Addendum B – Decommissioning of Sediment Dams

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1 INTRODUCTION

During the construction of the Maules Creek Rail Spur, Rail Loop and Mine Access Road, temporary sediment dams were established as erosion and sediment control (ESC) measures. The purpose of the temporary sediment dams was to collect runoff from construction areas and allow for settling prior to discharge to the receiving environment or pumped to the mine water management system, consistent with the objectives of the water management strategy described in the *Maules Creek Coal Project Environmental Assessment* (Whitehaven, 2011).

Catchment areas draining to the temporary sediment dams located near the rail spur, rail loop and mine access road have been rehabilitated and stabilised. These temporary sediment dams are therefore not required and need to be decommissioned and removed to reinstate natural flow regimes.

The temporary sediment dams to be decommissioned and removed include (Attachment 1):

- MC04, MC05, SD9 and MC02 (Area A);
- MC08 and MC09 (Area B);
- SD7 and MC10 (Area C); and
- MC17A and MC17B (Area E).

Sediment dams SD7 and MC10 are required to be decommissioned and removed in accordance with an enforceable undertaking issued by the Minister's delegate (the Natural Resources Access Regulator) under the relevant provisions of the *Water Management Act 2000* (WM Act).

Decommissioning and removal of each sediment dam will involve earthworks (i.e. cutting/removing raised embankments or dam walls, and filling depressions) to establish a free draining land surface and a Dam Dewatering Protocol for management of native fauna in the dams. The removal works are described in Section 2 of this Addendum. Section 3 of this Addendum describes the approval considerations relevant to the decommissioning works.

Addendum B supplements the mines Water Management Plan and has been developed in response to the EU with NRAR. Addendum B is not associated with Addendum A, which documented the construction of high wall dams to divert clean water.

2 DECOMMISSIONING AND REMOVAL WORKS

2.1 DECOMMISSIONING OF DAMS ON NON-MINOR STREAMS

Dams SD7 and MC10, located in series on a non-minor stream west of the active mining area, are to be decommissioned. The locations of these dams, on the northern side of the site access road, is shown in Attachment 1.

WRM Water and Environmental Pty Ltd (WRM) prepared a hydraulic assessment of the drainage line re-establishment and decommissioning of SD7 and MC10 using HEC-RAS software (Attachment 2). The drainage lines re-establishment was designed in accordance with the following guidelines:

- Queensland Department of Natural Resources and Mines. Guideline: Works that interfere with water in a watercourse – watercourse diversions. State of Queensland, September 2014 (Queensland Department of Natural Resources and Mines [DNRM], 2014);
- Hardie, R and Lucas, R. 2002. Bowen Basin River Diversions Design and Rehabilitation Criteria. Project C9068 Report for Australian Coal Association Research Program (ACARP). Fisher Stewart Ltd, July 2002 (Hardie & Lucas, 2002); and
- Managing Urban Stormwater: Soils and Construction (Landcom, 2004). Managing Urban Stormwater: Soils and Construction Volume 2E Mines and Quarries (Department of Environment & Climate Change [DECC], 2008).

The DNRM Guideline (2014) identifies five outcomes for watercourse diversions. These outcomes are summarised in Table 1, along with a brief summary of how each of these outcomes has been achieved for the re-establishment of the drainage line through SD7 and MC10.

Table 1
Target Outcomes for Reinstated Drainage Lines

	Outcome	Achieved by
1	The permanent watercourse diversion incorporates natural features (including geomorphic and vegetation) present in the landscape and in local watercourses.	Constructing the landform from in-situ materials with cross-sections transitioning smoothly between upstream and downstream reaches. Natural vegetation will be allowed to re-establish in reinstated reaches.
2	The permanent watercourse diversion maintains the existing hydrologic characteristics of surface water and groundwater systems.	Removal of the dams will return hydrologic characteristics to pre-development conditions.
3	The hydraulic characteristics of the permanent watercourse diversion are comparable with other local watercourses and are suitable for the region in which the watercourse diversion is located.	A detailed hydraulic assessment has been undertaken using the HEC-RAS one-dimensional hydraulic model. Key hydraulic parameters were compared between reinstated reaches and reaches upstream, downstream and between the two dams. A comparison of hydraulic parameters is provided in Table 2, Table 3, and Table 4.
4	The permanent watercourse diversion maintains a sediment transport regime that allows the watercourse diversion to be self-sustaining, while minimising any impacts to upstream and downstream reaches.	Hydraulic characteristics consistent with undisturbed reaches. Local vegetation will be re-established post-construction. Erosion control measures to be implemented in higher-risk areas.
5	The permanent watercourse diversion and associated structures maintain equilibrium and functionality and are appropriate for all substrate conditions they encounter.	Landform constructed from in-situ materials with cross-sections transitioning smoothly between upstream and downstream reaches.

Table 2 Channel Velocity (m/s) – Post Construction

Reach	50% AEP			2% AEP		
	20%ile	Mean	80%ile	20%ile	Mean	80%ile
Upstream of MC10	1.3	1.5	1.7	0.9	1.8	2.4
MC10*	1.8	1.9	1.9	2.4	2.5	2.5
Between MC10 and SD7	0.9	1.3	1.6	1.3	1.6	2.0
SD7 *	1.8	1.8	1.9	2.3	2.4	2.4
Downstream of SD7	1.5	1.7	1.9	2.1	2.3	2.5

* Reinstated reach Guideline values: 50% AEP (no vegetation) = 1.0 m/s; 2% AEP = 2.5 m/s

Table 3 Bed Shear Stress (N/m^2) – Post Construction

Reach	50% AEP			2% AEP		
	20%ile	Mean	80%ile	20%ile	Mean	80%ile
Upstream of MC10	27	41	55	10	53	83
MC10*	25	25	26	37	37	37
Between MC10 and SD7	22	50	74	36	69	95
SD7 *	25	25	25	35	36	37
Downstream of SD7	33	46	61	35	36	37

* Reinstated reach Guideline values: 50% AEP = <40 N/m^2; 2% AEP = <50 N/m^2

Table 4 Channel Stream Power (N/m.s) – Post Construction

Reach	50% AEP			2% AEP		
	20%ile	Mean	80%ile	20%ile	Mean	80%ile
Upstream of MC10	34	69	95	10	120	197
MC10*	46	47	48	90	93	92
Between MC10 and SD7	21	75	121	46	130	190
SD7 *	46	47	47	82	86	91
Downstream of SD7	55	81	115	100	171	226

* Reinstated reach Guideline values: 50% AEP (no vegetation) <35 N/m.s; 2% AEP = <150 N/m.s

A detailed hydraulic analysis of a 700 m length of the reinstated drainage line through SD7 and MC10 was undertaken using the HEC-RAS one-dimensional hydraulic model. Design peak flow rates for the 50% Annual Exceedance Probability (AEP) and 2% AEP events were estimated using the Rational Method.

