Carmichael Coal Mine and Rail Project
Supplementary Environmental Impact Statement

Volume 4, Appendix C4e – Application to take water from the Belyando River

Containing

- Application License to take water from the Belyando River
- Application supporting information

Queensland Government

Department of Environment and Resource Management

Application for licence to take water

(Water Act 2000)

Purpose of this Form
To apply for a water licence to take and use the water on a parcel or contiguous parcels of land owned by the applicant.

PART A Licence Information

Will this licence replace a water licence? ☐ Yes ☑ No If 'yes' please supply licence reference [ ]

PART B Applicant Details

Name *Specify the full name of all persons applying for this licence*

[ ]

[ ]

If the applicant is a corporation please supply the ACN [ ][ ][ ] [ ][ ][ ] [ ][ ][ ]

Attention (Optional) *(eg, Principal, Secretary, Managing Director, etc)*

[ ]

Street Address

[ ]

[ ]

State [ ] Postcode [ ]

Mailing Address *All correspondence will be delivered to this address (if same as street address please write 'as above')*

[ ]

[ ]

State [ ] Postcode [ ] Country *if not Australia* [ ]

Contact Person's Details *(If different from above)* Title ☐ Mr ☐ Mrs ☐ Ms ☐ Miss ☐ Other *please specify* [ ]

Given Name [ ]

Last Name [ ]

Preferred Phone [ ] Alternate Phone [ ] Facsimile [ ]

Email Address [ ]

OFFICE USE ONLY	Fee Received $	Application
	Receipt No.	Client
	Registration Date / / Initials	Authorisation

OFFICE STAMP ONLY

PART C Description of Land

Specify the Lot and Plan numbers for the land on which the water is to be used. This is the land to which the proposed licence would attach.

Lot	Plan
662	PH1491

PART D Source and Location of Water

Specify the type of water and the location from which water is to be taken

SOURCE OF WATER

- [x] Water in a watercourse, lake or spring — Name: Belyando River
- [ ] Underground artesian water — Aquifer Name: — Target depth: metres
- [ ] Underground subartesian water — Aquifer Name: — Target depth: metres
- [ ] Overland Flow water

LOCATION OF WATER

Describe the parcels on or adjoining the place from which the water is to be taken. If water is to be taken from a point on land within the bed and banks of a watercourse which cannot be properly described in terms of a Lot on Plan, enter the property description of the nearest adjacent land and tick the *'Adjacent to'* (✓) *box.*

Adjacent to (✓)	Lot	Plan	Adjacent to (✓)	Lot	Plan
	662	PH 1491			

Sketch a plan showing the source and location where the water is proposed to be taken and used. Include property boundaries, Lot/Plan descriptions, existing water facilities (eg. pump, bore), and location of any watercourse, lake or spring

N

Refer to attached document.

PART E Water Use

Specify which of the purposes below apply to the proposed taking of water

- [ ] Domestic
- [ ] Stockwatering
- [ ] Waterharvesting
- [ ] Aquaculture *(Attach Proposal)*
- [x] Industrial *(Attach Proposal)*
- [ ] Irrigation *(Complete Irrigation Requirement Table)*
- [ ] Stock Intensive *(eg Feedlot; Piggery; Dairy)* Stock Type: ____ No. of Stock: ____
- [ ] Other *(Specify)* ____

PART F Water Requirement

Describe the proposed water scheme

Irrigation Requirements

	Crop Type	Proposed Area (Hectares)	Maximum Weekly Application (mm)	Maximum Monthly Volume (Megalitres)	Time of Year Required (Months)
Crop 1					
Crop 2					
Crop 3					

Requirements for other purposes

Tick the appropriate box

____ **megalitres per** [ ] day [ ] week [ ] month

Refer to attached Document

PART G Amount of Water

Specify the amount of water being applied for

Maximum annual volume of water required: 12500 megalitres

Maximum rate at which water is to be taken: 4629 litres per second

Maximum area to be irrigated: ____ hectares

PART H Comments

Provide any further comments or information that may be of assistance in assessing this application

A document has been attached, which includes supporting information to the application. Whilst maximum extraction is 12500 ML/a the average take is 10,000 ML/a.

PART I Declaration

All parties to complete and sign the declaration below

Being the owners of all the land referred to in Part B of this application, I/we do hereby apply for a licence to take water and declare that the information contained in this application is true and correct. I/We also acknowledge that materials submitted in support of this application are part of the application and can be copied and made available to the public as required under section 208(4)(b) of the Water Act 2000. I/We hereby provide consent for any supplied information considered to be commercial-in-confidence or copyright to be copied and made available only for the purposes of the licence application, including notification to and consultation with the public and other relevant government agencies.

INDIVIDUAL

Attach separate sheet (or photocopy) if more than 2 signatures required

Name		Name	
Signature		Signature	
Position/Title *(if applicable)*		Position/Title *(if applicable)*	
Date		Date	

CORPORATION

Executed for and on behalf of (Corporation)

By *(Name)*		By *(Name)*	
Position		Position	
Signature		Signature	
Date		Date	
Witnessed By		Witnessed By	
Witness Signature		Witness Signature	
Date		Date	

Application Fee

The prescribed application fee is payable at the time of application.

Please refer to the provided 'fee link' located on the departmental website to obtain the current fee for this form.
<www.nrw.qld.gov.au/water/management/application_forms.html>

Payment by Cheque, Cash or EFTPOS

☐ Cheque - To be made payable to the '***Department of Environment and Resource Management***' *and marked* '***Not Negotiable***'.

☐ Cash - Cash is only a payment option when paying in person.

☐ EFTPOS - Payment facilities may vary between offices, please contact your local DERM office in advance.

Payment by Credit Card *Please print clearly*

Please charge this payment to my *(tick appropriate box)* ☐ Visa ☐ Mastercard ☐ American Express

Amount of Payment $ ____ . __

Card Number

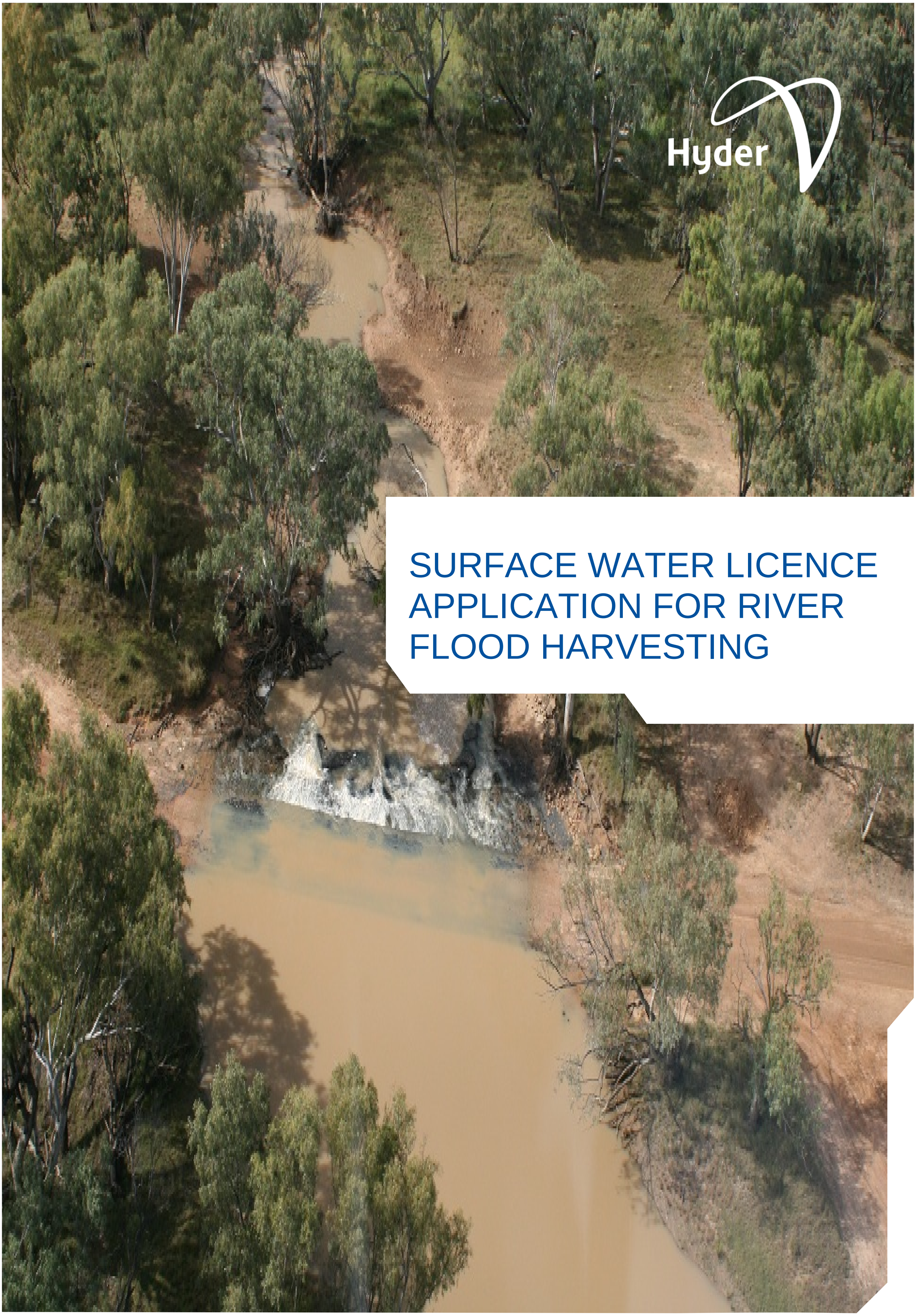
Expiry Date

Phone No.

Cardholder's Name

Cardholder's Signature

Date / /



Hyder

SURFACE WATER LICENCE APPLICATION FOR RIVER FLOOD HARVESTING

Hyder Consulting Pty Ltd
ABN 76 104 485 289
Level 7, 199 Grey Street
South Brisbane QLD 4101
Australia
Tel: +61 7 3337 0000
Fax: +61 7 3337 0050
www.hyderconsulting.com

ADANI MINING

CARMICHAEL COAL MINE AND RAIL PROJECT

Surface Water Licence Application for River Flood Harvesting Extraction

Author	Louise Clarke/Ben Seligmann
Checker	Sam Pollard
Approver	Sam Pollard
Report No	0001-AA006247-AAR-012
Date	30/07/2013

1 INTRODUCTION

1.1 BACKGROUND

1.1.1 PROJECT OVERVIEW

Adani Mining Pty Ltd (Adani, the Proponent), commenced an Environmental Impact Statement (EIS) process for the Carmichael Coal Mine and Rail Project (the Project) in 2010. On 26 November 2010, the Queensland (Qld) Office of the Coordinator General declared the Project a 'significant project' and the Project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (referral No. 2010/5736). The Project was assessed to be a controlled action on the 6 January 2011 under section 75 and section 87 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions for the Project include:

- World Heritage properties (sections 12 & 15A)
- National Heritage places (sections 15B & 15C)
- Wetlands (Ramsar) (sections 16 & 17B)
- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- The Great Barrier Reef Marine Park (GBRMP) (sections 24B & 24C).

The Qld Government's EIS process has been accredited for the assessment under Part 8 of the EPBC Act in accordance with the bilateral agreement between the Commonwealth of Australia and the State of Queensland.

The Proponent prepared an EIS in accordance with the Terms of Reference (ToR) issued by the Qld Coordinator-General in May 2011 (Qld Government, 2011). The EIS process is managed under section 26(1) (a) of the *State Development and Public Works Act 1971* (SDPWO Act), which is administered by the Qld Government's Department of State Development, Infrastructure and Planning (DSDIP).

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with developing a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the northern Galilee Basin, approximately 160 kilometres (km) north-west of Clermont, Central Queensland, Australia. Coal from the Project will be transported by rail to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited (Aurizon). The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year (90 years in the EIS) mine life.

Project components are as follows:

- The Project (Mine): a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure
- The Project (Rail): a greenfield rail line connecting to mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
    - Rail (west): a 120 kilometre (km) dual gauge portion running west from the Mine site east to Diamond Creek

- Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah.
- Quarries: The use of five (5) local quarries to extract quarry materials for construction and operational purposes.

1.1.2 PROJECT LOCATION

The Project is located approximately 160 km north-west of the town of Clermont. The nearest regional centre is Emerald, approximately 350 km south (refer to Figure 1). The Project (Mine) is predominantly within the Local Government Area (LGA) of Isaac Regional Council (IRC), with the exception of 167 ha within the north-western corner of the EPC1690, which is located within the LGA of Charters Towers Regional Council (CTRC). The IRC is located within the Isaac, Mackay and Whitsunday Region while the CTRC is located within the Northern Region of Queensland.

LEGEND

- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- Local Road
- Watercourse
- Local Government Area
- Project (Rail)
- Rail (West)
- Rail (East)
- Mine (Offsite)
- Project (Mine)

Based on or contains data provided by the State of QLD (DERM) [2010]. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.

