods. Macrophytes were not observed within the assessment area.

A field survey was conducted within the upper reaches of North Creek as part of the *Mine Aquatic Ecology Report (GHD November 2012)*. The assessment identified limited aquatic habitat features, however, some isolated pools and signs of yabby holes and aquatic snails were present.

The assessment of North Creek suggests the area has questionable connectivity from a fisheries perspective. This is further emphasised by the indirect downstream connection of North Creek to Ogenbeena Creek via a flood plain.

Photo: North Creek

2.3. Proposed Works

The crossing proposed for North Creek is a bridge structure as detailed within **Appendix B**. Regardless of the discrepancies between the waterway Spatial Data Layer and on-site findings, the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment (Refer to **Table 2** and **Figure 2** below). This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 2: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The piles and pile platform are located outside of the low flow channel.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of North Creek is in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutment and associated scour protection is located outside of the banks of North Creek.

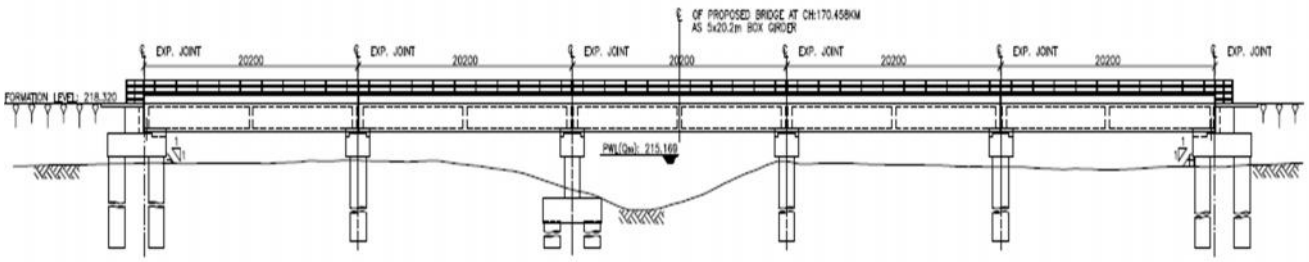


Figure 2: North Creek (Crossing 84)

3. Ogenbeena Creek (Crossing 80)

3.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	Ogenbeena Creek is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 3.2**	Ogenbeena Creek is clearly not a 'waterway' as defined by the *Fisheries Act 1994*. The area is incorrectly mapped by the Fisheries Data Spatial Layer.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross Ogenbeena Creek.
Assessment Trigger	**NA**	NA

Photo: Ogenbeena Creek

3.2. Field Determination

This part of Ogenbeena Creek is situated within a floodplain. This location does not have any characteristics consistent with the definition of a 'waterway'.

No further assessment is provided for this location in relation to Waterway Barrier Works. Engineering details showing the proposed bridge structure through this location are presented in **Appendix B** and **Figure 3**.

Photo: Ogenbeena Creek

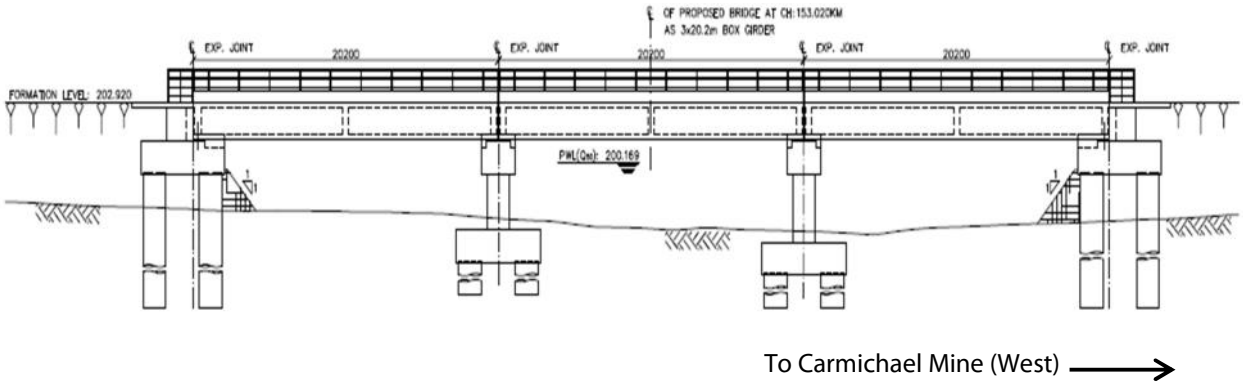


Figure 3: Ogenbeena Creek (Crossing 80)

4. Ogenbeena Creek (Lower - Crossing 79)

4.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	Ogenbeena Creek (lower crossing) is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 4.2**	Field assessment of Ogenbeena Creek has identified inconsistencies within the 'waterway' classification. Ogenbeena Creek retains no defined channel features and is not considered a 'waterway' as defined by the *Fisheries Act 1994*. The area is incorrectly mapped by the Fisheries Data Spatial Layer.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross Ogenbeena Creek.
Assessment Trigger	**NA**	NA

Photo: Ogenbeena Creek (lower crossing)

4.2. Field Determination

This drainage feature flows West to East within an alluvial floodplain before joining to a Stream Order 2 flow path associated with the Belyando River. Boundaries of the flow path could not be clearly defined with only minor depressions along the broader floodplain present. The area does not meet the definition of a 'waterway' under the *Fisheries Act*.

No further consideration of this area is provided in relation to Waterway Barrier Works. **Appendix B** and **Figure 4** provide details of the bridge structure through this location for information purposes only.

Photo: Ogenbeena Creek (lower crossing)

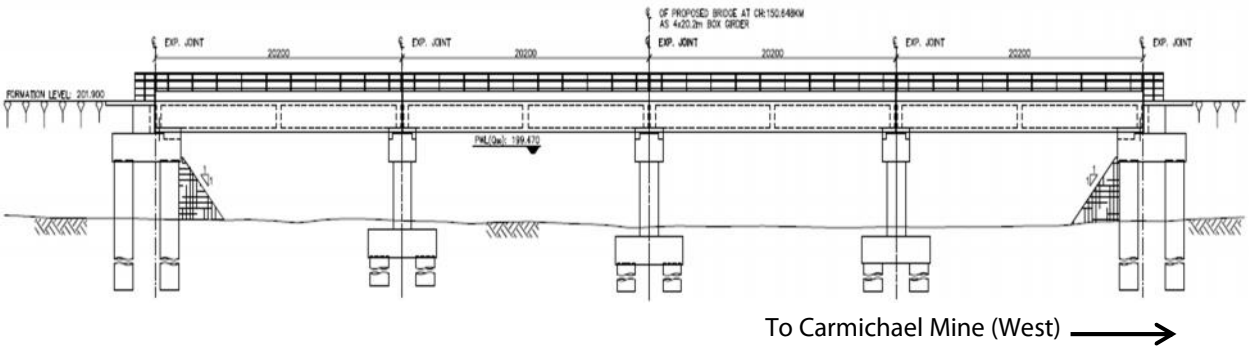


Figure 4: Ogenbeena Creek (Lower - Crossing 79)

5. Belyando River Tributary (Crossing 78c)

5.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This tributary of the Belyando River is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 5.2**	This Belyando River tributary is clearly a 'waterway' as defined by the *Fisheries Act 1994*.
Proposed Works	**Appendix B**	A bridge structure is proposed over this 'waterway'.
Assessment Trigger	**Section 5.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: Belyando River Tributary

5.2. Field Determination

This 'waterway' runs from South to North through *Eucalyptus coolabah* dominated remnant vegetation on an alluvial plain. Riparian vegetation associated with this 'waterway' also included *Eucalyptus camaldulensis* with a sparse mid-layer containing *Eucalyptus populnea*, *Terminalia oblongata* and *Acacia salicina*. *Muehlenbeckia florulenta* was present within the shrub layer but, in general, the shrub layer was sparse. The ground layer was moderately dense and contained *Pennisetum ciliare*, *Bothriochloa bladhii, Bothriochloa ewartiana, Cyperus flavidus, Cyperus difformis* and *Cyperus exaltatus*.

Assessment of this 'waterway' occurred after a period of heavy rainfall and water flow was apparent. Such water flow, however, appears seasonal in nature and during drier times the 'waterway' would not contain any permanently running water with only isolated pools of standing water remaining. Macrophytes were generally absent from the 'waterway' and banks. Sediments on the 'waterway' bed were a combination of sand, small gravel, clays and silts.

'Waterway' banks showed signs of erosion and slumping associated with cattle grazing and flood disturbance. Vegetation was basically absent from the 'waterway' bank. Freshwater mussels and crab shells were observed scattered along the 'waterway' bed, banks and riparian area.

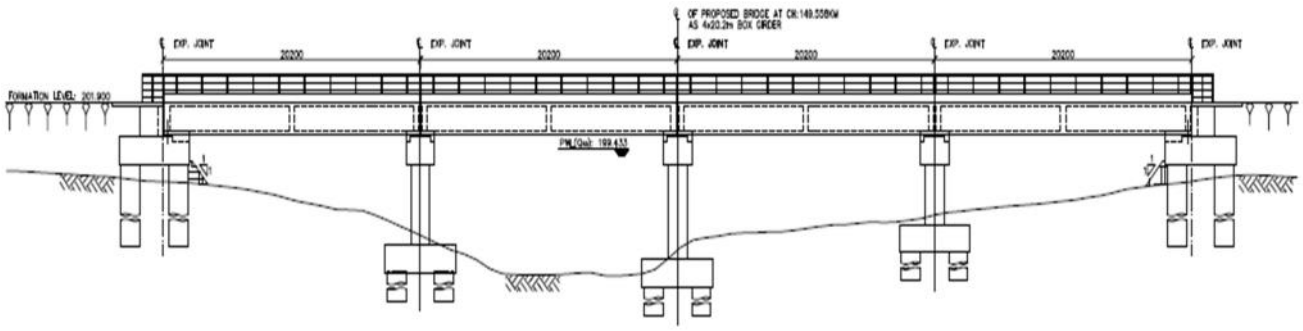
Photo: Belyando River Tributary

5.3. Proposed Works

The crossing proposed for the Belyando River tributary at this site is a bridge structure as detailed in **Appendix B**. **Table 3** and **Figure 5**, below, define why the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment. This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 3: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The pile and pile platform on the western side only are located within the toe of the bank, adjoining the low flow channel. It is noted that the flow path bed is a dynamic sandy substrate.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of the Belyando River Tributary is well in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutment and associated scour protection is located outside of the toes of the banks.



To Carmichael Mine (West) →

Figure 5: Belyando River (Crossing 78c)

6. Belyando River – East (Crossing 78a)

6.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This tributary of the Belyando River is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer
Field Determination	**Section 6.2**	At this location, the flow path appears to branch from the main Belyando River (upstream) and reconnect further downstream of the rail alignment. This flow path meets the 'waterway' definition.
Proposed Works	**Appendix B**	A bridge structure is proposed over this 'waterway'.
Assessment Trigger	**Section 6.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: Belyando River (East Tributary)

6.2. Field Determination

This 'mapped waterway' forms part of the Belyando River Floodplain. Riparian vegetation within the alignment at this site is consistent with REs 11.3.25 and 11.3.37. Tree species present include *Eucalyptus coolabah* and *Eucalyptus camaldulensis*. Other species observed within the T2 and shrub layers included *Geijera parviflora, Terminalia oblongata* and *Acacia stenophylla*. The ground layer contained a mix of exotic and native grasses including *Pennisetum ciliare, Dichanthium sericeum, Leptochloa digitata*, *Enteropogon acicularis* and *Bothriochloa ewartiana*

Some areas of severe erosion, primarily caused through flooding and grazing pressure, were observed. Materials deposited within the stream bed were comprised of sand, small gravel, clays and fine silts. Outside of the 'waterway', the landscape appears highly erodible with a series of gullies and depressions.

Due to recent rainfall, some pool areas still contained water when the site was assessed, but, due to the seasonal nature of the 'waterway', these pools would only be temporary and not exist during extended periods of drier weather. Utilisation of these pools for long term survival by aquatic fauna species would be highly unlikely.

Photo: Belyando River (East Tributary)

6.3. Proposed Works

The crossing proposed for the Belyando River East Tributary at this site is a bridge structure as detailed in **Appendix B**. The abutment and bank revetment works are limited to the toe of the bank and do not extend beyond it. Therefore, the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment (Refer to **Table 4** and **Figure 6**, below). This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 4: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The pile and pile platforms are located outside of the low flow channel.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of the Belyando River East tributary is in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutment and associated scour protection is limited to the toe of the bank and does not extend beyond it.

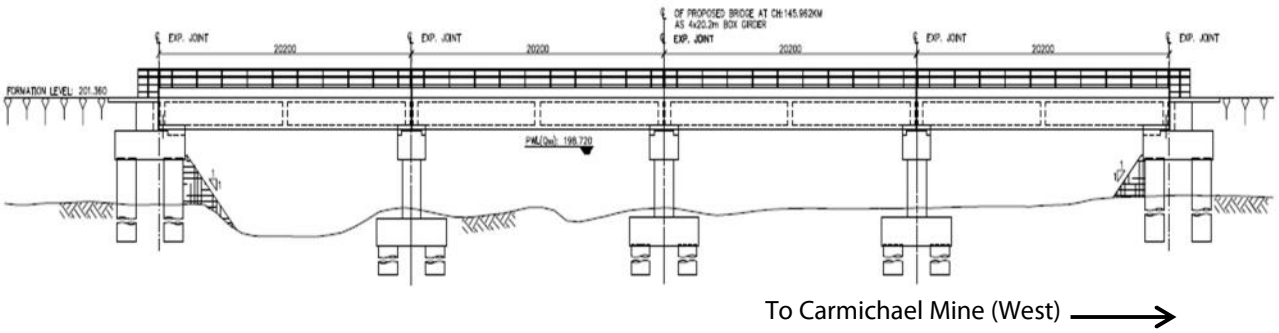


Figure 6: Belyando River (Crossing 78a)

7. Unnamed Flow Path (Crossing 73)

7.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This unnamed flow path is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 7.2**	Field assessment identified the Spatial Data Layer mapping for this location is incorrect. The drainage feature forms an isolated depression.
Proposed Works	**N/A**	A culvert structure is proposed to cross this unnamed flow path.
Assessment Trigger	**Section 7.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Unnamed Flow Path (Crossing 73)

7.2. Field Determination

This 'mapped waterway' is situated within a highly disturbed agricultural paddock which retains limited canopy vegetation. The area displays no defined features of a channel capable of providing for fish movement. The mapping error is believed to have originated from the digital Stream Order mapping layer which identifies an approximately 5 km long isolated drainage feature at this site. This mapping layer is generally inaccurate, especially within upper catchment areas.

Photo: Unnamed Flow Path (Crossing 73)

7.3. Proposed Works

The crossing proposed for this unnamed flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

8. Water Body Adjoining Mistake Creek (Crossing 69d)

8.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This water body near Mistake Creek is **not** mapped by the Spatial Data Layer.
Field Determination	**Section 8.2**	This extensive water body appears to form a tributary of Mistake Creek, and aerial imagery suggests it branches from Mistake Creek upstream of the alignment and reconnects further downstream.
Proposed Works	**N/A**	A culvert structure is proposed to cross this unnamed water body.
Assessment Trigger	**Section 8.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Water Body near Mistake Creek (Crossing 69d)

8.2. Field Determination

Banks of the water body associated with the alignment at this site are stabilised with grasses and sedges interspersed with variable states of erosion dependent on the location of cattle access points. Numerous habitat values were observed within the water body, including submerged logs and macrophytes.

The riparian vegetation can be described as woodland to open-woodland with a grassy understorey. Vegetation is dominated by *Eucalyptus coolabah, Acacia cambagei* and *Acacia harpophylla*. Scattered tree or shrub species, such as *Eucalyptus populnea*, *Terminalia oblongata, Eremophila mitchellii* and *Atalaya hemiglauca,* were occasionally present. The ground layer is very sparse and dominants included *Muehlenbeckia florulenta, Paspalidium caespitosum, Bothriochloa ewartiana, Iseilema vaginiflorum, Eragrostis macrocarpa* and *Aristida latifolia. Leptochloa digitata* and *Muehlenbeckia florulenta* dominated the vegetation on the banks of the water body.