The results of the hydraulic assessment are shown in Table 2, Table 3 and Table 4 which compare channel velocity, bed shear stress and stream power, respectively, for the reinstated reaches through SD7 and MC10 with the reaches upstream of, downstream of, and between the two dams. Results are shown for “post-construction” conditions which would represent the worst case for flow velocity prior to re-establishment of vegetation. A Manning’s “n” value of 0.023 was adopted for the reinstated reaches.

Table 2, Table 3 and Table 4 also indicate Guideline threshold values derived from an ACARP (Hardie & Lucas, 2002) study of natural watercourses and diversions in Queensland’s Bowen Basin. However, the Guideline notes that the hydraulic characteristics of the existing watercourse should be used as first preference to develop design parameters for any modified watercourse.

The results of the hydraulic assessment for post-construction conditions show:

- For more frequent events (50% AEP), flow velocities in the reinstated reaches (1.8 to 1.9 metres per second [m/s]) are higher than the undisturbed reaches (0.9 to 1.9 m/s) and well above the Guideline value of 1.0 m/s.
- For larger events (represented by 2% AEP), maximum flow velocities in the reinstated reaches are within the Guideline value (2.5 m/s) but generally higher than velocities in the undisturbed reaches.
- Bed shear stress values in the reinstated reaches (25 to 37 Newton metres squared [N/m2]) are within the range of undisturbed values and less than the Guideline value of 40 N/m2.
- Stream power in the reinstated reaches (46 to 93 N/ms) is within the range of undisturbed values and below the Guideline value for the 2% AEP event. However, stream power in the reinstated reaches for smaller events (46 to 48 N/ms for 50% AEP) is above the Guideline (no vegetation) value of 35 N/ms.

In summary, the results of the hydraulic assessment indicate that the modelled hydraulic parameters in the reinstated reaches are within the range of the undisturbed reaches for larger events. However, for more frequent events, the hydraulic parameters in the reinstated reaches may be higher than some of the undisturbed reaches and exceed Guideline values.

This means there is a moderate risk of erosion in the reinstated reaches during small runoff events in the immediate post-construction period before vegetation becomes established. The following measures are proposed to address the erosion risk:

- The design of the proposed reinstated drainage lines includes rock protection at the upstream end of MC10 (Attachment 3) where the hydraulic analysis indicated potentially high velocities.
- Jute matting or similar erosion protection will be installed on channel banks to provide additional erosion resistance in the post-construction period until vegetation becomes established.
- A TARP has been developed for monitoring and, if necessary, remediation of the reinstated reaches – see Table 5.

Table 5 TARP – Reinstated Drainage Lines

Level	Trigger	Action	Response
Level 1 (Post-event inspection – no damage)	Recorded site rainfall >25 millimetres (mm) in 24 hour period.	• Inspect reinstated drainage lines to check for evidence of instability such as: o bank slumping; o excessive rilling; o debris accumulation; o active areas of erosion; and o excessive sediment accumulation.	• Collect site photographs of reinstated drainage line for comparison to future conditions.
Level 2 (Minor damage)	Post-event inspection identifies minor damage	• Arrange maintenance if required to correct identified issues. • Implement erosion control measures to prevent recurrence.	• Undertake post-maintenance inspection approximately 1 month after works to confirm maintenance activities effective.
Level 4 (Major damage or evidence of geomorphic instability)	Post-event inspection identifies major damage	• Undertake detailed assessment to investigate likely cause of major damage. • Obtain design advice on best actions for remediation and potential design changes to prevent recurrence. • Implement recommended works.	• Undertake post-maintenance inspection approximately 1 month after works to confirm remediation works effective.

2.2 DECOMMISSIONING OF DAMS ON MINOR STREAMS

The sediment dams that are not located on any streams, but are adjacent to, include:

- MC02, MC04 and MC05;
- SD9;
- MC17A & MC17B; and
- MC18.

The sediment dams will require cutting/removing raised embankments or dam walls, and filling depressions to establish a free draining land surface as a decommissioning requirement.

Engineering designs have been prepared by WRM for each site and include details of the design for the finished surface and cut and fill extents. Designs for decommissioning of temporary sediment dams are shown in Attachment 3. Dams MC09 and MC08 only require backfilling to prevent ponding of water and therefore detailed designs were not required, however, concept layouts have been provided in Attachment 3. The design to decommission the dams have been developed to comply with the guideline *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

2.3 EROSION AND SEDIMENT CONTROLS

During the decommissioning phase, temporary ESC measures shall be installed and maintained in accordance with best-practice methods and *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) to minimise erosion until native vegetation is established. The ESC measures that will be used at each site include:

- Clean water diversion around the work site where possible and practical.
- Sediment fences erected on the downstream side of the disturbance area to contain sediment.
- All disturbed areas will be remediated and include application of topsoil and seeding with native vegetation or pasture grasses where applicable. If suitable growth medium is not available, hydromulch shall be used (except in drainage lines).
- Steeper grade sections will incorporate rock lining or jute matting installed as additional protection where required.

The ESC measures shall be maintained until suitable vegetation cover has been established. A Trigger Action Response Plan (TARP) has been developed (Table 5) for the ongoing monitoring and maintenance of the decommissioned dams to ensure the controls remain effective and any damage is rectified. Sediment and Erosion Control plans for each dam are shown in Attachment 3.

2.4 DEWATERING PROTOCOL

A dewatering protocol has been developed by Eco Logical Australia to manage fauna potentially in the sediment dams in response to consultation with the Biodiversity, Conservation and Science Directorate (BCS). The protocol outlines steps for dewatering and fauna relocation and is provided in Attachment 4. The dewatering protocol was reviewed by the BCS and the following will be included in the dewatering process:

- The supervising ecologist will have the appropriate permits and research ethics required to trap, relocate or euthanise any fauna unsuitable for relocation;
- DPI and NSW fisheries will be consulted on any displacement of native fish species if they are encountered in the dams.

2.5 MANAGING EXCESS FILL

The dams proposed to be decommissioned were operated as either clean water dams or dirty water dams. Therefore, no contaminates are expected. The water quality results shown in Attachment 5 indicate there is unlikely to be any contaminates in the soils, as there are no contaminates in the water.

Cut and fill balances will be managed to achieve a stable land surface at each site and minimise excess fill overall. If excess fill is produced, soil testing will be undertaken to confirm that it is suitable (i.e. not contaminated) for placement. If any contaminated soils are detected they will be collected by a suitably licensed contractor and disposed of at an appropriately licensed facility.

Excess fill will be sampled and tested in accordance with principles described in AS4482.1-2005: *Guide to Sampling and Investigation of Potentially Contaminated Soil* (Part 1: Non-volatile and semi-volatile compounds) and AS4482.2-1999: *Guide to sampling and investigation of potentially contaminated soil* (Part 2: Volatile compounds).