1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS

Job Number	41-26630
Revision	A
Date	19-07-2013

Project Location

Figure 1

G:\41\26630\GIS\Maps\MXD\NewMaps\41_26630_Fig1.mxd

Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DNRM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); DME: EPC1690 (2010), EPC1080 (2011); Adani: Mine Offsite, Alignment SP1 Opt11 Rev2, SP2 Opt9 Rev 3 (2013). Created by: MS

1.1.3 PROJECT SPECIFICS

A secure supply of water to the mine is crucial to the construction and operation of the mine. For this reason a number of local water sources are being considered for supply to the mine. Current studies (SEIS/EIS) indicate that under current water legislation, there is enough surface and groundwater available locally to supply the mine site.

A key local water source will be from the Belyando River, near the confluence with Carmichael River, on the Moray Downs property approximately 40kms east of the Adani coal mine site. This application, for a licence to take water, seeks to access available un-supplemented strategic reserve water (Under the conditions in the Burdekin Basin Water Resource Plan (WRP), a project of state significance has access to unallocated water in the state's strategic reserves.) within the Burdekin Basin via flood harvesting from the Belyando River.

1.1.4 APPLICATION TO TAKE WATER

This application for a licence to take water is being submitted through Department of Natural Resources and Mines (DNRM) and the Department of Energy and Water Supply (DEWS), (the regulator). This is in accordance with Chapter 2, Part 6 of the Water Act 2000, with the licence accessing the state's strategic reserve within sub-catchment E of the Burdekin Basin WRP. Refer to Figure 1.2 for the location of the mine relative to the WRP catchment boundaries. An average extraction of 10,000 ML/a, with a maximum of 12,500 ML/a is being applied for.

Figure 1.2 – Mine Location relevant to the WRP Catchment boundaries

1.1.5 DOCUMENT OBJECTIVE

The objective of this document is to provide all of the supporting documentation required by the regulator to assess the application and approve Adani's licence to take water. The supporting documentation (outlined by the *Water Act 2000*) is to include:

- The purpose for which the water is required.
- The efficiency of existing and proposed water use practices.
- The extent to which water is being taken under existing authorisations in the plan area.

- The availability of an alternative water supply for the purpose for which the water is required.
- The impact the proposed taking of, or interfering with, the water may have on existing water users in the plan area.
- Whether the proposed taking or interfering is likely to have a direct adverse effect on groundwater flows.
- The impact, the taking of, or proposed taking of, or interfering with, water may have on the following:
  - Water quality
  - EFOs
  - Downstream users
  - Cultural values including, for example, cultural values of local Aboriginal communities.
- A detailed outline of the water requirements for the Project.
- The availability and reliability of the water source the water will be extracted from.
- Detailed plans of water infrastructure for extracting the water.

The above information has been provided in this document and is supported by the EIS, SEIS reports for the Adani mine and rail project and their relevant supporting technical documents.

1.2 REFERANCE DOCUMENTS

The following documents are referenced within this supporting document:

- Carmichael Coal Mine, Water Balance (GHD, 2013)
- Watercourse Determinations for the Carmichael Coal Mine Project Area, Offsite Infrastructure Area and Rail Project Area- Letter from DNRM 17 May 2013
- Carmichael Coal Mine and Rail Project Environmental Impact Statement
- Carmichael Coal Mine and Rail Project Supplementary Environmental Impact Statement

1.3 LEGISLATION

As discussed, above, the proposed water harvesting operation requires a licence to take water under the *Water Act 2000*. It also requires compliance with a number of other state and national legislation. These are discussed below:

Water Act 2000

The *Water Act 2000* provides for the sustainable management and allocation of water to meet Queensland's future water requirements including the protection of natural ecosystems and security of supply to water users through the development of Water Resource Plans (WRP), and other activities.

Under the *Water Act 2000*, each water management area has a separate WRP and associated Resource Operations Plan (ROP). A WRP is written for each catchment to provide a framework to apply (under the *Water Act 2000*, Chapter 2 part 6) and regulate water extractions to ensure that they are maintained as a sustainable resource. As the mine is located within the Burdekin Basin, the river extraction must comply with the Burdekin Basin WRP and Burdekin Haughton ROP.

Native Title Act 1993

The Native Title Act 1993 is an agreement between the Government of Australia and indigenous peoples that regulates claims to land and proposals for land use.

Whilst not directly applicable under the *Water Act 2000*, the regulatory process for all water permits and licences requires the investigation of potential native title impacts (construction impacts) and agreements.

Sustainable Planning Act (SPA) 2009 QLD

Any proposed developments in Queensland need to go through an application process in accordance with the *Sustainable Planning Act (SPA) 2009 (QLD)*. The Integrated Development Assessment System (IDAS) is part of the SPA and is the system for integrating State and local government assessment and approval processes for development. Chapter 6 part 1 of the Act refers to the development approvals and consents (of the chief executive) required for a works associated with a new water licence or permit. The State Assessment and Referral Agency (SARA) provides a coordinated, whole of government approach to state development assessment for applications lodged under the SPA.

A permit or licence to take or interfere with water does not authorise the construction of the works. A development permit will be required for Adani to commence works on the diversion drains and an application will be made by Adani on approval of this water licence.

Environmental Protection Act (EPA) 1994

The *Environmental Protection Act 1994* was written to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development). All proposed infrastructure for water supply will need to satisfy the requirements under the EPA Act 1994.

State Development and Public Works Organisation Act 1971

The "State Development and Public Works Organisation Act 1971" grants the Co-ordinator General the power to declare a Project to be a 'significant Project'. The Carmichael Coal Mine and Rail Project has been identified as a State Significance project and declared a coordinate project.. As stated above, this gives the Project access to water held in the State reserve.

1.4 PREVIOUS INFORMATION

1.4.1 PREVIOUS SUBMISSION

A previous water licence application for the Adani mine site, was made in August 2012 for accessing 22GL of surface water from sub-catchment E of the Burdekin Basin. The water was proposed to be extracted via 8 in-stream storages (maximum extraction of 2,000 ML/a) and a river flood harvesting operation on the Belyando River (maximum extraction of 20,000 ML/a, mean approximately 15,000 ML/a).

The purpose of the initial submission was to communicate to the regulator, Adani's water requirements for the mine and how it was proposed to secure this water. It was also intended for the initial licence application to show the regulator Adani's understanding of the approval process and to initiate the process (including liaison and meeting between Adani and the regulator) of securing the water required for the mine

The application was well received, with a meeting to discuss the application requested by the regulator. During the meeting, optimisation of extraction and assessing cumulative impacts was discussed. It was agreed a re-application of the licence to take water would be completed once a final assessment of water demands and system efficiencies was carried out by Adani.

This document is the result of the above requested optimisation of the water demands, review of cumulative impacts, mine operation, water balance and supply infrastructure plan and contains the resulting updated hydrological assessment of the proposed extractions from the Belyando River.

A number of studies (summarised in the EIS/SEIS) have been carried out to understand what water sources exist, to provide water to the mine. From these studies, a number of local water sources, based on reliabilities and sustainable yields, were identified as being possible supplies for the mine. These sources included local groundwater and surface water extractions (river harvesting from the Belyando River being a key source).

A detailed water balance model (SEIS supporting technical report – Carmichael Coal Mine and Rail Project SEIS – report for Water Balance GHD July 2013) for the mine was completed to ensure reliability and efficiency (delivery and operational methods) of supply is achieved. This approach has reduced the amount of water required per run of mine tonne of coal produced, in turn increasing reliability of the proposed supply system, and reducing the external water requirement to 12,000 ML/a of which an average of 10,000 ML/a would come from the flood harvesting operation from the Belyando River.

The EIS and SEIS has detailed the supply arrangements for all of water sources, with only the river harvesting operation discussed in this water licence application.

2 WATER SOURCE AND DEMANDS

Various water sources, from the mine itself (on-site) and local supplies (offsite) will be accessed to meet the mines water requirements. A priority system will be used, with the river harvesting operation only utilised when onsite water (from overland flow capture in the pit, and re-use) and borehole extractions are unavailable. Further information can be found in the SEIS supporting technical report – Carmichael Coal Mine and Rain Project SEIS – report for Water Balance GHD July 2013.

The mine site water balance indicated that, to ensure reliability of supply and meet yield requirements an external (river harvesting, boreholes etc.) raw water demand for the mine will be 12,000 ML/a, of which 10,000 ML/a is proposed to be taken from the river harvesting operation on the Belyando River.

2.1 AVAILABLE WATER SOURCES

As discussed, potential water sources were identified and categorised into regional and local water supplies.

The regional supplies that were considered were:

- Burdekin Falls Dam (BFD)

  The local supplies that were considered were:

- Boreholes
- River flood harvesting
- Mine dewatering (groundwater infiltration and overland flow within the pit)

2.1.1 SOURCE JUSTIFICATION

Local water supply sources, such as the water harvesting option and groundwater, were considered to be the most viable solution due to their ability to meet the yield and reliability requirements and lower cost in comparison to the Burdekin Falls Dam regional supply option.

Therefore in the short term, river flood harvesting via the Belyando River, has been chosen as a viable source for a number of reasons which include:

- Local resource
- Relatively low environmental impact
- Legislatively viable.

Local Resource

The proposed extraction point on the Belyando River is located within 40km of the mine site, with relatively flat terrain in between, minimising the requirement for intermediate pump stations. This is in comparison to the regional BFD supply option, which requires a 200km pipeline route over a mountain range, and at least 4 booster pump stations along the route. It also draws on a different and much larger catchment than the other local sources (groundwater and mine affected water storages), increasing reliability and reducing the impact by only having one extraction per catchment. This also reduces the impact on the local water resources.

Relatively Low Environmental Impact

The minimal infrastructure requirement when compared to the BFD pipeline also decreases the environmental footprint and associated impacts. Due to Adani owning the Moray Downs property leases, there also exists the potential to align the required pipeline infrastructure with the proposed rail corridor in order to avoid critical or endangered flora and fauna further reducing the environmental impact.

Legislatively Viable

River flood harvesting is a legislated option and is currently allowed via a water permit or licence under the current Burdekin Basin WRP and ROP. As the project is a coordinate project (similar to a project of state significance), access is also available to the Strategic Reserve (Part of the WRP) held by the regulator. Therefore in effect, no unaccounted and unassessed water will be taken from the system. This reserve is held for projects of State Significance as well as town supplies and emergency requirements. A water entitlement from the Strategic Reserve is considered to provide higher security of supply than those from the General Reserve, as in times of drought, allocations from the General Reserve may incur restrictions.

The borehole option constitutes accessing local groundwater supplies and a licence for these sources will be sought in a separate application. The mine dewatering and bore field yields have been estimated from basic assessments with further details in the EIS and SEIS.

3 PROPOSED WATER EXTRACTION

Details of the proposed water harvesting operation, is discussed below and includes:

- Extraction details,
- Hydrological assessment
- Required infrastructure

3.1 EXTRACTION DETAILS

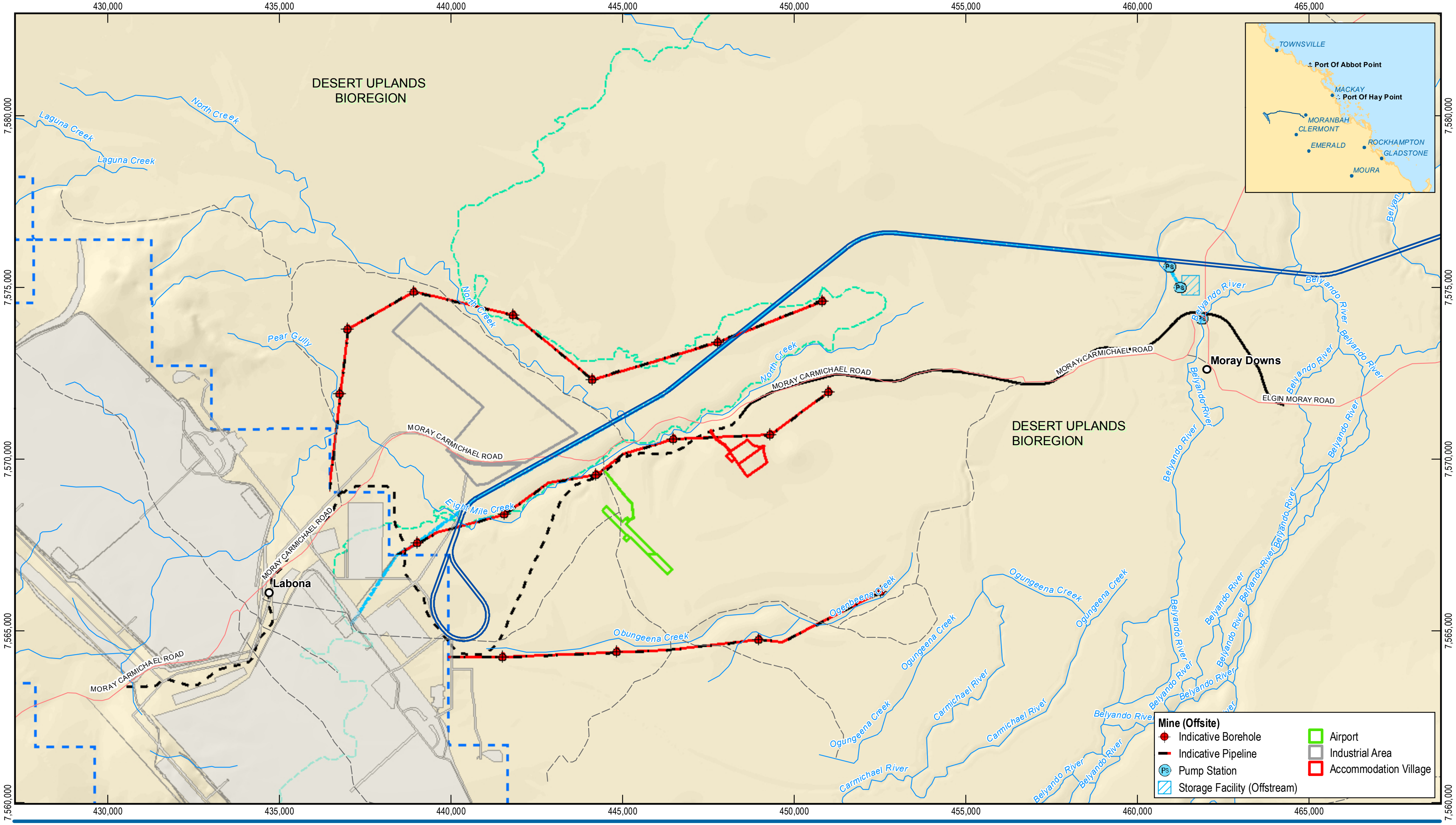
A key source of supply to the mine will be a flood water harvester on the Belyando River. The extraction system will pump water from the river into an off-site storage then supply water to the mine via a trunk main pipeline. The extraction from the Belyando will be triggered by flood events over 200ML/d, stored in an off-stream storage and used to meet mine water demands when onsite and groundwater (off and onsite) supplies are exhausted. The amount of water sought, and operation of the water harvester, is presented in table 3.1: The location of the water harvester will be directly downstream of the confluence of the Belyando River with the Carmichael River (approximately 70km Adopted Middle Thread Distance (AMTD) Belyando River).