Photo: Water Body near Mistake Creek (Crossing 69d)

8.3. Proposed Works

The crossing proposed for this unnamed water body is a culvert structure. Although this location is not triggered by the Spatial Data Layer, the area does provide habitat and movement opportunity for fish. As a precaution, and where possible, works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 –Minor waterway barrier works – Part 3 – culvert crossings).*

9. Mistake Creek Anabranch (Crossing 69c)

9.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This branch of Mistake Creek is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 9.2**	This branch of Mistake Creek is a 'waterway' as defined by the *Fisheries Act 1994,* and appears to join upstream and downstream to the main Mistake Creek.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross this waterway.
Assessment Trigger	**Section 9.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: Mistake Creek Anabranch

9.2. Field Determination

This 'waterway' runs from South to North and forms part of the Mistake Creek catchment. The agricultural property to the West is used for grazing cattle and the vegetation to the East adjoins the main tributary of Mistake Creek.

Riparian vegetation at this site is consistent with REs 11.3.25 and 11.3.37 and dominated by *Eucalyptus coolabah* and *Eucalyptus camaldulensis*. Other species observed within the T2 and shrub layers included *Geijera parviflora*, *Terminalia oblongata* and *Acacia stenophylla*. The ground layer contained a mix of exotic and native grasses, including *Pennisetum ciliare, Dichanthium sericeum, Leptochloa digitata, Enteropogon acicularis* and *Bothriochloa ewartiana*.

Stream bed materials were formed from sand, gravel, clay and silt materials. Sand formed the greatest percentage of the substrate within the stream bed. Temporary pools were observed in areas where timber had deposited from flood events and silt and sand materials had deposited preventing water deviation.

Observed severe bank erosion and slumping were predominantly caused by grazing and flood disturbances. Erosion has resulted in fallen trees and exposed roots for a number of trees within the assessment area.

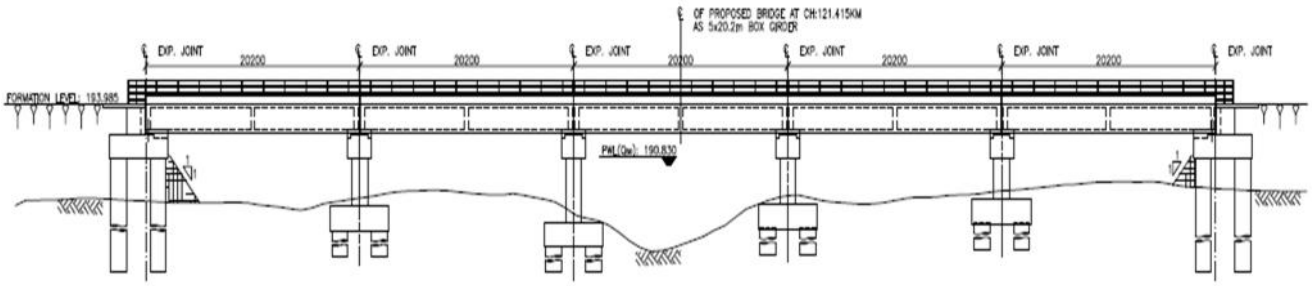
Photo: Mistake Creek Anabranch

9.3. Proposed Works

The crossing proposed for the Mistake Creek Anabranch at this site is a bridge structure as detailed in **Appendix B**. **Table 5** and **Figure 7**, below, outline why the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment. This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 5: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The pile and pile platforms are located outside of the low flow channel.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of the Mistake Creek Anabranch is in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutment and associated scour protection is located outside of the toes of the banks.



To Carmichael Mine (West) ⟶

Figure 7: Mistake Creek Anabranch (Crossing 69c)

10. Gowrie Creek (Crossing 68)

10.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	Gowrie Creek is identified as a 'Purple waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 10.2**	Gowrie Creek has the potential to be a 'waterway' due to its proximity to Mistake Creek and the presence of upstream and downstream water bodies. However, this flow path funnels localised immediate rainfall only, and it appears that the crossing is above the upstream limits of the 'waterway'. Therefore, Gowrie Creek is not considered a 'waterway' as defined by the *Fisheries Act 1994*.
Proposed Works	**Appendix B**	A bridge structure is proposed to cross Gowrie Creek.
Assessment Trigger	**Section 10.3**	The proposed bridge works are **not** considered Waterway Barrier Works assessable.

Photo: Gowrie Creek

10.2. Field Determination

Gowrie Creek does not possess all of the fundamental characteristics required for it to be defined as a 'waterway'. The absence of riverine vegetation and the presence of areas where the channel becomes less defined suggest it forms a 'drainage feature' rather than a 'waterway'.

No remnant or high value regrowth vegetation is associated with this drainage feature. Trees adjoining the flow path included *Acacia harpophylla, Acacia cambagei, Eucalyptus coolabah, Acacia salicina* and *Terminalia oblongata* up to 10 m in height. Shrub and ground species included *Citrus glauca, Carissa ovata, Lysiphyllum carronii, Archidendropsis basaltica, Leptochloa digitata, Enteropogon acicularis, Pennisetum ciliare, Parthenium hysterophorus, Eriocereus martini* and *Aristida latifolia.*

Photo: Gowrie Creek

10.3. Proposed Works

The crossing proposed for Gowrie Creek at this site is a bridge structure as detailed in **Appendix B**. The abutment and bank revetment works are limited to the toe of the bank and do not extend beyond it. Therefore, the proposed bridge structure is **not** considered to trigger Waterway Barrier Works Assessment (Refer to **Table 6** and **Figure 8**, below). This determination was made using *FHMOP8 - Appendix 3 – Examples of what constitutes a waterway barrier*.

Table 6: Waterway Barrier Works Assessment Triggers

Structures that are not considered Waterway Barrier Works: Bridges		Comments (Refer Appendix B for Engineering detail)
1	**The pile and/or pile platform are completely outside of the low flow channel, and**	The pile and pile platforms are located outside of the low flow channel.
2	**The Bankful width of the waterway where the bridge is constructed is more than 25 metres, and**	The bankful width of Gowrie Creek is in excess of 25 m.
3	**The abutment and/or bank revetment works do not extend into the waterway beyond the toes of the banks.**	The abutments and associated scour protection are not located outside of the toes of the banks.

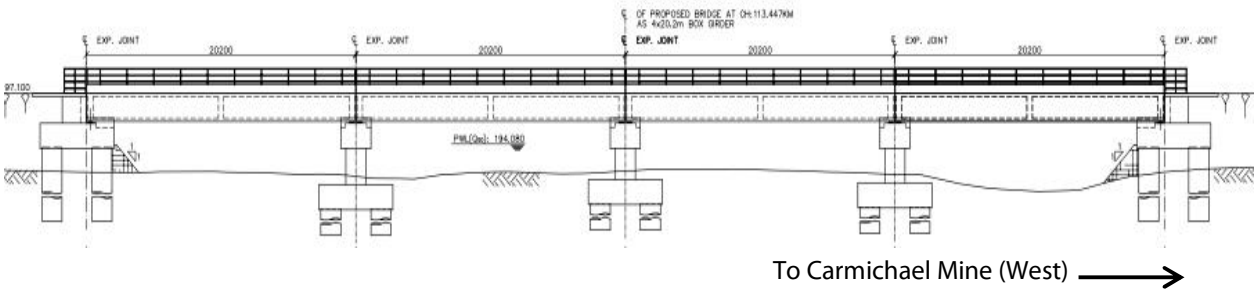


Figure 8: Gowrie Creek (Crossing 68)

11.Gowrie Creek Tributary (Crossing 67)

11.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This Gowrie Creek Tributary is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 11.2**	This Gowrie Creek Tributary forms isolated broken sections of a depression, and funnels immediate localised rainfall only. At periods of high flow it could connect habitats if present. This Gowrie Creek tributary is therefore not considered a 'waterway' as defined by the *Fisheries Act 1994*.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this Gowrie Creek Tributary.
Assessment Trigger	**Section 11.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Gowrie Creek Tributary (Crossing 67)

11.2. Field Determination

This drainage feature runs from South-East to North-West across the alignment with aerial imagery showing the presence of two storage dams, one upstream and one downstream of the crossing. The drainage feature is surrounded by pastoral areas utilised for cattle production. The area has been historically cleared of all woody vegetation and is now dominated by the exotic fodder grass species *Pennisetum ciliare*.

This drainage feature was completely dry during the survey and only appears to flow and contain water after periods of intense or continual rainfall. The substrate within the stream bed was comprised predominantly of cracking clays and silt materials.

The area was highly disturbed with very high levels of erosion and bank slumping throughout. The majority of the erosion was as a result of cattle grazing and watering.

Photo: Gowrie Creek Tributary (Crossing 67)

II.3. Proposed Works

The crossing proposed for this unnamed flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

12. Gowrie Creek Tributary (Crossing 66)

12.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This Gowrie Creek Tributary is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 12.2**	This Gowrie Creek Tributary forms isolated broken sections of a depression, funnels immediate localised rainfall only, and would have inadequate flow. It is also poor habitat. This Gowrie Creek tributary is therefore not considered a 'waterway' as defined by the *Fisheries Act 1994*.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this Gowrie Creek Tributary.
Assessment Trigger	**Section 12.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Gowrie Creek Tributary (Crossing 66)

12.2. Field Determination

This area contains no features consistent with a 'waterway'. The area has been historically cleared of all woody vegetation and is now dominated by the exotic fodder grass species *Pennisetum ciliare*.

This flow path was completely dry during the survey and only appears to flow and contain water after periods of intense or continual rainfall. The area contained a number of shallow dry depressions.

Photo: Gowrie Creek Tributary (Crossing 66)

12.3. Proposed Works

The crossing proposed for this unnamed flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

13. Gowrie Creek Tributaries (Crossings 64 & 63)

13.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	These Gowrie Creek Tributaries are identified as 'Amber waterways' by the Fisheries Spatial Data Layer.
Field Determination	**Section 13.2**	These Gowrie Creek Tributaries form isolated broken sections of depressions that funnel immediate localised rainfall only and would have inadequate flow. They are also poor habitat, and therefore do not contain features consistent with a 'waterway'.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross these Gowrie Creek Tributaries.
Assessment Trigger	**Section 13.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Gowrie Creek Tributaries (Crossings 64 & 63)

13.2. Field Determination

Vegetation observed at this site included small scattered *Acacia harpophylla, Terminalia oblongata* and *Citrus glauca* less than 2 m in height. A dense ground layer, containing *Pennisetum ciliare, Parthenium hysterophorus, Capparis lasiantha, Carissa ovata, Leptochloa digitata, Aristida latifolia* and *Cyperus exaltatus* was present.

Weed species observed included *Parthenium hysterophorus, Pennisetum ciliare, Opuntia tomentosa, Eriocereus martini* and *Xanthium pungens.*

Photo: Gowrie Creek Tributaries (Crossings 64 & 63)

13.3. Proposed Works

The crossing proposed for these unnamed flow paths is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings).*

14. Unnamed Flow Path (Crossing 60)

14.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This unnamed flow path is identified as a 'Green waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 14.2**	This unnamed flow path forms a drainage depression that does not contain features consistent with a 'waterway'.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this unnamed flow path.
Assessment Trigger	**Section 14.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Unnamed Flow Path (Crossing 60)

14.2. Field Determination

This 'mapped waterway' runs West to East along the alignment before turning away to the South. The flow path contains no remnant or riparian vegetation and is bounded by pastoral holdings dominated by *Pennisetum ciliare*.

Vegetation observed included small scattered *Acacia harpophylla, Terminalia oblongata* and *Citrus glauca* less than 2 m in height. A dense ground layer containing *Pennisetum ciliare, Parthenium hysterophorus, Capparis lasiantha, Carissa ovata, Leptochloa digitata, Aristida latifolia* and *Cyperus exaltatus* was present.

Weed species observed included *Parthenium hysterophorus, Pennisetum ciliare, Opuntia tomentosa* and *Eriocereus martini.*

Photo: Unnamed Flow Path (Crossing 60)

14.3. Proposed Works

The crossing proposed for this unnamed flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

15. Unmapped Flow Path (Crossing 59)

15.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This flow path is **not** mapped by the Spatial Data Layer.
Field Determination	**Section 15.2**	Although the bed and banks are continuous immediately up- and downstream, this unmapped flow path forms a drainage depression that does not contain features consistent with a 'waterway'.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this unmapped flow path.
Assessment Trigger	**Section 15.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Unmapped Flow Path (Crossing 59)

15.2. Field Determination

The vegetation at this site is dominated by *Acacia harpophylla* and *Acacia cambagei*. The shrub and ground layer was comprised of *Eremophila mitchellii, Carissa ovata, Citrus glauca, Bothriochloa bladhii, Bothriochloa ewartiana, Pennisetum ciliare, Dichanthium sericeum, Leptochloa digitata* and *Enteropogon acicularis*.

The depression is formed by the concentration of overland flow with the substrate comprised of sand and gravel with areas of fine sediment and silts. No pools or areas capable of holding water were observed within the alignment area.

Photo: Unmapped Flow Path (Crossing 59)

15.3. Proposed Works

The crossing proposed for this unmapped flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

16. Unnamed Flow Path (Crossing 56)

16.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This unnamed flow path is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 16.2**	This unnamed flow path does not contain features consistent with a 'waterway'.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this unnamed flow path.
Assessment Trigger	**Section 16.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Unnamed Flow Path (Crossing 56)

16.2. Field Determination

Field survey identified that this drainage feature does not meet the requirements of a 'waterway' under the *Fisheries Act 1994*.

16.3. Proposed Works

The crossing proposed for this unnamed flow path is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

17. Logan Creek Tributary (Crossing 53)

17.1. Assessment Overview

Overview	Section	Comment
Fisheries Act Waterway Zoning	**Plan 2**	This Logan Creek Tributary is identified as an 'Amber waterway' by the Fisheries Spatial Data Layer.
Field Determination	**Section 17.2**	This Logan Creek Tributary does not contain features consistent with a 'waterway'.
Proposed Works	**Appendix B**	A culvert structure is proposed to cross this Logan Creek Tributary.
Assessment Trigger	**Section 17.3**	The proposed culvert works are considered Waterway Barrier Works that are self-assessable.

Photo: Logan Creek Tributary (Crossing 53)

17.2. Field Determination

This flow path runs from South to North and is surrounded by remnant vegetation. Areas adjoining the remnant vegetation have historically been cleared and are now dominated by exotic *Pennisetum ciliare*.

The area contains no formalised 'waterway' structure, with no obvious stream channels, beds or banks observed during the field survey.

No ponds, pools, riffles or bars were observed within the survey area, and no aquatic habitats were present. Vegetation observed included *Eucalyptus coolabah, Terminalia oblongata, Eucalyptus populnea, Eremophila bigoniiflora, Geijera parviflora* and *Citrus glauca*. The shrub layer would be considered very sparse with the ground layer within remnant vegetation dominated by native grasses.

17.3. Proposed Works

The crossing proposed for this Logan Creek tributary is a culvert structure. Despite the absence of a 'waterway', it has been determined that works will be **self-assessable** at this location. Works will be undertaken in accordance with the *Self Assessable Guideline (WWBW01 – Minor waterway barrier works – Part 3 – culvert crossings)*.