2.6 PROJECT SCHEDULE

Decommissioning of all dams is estimated to take up to 3 months (weather dependant). The project schedule is broken into the following key stages:

1. Awarding of the contract to civil contractors and mobilisation of equipment to site-4 to 6 weeks.
2. Site preparation including installation of ESC measures – 1 week.
3. Dewatering of the dams in accordance with the dewatering protocol – 1 week.
4. Civil earthworks – 4 weeks.
5. Site remediation and revegetation – 1 week.

The decommissioning works shall not occur immediately prior to or during the period of highest rainfall, which is from December to February. In accordance with the enforceable undertaking, works shall commence based on the timing of approval:

- If approval is received prior to 31 August 2022, MCCPL shall commence works.
- If approval is received after 31 August 2022, MCCPL shall commence works after 1 March 2023.

3 ASSOCIATED APPROVALS

3.1 CONTROLLED ACTIVITY APPROVAL

All sediment dams that will be removed are located adjacent to, but not within any streams, except for SD7 and MC10 which are located on non-minor streams. However, a Controlled Activity Approval under section 92 of the WM Act is not required for removal of SD7 and MC10 given the exemption under clause 35, Part 2 of Schedule 4 of the *Water Management (General) Regulation 2018* (i.e. SD7 and MC10 are being removed in accordance with the enforceable undertaking).

3.2 EPL VARIATION

Environment Protection Licence (EPL) 20221 regulates the discharge of water at SD7 and SD9.In consultation with the EPA, EPL 20221 was varied to remove the license discharge points from SD7 and SD9.

A review of the historical water quality data collected at the Namoi River, SD7 and SD9 was undertaken by WRM, the report is included in Attachment 5. The review compared the field pH, total suspended solids and laboratory electrical conductivity in SD7 and SD9 to water quality collected in the Namoi River, which indicates:

- Water quality in SD7 and SD9 is generally the same as water quality in the Namoi River.
- Water quality during discharge events from SD7 and SD9 is generally better quality than in the Namoi River 80th percentile values.

Based on this analysis, the water quality collected in SD7 and SD9 is of similar quality to the Namoi River, indicating that the catchment has stabilised and the sediment dams are no longer required to manage runoff and the natural flow regime can be re-established to return water to the environment. These dams are now operated as clean water dams (comply with Harvestable Rights) until they are decommissioned.

The Maules Creek Coal Mine Rehabilitation Management Plan (RMP) incorporated within the current MOP, has been amended to describe removal works for sediment dams located within the mining lease boundary (i.e. MC16, MC17A, MC17B, and MC18).

3.3 POST-WORKS

In accordance with the enforceable undertaking, a report will be provided to the Natural Resources Access Regulator within 2 weeks of the completion of works at SD7 and MC10.

4 REFERENCES

Department of Environment and Climate Change (2008) *Managing Urban Stormwater: Soils and Construction Volume 2E Mines and Quarries.*

Hardie, R & Lucas, R. (2002) *Bowen Basin River Diversions Design and Rehabilitation Criteria. Project C9068 Report for Australian Coal Association Research Program. Fisher Stewart Ltd, July 2002.*

Landcom (2004) *Managing Urban Stormwater: Soils and Construction.*

Whitehaven (2011) *Maules Creek Coal Project Environmental Assessment Statement*

Queensland Department of Natural Resources and Mines (2014) *Guideline: Works that interfere with water in a watercourse – watercourse diversions. State of Queensland, September 2014.*

ATTACHMENT 1
SEDIMENT DAM LOCATION FIGURES

Paper size A3

Scale: 1:40,000

500 0 500 1000 1500

Metres

Spatial Reference

Legend

- Mine Asset
- Access road
- Railway
- Dam
- Project Boundary
- Offset conservation area

WHITEHAVEN COAL PTY LTD

Name of Map: MCCM Dam Decommission

Date Exported: 9/06/2022 12:21 PM

Path: C:\Local_Copy\7. WHC GIS Projects\0. ARCHIVE\WHITEHAVENCOAL_MCCM_20210813_AS\WHITEHAVENCOAL_MCCM_DAMS_DECOMISSION_20210813_AS.aprx

ATTACHMENT 2
MAULES CREEK DAM DECOMMISSIONING MEMORANDUM

Memorandum

Date	4 August 2021	Pages	4
Attention	Huw Morgan		
Company	Whitehaven Coal		
Job No.	0644-44-B		
Subject	Maules Creek Coal Mine, Dam Decommissioning		

Dear Huw,

WRM has completed drawings showing decommissioning concept plans for 12 dams along the rail corridor at the Maules Creek Coal Mine (10 storages on minor streams and 2 on non-minor streams). A 1D hydraulic assessment (HEC-RAS) has been completed for each of the dams on non-minor streams.

For all 12 dams, except MC08 and MC09, 3 drawings have been provided:

- a conceptual decommissioning layout/plan (showing cut/fill volumes and locations);
- a longitudinal section of the reinstated stream centreline; and
- a plot of cross-sections taken from the decommissioning design surface.

MC08 and MC09 had limited survey information. Each of these dams has one conceptual plan/layout drawing each showing approximate cut and fill areas.

Drawings were completed for the following dams on minor streams:

- MC04
- MC05
- SD9
- MC02
- MC17A
- MC17B
- MC18
- MC16
- MC08
- MC09

SD7 and MC10 are located on a non-minor stream. We completed a 1D hydraulic assessment to aid in the design of a suitable configuration for the reinstated streamline. The hydraulic assessment included:

- estimation of the 2 and 50 year ARI discharges using the Rational Method (RM);

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Tel 07 3225 0200
wrmwater.com.au

ABN 96 107 404 544

- a channel concept design and surface in 12D/Civil 3D based on natural profiles and cross-sections upstream and downstream of the dam locations;
- a simple 1D hydraulic model (HEC-RAS) of the reconstructed channel design to quantify flow velocities for both post-construction conditions (low channel roughness, n = 0.023 in design channel areas) and long-term re-vegetated conditions (higher channel roughness, n = 0.035 in design channel areas); and
- identification of any required temporary or permanent erosion control measures that may be necessary.

Rational Method results:

Time of concentration (tc) calculations were based on the Pilgrim and McDermott method (0.76*A^0.38, A in km^2, tc in hrs). 2 year ARI (39% AEP) and 50 year ARI (2% AEP) Rational Method values and results are shown in Table 1.

MC10 is upstream of SD7. The current catchment to SD7 is larger than MC10 (361.5 ha vs. 338.6 ha) so the larger catchment to SD7 has been adopted as a representative catchment area for RM calculations.