Table 3-1 Proposed Adani Water harvesting extraction

Extraction Location (sub-catchment E – WRP)	Maximum Volumetric limit per year	Average Volumetric Extraction per year	Pump size	Trigger (start and cease to pump)
Approximately 70km AMTD Belyando River	12,500 ML/a	10,000 ML/a	400 ML/day	200 ML/day

The maximum pump rate is 400ML/d, however this can only be achieved once the total flow in the system reaches 600 ML/d. The pumping arrangement will be configured such that incremental extractions (under the 400ML/d maximum) for flows between 200 ML/d and 600ML/d can occur.

Figure 3.1 below provides a locality plan of the proposed extraction in reference to the mines site.



1:150,000 (at A4)

0 2.5 5

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Bioregion Boundary
- Project (Rail)
- Mine (Onsite)
- Road Corridor
- Road Corridor (proposed)
- Water Supply Pipeline
- Mine Footprint

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS

Job Number	41-26422
Revision	A
Date	31-07-2013

River Harvesting Location
Pump Station and Storage

Figure 3

G:\41\26422\GIS\Maps\MXD\0300_Hydrology\41-26422_520_rev_a.mxd

Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM: Bioregion Boundary (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

3.2 HYDROLOGICAL ASSESSMENT

A hydrological assessment was performed using the Integrated Quantity and Quality Model (IQQM) to understand the potential for the Belyando River to supply the required water to the mine. IQQM was then used to examine the effects of the proposed scenario (Adani extraction as per table 3.1), on downstream users of the extraction point and Environmental Flow Objectives (EFO's) at node 347 (EFO node 11) on the Belyando River, as stipulated in the Water Resources (Burdekin Basin) Plan (WRP).

3.2.1 BACKGROUND

The IQQM is a river system modelling tool used by the QLD State Government for planning and evaluating water resource management policies.

The IQQM model for the Burdekin Basin forms part of the WRP and Resource Operation Plan (ROP) legislation. Based on Chapter 2 of the Burdekin Basin ROP, there is 150,000 ML/a of unallocated water reserved as either Strategic or General reserve within sub-catchment E of the Burdekin Basin System. As the mine site is based in sub-catchment E, the reserve (without an increase to the total WRP extraction) can be utilised for Adani's water supply requirement at the Carmichael Mine Site.

3.2.2 PROPOSED SCENARIO

The Burdekin Basin ROP IQQM model was used to assess the potential extraction at the Adani site. The ROP IQQM is a "full use of entitlements case" including water sharing and environmental flow release rules, water supply storages, nominal allocations, seasonal demand and resource assessment.

A proposed scenario was developed to represent the proposed flood harvesting with an additional un-supplemented node (node 753) added to the existing ROP model on the Belyando River, near the mine site. This node has similar parameters to the existing unallocated water (node 335) with a maximum cap of 12500 ML/a, and a pump capacity of 400 ML/day. The 150,000 ML/a of unallocated water (node 335) was reduced by the amount allocated into the Belyando River (node 753). There is no additional water being taken from the system.

Table 3.2 provides parameters assumed in the proposed scenario. An amended IQQM schematic diagram displaying the additional nodes is provided in appendix A.

Table 3-2 Changes to Existing ROP IQQM – Proposed Scenario

Node	Node Type	Belyando River Trigger Flow (ML/day)	Pump Capacity (ML/day)	Annual Max Extraction Cap (ML/a)	Mean Annual Diversion (ML/a)
753 (additional node –proposed scenario)	Water harvester (8.3 node type)	200	400	12,500	10,000
335 (existing ROP node)	Water harvester (8.3 node type)	5,000	12,000	385,000	150,000
335 (amended node proposed scenario)	Water harvester (8.3 node type)	5,000	10,000	370,000	140,000

The performance of the additional water harvester node (node 753) has been provided in Table 3.3. This shows that the mean annual diversion of 10,000 ML is achieved approximately 75% of the time.

Table 3-3 Adani Water harvester performance (node 753)

Time equalled or exceeded (%)	Maximum Volumetric limit (ML/a)
95	225
90	3,710
75	9,800
70	10,825
50	12,500
45	12,500

3.3 REQUIRED INFRASTRUCTURE

To support the proposed water extractions, a number of pump stations, storages and pipelines will need to be constructed. As mentioned earlier, the water is proposed to be extracted from the Belyando River which at the proposed extraction point, runs through the property (Lot 662 on PH1491) on which Adani own the property leases. All associated infrastructure will be located within the bounds of the property. Appendix B in this submission provides an overall layout plan of the infrastructure, and concept for several of the pump stations. The recommended infrastructure design was described in the EIS, with the key changes since then being the removal of the pump stations and in stream storage extractions on North and Obungeena Creeks.

3.3.1 BELYANDO RIVER PUMP STATION

The pump station will be located on the western bank of the existing storage formed by the causeway for the Moray Carmichael Road entering the Moray Downs Property from the east, within the Belyando Creek. The pump station will consist of 5 No. centrifugal, wet well submersible pumps, operating in duty / duty / duty / duty / standby configuration. The pumps will be located within a three sided reinforced concrete structure, which will protect the pumps from flood flows and debris. The pumps will also be protected by a bar screen on the open face and roof of the wet well. This bar screen will be removed when maintenance is required. A channel will be dug perpendicularly to the river at invert level to provide a pump sump.

The pipe fittings within the pump station will be ductile iron, with a gate valve, check valve and dismantling joint on each pump discharge pipeline. Once underground, the discharge pipeline will transition to HDPE via a stub flange and backing ring, before splitting to twin pipelines to the storage dam. Both pipelines will contain a gate valve to allow for isolation for maintenance.
The electrical infrastructure will be housed on a steel platform supported on the pump station walls, above the defined floodplain level. Gate valve spindles will also extend to the platform to allow for operation during flood conditions. Access to the platform will be via a steel staircase, for which the design is to be confirmed.

Due to the size of the pumps and the location within the flood plain, no permanent pump lifting equipment will be provided at the pump station site. Lifting arrangements for maintenance and replacement will need to be made on site.

3.3.2 OFF-SITE STORAGE

Flow will be extracted from the storage via a dry well with submersible pumps located adjacent to the storage at ground level. The suction pipes will pass through the storage wall. The storage will be both above and below existing ground levels. Further details of the storage have been defined in the SEIS and EIS.

4 IMPACTS

The project EIS was submitted to the government in December 2012. In addition to this, a supplementary EIS was submitted in July 2013 which supports this document. These documents address the Project (Mine) environmental values and potential impacts and mitigation measures. As part of those documents, a detailed investigation of water supply options, including impacts and mitigation strategies was undertaken to inform both the EIS and SEIS.

A number of water supply options, including access to groundwater and surface water are currently being considered to meet the operational demands for the lifecycle of the Carmichael Mine. These include flood harvesting-river extraction, mine site dewatering and groundwater extractions.

An overview of environmental values, potential impacts and mitigation strategies for the flood harvesting-river extraction water supply options from the Belyando River is outlined below.

4.1 INFRASTRUCTURE

4.1.1 WATER QUALITY

The Queensland Water Quality Guidelines classify the Belyando River system and the surrounding area as a level 2 system. A level 2 system is defined to be moderately disturbed with ecological value.

Current water quality

Water quality data has been collected between 1970 and 2011 from the Gregory Development G.S (G.S 120301B, AMTD 10km) on the Belyando River approximately 50km downstream from the extraction point. A summary of key data is shown in table 4.1.

Table 4.1- DNRM Water Quality Data- Belyando River

Indicator	Number of Tests Taken	Mean	Median	Standard Deviation
Conductivity (µS/cm)	91	161.17	144	82.13
Turbidity (NTU)	80	386.125	127.5	665.23
pH	91	7.365	7.41	0.39
Water Temperature (°C)	97	26.04	27.7	4.2
Total Alkalinity (mg/L)	83	56.7	53	28.3
Dissolved Oxygen (mg/L)	51	5.72	5.6	1.95
Total Suspended Solids	90	263	110	386.7
Total Nitrogen (mg/L)	45	0.96	0.87	0.41

Taken from: http://watermonitoring.dnrm.qld.gov.au/host.htm

The data collected by DNRM above does not specify the times, flow depth and rate or season in which the data was collected. The water quality will vary considerably depending on these factors. In addition, the gauging station is 50km downstream of the extraction, which will also affect water quality significantly as tributaries such as Mistake Creek and Tomahawk Creek add to the flows to the system.

To gain a better understanding of the water quality at the extraction point at various times of the day and year, a thorough water quality investigation will need to be undertaken.

Monitoring and Sampling

The water quality testing should be undertaken as a long-term exercise to understand the variation of water quality. It is suggested that this is completed by using an automatic DO meter and other automatic instrumentation. This should be completed during the wet seasons, when the water will be extracted for use at the mine.

Mitigating Impacts to water quality

Whilst the extraction of water itself does not pose a threat to water quality the supporting infrastructure has the potential to impact the water quality of the existing system for short periods of time. To ensure that this does not occur effective operating and monitoring plans will need to be put in place. This includes:

- Low flow extractions - limiting extractions where dredging of river bank material may occur (done via the 200ML/d start to pump)
- Bunding of pump station – bunding of the pump station facility will ensure that any pollutants (petrochemicals) spilled will be captured and not released to the environment.

To ensure that water quality is maintained, operating manuals will include the above mentioned measures as a minimum.

4.1.2 FLOODING

The proposed infrastructure (pump station, extraction point and parts of the pipeline) will be located within the flood plain, and designed such that it is able to operate submerged. Whilst the infrastructure will reduce flood detention in the immediate area, the impact to the surrounding area is seen as minimal. This is due to the following reasons:

- ***No nearby properties or residences*** – the proposal will not impact on any other properties or cause afflux to any properties
- ***Flood plain size*** – The area around the proposed pump station is a large flood plain, of which the proposed site is small, thus the overall impact/change in flood extents/afflux would be seen as negligible.

4.1.3 ENVIRONMENTAL VALUES

Environmental values applicable to Belyando River include:

- The presence of high value regrowth vegetation, including - Scattered Eucalyptus *coolabah* along riparian the Belyando River riparian zone.

- Biological integrity of aquatic ecosystems
- Suitability for minimal treatment prior to supply as drinking water
- Water for agricultural use, including irrigation and stock and domestic.