Appendix B

Engineering Plans for SP-I Bridges that Cross Assessed Flow Paths

environmental management

saunders havill group

Carmichael Coal Project (Rail)
Separable Portion 1

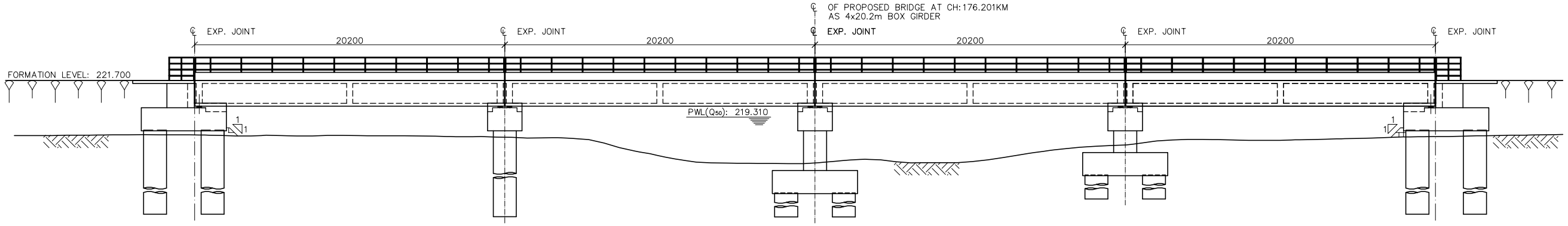
Fisheries Act 1994
Waterway Barrier Works

Appendix B
Engineering Plans

6396
21 March 2013
Adani Mining Pty Ltd

adani™

surveying · town planning · urban design · environmental management · landscape architecture



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CHAINAGE KM	176.160 ABUTMENT–A		176.180 PIER–1	176.201 PIER–2	176.221 PIER–3	176.241 ABUTMENT–B

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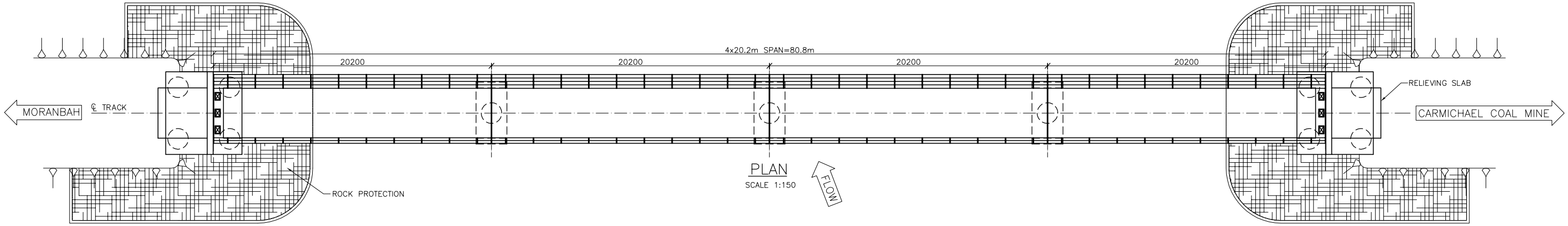

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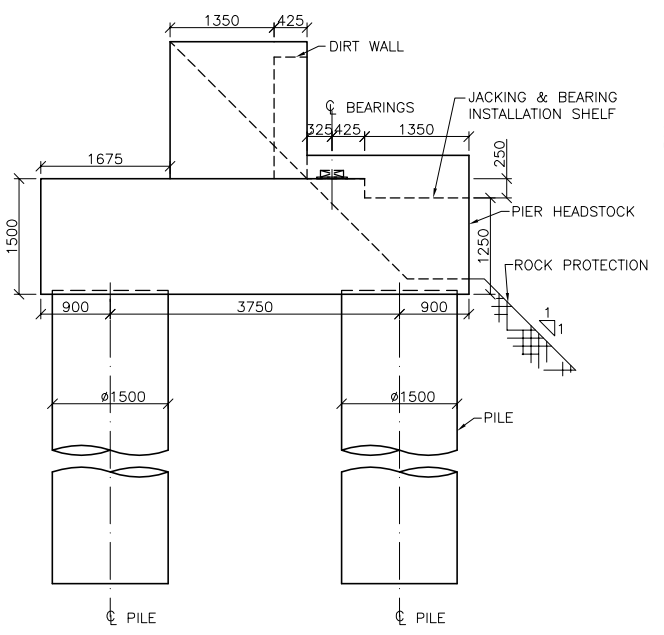

TYPICAL ELEVATION OF ABUTMENT
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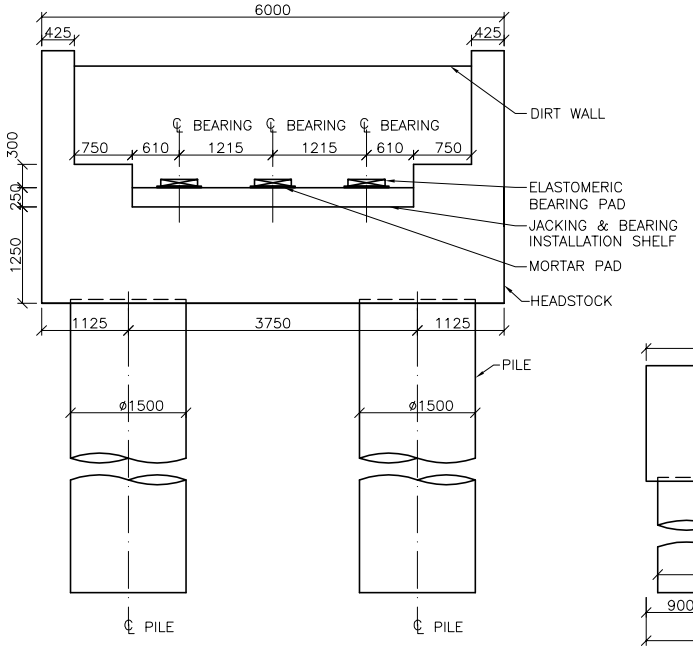
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
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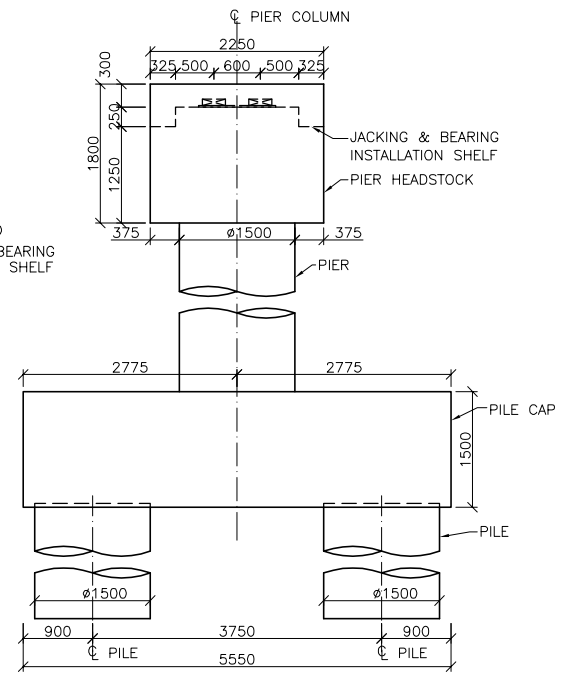
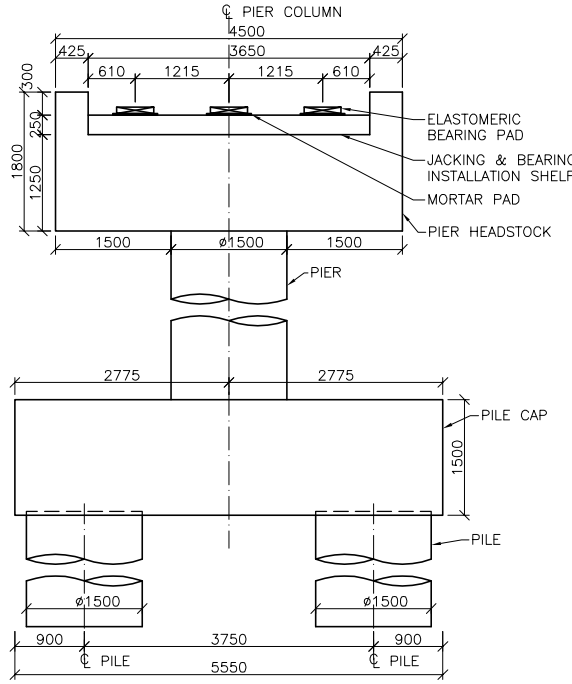


TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (ABUTMENT)
XXX TYPICAL DETAILS OF PILE CAP AT PIER LOCATIONS
XXX TYPICAL DETAILS OF CAST IN SITU BORED PILES
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (PIER)
XXX TYPICAL DETAILS OF PILE, PILE CAP, PIER & PIER HEADSTOCK

GENERAL NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CONCRETE GRADE SHALL BE AS FOLLOWS.
   - CAST IN SITU – S40
   - PRECAST – S50
3. COVER TO REINFORCEMENT ARE AS FOLLOWS.
   - PILES – 85mm
   - PILE CAP – 90mm
4. EXPOSURE CLASSIFICATION B2
5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

ISSUED FOR APPROVAL

REV	BY	DATE	DESCRIPTION	CKD	APP
0		06/10/12	ISSUED FOR APPROVAL		

SCALES:
1 : 150 0 2 4 6 8m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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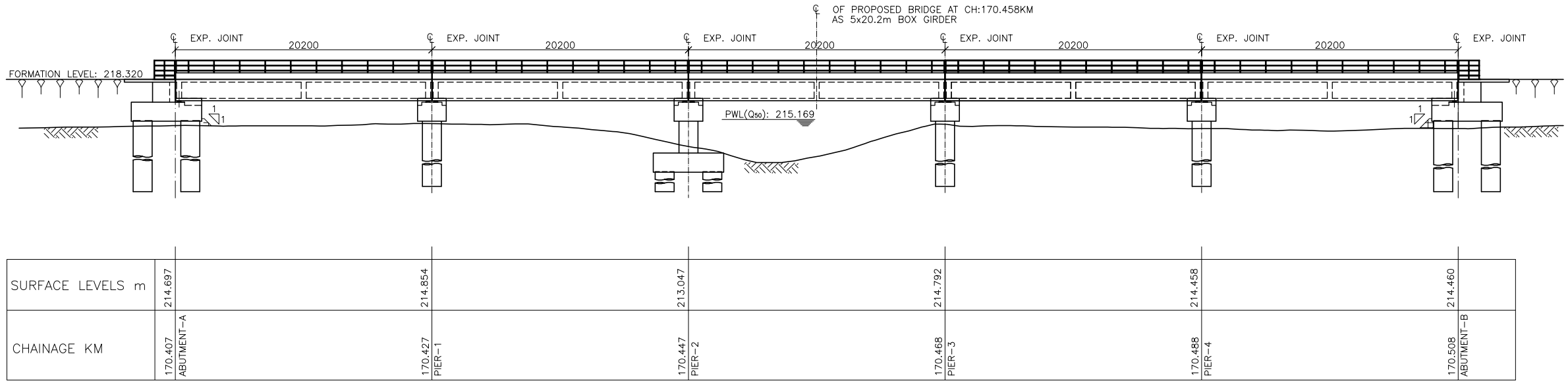
Fax: +61 (0)7 3112 5101

adani™

CARMICHAEL COAL MINE AND RAIL PROJECT
GENERAL ARRANGEMENT DRAWING OF EIGHT MILE CREEK (4 x 20.2m) AT CHAINAGE 176.201KM

PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0

E:\SYAM\AUSTRALIA\Drawings\RAIL BRIDGE GADS\176.201.dwg Plotted by: ##### on 10/6/2012 7:32:52 PM



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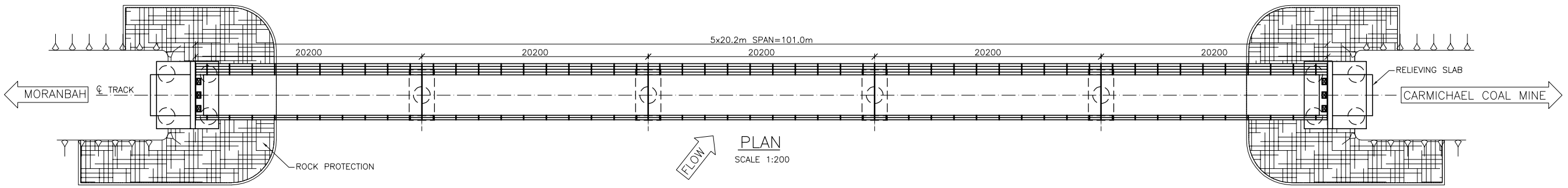

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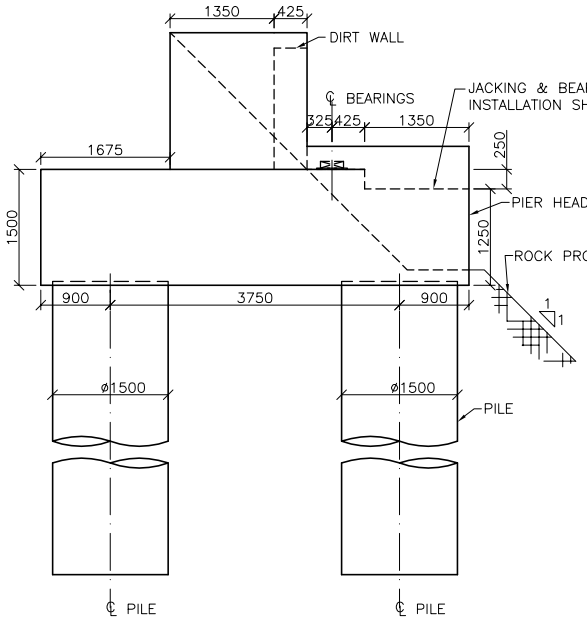
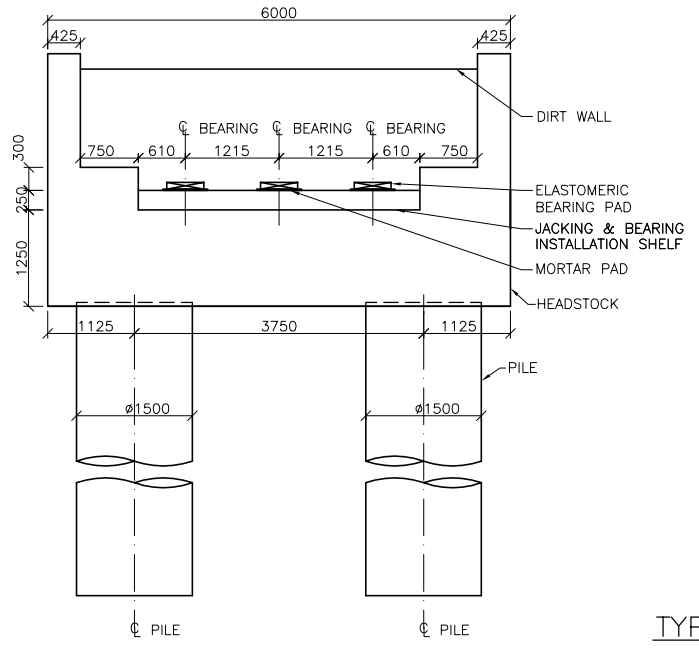
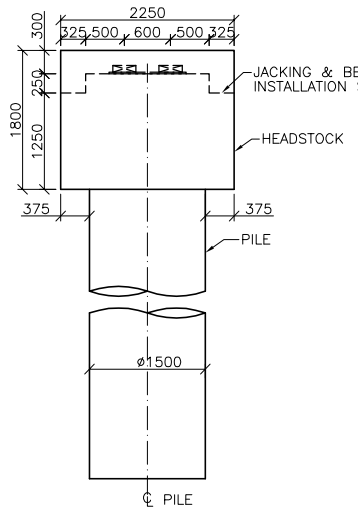


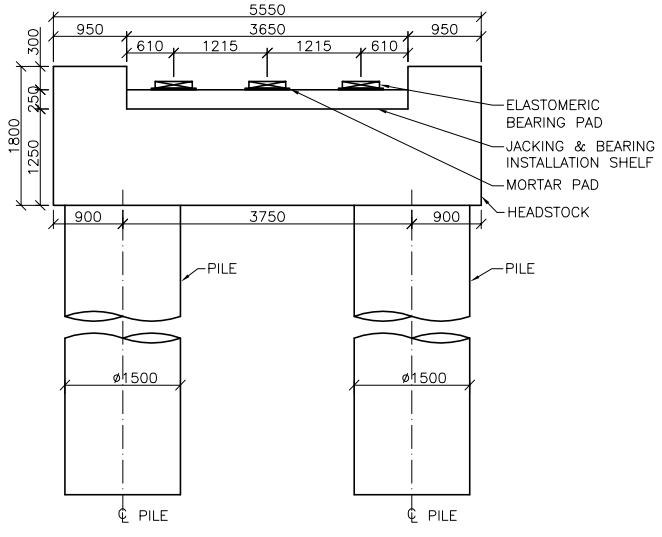
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PILE
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PILE
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (ABUTMENT)
XXX TYPICAL DETAILS OF PILE CAP AT PIER LOCATIONS
XXX TYPICAL DETAILS OF CAST IN SITU BORED PILES
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (PIER)
XXX TYPICAL DETAILS OF PILE, PILE CAP, PIER & PIER HEADSTOCK

GENERAL NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CONCRETE GRADE SHALL BE AS FOLLOWS.
   CAST IN SITU – S40
   PRECAST – S50
3. COVER TO REINFORCEMENT ARE AS FOLLOWS.
   PILES – 85mm
   PILE CAP – 90mm
4. EXPOSURE CLASSIFICATION B2
5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