Table 1: Rational Method (RM) data and calculations

Variable	2 yr ARI	50 yr ARI
Area (km^2)	3.615	3.615
Fy	0.85	1.15
Intensity (mm/hr)	21.0	48.7
Cy	0.204	0.276
tc (hr)	1.24	1.24
Q (m^3)	**4.3**	**13.5**

HEC-RAS 1D hydraulic model velocities:

Figure 1 and Figure 2 show modelled velocity profiles through dams MC10 and SD7 for post-construction and revegetated conditions. Due to the stream gradient, velocities are generally high and present the risk of erosion. Velocities are particularly high at the transition from the natural channel to the design channel at the upstream end of dam MC10. Erosion protection, such as dumped rock rip-rap, will be required at this location to reduce erosion potential (shown on drawing 0644-44-025_A-MC10 EARTHWORKS – LAYOUT). The reach of interest is susceptible to erosion due to high natural gradients. Hence, ongoing monitoring of creek erosion should be undertaken and repairs completed as necessary to maximise long-term stability.

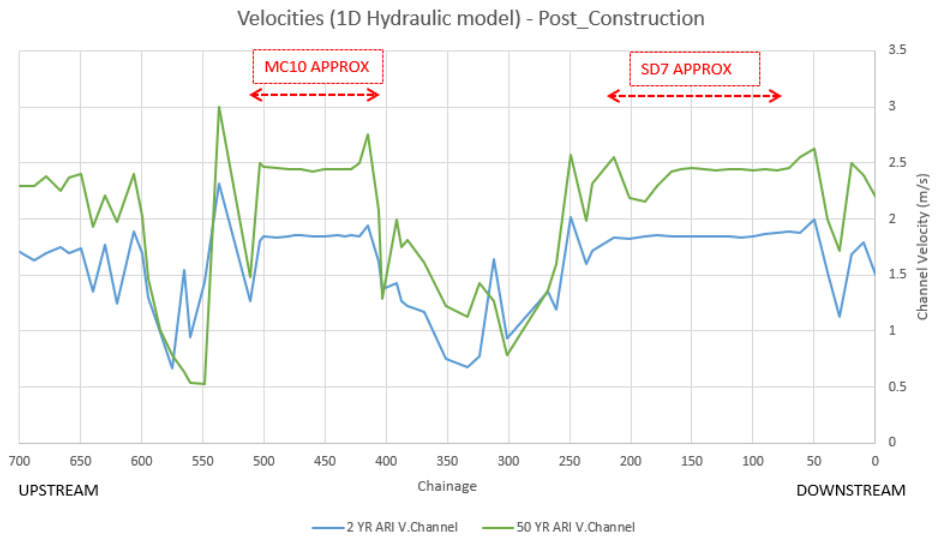


Figure 1 – 1D Velocity plots for design channel post-construction

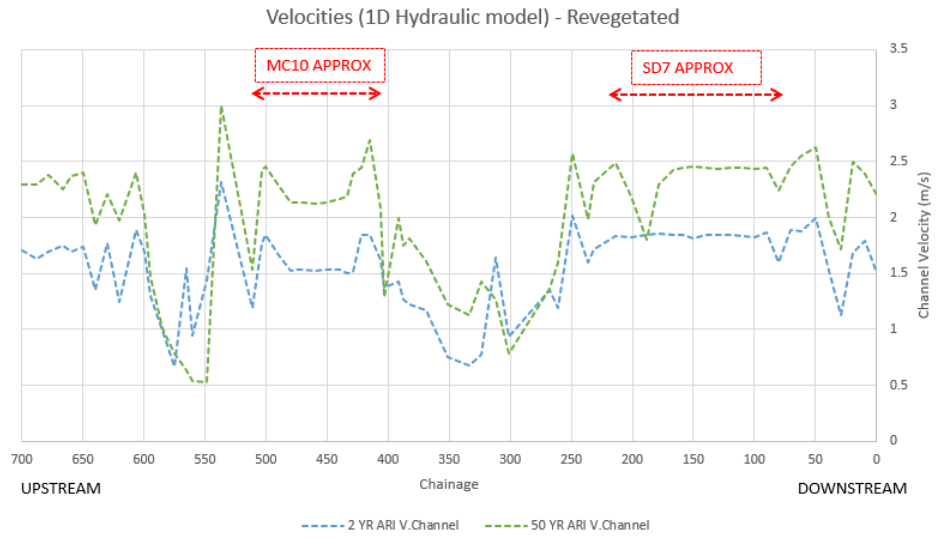


Figure 2 - 1D Velocity plots for design channel revegetated

Please do not hesitate to contact me if we can be of further assistance.