4.1.4 ENVIRONMENTAL IMPACTS

Potential environmental impacts associated with water extraction from the Belyando River with regard to both construction and operational phases include:

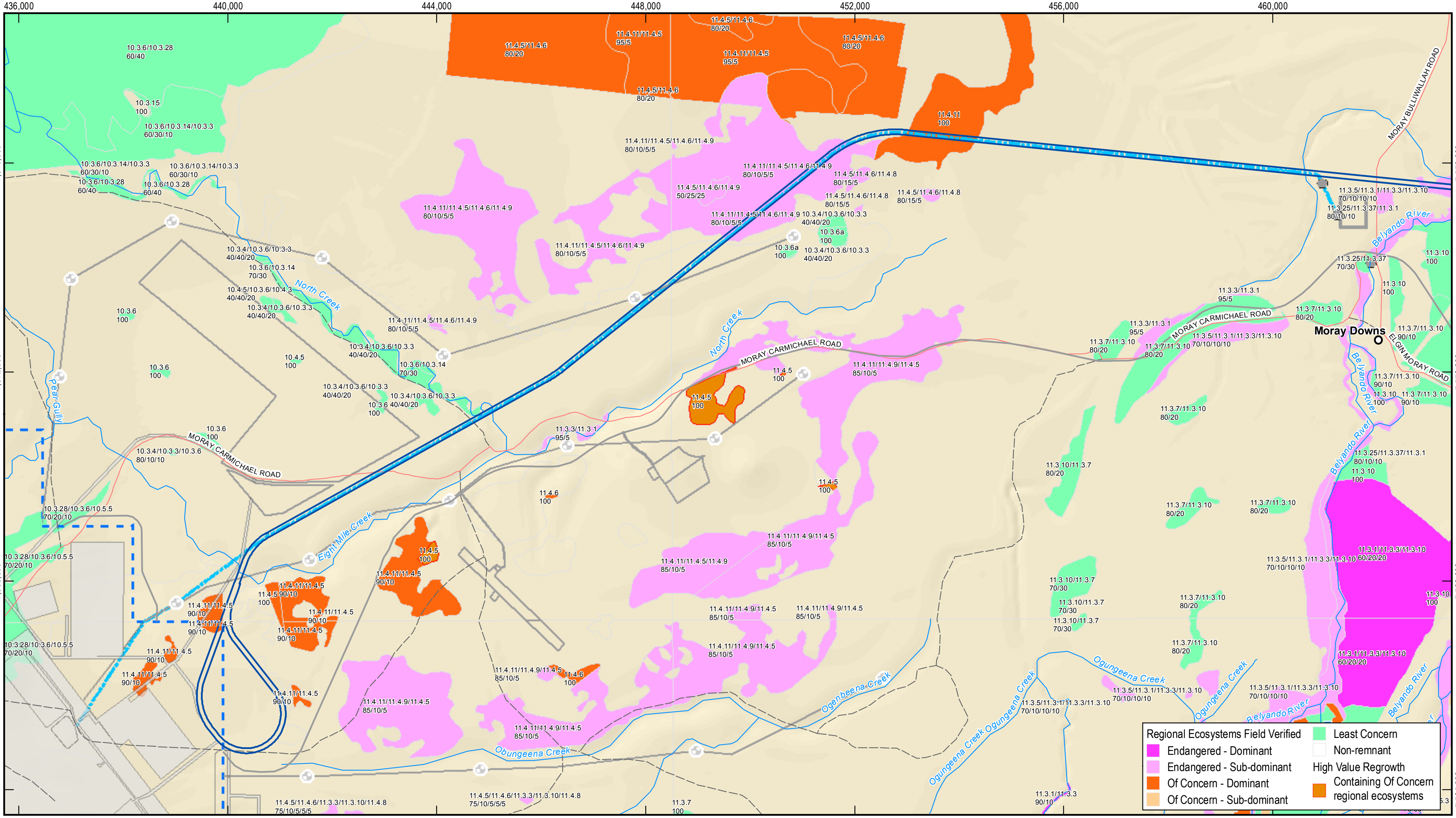
- Riparian vegetation clearing may result in erosion and sedimentation-related impacts, especially in the early years after the diversion prior to re-establishment of groundcover, shrubs and trees (impacts on water quality)
- Clearing of Regional Ecosystems of least concern i.e. River red gum (Eucalyptus camaldulensis) and / or Coolibah (E. coolabah) located in riparian area currently designated for pump site footprint and supply pipeline.
- Clearing in riparian zone and modification to Belyando River at pump station site may disturb habitat for listed fauna species (mainly birds and some mammals).
- Potential weed invasion from earthworks activities in sensitive areas, particularly along watercourses.
- Riparian zone clearing - may lead to a loss of habitat connectivity across the study area, and habitat fragmentation.
- Clearing of large trees within the riparian zone - may impact on species which roost in tree hollows near water.
- Disturbance of watercourse resulting in increased erosion and sediment transport to downstream areas impacting water quality.
- Noise, vibration and dust (associated with construction and operational phases) - may mean some species avoid areas they currently utilise.
- Impacts on environmental flows during operational phases of the project (investigated further in this report).
- Impacts on downstream water users (stock, domestic, irrigation) during operational phase (investigated further in this report).

Adani have assessed the significance of the above-mentioned impacts and is discussed in the EIS (Water Resources) and SEIS.

4.1.5 MITIGATION STRATEGIES

The concept design for pumping infrastructure on Belyando River as well as associated water supply pipelines will be designed to avoid impacts to significant environmental values located in the riparian zone and adjacent floodplain. Sensitive areas in the vicinity of all construction will be clearly demarcated prior to construction to avoid accidental clearing or disturbance.

Construction works adjacent to the Belyando River will be undertaken during dry conditions to assist in minimising indirect impacts to water quality and aquatic ecosystems, adjacent to the pump site and downstream. Construction impacts in the riparian zone will be managed through the implementation of management measures to minimise erosion and prevent the mobilisation and transport of sediments and to prevent potential water quality impacts such as spills and leaks. Monitoring requirements will be included in the Project Environmental Management Plan for both the effectiveness of management measures and the water quality conditions. A project



1:100,000 (at A4)

0 2 4

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Project (Rail)
- Water Supply Pipeline
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Mine (Offsite) - Borehole Indicative
- Mine Footprint

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS

River Harvesting location with areas of potential environmental impact

Job Number	41-26422
Revision	A
Date	31-07-2013

Figure 4

G:\41\26422\GIS\Maps\MXD\0300_Hydrology\41-26422_521_rev_a.mxd

Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DME: EPC1690 (2010)/EPC1080 (2011); DNRM\GHD: Field Verified Regional Ecosystems (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013); Gassman/Hyder: Mine (Offsite) Moray Carmichael Road Realignment (Opt 2) (2013). Created by: AJ weed management plan will also be developed to minimise impacts associated with weed invasion in the riparian zone.

It is expected that any impacts in the riparian zone that occur during construction will be localised and temporary.

As part of the WRP environmental requirements (EFO's and impacts on other users) the operating rules (see table 3.1) have been developed to minimise the impact and ensure all WRP EFO targets have been met.

4.2 WRP REQUIREMENTS

4.2.1 ENVIRONMENTAL FLOW OBJECTIVES

The Water Resource (Burdekin Basin) Plan 2007 provides benchmarks for water extractions within the catchment. It does this by providing project performance indicators and targets in the form of Environmental Flow Objectives (EFO's) and Water Allocation Security Objectives (WASO's). EFO's provide minimal flow requirements at set locations within the catchment (model) that must be met under any proposed scenario and WASO's provide a minimal performance for water licences.

The EFO's are provided in Schedule 5, section 16 of the WRP and the EFO's for the Belyando River are referred to as node 11 in these tables of information. The following low and medium to high EFO's are provided:

Low Flow Objectives

- Total number of days 50% non-zero daily flow is equalled or exceeded be at least 32%
- Total number of days 80% non-zero daily flow is equalled or exceeded be at least 52%
- Total number of days the flow is zero be not more than 35%
- Periods of no flow of more than 1 month but not more than 6 months be no more than 118
- Periods of no flow of more than 6 months be no more than 1

Medium to High Flow Objective

- Mean annual flow, expressed as a percentage of pre development flow pattern, be no less than 92%
- Median annual flow, expressed as a percentage of the pre development flow pattern, be no less than 88%.
- 1.5 year daily flow volume in the simulation period, expressed as a percentage of the 1.5 year daily flow volume for the pre-development flow pattern, be at least 94%
- 5 year daily flow volume in the simulation period, expressed as a percentage of the 1.5 year daily flow volume for the pre-development flow pattern, be at least 96%
- 20 year daily flow volume in the simulation period, expressed as a percentage of the 1.5 year daily flow volume for the pre-development flow pattern, be at least 98%
- The annual proportional flow deviation (APFD) be not more than 1.

The water extraction rules for the proposed scenario were developed to minimise the impacts on the EFO's and the downstream water users.

Impacts on the EFO's have been checked using the appropriate node in the IQQM. The EFO reporting node for the Belyando River in the WRP is referred to as node 11, as mentioned previously. The IQQM node number that represents this location in the model is node number 347.

The statistics provided in the ROP are a minimum performance requirement, which are based on the results of the ROP IQQM but are not the exact numbers resultant of this modelling. The actual results from the ROP IQQM have been reproduced to more clearly demonstrate the impacts of the proposed scenario.

Table 4.2 presents a comparison of the amended model (proposed scenario) on the identified EFO's and on the results of the ROP IQQM.

Table 4.2 EFO Comparison

Statistic	WRP Objective	ROP IQQM	Proposed Scenario
Low flow objectives			
Percent of days 50% non-zero daily flow is equalled or exceeded	32%	32.6%	32.4%
Percent of days 80% non-zero daily flow is equalled or exceeded	52%	53.2%	53.2%
Percent of days zero flow is not more than	35%	33.3%	33.3%
Periods of no flow of more than 1 month but not more than 6 months be no more than	118	118	118
Periods of no flow of more than 6 months be no more than	1	1	1
Medium to high flow objectives			
Mean Annual Flow be at least	92%	92.8%	92.8%
Median Annual Flow be at least	88%	89.1%	89.1%
1.5 year daily flow volume in the simulation period, expressed as a percentage of the 1.5 year daily flow volume for the pre-development flow pattern be at least.	94%	94.7%	94.5%
5 year daily flow volume in the simulation period, expressed as a percentage of the 5 year daily flow volume for the pre-development flow pattern be at least.	96%	96.8%	97.1%
20 year daily flow volume in the simulation period, expressed as a percentage of the 20 year daily flow volume for the pre-development flow pattern be at least	98%	98.0	98.2%
Annual proportional flow deviation (APFD) be not more than	1.0	0.91	0.94

Table 4.2 demonstrates that the proposed amendments to the system (proposed scenario) meet all of the identified EFO’s. This is due to the following:

- The water harvesting is based on flood water which takes water above a threshold that minimises the impact on low flows, and freshes which are critical for the protection of environmental values (and EFO’s).
- No new water is being taken. The 150GL of reserve has already been included in the IQQM and this reserve has been reduced in proportion to Adani extraction requirements.

The table also demonstrates there is negligible difference in results from the actual ROP case results. The apparent increase in flows for the 5 and 20 year Average Recurrence Interval (ARI) statistics are a result of the assessment methodology. ARI flows are calculated using NRM statistical tools provided by the department. It is well within the accuracy of this method to expect that the results can vary slightly up or down by a small amount resultant of very minor changes to the flow

4.2.2 IMPACTS ON OTHER USERS

In additional to meeting EFO requirements, the impact of the proposed Adani water extraction on downstream users along the Belyando River system was also assessed. The operating rules for the Adani extractions have been optimised to minimise this impact and consequently there is limited to no impact on downstream users.

There are no Water Allocation Security Objectives (WASO’s) for the licences on the Belyando River downstream of the Adani extractions but it is still considered prudent to provide some assessment of the impact on these users. Table 4.3 below provides a summary of the impact on the users situated on the Belyando River that may be affected by the Adani extractions. The information summarises the expected extractions rates under the Base Case (WRP scenario) and the Adani Scenario (with amended extractions).

Table 4.3 Impacts on other users

Node	ROP IQQM		Proposed Scenario	
Stock and domestic nodes	**Mean Annual Demand (ML/a)**	**Mean Annual Diversion (ML/a)**	**Mean Annual Demand (ML/a)**	**Mean Annual Diversion (ML/a)**
233	43.1	18.0	43.1	18.0
246	33.6	28.3	33.6	28.3
279	10.1	5.7	10.1	5.7
Water harvesting / irrigation nodes	**Mean Annual Diversion (ML/a)**		**Mean Annual Diversion (ML/a)**	
232	828		828	
291	551		551	
292	4809		4801	
293	2686		2686	
300	3516		3511	
302	1118		1118	

As shown above, no impact on nearby users occurs due to the Adani extractions. This can be attributed to the small percentage of flows seen by Adani when compared to the total flow in the Belyando system and to the threshold adopted for pumping.

The impact on downstream water harvesters is further demonstrated by Figure 4.1. Figure 4.1 presents the annual diversions from the water harvester node directly downstream of the extraction point (node 300) for the ROP IQQM and for the proposed scenario. This figure shows there are very minimal reductions in water harvesting opportunity.