ISSUED FOR APPROVAL

REVISIONS			
REV	BY	DATE	DESCRIPTION
0		06/10/12	ISSUED FOR APPROVAL

SCALES:
1:200 0 2 4 6 8 10m
1:50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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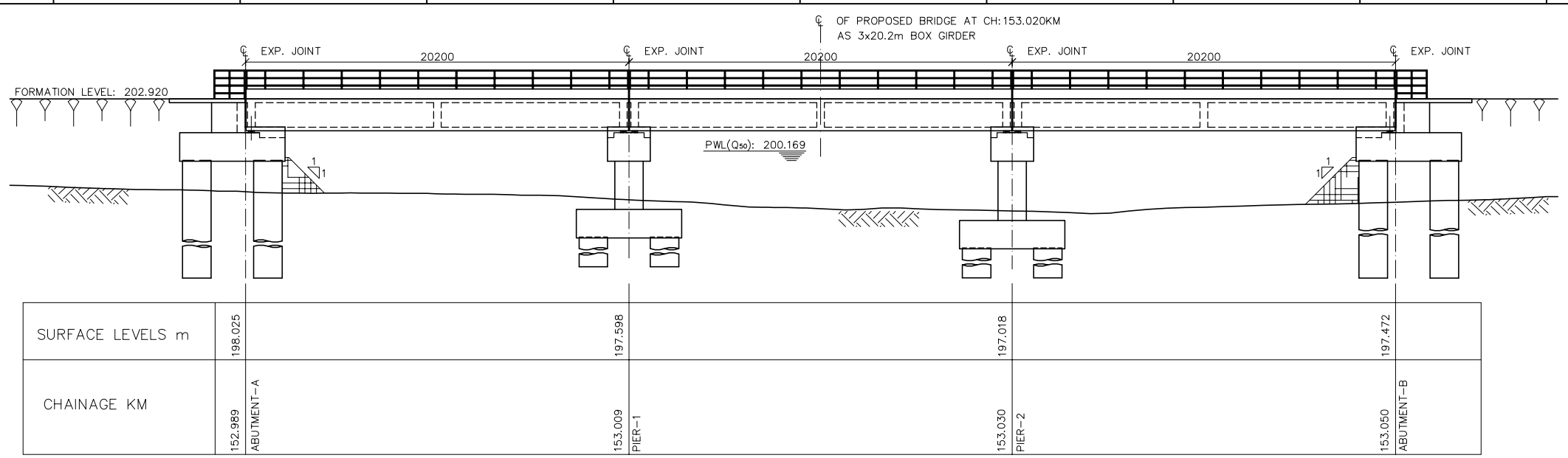
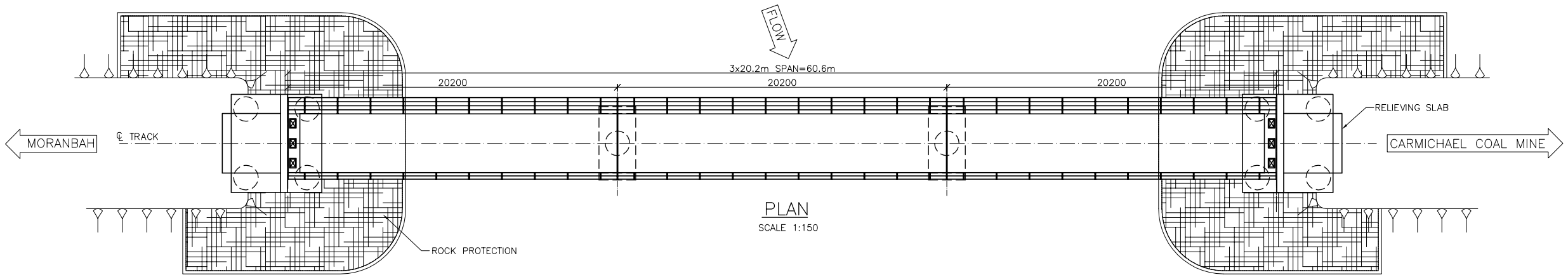
CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF NORTH CREEK (5 x 20.2m) AT CHAINAGE 170.458KM

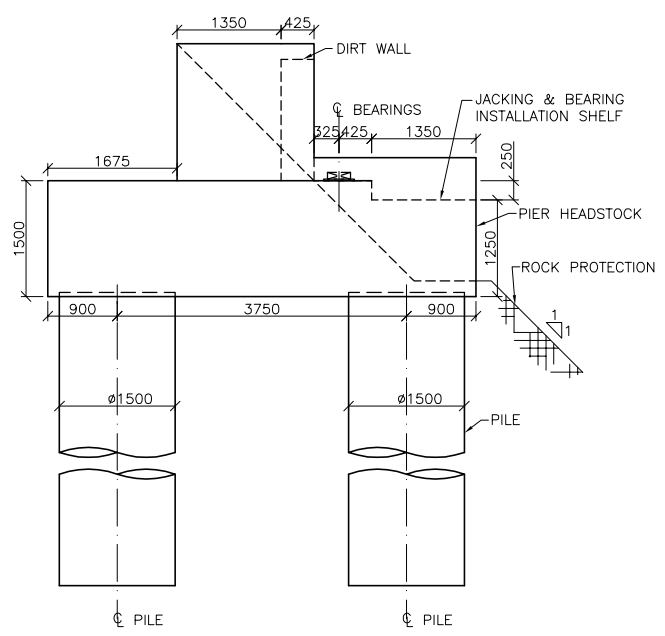
PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0



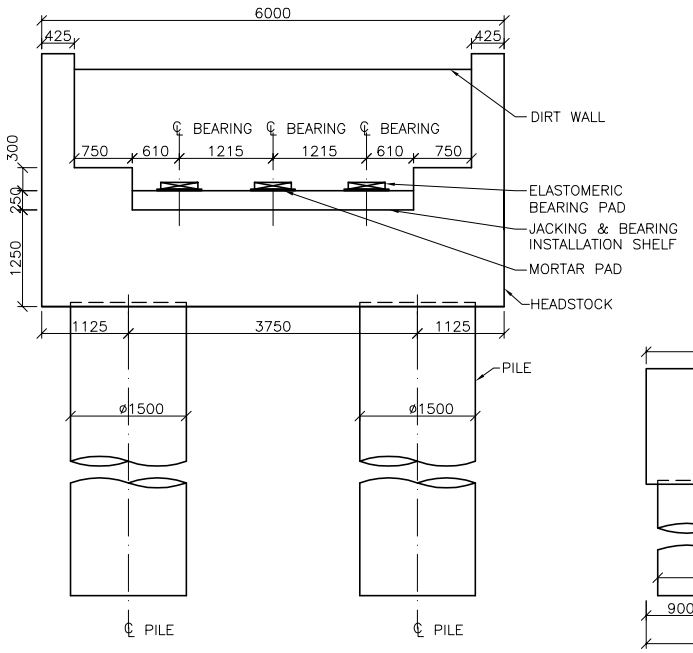
ELEVATION
SCALE 1:150



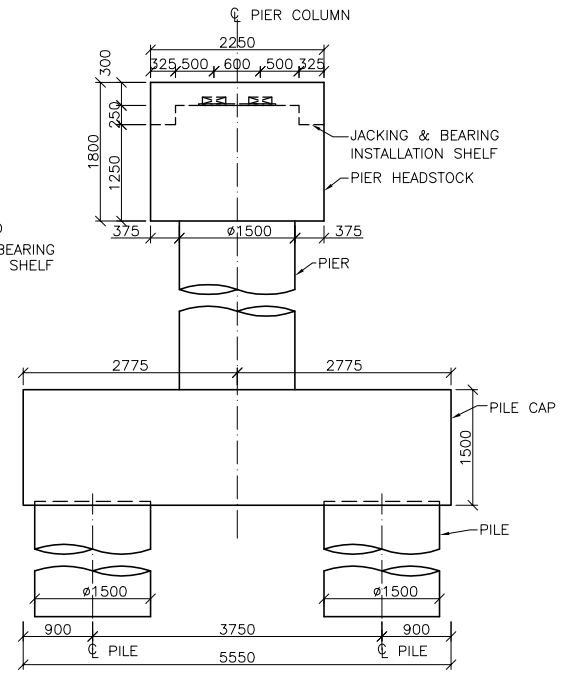
PLAN
SCALE 1:150



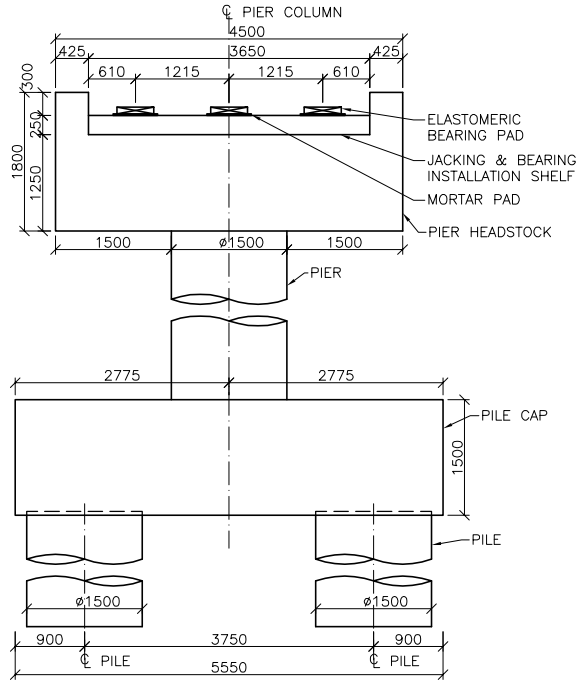
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

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REVISIONS

REV	BY	DATE	DESCRIPTION	CKD	APP
0		06/10/12	ISSUED FOR APPROVAL		

SCALES:
1:150 0 2 4 6 8m
1:50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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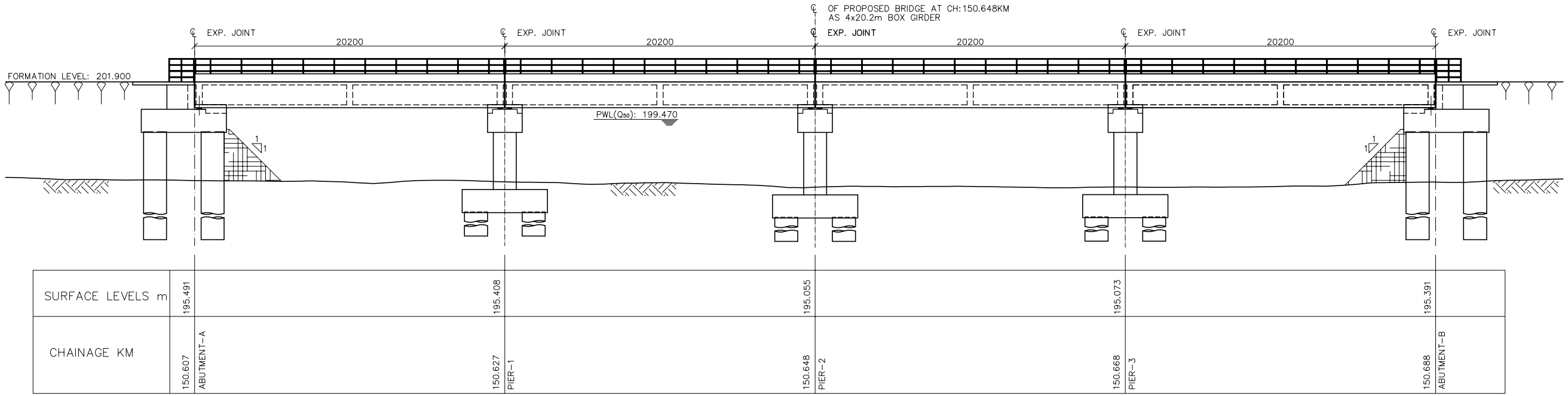
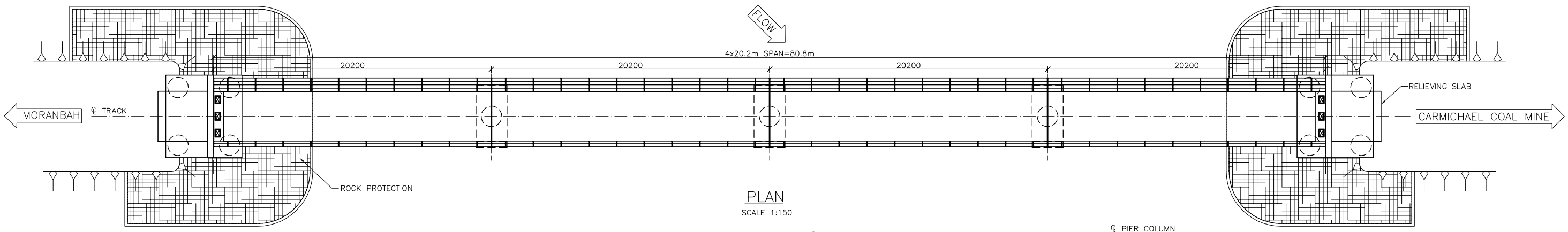
CARMICHAEL COAL MINE AND RAIL PROJECT
GENERAL ARRANGEMENT DRAWING OF OGENBEENA CREEK (3 x 20.2m) AT CHAINAGE 153.020KM

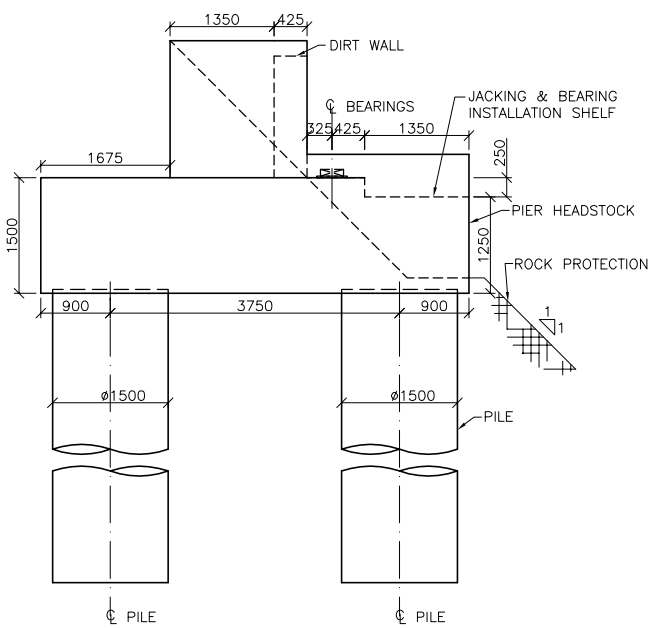
PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0



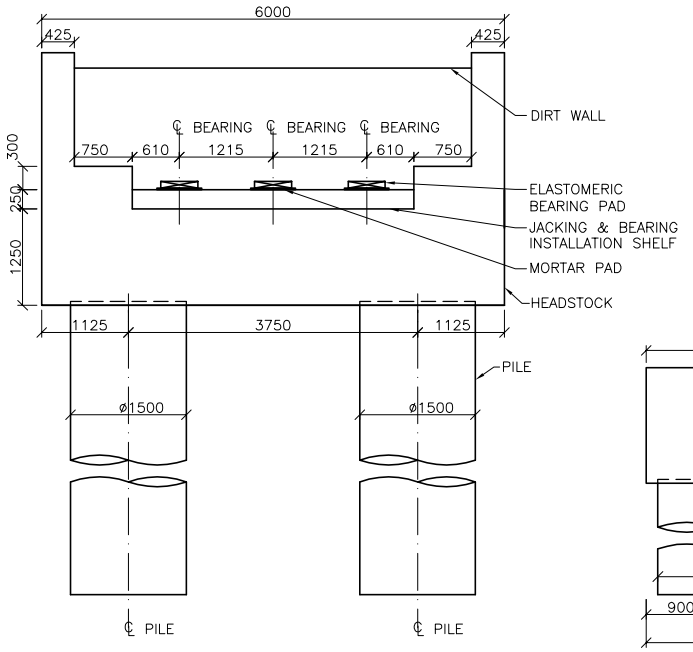
ELEVATION
SCALE 1:150



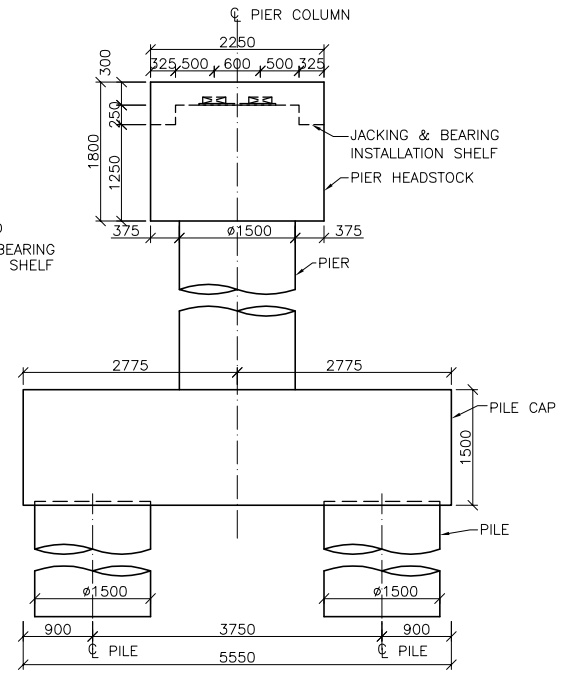
PLAN
SCALE 1:150



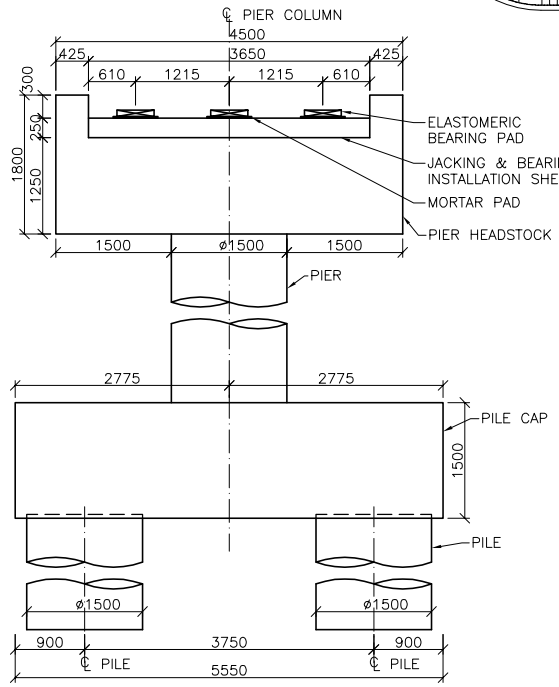
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
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GENERAL NOTE:

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SCALES:
1 : 150 0 2 4 6 8m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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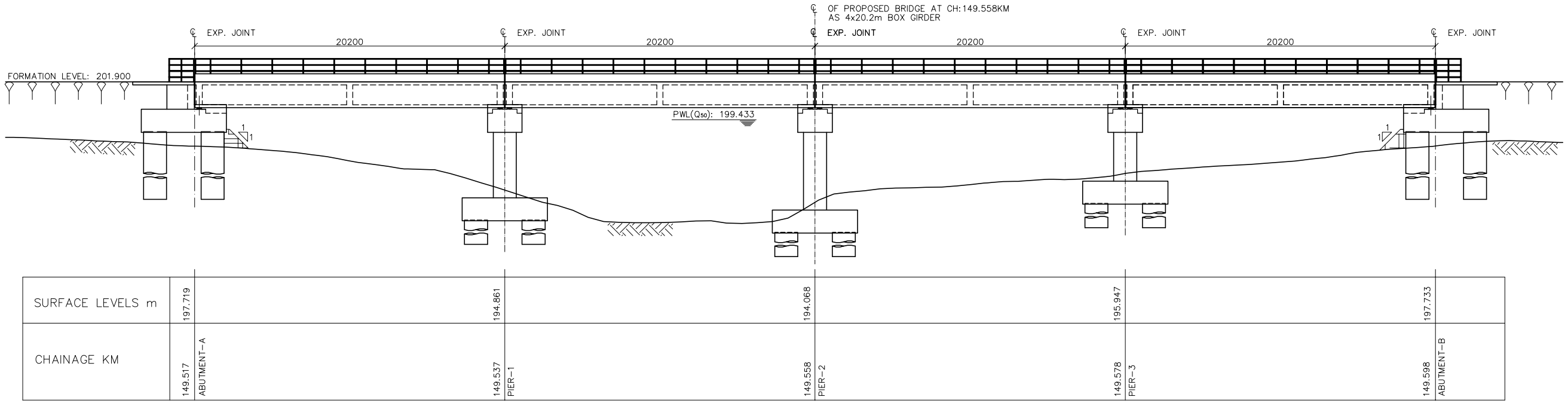
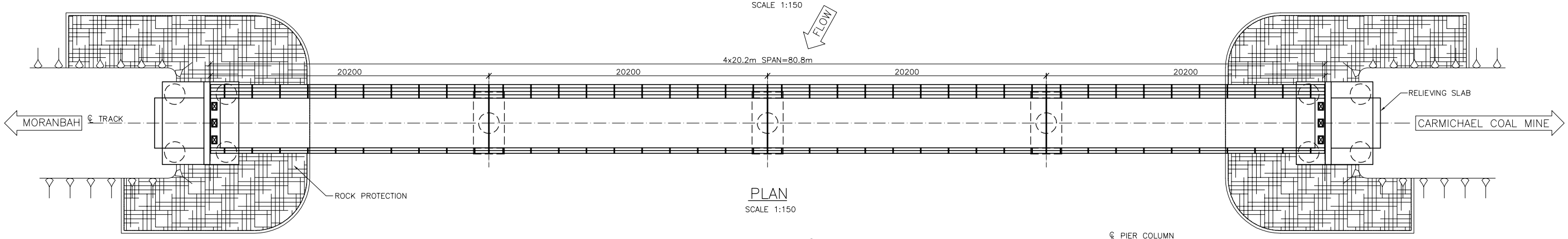
CARMICHAEL COAL MINE AND RAIL PROJECT
GENERAL ARRANGEMENT DRAWING OF OGENBEENA (4 x 20.2m) AT CHAINAGE 150.648KM

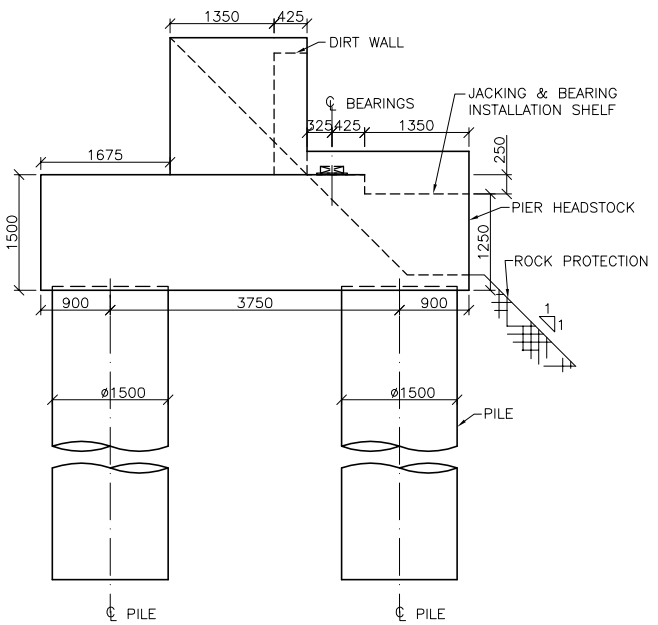
PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0



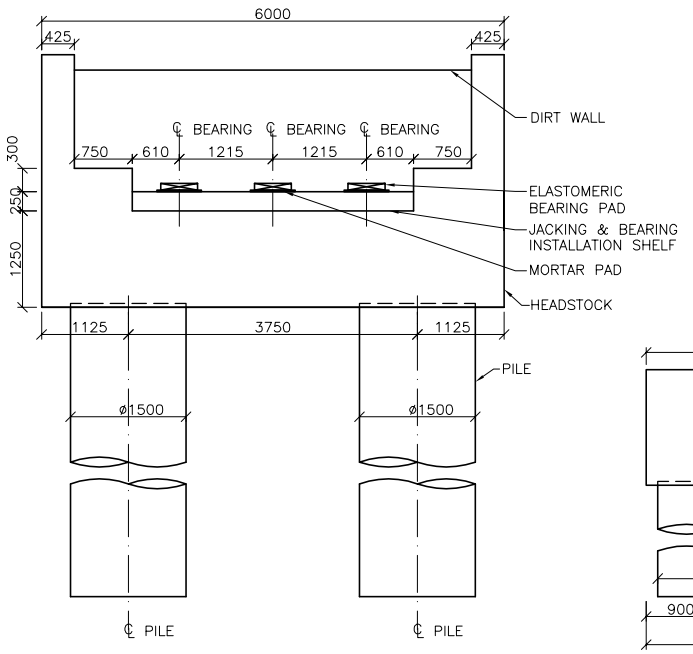
ELEVATION
SCALE 1:150



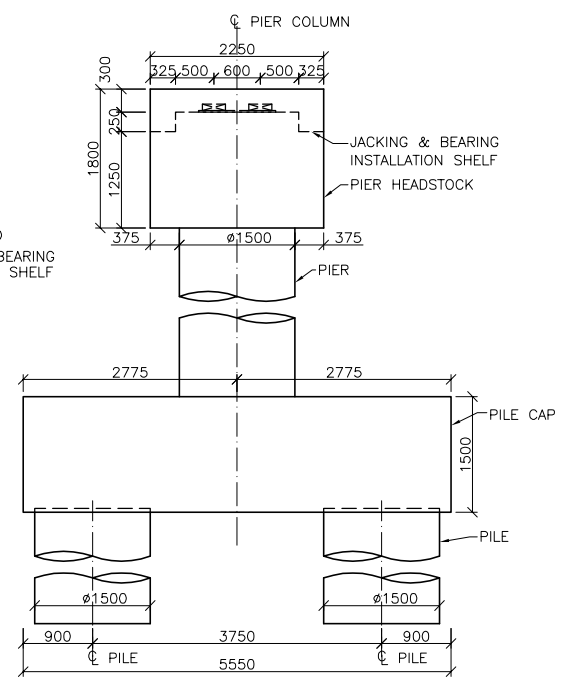
PLAN
SCALE 1:150



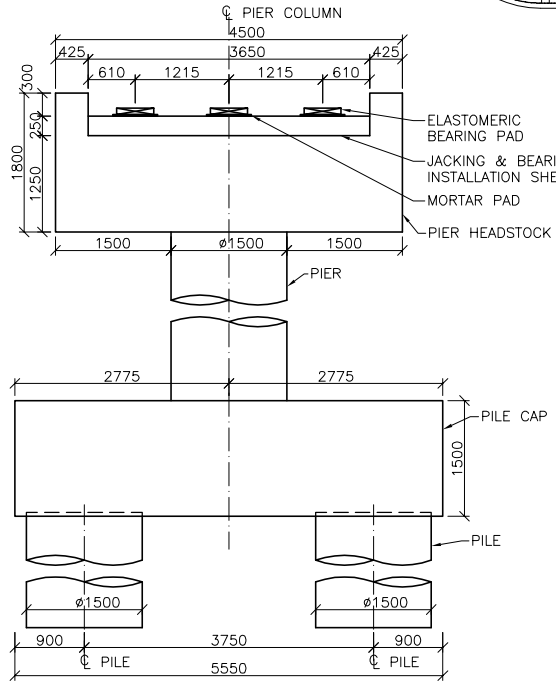
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
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XXX TYPICAL DETAILS OF PILE & HEADSTOCK (PIER)
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GENERAL NOTE:

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REVISIONS

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0		06/10/12	ISSUED FOR APPROVAL		

SCALES:
1 : 150 0 2 4 6 8m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF BELYANDO RIVER (4 x 20.2m) AT CHAINAGE 149.558KM

PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0

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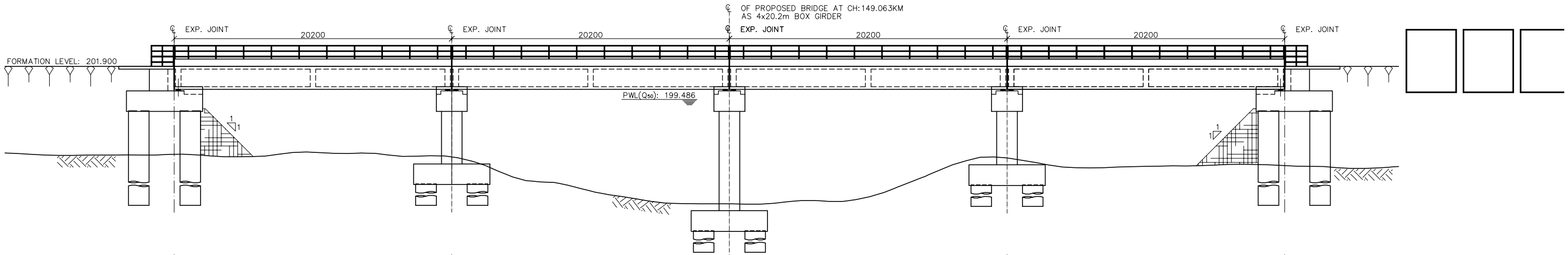

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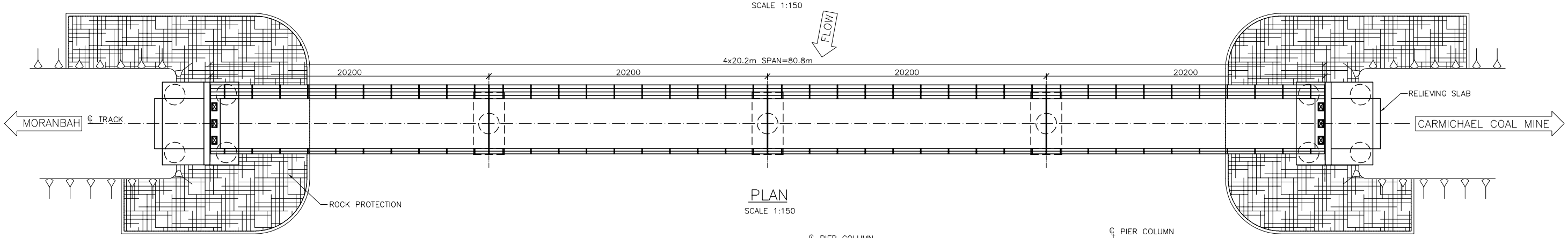
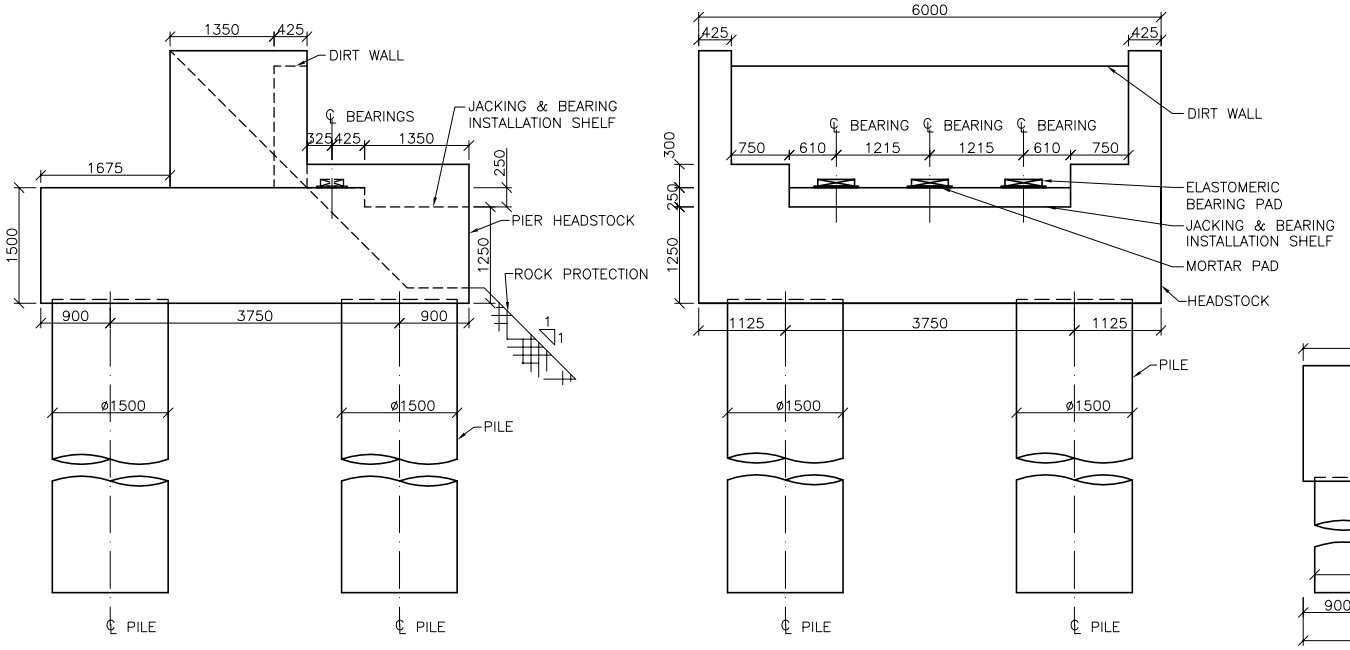
CHAINAGE KM	149.022	ABUTMENT-A		149.042	PIER-1		149.063	PIER-2		149.083	PIER-3		149.103	ABUTMENT-B