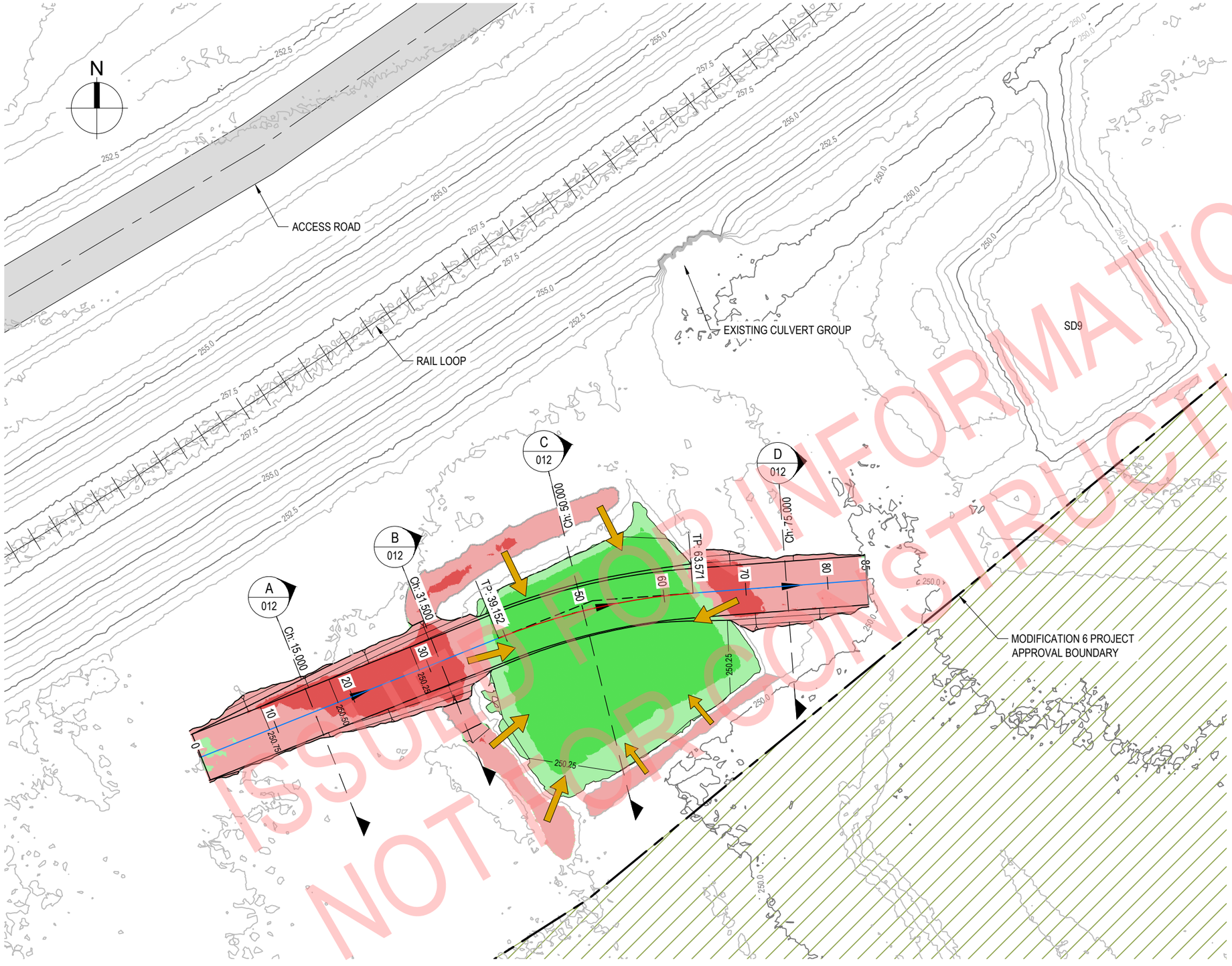
For and on behalf of

WRM Water & Environment Pty Ltd

Matthew Briody

Principal Engineer

ATTACHMENT 3
DAM DECOMMISSIONING DIAGRAMS AND SEDIMENT & EROSION CONTROL PLANS



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-1.307	-0.500	CUT
	-0.500	0.000	CUT
	0.000	0.500	FILL
	0.500	2.200	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC02	243	-841	-598
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

1. COMPACTION AND SWELL FACTORS NOT CURRENTLY ACCOUNTED FOR.
2. CUT/FILL FACTOR SET TO 1.00. (TO BE ADVISED BY CLIENT).
3. NO ALLOWANCE CURRENTLY MADE FOR TOPSOIL STRIP IN CUT/FILL VOLUMES. (TO BE ADVISED BY CLIENT).
4. ALL DRAWINGS ISSUED FOR INFORMATION ONLY AND TO ASSIST WITH PROJECT COSTING. CIVIL DESIGN DETAIL INCLUDING COMPACTION AND FILL MATERIAL SPECIFICATION BY OTHERS.

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

0 25m

SCALE - 1 : 500 (A3)
MGA-94 Zone 56

MC02 PLAN CUT/FILL EXHIBIT

REFERENCE

DRG No.	TITLE
0644-44-012	MC04 EARTHWORKS - SECTIONS
0644-44-011	MC04 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	11.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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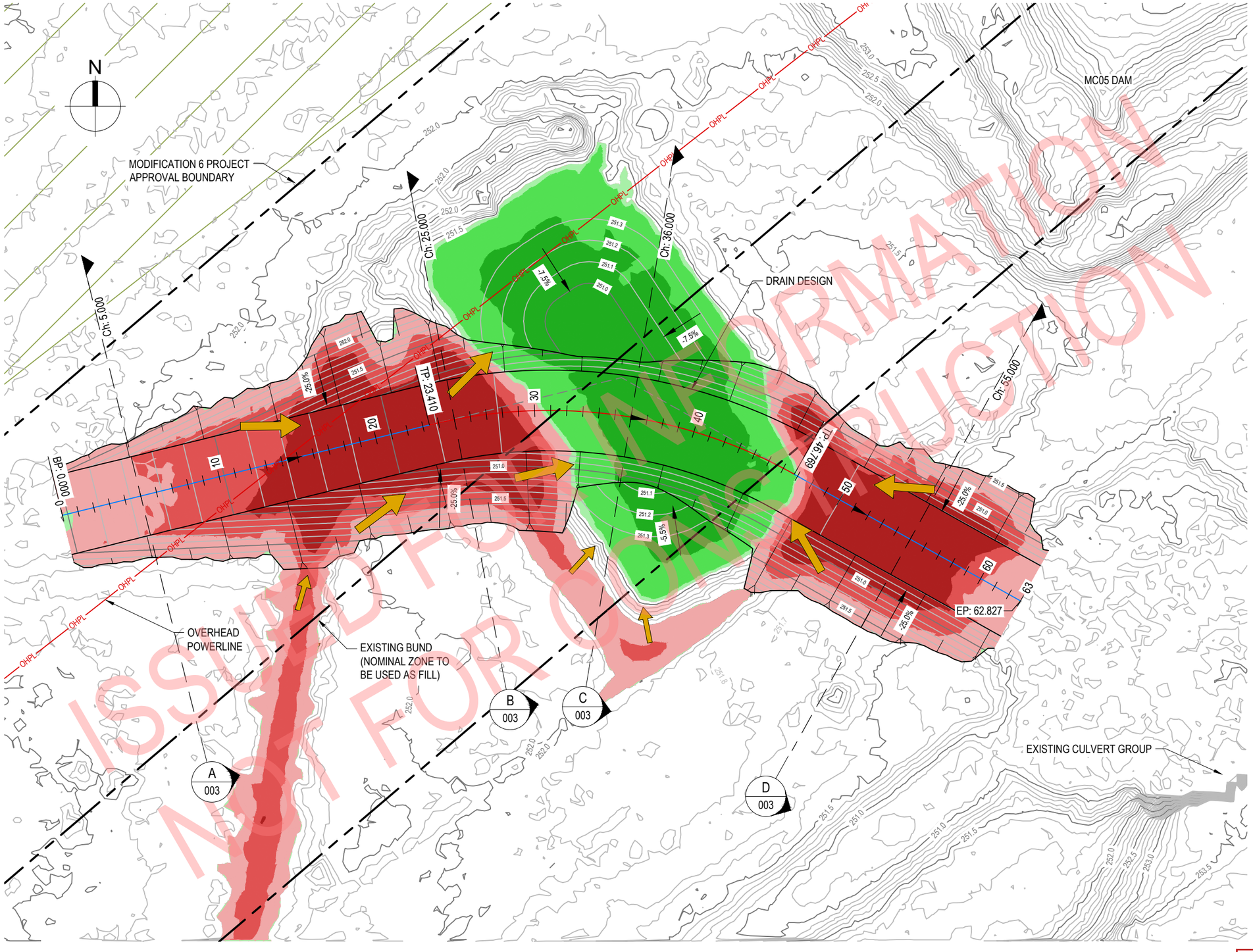
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC02 EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE 1:500	WRM DRG No. 0644-44-010	REV A



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-1.488	-0.600	CUT
	-0.600	-0.300	CUT
	-0.300	0.000	CUT
	0.000	0.100	FILL
	0.100	0.900	FILL
	0.900	1.700	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC04	295	-279	16
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND
- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET