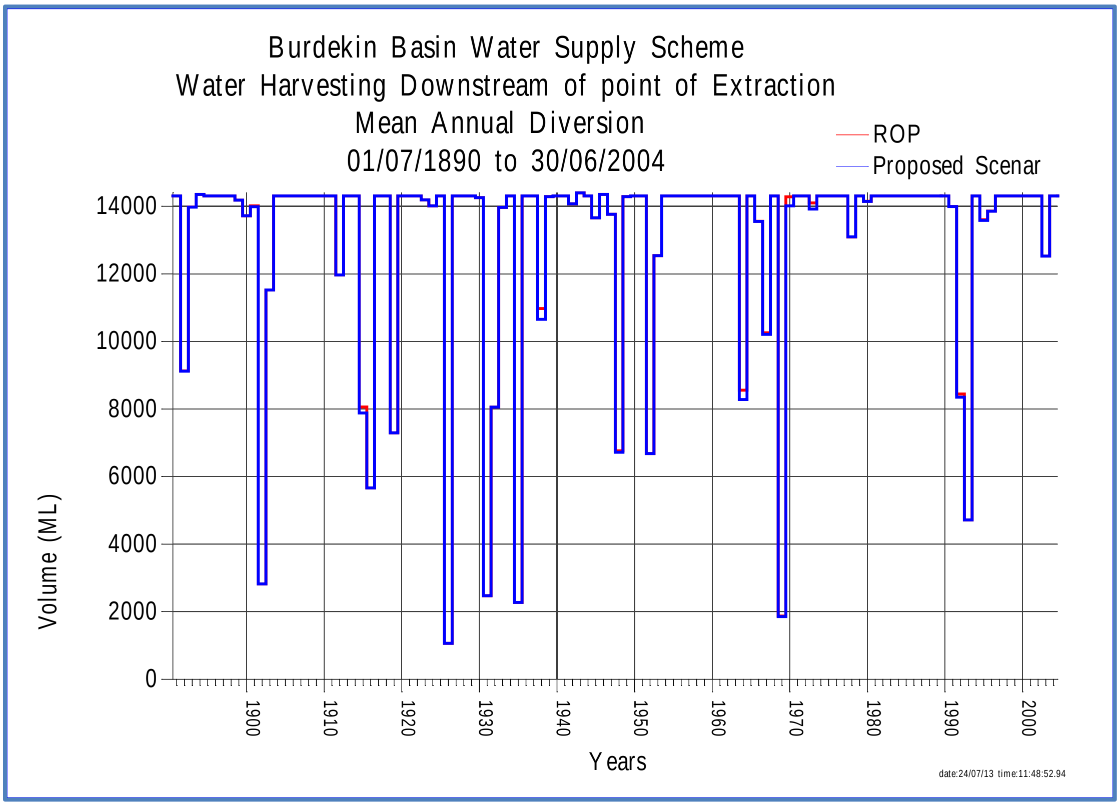


Figure 4.1 Total Water Harvesting Diversion – ROP Case vs. Proposed Case

Further assessment of the impact on flows has been provided in figure 4.2. Figure 4.2 shows a ranked plot of the flows at the Gregory Development Gauging Station (G.S. 120301B), approximately 50 km downstream of the site, for the ROP IQQM and for the proposed scenario. The plot shows there is no impact on flows up to 200 Ml/d and then there is a minor impact on flows between approximately 400 ML/d and 6,000 ML/d.

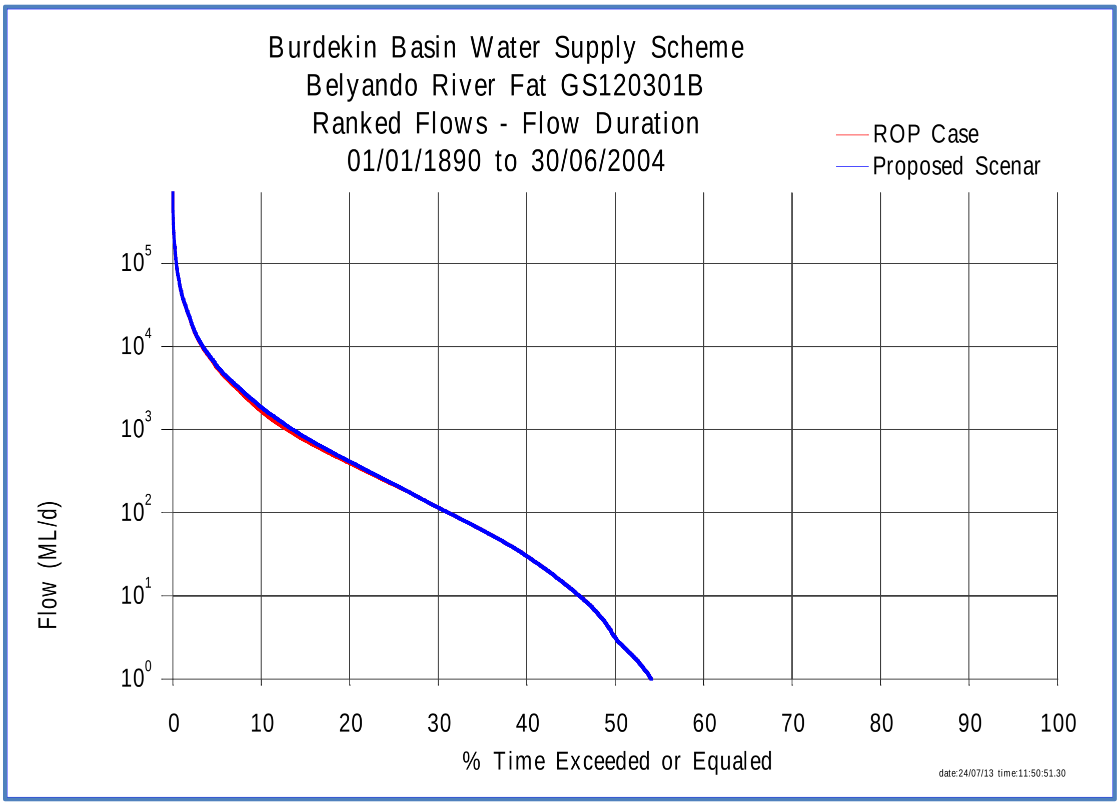


Figure 4.2 Downstream Flow Duration – ROP Case vs. Proposed Case

4.2.3 CUMULATIVE IMPACTS.

A key issue for the regulator is to understand what the total potential future use within each of the water resource basins will be, and what impacts (cumulative etc.) on the system may occur, and how they can be mitigated or planned for. Inherent within each of the WRPs, is an allowance for future development. These allowances are dependent on the EFO's and WASO's within the WRP for each basin. Basins such as Cooper Creek, whose current levels of development only just meet the EFO's, allow limited or no further development. Basins like the Burdekin have a little more room to move, with some allowance for future development before the EFO's are not met.

These allowances for additional water to be provided are usually in the form of a volumetric reserve for each of the basins sub-catchments. They are not yet allocated, but included in the assessment of the WRP and Resource Operation Plan (ROP). For the Burdekin Basin a number of un-supplemented and supplemented reserves exist, with Table 4.4 below showing the available reserve in sub-catchment E (Location of the proposed Adani water harvester).

Table 4.4 Burdekin Basin Reserves

Location – Burdekin Basin	Reserved purpose	Mean annual volume (ML)
Sub – Catchment E	General	130,000
Sub – Catchment E	Strategic	20,000
Sub – Catchment E	TOTAL	150,000

The basin reserves are modelled in the ROP and WRP IQQM scenarios (ROP scenario was used as the baseline case for the hydrological assessment discussed here) to understand the cumulative impact of all estimated/future development on the system. This includes impacts on EFO's and other users in the system.

Currently, for the WRP and ROP, the department has assessed the cumulative impact of future users in sub-catchment E on the rest of the system with a single large unallocated water harvester (node 335 on the node diagram given in appendix A) on the Belyando/Suttor River, which reflects a mean annual diversion of 150GL/a (total reserve available). For the Adani extraction, no new water was taken from the basin, only re-distributed upstream (refer to table 3.2). Water was taken from the reserve on the Belyando/Suttor River (node 335) upstream to the Adani mine extraction site (node 735) on the Belyando River therefore; the change to the system (as shown) was minimal. The only impact on the system is some very minor reduction in opportunity for users directly downstream of the Adani extraction node.

Further spatial distribution of the reserve currently modelled in one node (node 335) into a number of small water harvesters similar to the Adani proposal, is not considered plausible to reflect a clear assessment of potential impacts on the future system for the following reasons:

Identifying future use - Currently there is no clear understanding, via publicly available information, of where the future uses may occur. Estimates can be made based on developed EIS and known mining leases, however uncertainties surround which projects will ever evolve beyond the planning and approval phase. Any assessment not completed by the regulator, who is in a better position to make the required assumptions, will be based on unsubstantiated assumptions and is not likely to reflect the future demand distribution accurately and therefore a reliable impact assessment.

Maintaining conservatism - Extractions of similar volume upstream of node 335 will have less of an impact on the EFO reporting node resulting in a less conservative assessment of the catchment. The current method of assessment therefore provides a more conservative assessment of the cumulative impact.

Limited impact on users – If an estimate was to be made where the majority of potential water harvesters may be developed, it would be in the region further upstream of the Adani Coal mine on the Belyando and the tributaries of the Carmichael River and Mistake Creek. Many of these areas have very few other users and the water available, if not extracted, is generally lost to creek breakouts, floodplains and transmission losses with little flow ever reaching areas downstream. This substantiates that a model of this type would result in reduced cumulative impacts with the current representation of unallocated water in node 335 providing a more conservative and more effective planning scenario.

Based on the above, allowable cumulative impacts have already been taken into account as the nearest EFO reporting node is down stream of both extraction nodes and this provides the most conservative representation of all future use in sub-catchment E of the Burdekin Basin.

4.3 GROUNDWATER

The proposed water harvesting extractions are not expected to have any discernible impact on local groundwater flows.

The hydrogeological unit, identified in the EIS for the Belyando River in the vicinity of the extraction site, is unconsolidated alluvium and colluviums of Cainozoic and Quaternary. These strata were identified to include sands, gravels and clay-dominated layers of variable thickness and lateral extend which form an unconfined aquifer along the Carmichael River. This study suggests that similar alluvial aquifers of this nature are likely to exist along the Belyando River as well.

The EIS reported there are strands of evidence to suggest interaction between groundwater and surface water resources in the Carmichael River. It suggests it is likely that groundwater discharges to the river upstream of the mine site and that the river may incur losses to groundwater downstream of the mine site.

The proposed water harvesting operation focuses on periods of high flows which only occur for short durations of time and therefore have limited opportunity to interact with groundwater aquifers. Groundwater recharge occurs gradually over time during high, medium and low flows so the proposed extraction regime will have minimal impact on potential groundwater recharge.

The unconfined aquifers identified for this region means it is unlikely that losses from the river would be recharging specific confined aquifers and it is therefore likely there would be minimal impacts on any bores within the area.

Further information can be found in the EIS (hydrogeological study) and SEIS, which outlines the interaction between surface and groundwater and potential impacts from extractions.

4.4 CULTURAL HERITAGE MANAGEMENT PLAN

4.4.1 BACKGROUND

The water infrastructure required for the water harvesting operation is located within the external boundaries of the Jagalingou People registered native title claim (QUD85/04, QC04/6). In 2011 Adani held discussions with the Jagalingou people in regards to the development/construction of the mine and associated infrastructure on their lands. The result of these discussions included a Cultural Heritage Management Plan (CHMP) which has been developed for the life of the Project. This has been approved by the Chief Executive of DNRM in November 2011. This details what is required during construction of any works on the Jagalingou Peoples lands.

4.4.2 POTENTIAL IMPACTS

Several infrastructure sites exist along the Belyando River which is an area seen to be culturally and scientifically significant due to the presence of scared trees, grinding grooves and other scattered artefacts (Adani EIS Volume 1 Section 4). This indicates that these areas were used as seasonal camping areas and pathways through the region. Therefore based on the above findings from the Adani EIS (Volume 1 Section 5), it is recommended that during detailed design and construction phases strict adherence to the CHMP be carried out. Further details of cultural heritage impact mitigation efforts are discussed in the EIS.