ELEVATION
SCALE 1:150

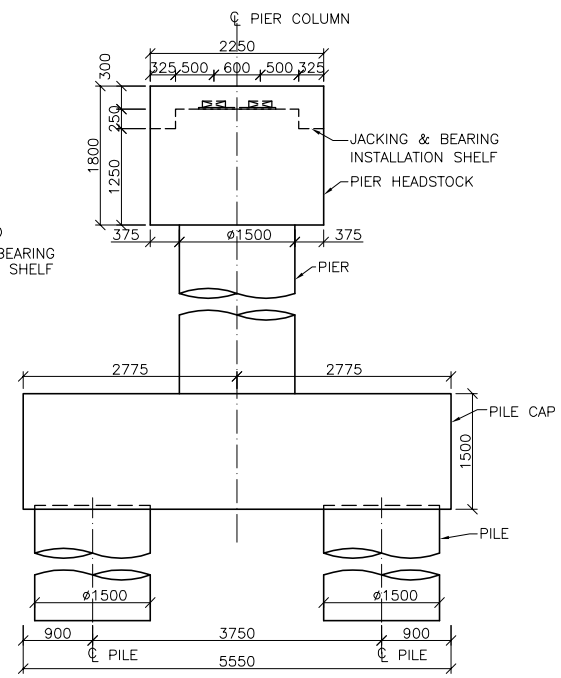


PLAN
SCALE 1:150

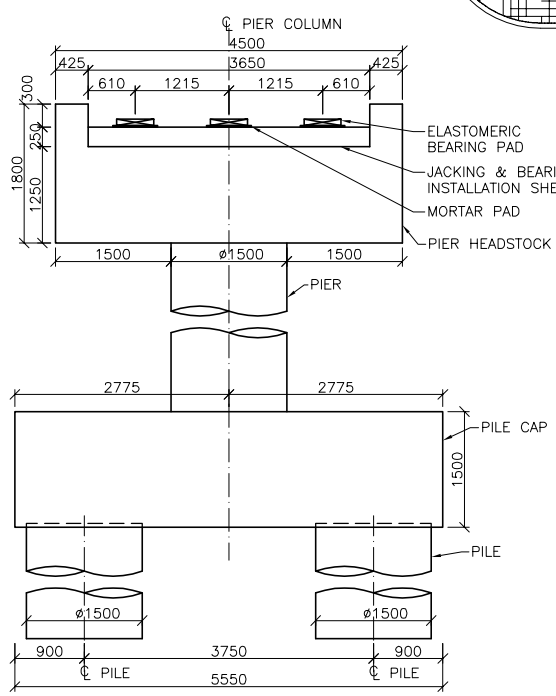


TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50

TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

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REV	BY	DATE	DESCRIPTION	CKD	APP
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SCALES:
1 : 150 0 2 4 6 8m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
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CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF BELYANDO RIVER (4 x 20.2m) AT CHAINAGE 149.063KM

PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0

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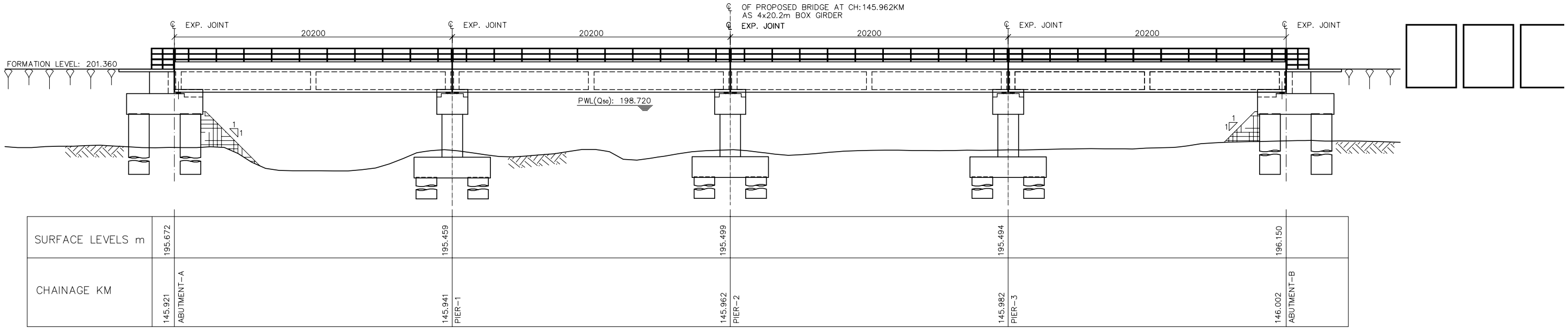
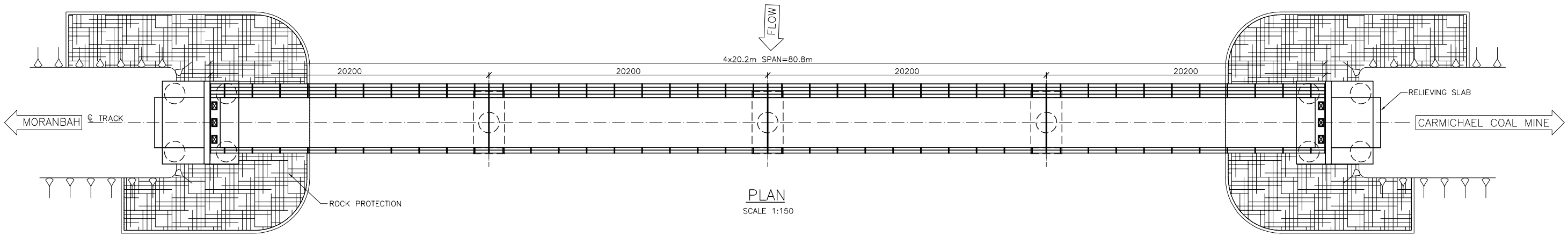
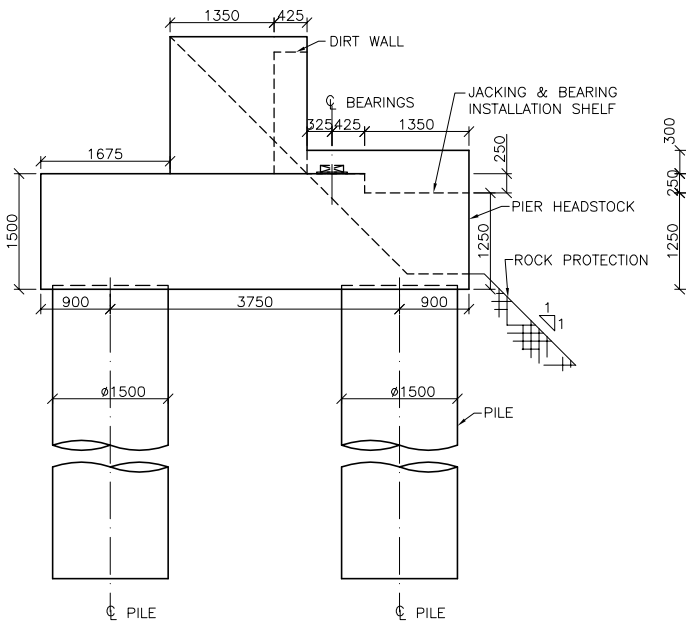


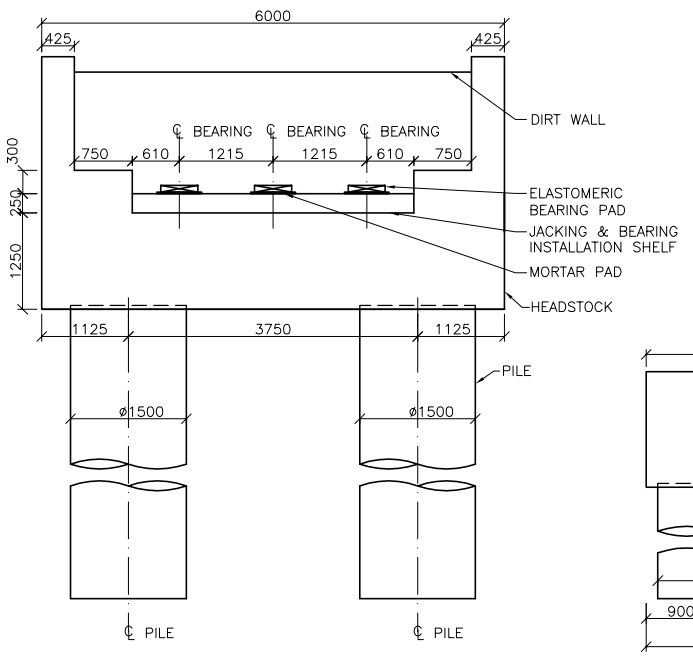
ELEVATION
SCALE 1:150



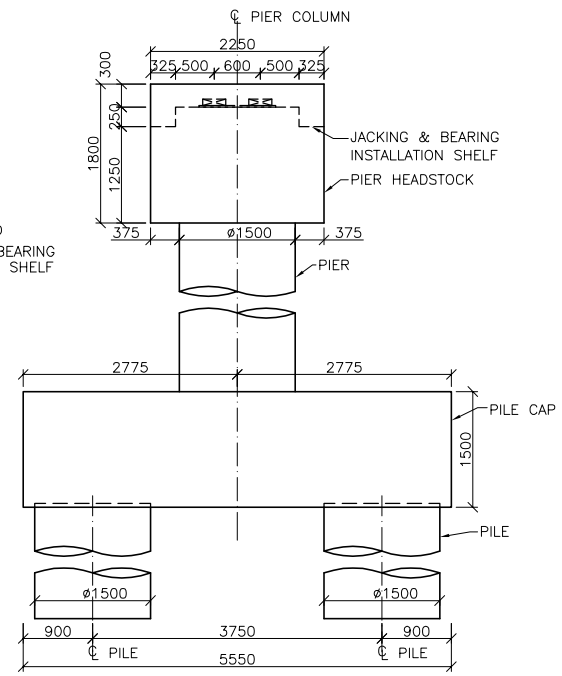
PLAN
SCALE 1:150



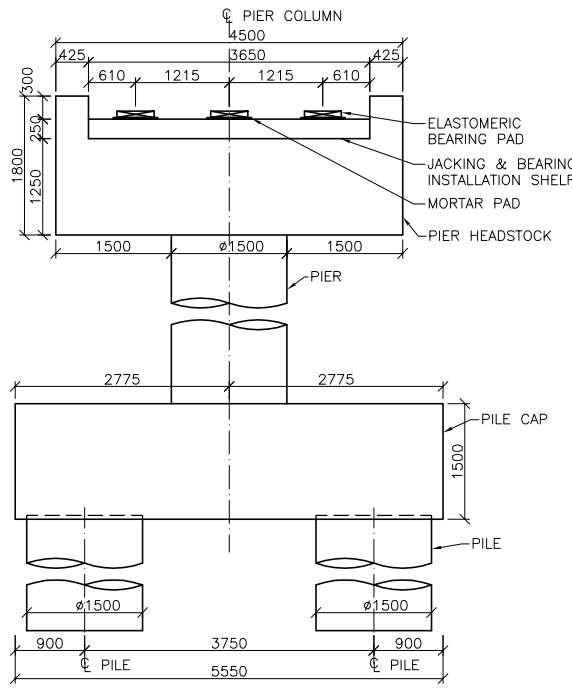
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (ABUTMENT)
XXX TYPICAL DETAILS OF PILE CAP AT PIER LOCATIONS
XXX TYPICAL DETAILS OF CAST IN SITU BORED PILES
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (PIER)
XXX TYPICAL DETAILS OF PILE, PILE CAP, PIER & PIER HEADSTOCK

GENERAL NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CONCRETE GRADE SHALL BE AS FOLLOWS.
   CAST IN SITU – S40
   PRECAST – S50
3. COVER TO REINFORCEMENT ARE AS FOLLOWS.
   PILES – 85mm
   PILE CAP – 90mm
4. EXPOSURE CLASSIFICATION B2
5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

ISSUED FOR APPROVAL

REVISIONS			
REV	BY	DATE	DESCRIPTION
0		06/10/12	ISSUED FOR APPROVAL

SCALES:
1 : 150 0 2 4 6 8m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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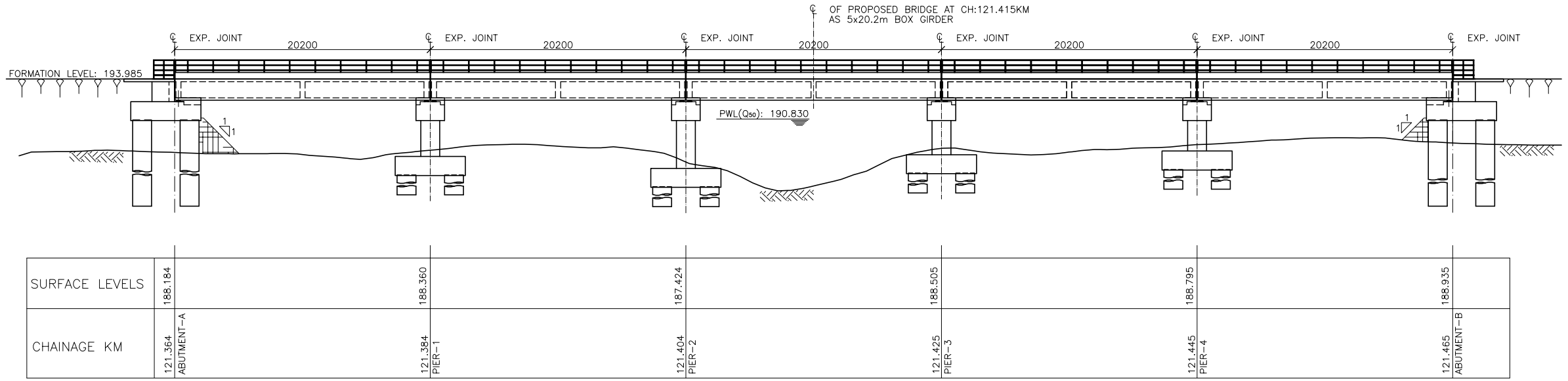
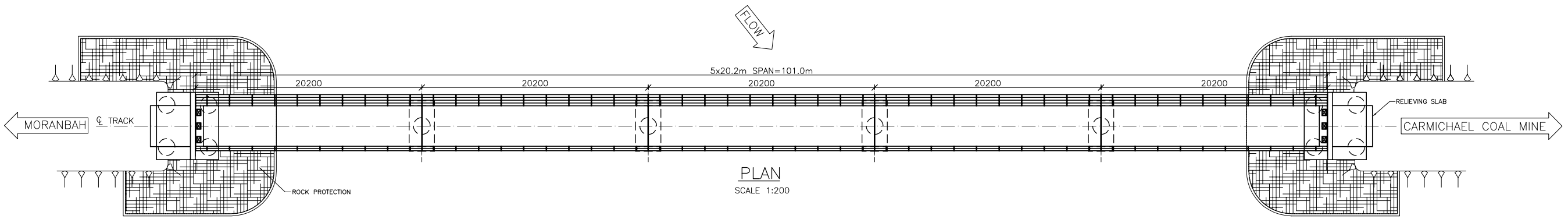
CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF BELYANDO RIVER (4 x 20.2m) AT CHAINAGE 145.962KM

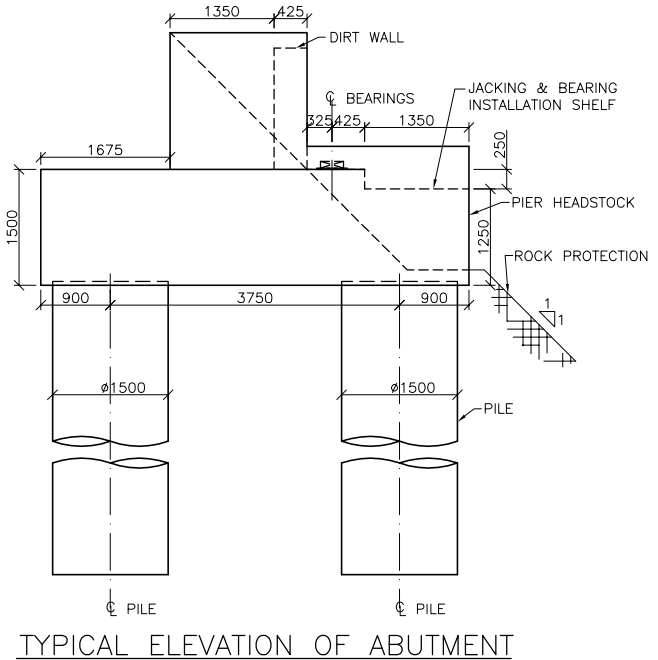
PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0