NOTES:
1. COMPACTION AND SWELL FACTORS NOT CURRENTLY ACCOUNTED FOR.
2. CUT/FILL FACTOR SET TO 1.00. (TO BE ADVISED BY CLIENT).
3. NO ALLOWANCE CURRENTLY MADE FOR TOPSOIL STRIP IN CUT/FILL VOLUMES. (TO BE ADVISED BY CLIENT).
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0 12.5m
SCALE - 1 : 250 (A3)
MGA-94 Zone 56
(mAHD)

MC04 PLAN CUT/FILL EXHIBIT

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-003	MC04 EARTHWORKS - SECTIONS
0644-44-002	MC04 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
C	26.5.22	REVISED DRAIN ALIGNMENT	SJU	MGB	MGB	
B	16.02.21	ISSUED FOR INFORMATION	SJU	MGB	MGB	
A	12.02.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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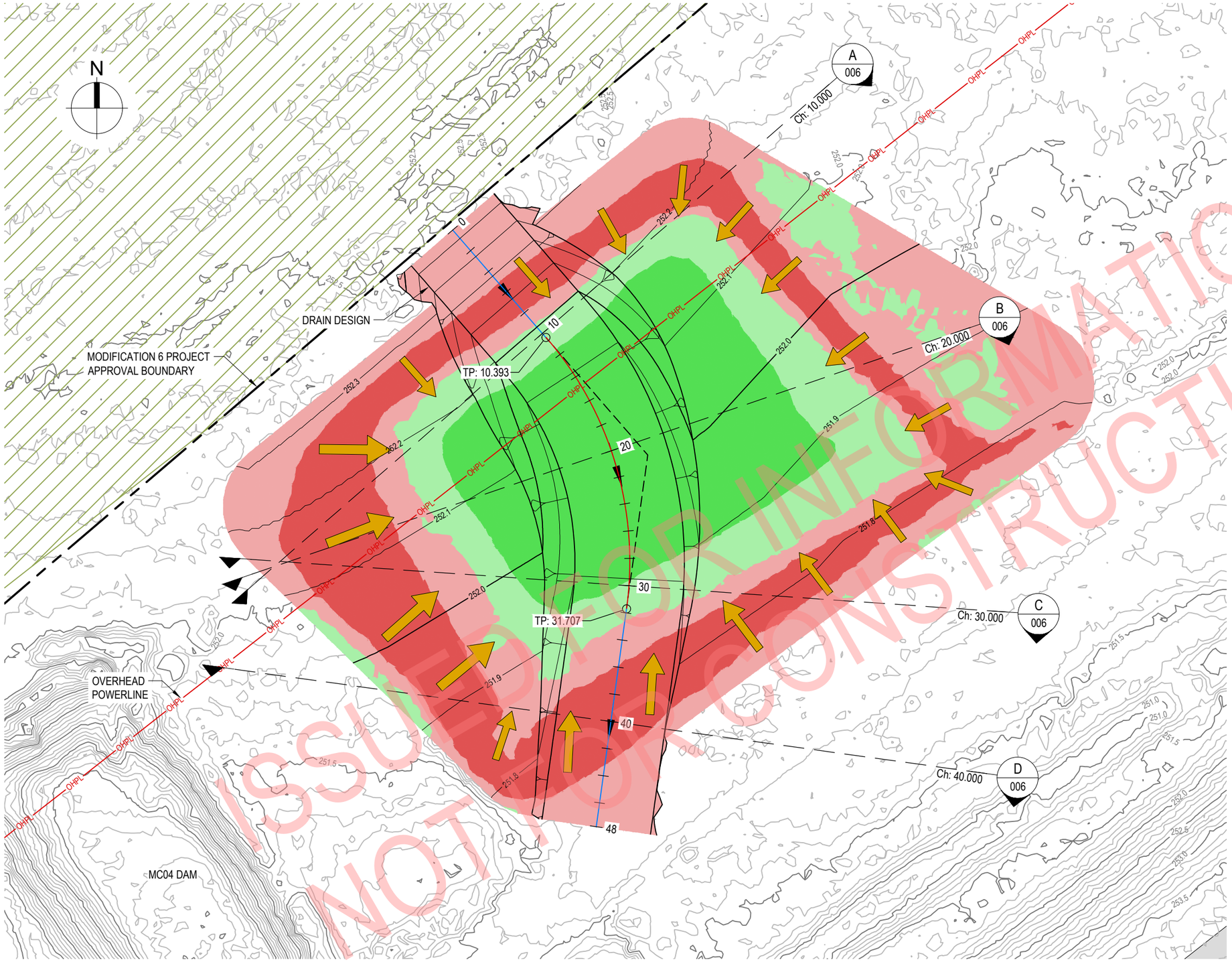
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC04 EARTHWORKS LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:250	0644-44-001	C



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-1.346	-0.300	CUT
	-0.300	0.100	CUT
	0.100	1.000	FILL
	1.000	2.100	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC05	342	-837	-495
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET

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3. NO ALLOWANCE CURRENTLY MADE FOR TOPSOIL STRIP IN CUT/FILL VOLUMES. (TO BE ADVISED BY CLIENT).
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FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