5 SUMMARY AND CONCLUSIONS

A summary of the information required to support the water licence application for the Belyando River (as required by the Burdekin WRP 2007) is provided in Table 5.1,

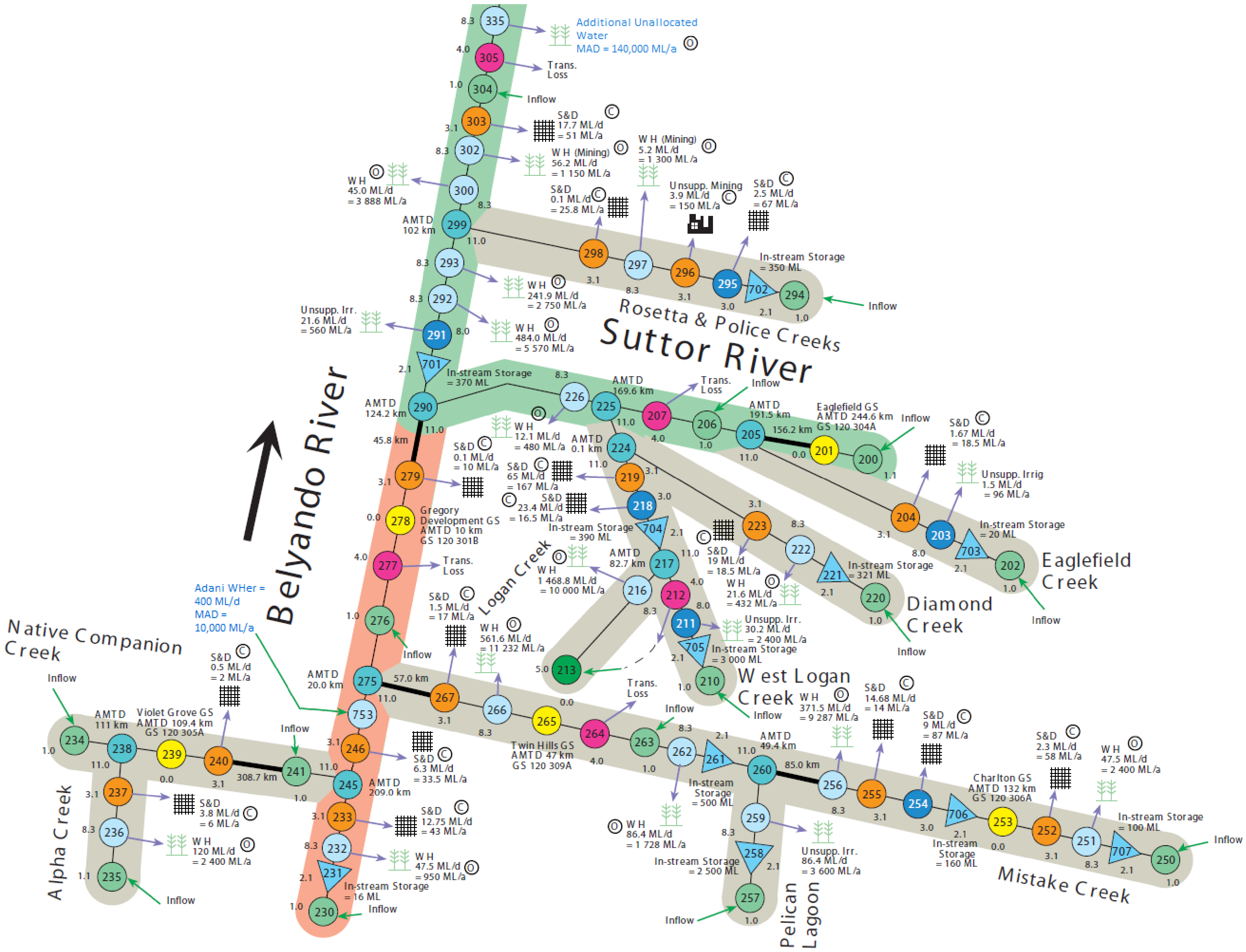
Table 5.1 Elements of a water allocation to take un-supplemented water (Burdekin Basin WRP 2007)

Element	Description
Location of extraction	70km AMTD along the Belyando River
Purpose of water use	To supply water to Adani's Carmichael Mine on Lot 662 of PH1491.
Mean Annual Diversion	10,000 ML/a
Maximum Rate of water extraction	400 ML/d
Daily Volumetric Limit	400 ML/d
Annual Volumetric Limit	12,500 ML/a
Flow Conditions	Flow must exceed 200 ML/d
Water Allocation Group	Un-supplemented Water Harvester
Water Management Area	Sub-catchment E of the Burdekin Basin WRP

The above proposed water harvester for the Adani Coal Mine, meets all of the *Water Act 2000* and Burdekin Basin WRP requirements.

APPENDIX A

AMENDED IQQM NODE DIAGRAM



NODE LEGEND

- 0.0 stream gauge/reporting node
- 1.0 tributary/residual inflow
- 1.1 headwater inflow
- 1.2 pumped inflow
- 2.0/2.1 on/in stream storage
- 2.0 on river en-route reservoir
- 2.1 on river headwater reservoir
- 3.0 fixed demand from storage (town water supply), channel initial loss, unused water allocation
- 3.0 unsupplemented demand tied to in-stream storage
- 3.1 unsupplemented demand (stock & domestic)
- 4.0 unsupplemented effluent
- 4.1 supplemented effluent
- 5.0 unsupplemented effluent return
- 5.1 supplemented effluent return
- 8.0 supplemented irrigation demand, channel continued loss, unused water allocation
- 8.0 unsupplemented irrigation tied to in-stream storage
- 8.3 unsupplemented irrigation/waterharvesting/additional unallocated water
- 8.3 unsupplemented spear/bedsand irrigation
- 9.0 forced environmental release
- 9.1 flow control (credit water)
- 9.4 maximum release node
- 11.0 confluence

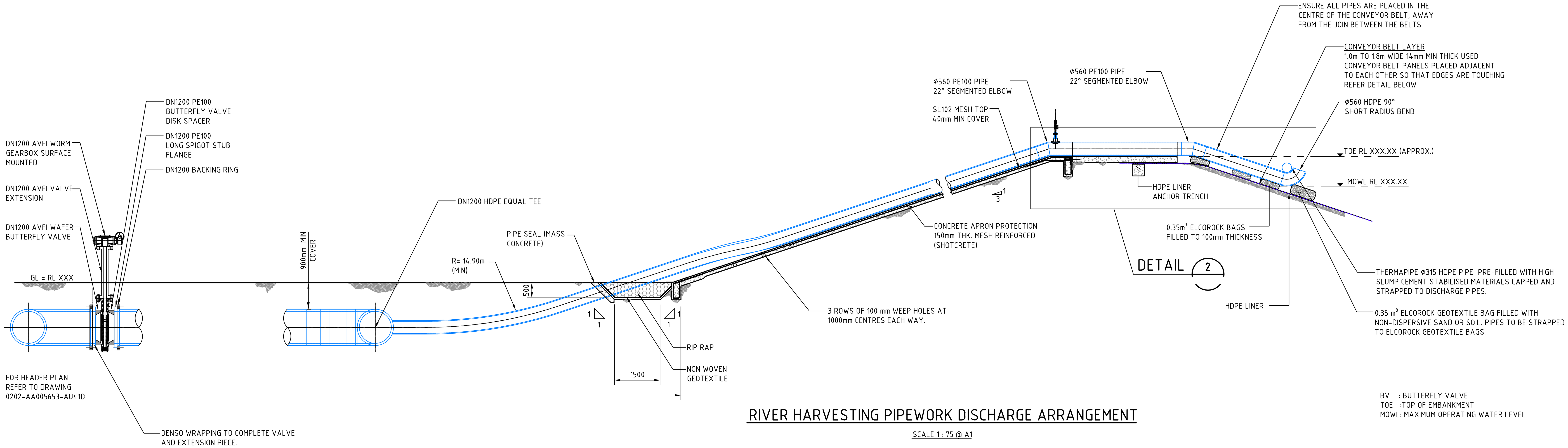
New and Amended Nodes

753	Adani Water Harvester
335	Additional Unallocated Water

ABBREVIATIONS

AMTD	Adopted Mean Thread Distance
BHWSS	Burdekin Haughton Water Supply Scheme
BRIA	Burdekin River Irrigation Area
BS	Bedsand
Cont	Continuous
EFO	Environmental Flow Objectives
Dist	Distribution
EOS	End of System
GS	Gauging Station
ha	Hectares
Irri	Irrigation
Km	Kilometre
MAD	Mean Annual Diversion
ML	Megalitres
ML/a	Megalitres per annum
Mt	Mount
NBWB	North Burdekin Water Board
NQ	North Queensland
OFS	Off-stream Storage
OSS	On-stream Storage
Supp	Supplemented
S&D	Stock and Domestic
SBWB	South Burdekin Water Board
TRANS	Transmission
TWS	Town Water Supply
T.W.	Tailwater
Unsup	Unsupplemented
WH	Waterharvesting
Ⓞ	represents Opportunity Demand Pattern for user
Ⓒ	represents Constant Daily Demand for user
MOL	Minimum Operating Level
NOL	Normal Operating Level
FSL	Full Supply Level
REH	High Priority Reserve
IN	Minimum Inflow
mAHD	metre in Australian Hight Datum
GOSS	Gattonvale Off_stream Storage
BRW	Bowen River Weir

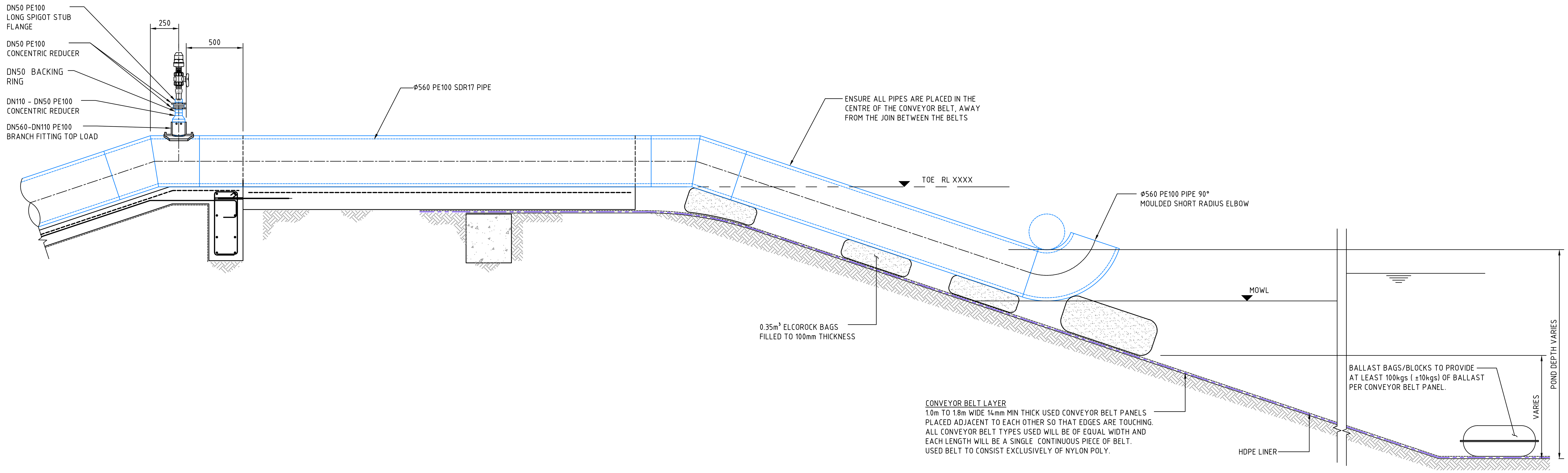
APPENDIX B
INFRASTRUCTURE LAYOUT AND LOCATION



BV : BUTTERFLY VALVE
TOE : TOP OF EMBANKMENT
MOWL: MAXIMUM OPERATING WATER LEVEL

RIVER HARVESTING PIPEWORK DISCHARGE ARRANGEMENT

SCALE 1 : 75 @ A1



AIR VALVE FOOTING R.C. PRECAST CULVERT DETAIL-2

SCALE 1 : 20 @ A1

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. ALL LEVELS IN m AHD.
3. FOR DETAILS OF THE 2GL STORAGE REFER TO DRAWINGS 0200 & 0201-AA005653-AU41D.

Issue	Description	Date
01	BFS FINAL ISSUE	30 APR 13

Status: BFS DESIGN
NOT TO BE USED FOR CONSTRUCTION

Scales	AS SHOWN	Current Issue Signatures	
		Author	A.Kumar
Original Size	A1	Checker	D.Morris
Datum	-	Approver	O.Bartz
Grid	-	© Copyright reserved	

Filename: 0203-AA005653-AU41D-00.DWG

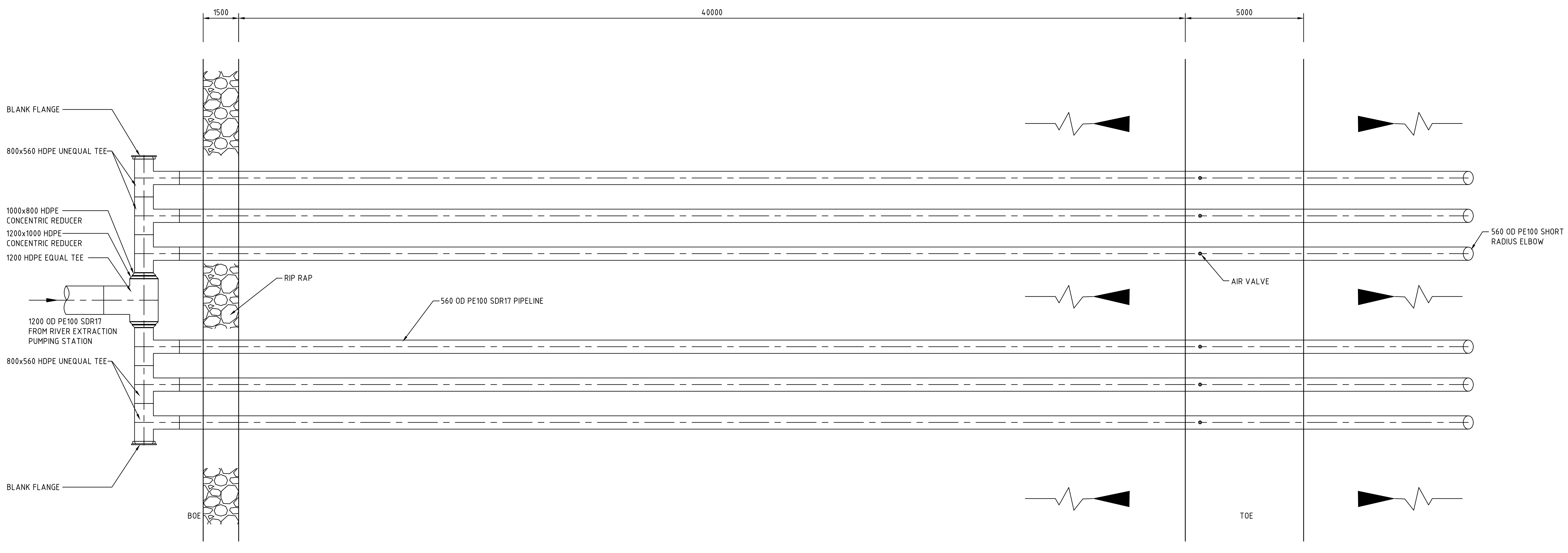
Client: adani™

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street, Southport, QLD 4215, Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