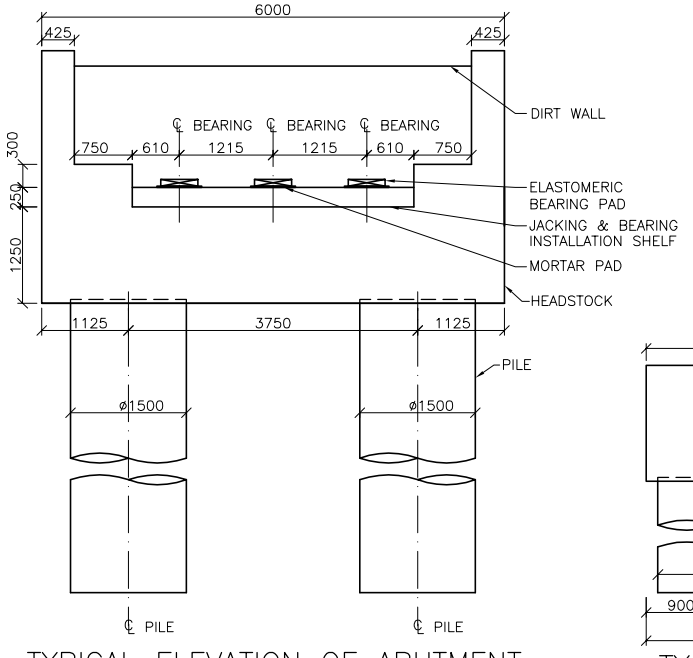
ELEVATION
SCALE 1:200



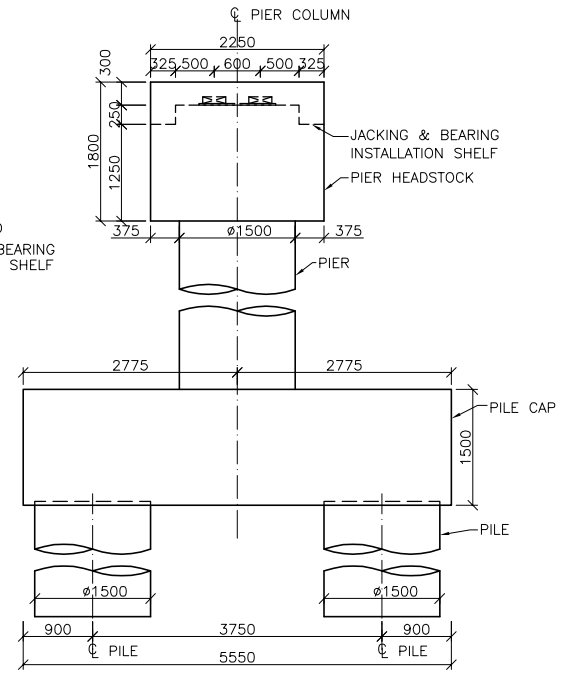
PLAN
SCALE 1:200



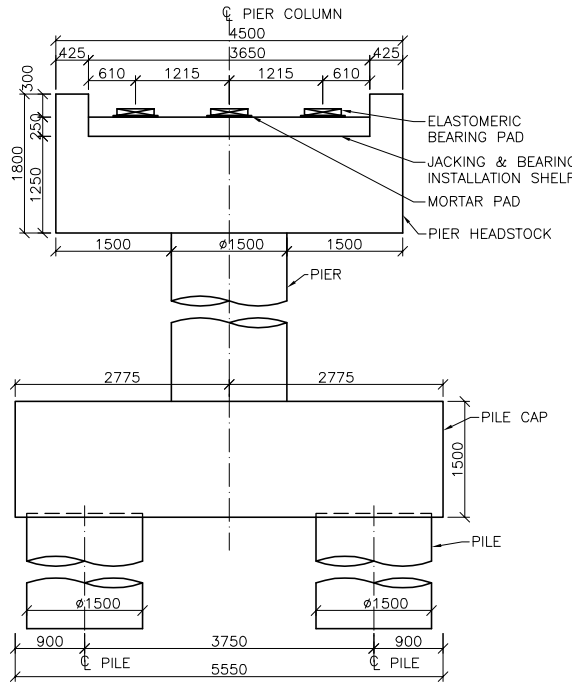
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (ABUTMENT)
XXX TYPICAL DETAILS OF PILE CAP AT PIER LOCATIONS
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XXX TYPICAL DETAILS OF PILE, PILE CAP, PIER & PIER HEADSTOCK

GENERAL NOTE:

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   - PRECAST – S50
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   - PILE CAP – 90mm
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5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

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REVISIONS

REV	BY	DATE	DESCRIPTION	CKD	APP
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SCALES:
1:200 0 2 4 6 8 10m
1:50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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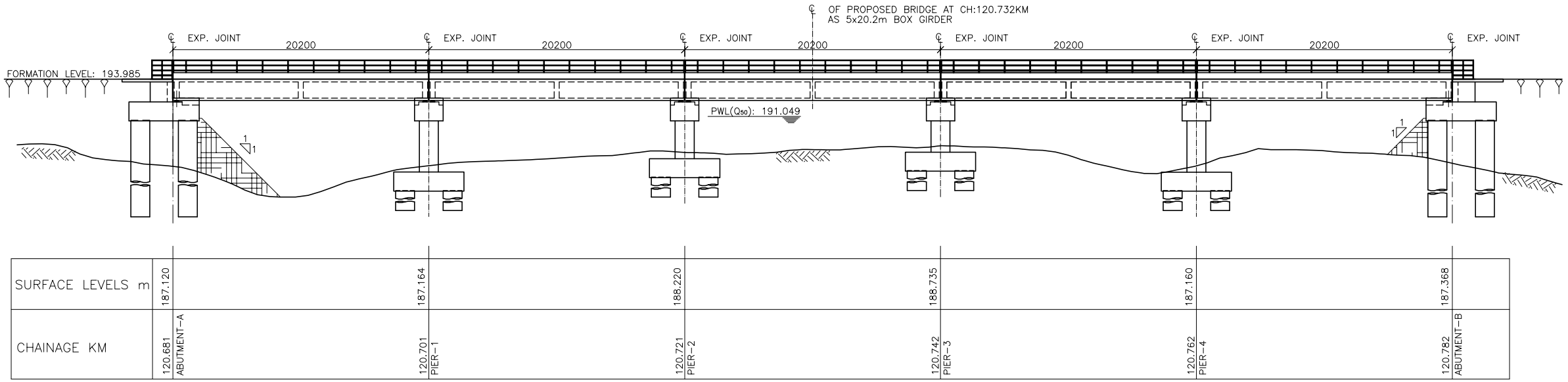
CARMICHAEL COAL MINE AND RAIL PROJECT

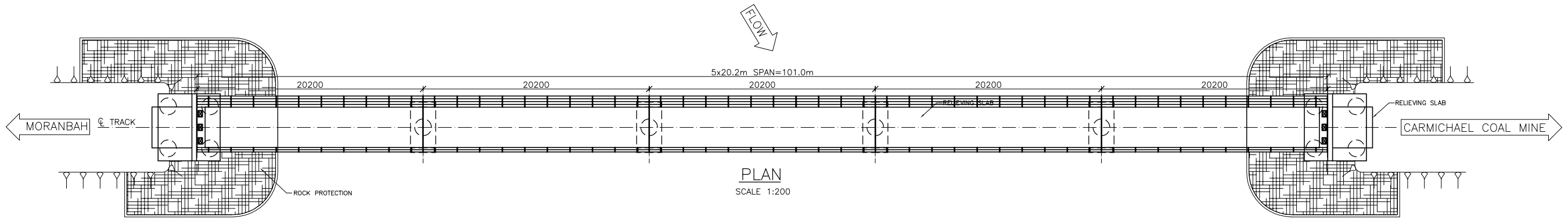
GENERAL ARRANGEMENT DRAWING OF MISTAKE CREEK (5 x 20.2m) AT CHAINAGE 121.415KM

PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0

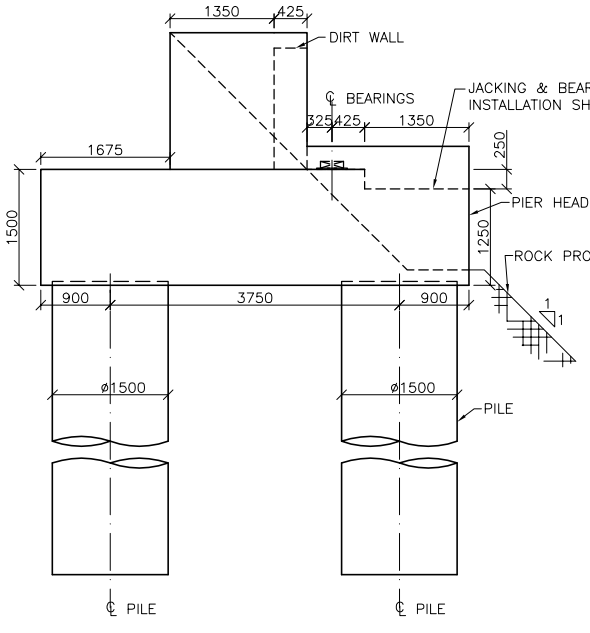
E:\SYAM\AUSTRALIA\Drawings\RAIL BRIDGE GADS\121.415.dwg Plotted by: ##### on 10/6/2012 7:28:56 PM



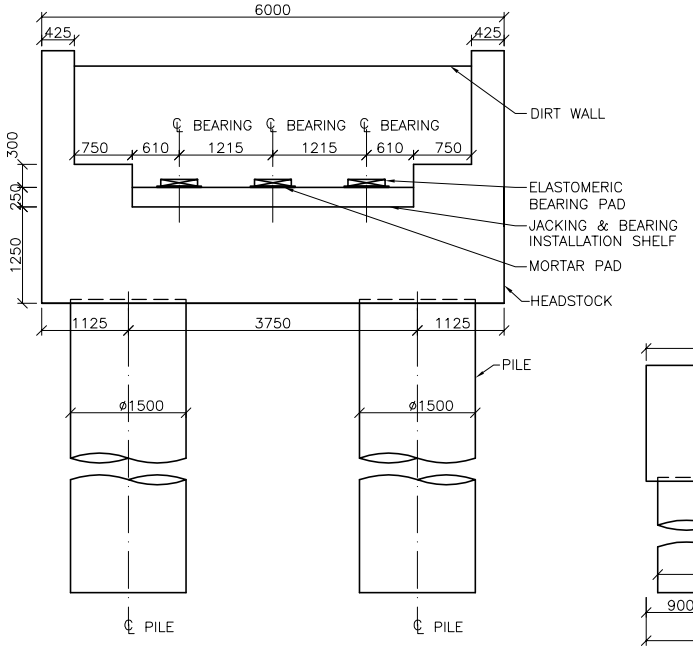
ELEVATION
SCALE 1:200



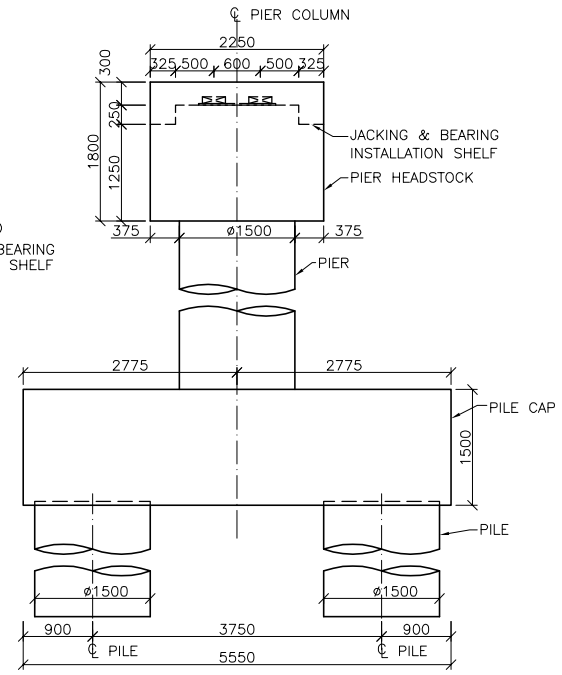
PLAN
SCALE 1:200



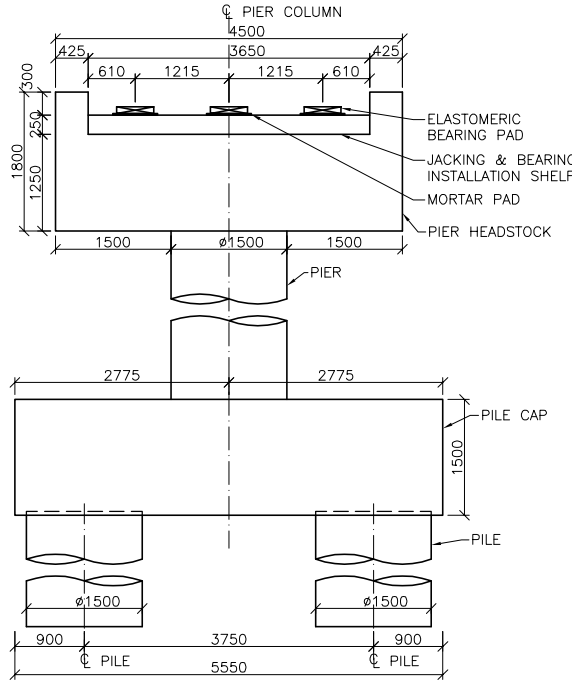
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

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XXX RAIL BRIDGE GIRDER DETAILS
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GENERAL NOTE:

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   CAST IN SITU – S40
   PRECAST – S50
3. COVER TO REINFORCEMENT ARE AS FOLLOWS.
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   PILE CAP – 90mm
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5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

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REV	BY	DATE	DESCRIPTION	CKD	APP
0		06/10/12	ISSUED FOR APPROVAL		

SCALES:
1 : 200 0 2 4 6 8 10m
1 : 50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF MISTAKE CREEK (5 x 20.2m) AT CHAINAGE 120.732KM

PROJECT No.	CARP12033-DWG-S-XXX
DRG No.	XXXX-XXX-XXX
REV	0

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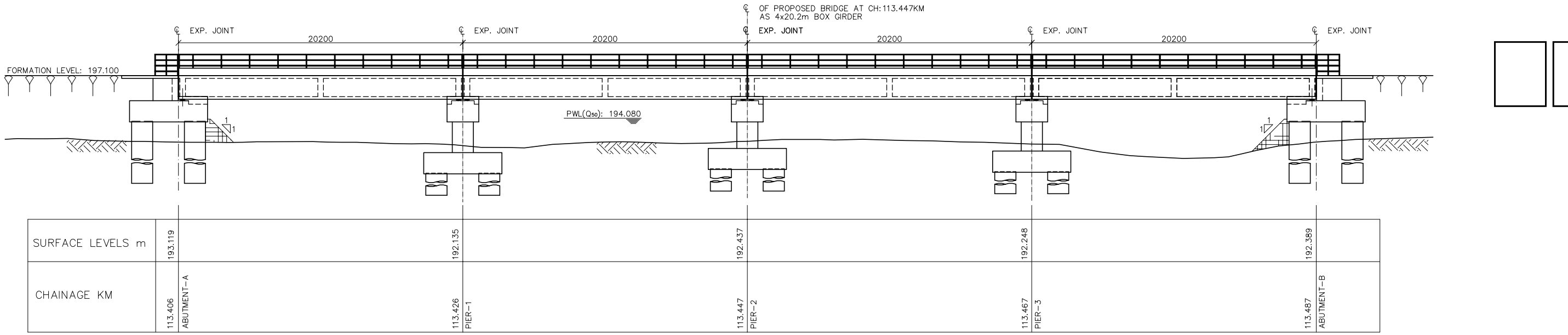
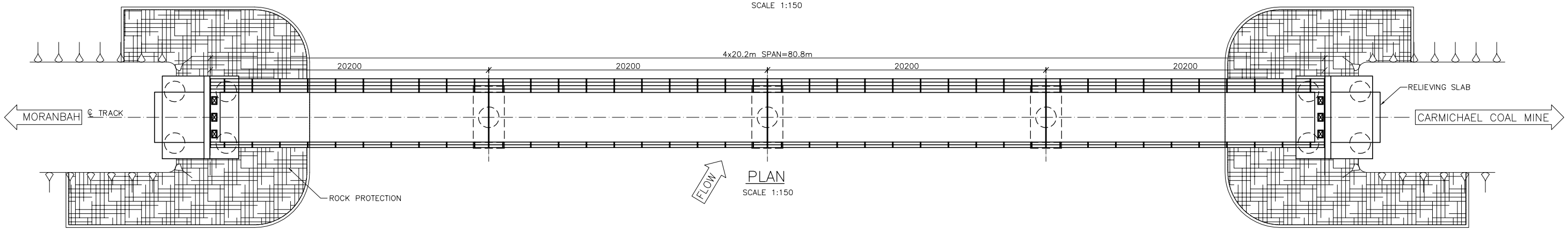
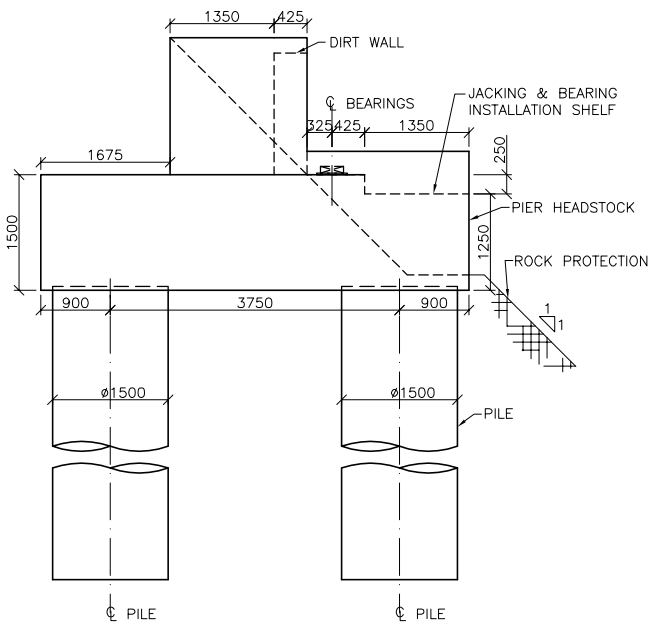