0 15m

SCALE - 1 : 300 (A3)
MGA-94 Zone 56

MC05 PLAN CUT/FILL EXHIBIT

REFERENCE

DRG No.	TITLE
0644-44-006	MC05 EARTHWORKS - SECTIONS
0644-44-005	MC05 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	18.02.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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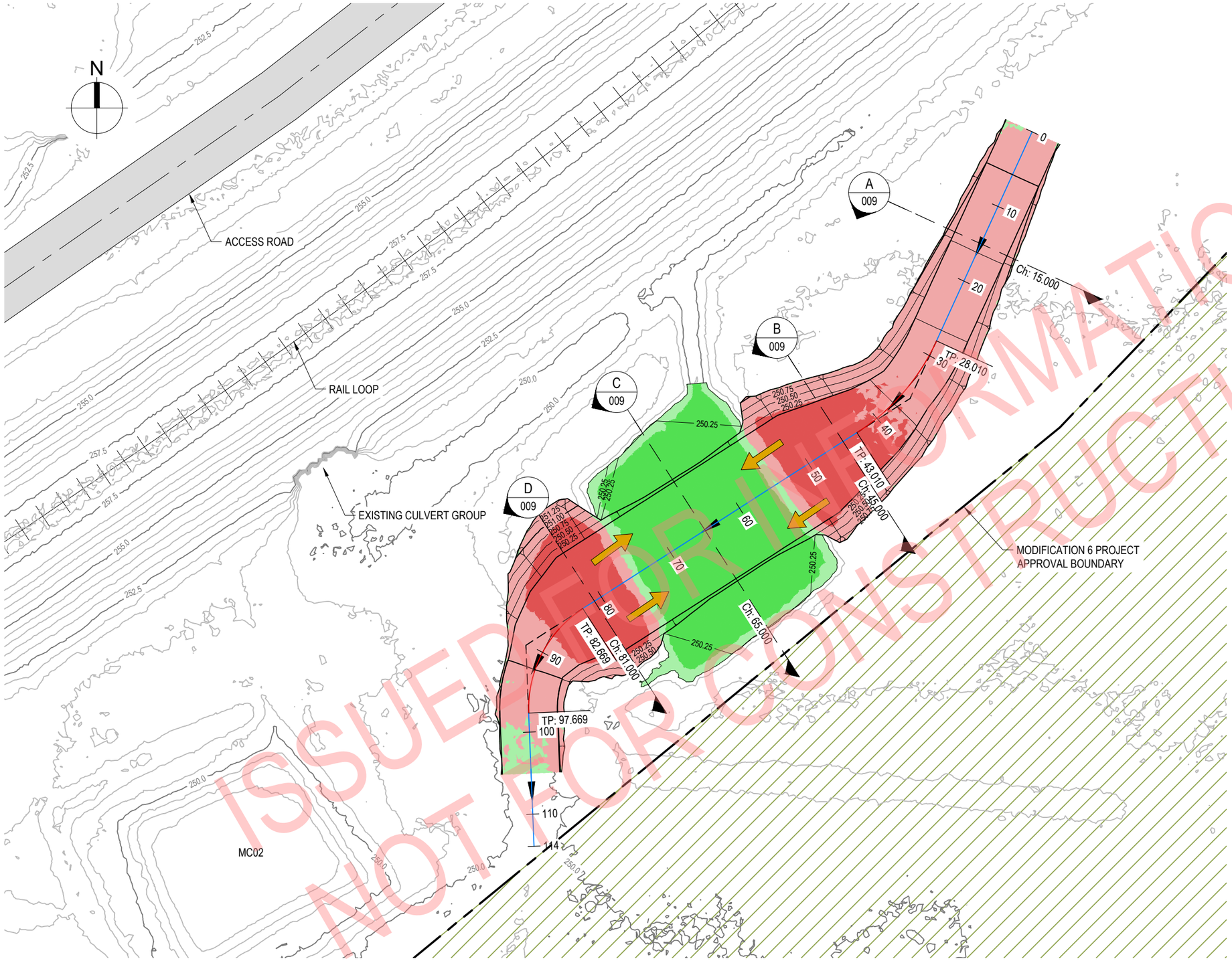
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC05 EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE 1:300	WRM DRG No. 0644-44-004	REV A



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-1.927	-0.700	CUT
	-0.700	0.000	CUT
	0.000	0.500	FILL
	0.500	1.700	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
SD9	534	-650	-116
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- 250 DESIGN CONTOURS
- 250 EXISTING CONTOURS MAJOR
- 250 EXISTING CONTOURS MINOR
- OHPL EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

1. COMPACTION AND SWELL FACTORS NOT CURRENTLY ACCOUNTED FOR.
2. CUT/FILL FACTOR SET TO 1.00. (TO BE ADVISED BY CLIENT).
3. NO ALLOWANCE CURRENTLY MADE FOR TOPSOIL STRIP IN CUT/FILL VOLUMES. (TO BE ADVISED BY CLIENT).
4. ALL DRAWINGS ISSUED FOR INFORMATION ONLY AND TO ASSIST WITH PROJECT COSTING. CIVIL DESIGN DETAIL INCLUDING COMPACTION AND FILL MATERIAL SPECIFICATION BY OTHERS.

0 25m

SCALE - 1 : 500 (A3)
MGA-94 Zone 56

SD9 PLAN CUT/FILL EXHIBIT

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-009	SD9 EARTHWORKS - SECTIONS
0644-44-008	SD9 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	11.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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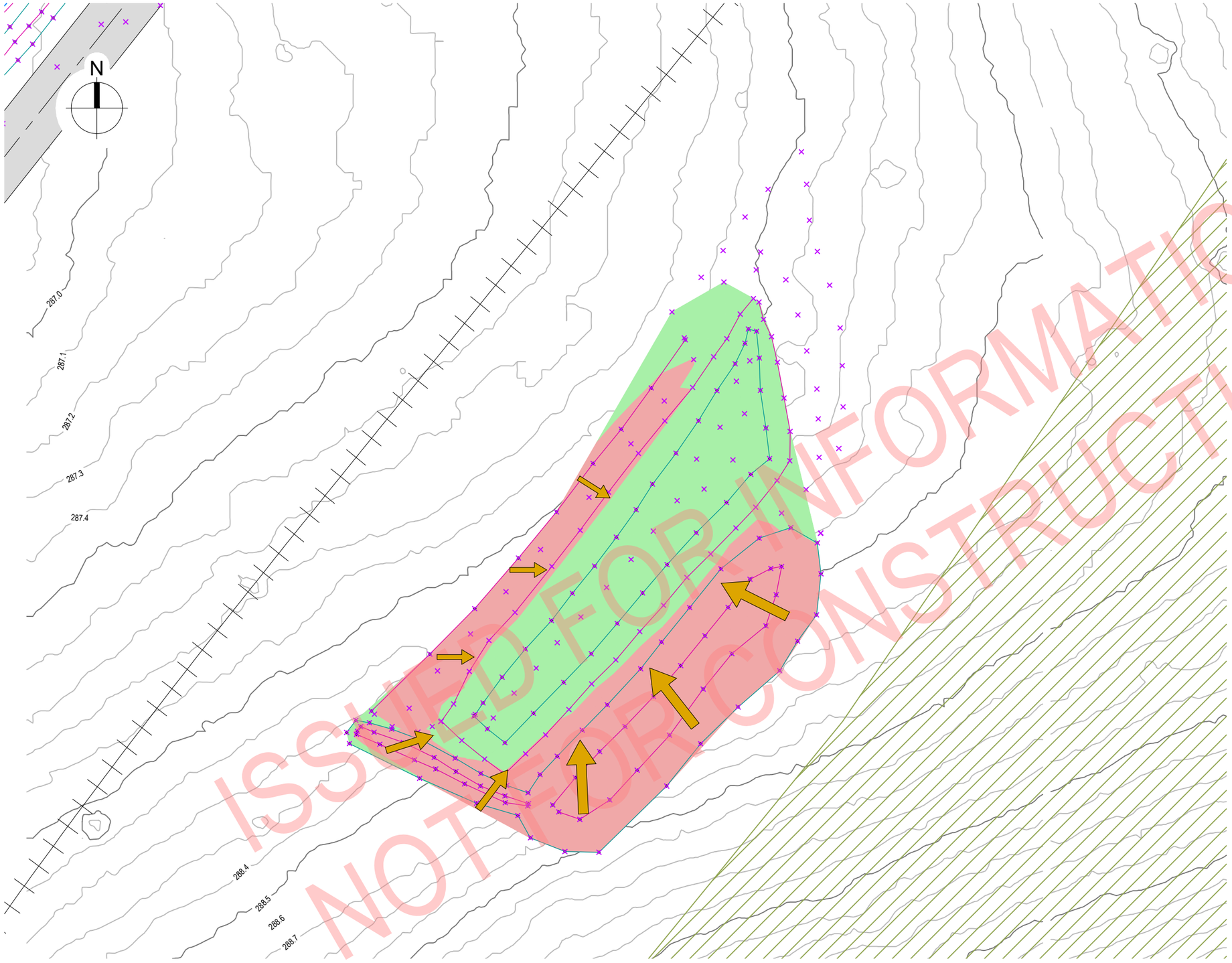
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
SD9 EARTHWORKS LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-007	A