Project
CARMICHAEL COAL MINE OFF-SITE WATER INFRASTRUCTURE BFS DESIGN

Title
RIVER EXTRACTION PIPELINE DISCHARGE ARRANGEMENT

Drawing No.	Project No.	Issue
0203	AA005653- AU41D	01



PLAN
1 : 100

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

LEGEND

TOE - TOP OF EMBANKMENT
BOE - BOTTOM OF EMBANKMENT

Issue	Description	Date
01	BFS FINAL ISSUE	30 APR 13

Status
BFS DESIGN
NOT TO BE USED FOR CONSTRUCTION

Scales	AS SHOWN	Current Issue Signatures	
		Author	A.Kumar
Original Size	A1	Checker	D.Morris
Datum	-	Approver	O.Bartz
Grid	-	© Copyright reserved	

Filename: 0202-AA005653-AU41D-00.DWG

Client

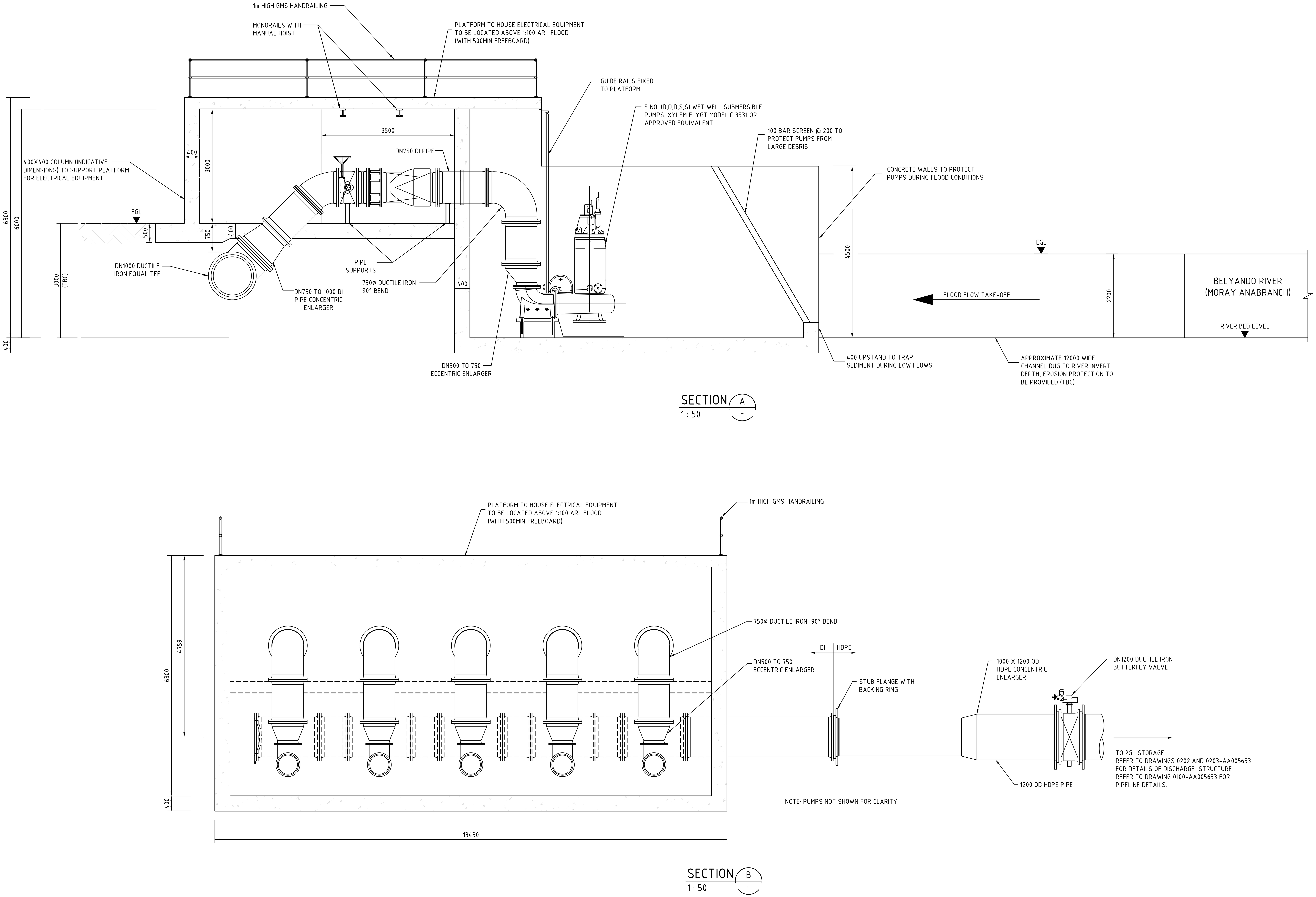
adani

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street,
Southport, QLD 4215,
Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

Project
CARMICHAEL COAL MINE OFF-SITE
WATER INFRASTRUCTURE
BFS DESIGN

Title
RIVER HARVESTING PIPELINE
DISCHARGE STRUCTURE PLAN

Drawing No.	Project No.	Issue
0202 -	AA005653- AU41D	- 01



NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. FOR PUMP STATION LOCATION REFER TO GENERAL ARRANGEMENT DRAWING 0001-AA005653-AU41D.
3. STAIRS TO ACCESS HIGH LEVEL ELECTRICAL EQUIPMENT NOT SHOWN.

REINFORCEMENT:

1. WALLS - N16-150 BOTH DIRECTIONS
2. BASE SLAB - N16-150 BOTH DIRECTIONS
3. SUSPENDED SLAB - N16-150 IN SPAN, N16-200 DISTRIBUTION (SECONDARY DIRECTION)
4. COLUMN - 1 % OF CROSS SECTIONAL AREA

LEGEND

EGL - EXISTING GROUND LEVEL
GMS - GALVANISED MILD STEEL

Issue	Description	Date
01	BFS FINAL ISSUE	30 APR 13

Status: **BFS DESIGN**
NOT TO BE USED FOR CONSTRUCTION

Scales	AS SHOWN	Current Issue Signatures	
		Author	Charan
Original Size	A1	Checker	D.Morris
Datum	-	Approver	O.Bartz
Grid	-	© Copyright reserved	

Filename: 0176-AA005653-AU41D-00.DWG

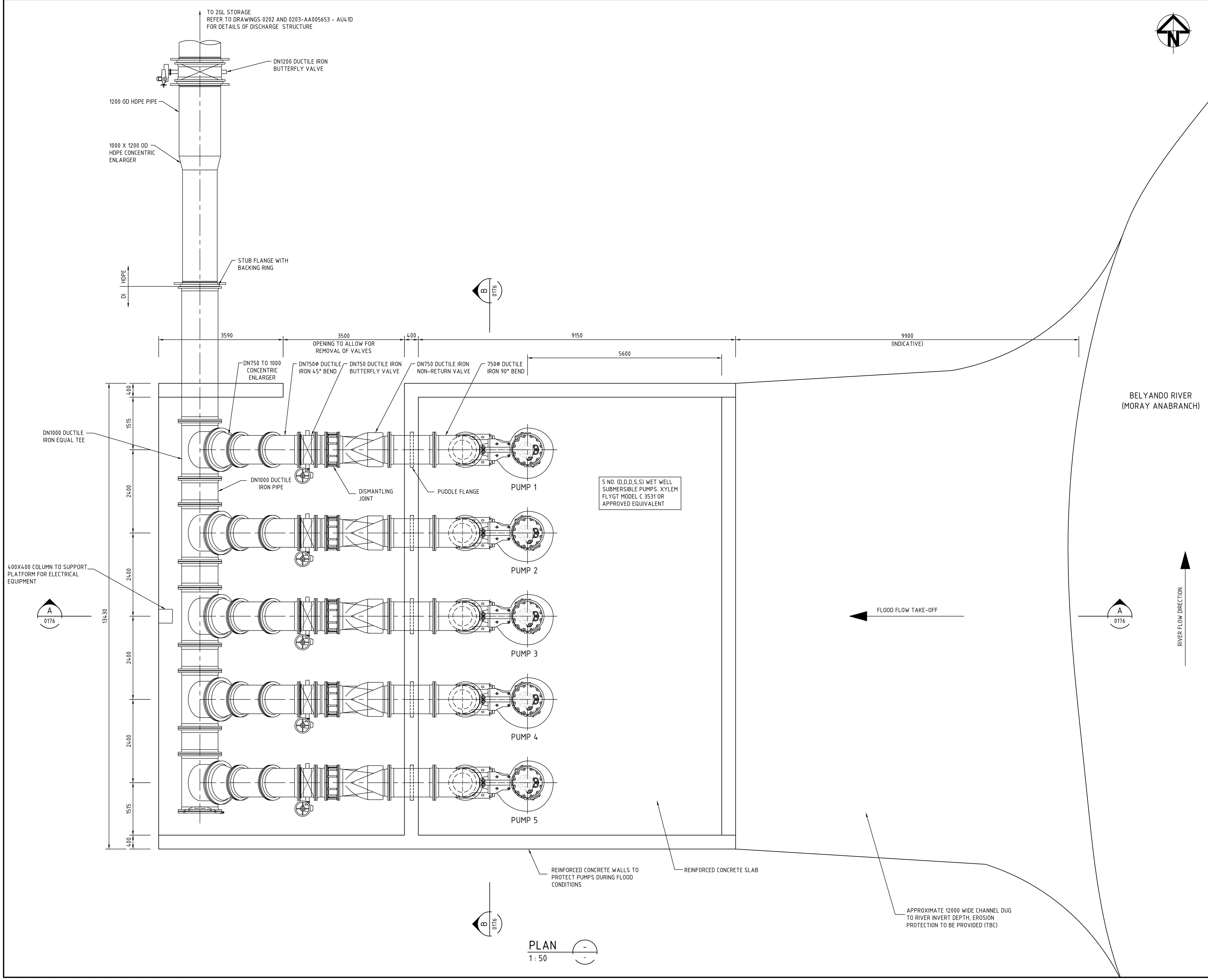
Client: adani™

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street, Southport, QLD 4215, Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

Project
CARMICHAEL COAL MINE OFF-SITE WATER INFRASTRUCTURE BFS DESIGN

Title
RIVER HARVESTING PUPMPING STATION SECTIONS

Drawing No. | Project No. | Issue
0176 - AA005653- AU41D - 01



NOTES:

1. ALL DIMENSIONS IN MILLIMETRES.
2. THE PUMPS FEED CHANNEL IS HYDRAULICALLY LINKED TO THE RIVER. LEVEL CONTROLS WILL ENSURE THAT NO WATER IS PUMPED UNTIL THE REQUIRED FLOOD LEVEL IS REACHED.
3. STAIRS TO ACCESS TO HIGH LEVEL ELECTRICAL EQUIPMENT NOT SHOWN.
4. BAR SCREEN NOT SHOWN, SEE SECTION FOR DETAILS.
5. THE RIVER DEPTH LEVEL IS TO BE CONFIRMED.
6. FOR PUMP STATION LOCATION REFER TO GENERAL ARRANGEMENT DRAWING 0001-AA005653-AU41D.