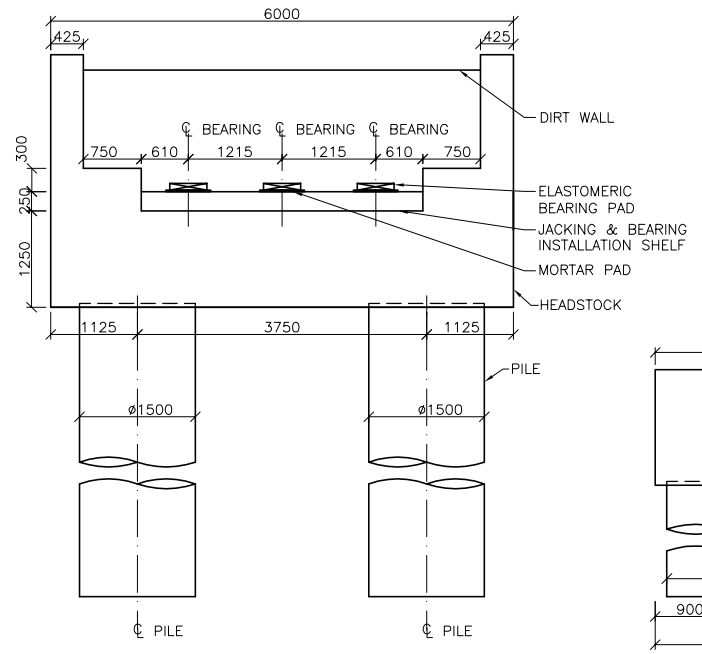
ELEVATION
SCALE 1:150



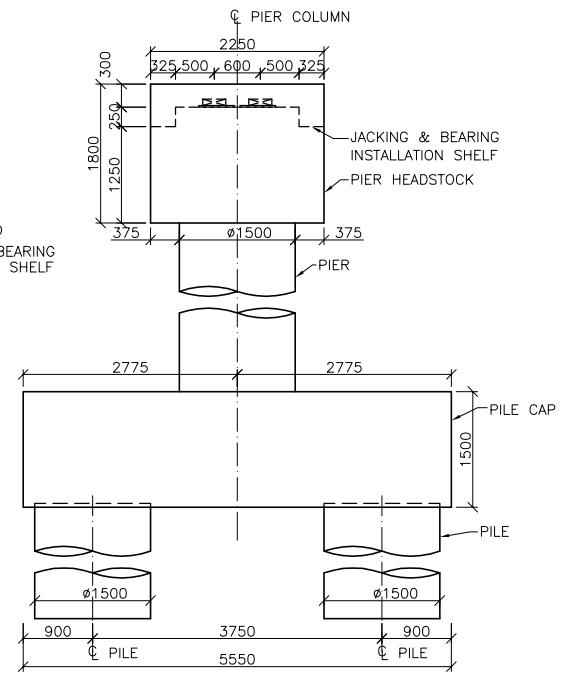
PLAN
SCALE 1:150



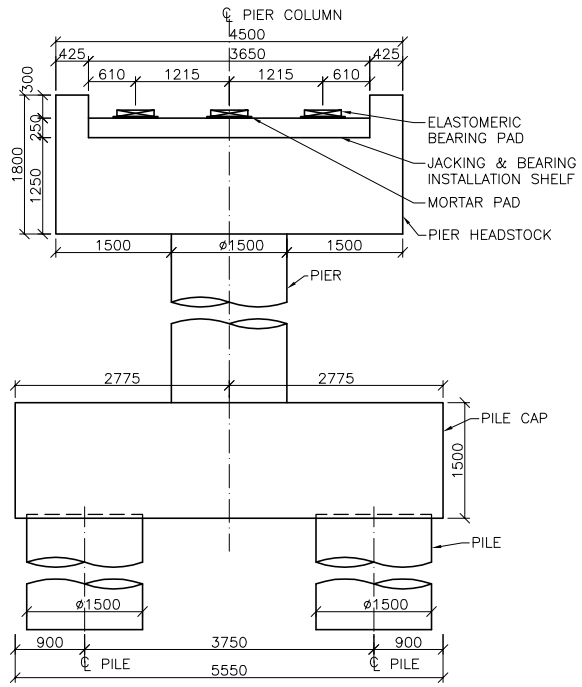
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

XXX 19.6m RAIL BRIDGE GIRDER PRE TENSION CONCRETE OUTLINES
XXX RAIL BRIDGE GIRDER DETAILS
XXX TYPICAL DETAILS OF ROCK PROTECTION
XXX TYPICAL DETAILS OF PILE & HEADSTOCK (ABUTMENT)
XXX TYPICAL DETAILS OF PILE CAP AT PIER LOCATIONS
XXX TYPICAL DETAILS OF CAST IN SITU BORED PILES
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XXX TYPICAL DETAILS OF PILE, PILE CAP, PIER & PIER HEADSTOCK

GENERAL NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CONCRETE GRADE SHALL BE AS FOLLOWS.
   CAST IN SITU – S40
   PRECAST – S50
3. COVER TO REINFORCEMENT ARE AS FOLLOWS.
   PILES – 85mm
   PILE CAP – 90mm
4. EXPOSURE CLASSIFICATION B2
5. PILES SHALL BE 1500mm DIAMETER BORED PILES. TEMPORARY STEEL LINERS TO BE USED AS PER SITE REQUIREMENT.
6. ALL REINFORCING BARS SHALL BE D500N IN ACCORDANCE WITH AS/NZS 4671:2001

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REVISIONS			
REV	BY	DATE	DESCRIPTION
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SCALES:
1:150 0 2 4 6 8m
1:50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
NAME:		
RPEQ No:		

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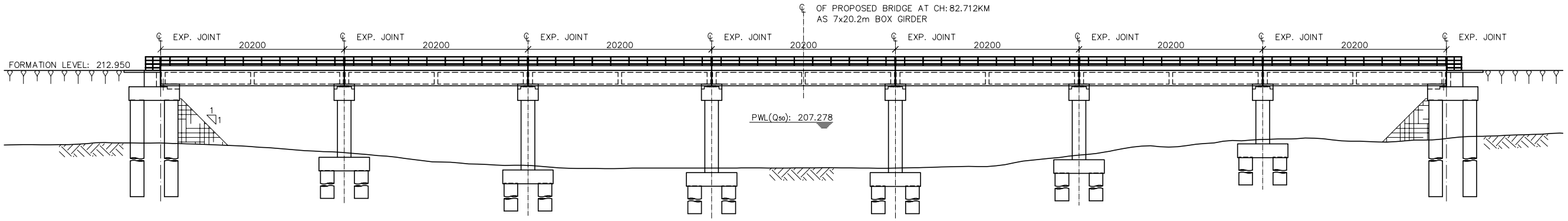
CARMICHAEL COAL MINE AND RAIL PROJECT

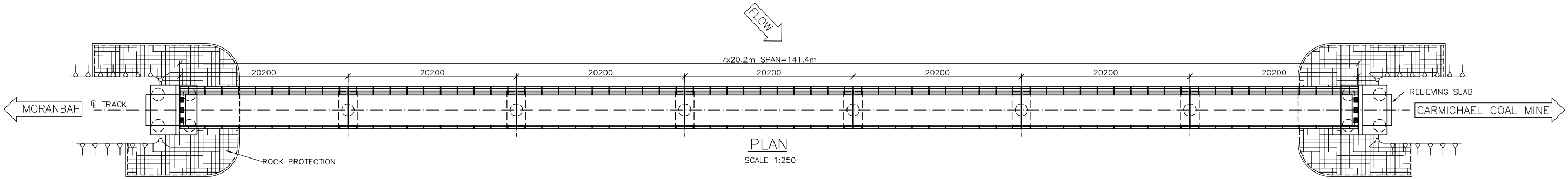
GENERAL ARRANGEMENT DRAWING OF GOWRIE CREEK (4 x 20.2m) AT CHAINAGE 113.447KM

PROJECT No. CARP12033-DWG-S-XXX
DRG No. XXXX-XXX-XXX
REV 0

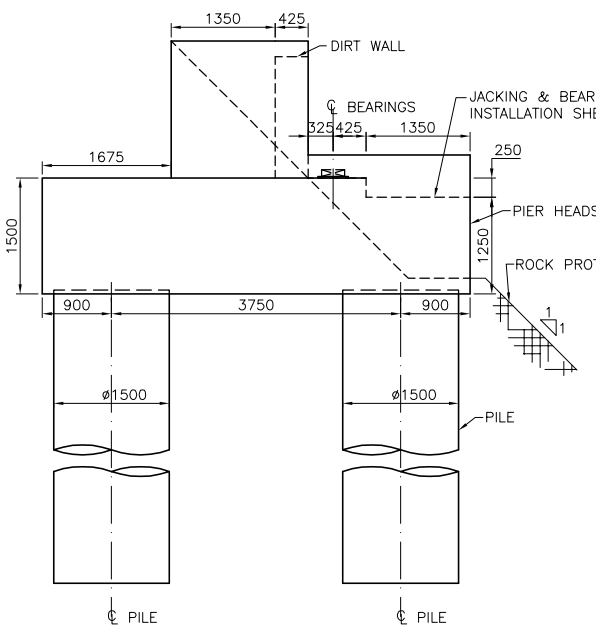
E:\SYAM\AUSTRALIA\Drawings\RAIL BRIDGE GADS\113.447.dwg Plotted by: ###### on 10/6/2012 7:27:51 PM



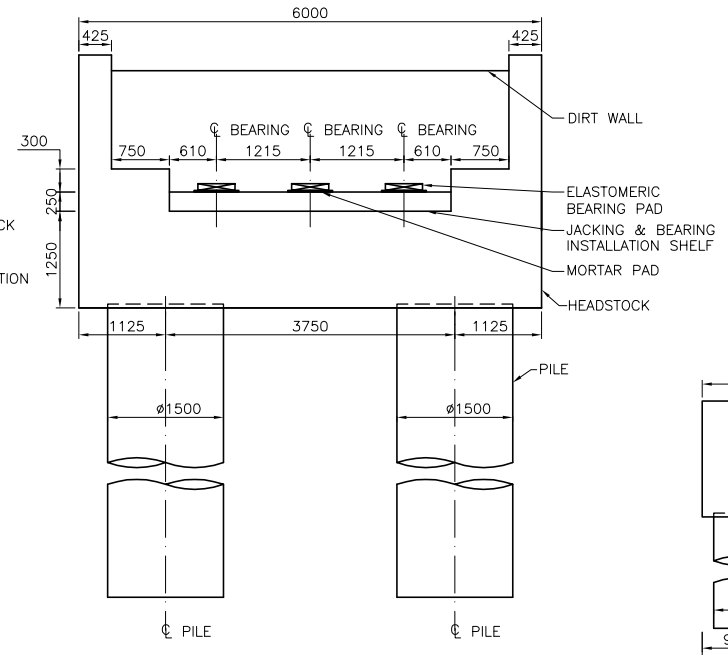
ELEVATION
SCALE 1:250



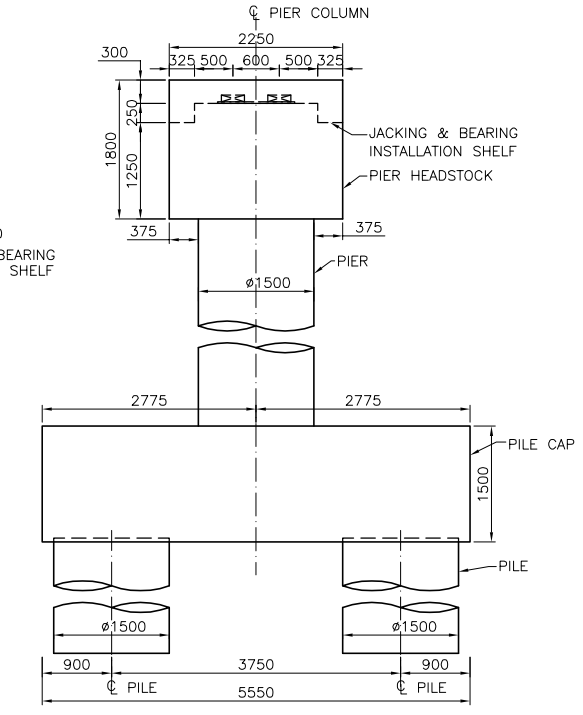
PLAN
SCALE 1:250



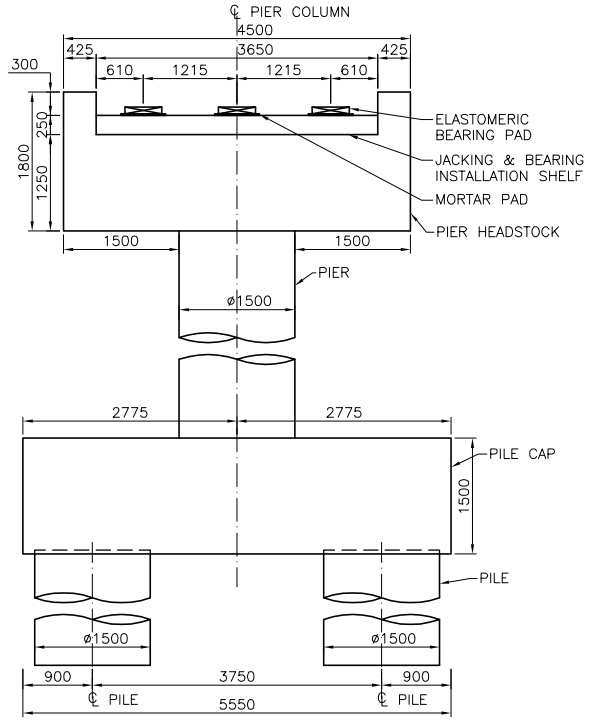
TYPICAL ELEVATION OF ABUTMENT
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF ABUTMENT
(TRANSVERSE DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(LONGITUDINAL DIRECTION)
SCALE 1:50



TYPICAL ELEVATION OF PIER
(TRANSVERSE DIRECTION)
SCALE 1:50

REFERENCE DRAWINGS:

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SCALES:
1:250 0 2 4 6 8 10m
1:50 0 1000 2000mm

DRAWN	SYAM	
DRAFTING CHECK	RAMAKRISHNA	
ENG. APPROVED	PVS SARMA	
PROJECT MANAGER	KAUSHAL	
RPEQ APPROVAL SIGNED:		
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CARMICHAEL COAL MINE AND RAIL PROJECT

GENERAL ARRANGEMENT DRAWING OF LOGAN CREEK (7 x 20.2m) AT CHAINAGE 82.712

PROJECT No. CARP12033-DWG-S-XXX

DRG No. XXXX-XXX-XXX

REV 0