REINFORCEMENT:

1. WALLS - N16-150 BOTH DIRECTIONS
2. BASE SLAB - N16-150 BOTH DIRECTIONS
3. SUSPENDED SLAB - N16-150 IN SPAN
   N16-200 DISTRIBUTION
   (SECONDARY DIRECTION)
4. COLUMN - 1 % OF CROSS SECTIONAL AREA

LEGEND

EGL - EXISTING GROUND LEVEL

Issue	Description	Date
01	BFS FINAL ISSUE	30 APR 13

Status
BFS DESIGN
NOT TO BE USED FOR CONSTRUCTION

Scales	AS SHOWN	Current Issue Signatures	
		Author	Charan
Original Size	A1	Checker	D.Morris
Datum	-	Approver	O.Bartz
Grid	-	© Copyright reserved	

Filename: 0175-AA005653-AU41D-00.DWG

Client

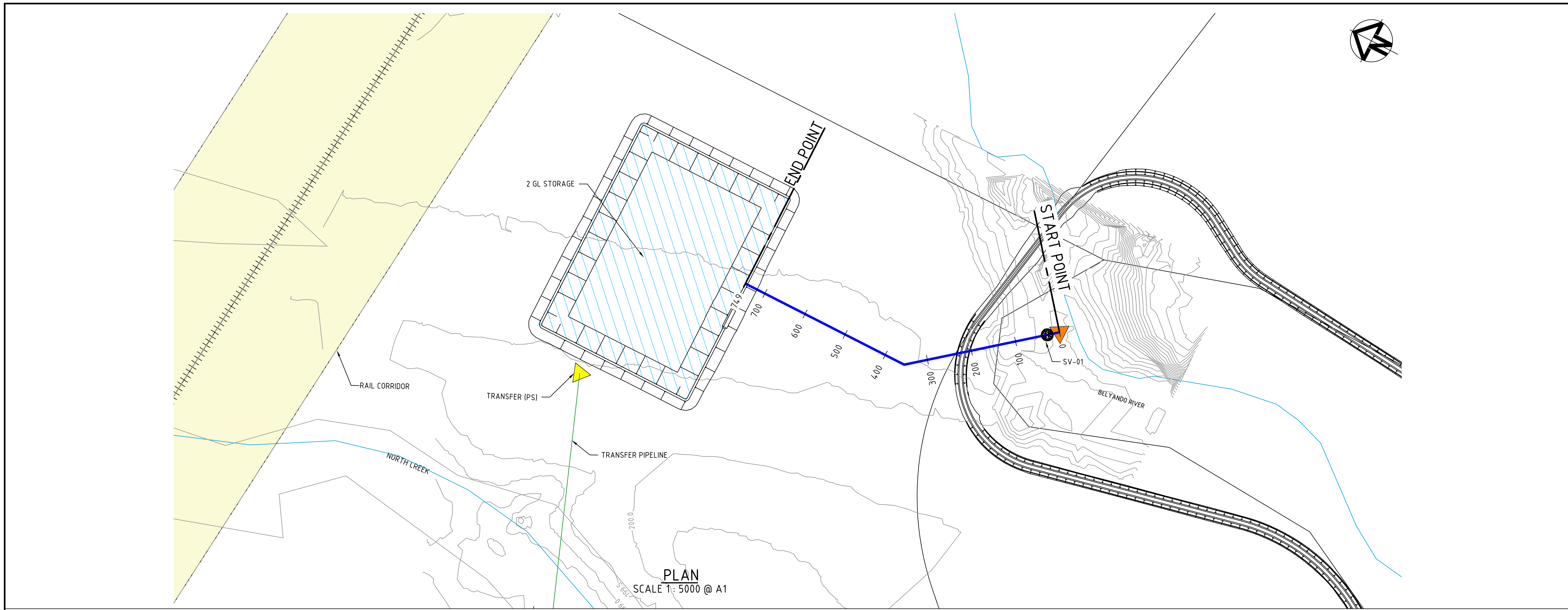
adani™

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street, Southport, QLD 4215, Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

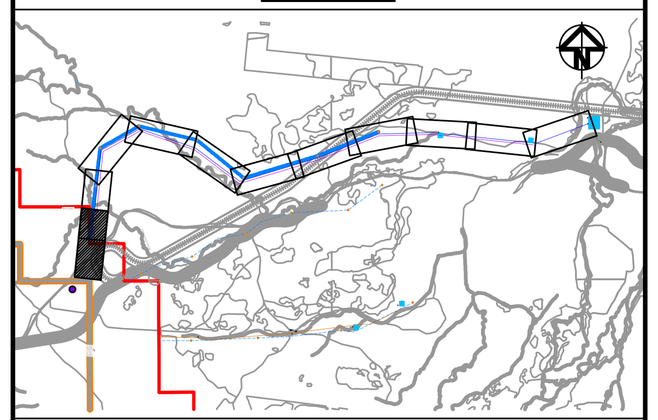
Project
CARMICHAEL COAL MINE OFF-SITE WATER INFRASTRUCTURE BFS DESIGN

Title
RIVER HARVESTING PUMPING STATION PLAN

Drawing No.	Project No.	Issue
0175	AA005653- AU41D	01



PLAN
SCALE 1 : 5000 @ A1

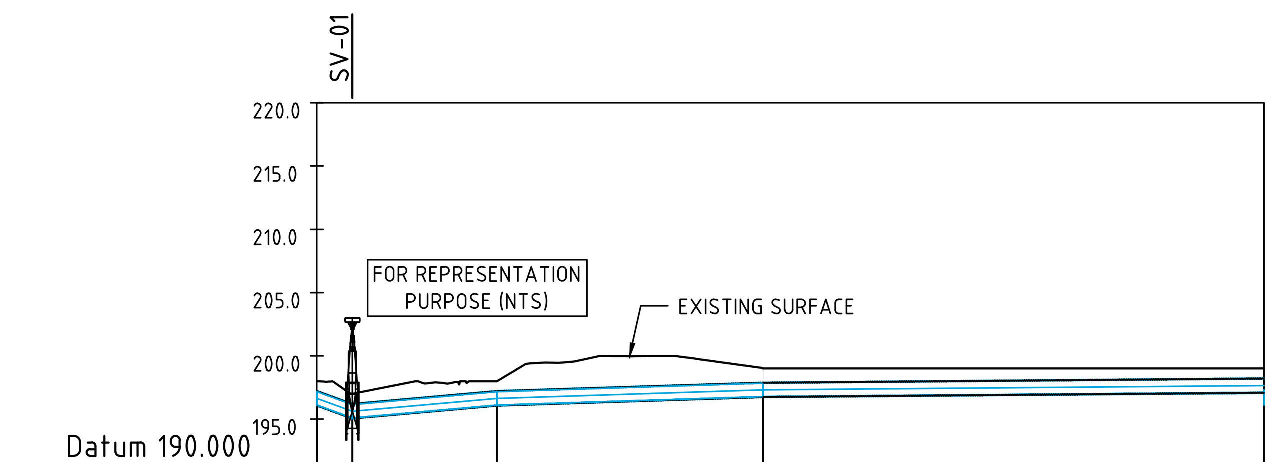


NOTES:

01. FOR OVERALL PLAN REFER TO DRAWING 001-AA005653-AU41D
02. FOR TYPICAL TRENCH DETAILS REFER TO DRAWING 0160-AA005653-AU41D
03. FOR CREEK CROSSING DETAILS REFER TO DRAWING 0161-AA005653-AU41D
04. FOR ROAD CROSSING DETAILS REFER TO DRAWING 0162-AA005653-AU41D
05. FOR TYPICAL AIR VALVE DETAILS REFER TO DRAWING 0164-AA005653-AU41D
06. FOR TYPICAL SCOUR VALVE DETAILS REFER TO DRAWING 0165-AA005653-AU41D

LEGEND:

- RIVER HARVESTING PIPELINE
- BOREHOLE COLLECTION PIPELINES
- TRANSFER PIPELINE
- ROAD
- CREEKS
- STORAGE
- IN STREAM STORAGE PUMP STATION
- BOREHOLE
- TRANSFER PUMP STATION
- AV AIR VALVE
- SV SCOUR VALVE



COVER DEPTH IN m	0.750	0.775	0.750	1.087	0.750
PIPE INVERT IN m	196.118	195.102	196.120	196.789	197.125
GROUND LEVEL IN m	196.778	195.762	196.780	197.974	198.310
CHAINAGE	0.000	28.051	142.356	352.682	748.574
SLOPE	3.62%	-0.89%	-0.32%	-0.08%	
LENGTH IN m	28.069	114.310	210.327	395.892	
PIPE DETAILS (CL to CL LENGTHS)	1200mm OD PE100 SDR17				

100 m 0 400 m
SCALE 1 : 5000

40 m 0 10 m
SCALE 1 : 500

LONGITUDINAL SECTION

Issue	Description	Date
01	BFS FINAL ISSUE	30 APR 13

Status: **BFS DESIGN**
NOT TO BE USED FOR CONSTRUCTION

Scales	AS SHOWN	Current Issue Signatures	
		Author	P.McKillop
Original Size	A1	Checker	D.Morris
Datum	-	Approver	O.Bartz
Grid	-	© Copyright reserved	

Filename: 0100-AA005653-AU41D-00.DWG

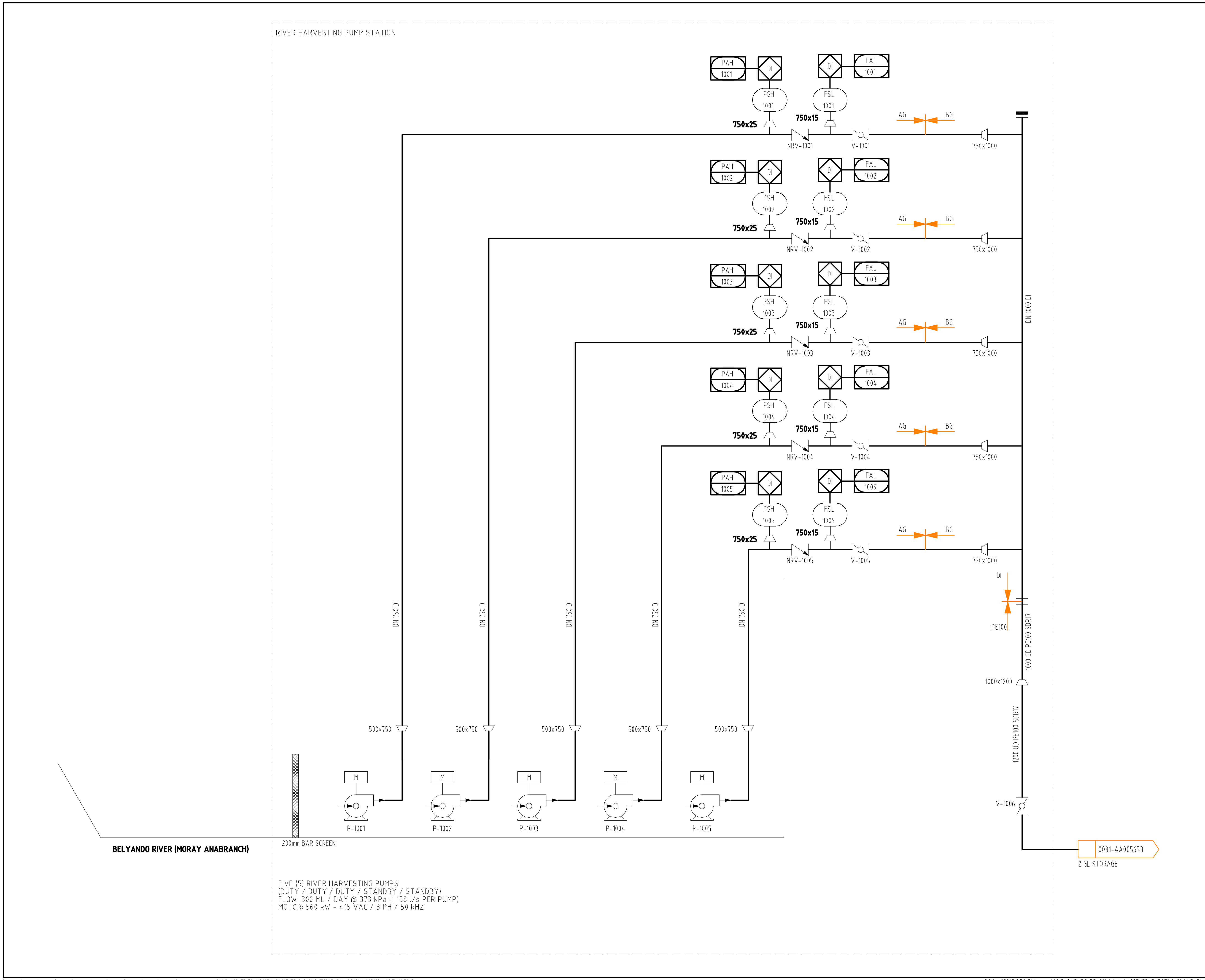
Client: adani

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street, Southport, QLD 4215, Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

Project
CARMICHAEL COAL MINE OFF-SITE WATER INFRASTRUCTURE BFS DESIGN

Title
RIVER EXTRACTION PIPELINE PLAN AND SECTION

Drawing No.	Project No.	Issue
0100	AA005653- AU41D	01



NOTES:

1. FOR P&ID SYMBOL KEY, REFER TO DRAWING 0093-AA005653-AU41D
2. FOR PUMP STATION DETAILS, REFER TO DRAWINGS 0175 AND 0176-AA005653-AU41D..
3. ALL DUCTILE IRON PIPEWORK TO BE PRESSURE CLASS 20.

Issue	Description	Date
01	BFS ISSUE	30 APR 13

Status: **BFS DESIGN**
NOT TO BE USED FOR CONSTRUCTION

Scales	NTS	Current Issue Signatures	
		Author	J.Nazeer
Original Size	A1	Checker	D.Morris
Datum	-	Approver	D.Bartz
Grid	-	© Copyright reserved	

Filename: 0080-AA005653-AU41D-00.DWG

Client: adani™

Hyder Consulting
HYDER CONSULTING PTY LTD
PO Box 1653, 45 Nerang Street,
Southport, QLD 4215,
Australia
Tel: +61 7 5503 4818
Fax: +61 7 5591 4778

Project
CARMICHAEL COAL MINE OFF-SITE
WATER INFRASTRUCTURE
BFS DESIGN

Title
PROCESS AND
INSTRUMENTATION DIAGRAM
RIVER HARVESTING
PUMP STATION

Drawing No.	Project No.	Issue
0080	AA005653- AU41D	01