EARTHWORKS CUT / FILL			
COLOUR	(mAHD)	(mAHD)	
	286.736	288.550	FILL
	288.550	290.500	CUT

LEGEND

- EARTHWORKS PUSH
- EXG CONTOURS MINOR (ELVIS)
- EXG CONTOURS MAJOR (ELVIS)
- SURVEYED WATER LEVEL
- SURVEYED BOTTOM OF BANK
- SURVEYED TOP OF BANK
- SURVEYED POINT
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

1. CUT AND FILL INDICATIVE ONLY BASED ON SURVEYED DAM TOP OF BANK FILL LEVEL OF APPROXIMATELY 288.55 mAHD.
2. SURVEY DATA USED TO INDICATE DAM AREA AND LEVELS. (FYFE FIELD SURVEY SUPPLIED BY CLIENT).
3. EXISTING GROUND LEVELS AND CONTOURS BASED ON PUBLICLY AVAILABLE DATA (ELVIS @ HTTPS://ELEVATION.FSDF.ORG.AU/).
4. DRAWING IS CONCEPT ONLY AND INDICATIVE OF POTENTIAL FILL MATERIAL LOCATION AND CURRENT DAM AREA TO BE FILLED.
5. CUT/FILL VOLUMES NOT CALCULATED IN THE ABSENCE OF DETAILED GROUND/TOPOGRAPHIC DATA.

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	27.07.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.

-

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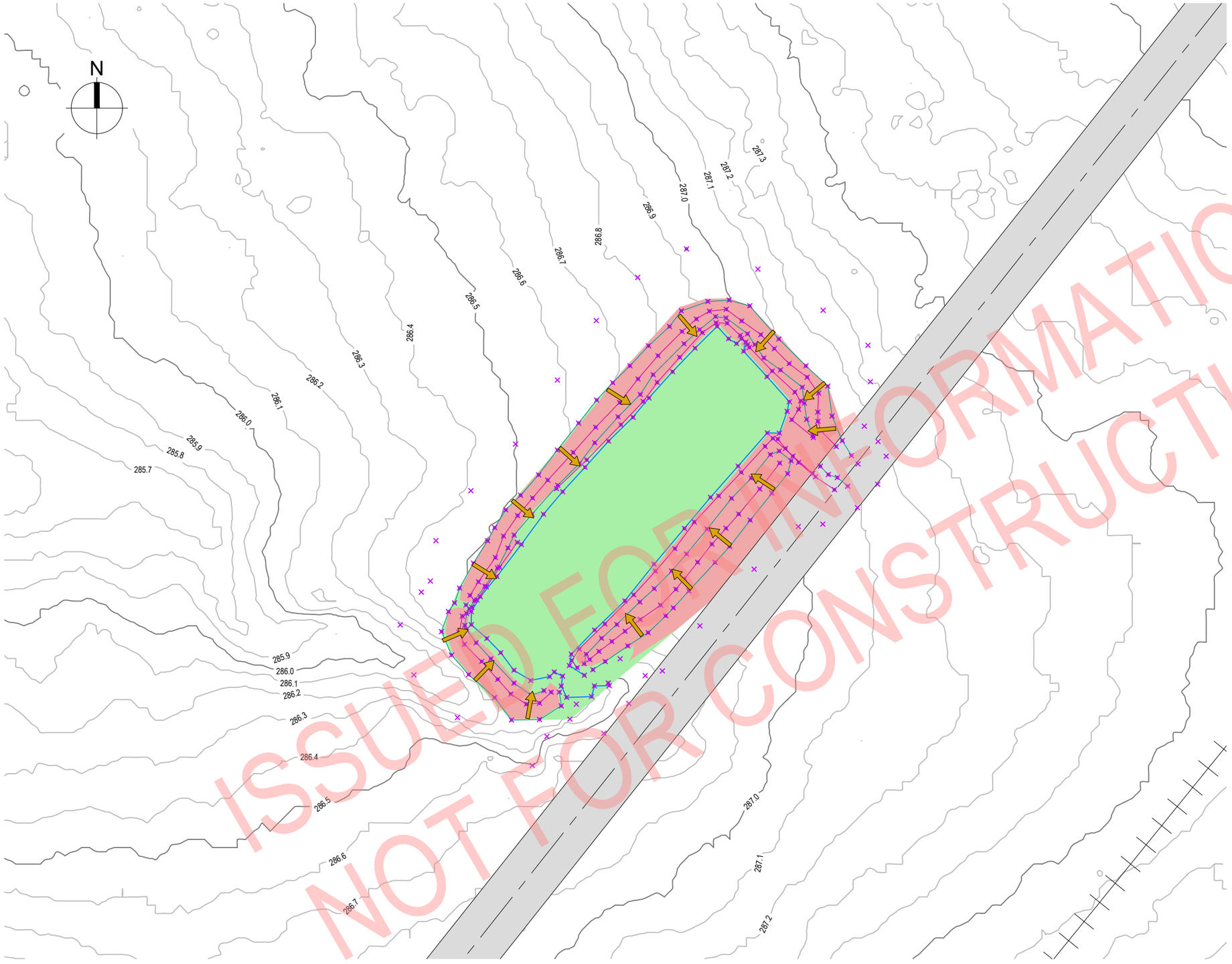
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC08 EARTHWORKS
CONCEPT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-031	A



0 25m
SCALE - 1 : 500 (A3)
MGA-94 Zone 56

EARTHWORKS CUT / FILL			
COLOUR	(mAHD)	(mAHD)	
	286.494*	286.700	FILL
	286.700	287.800	CUT

*SURVEYED WATER SURFACE LEVEL

LEGEND
- EARTHWORKS PUSH
- EXG CONTOURS MINOR (ELVIS)
- EXG CONTOURS MAJOR (ELVIS)
- SURVEYED WATER LEVEL
- SURVEYED BOTTOM OF BANK
- SURVEYED TOP OF BANK
- SURVEYED POINT
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:
1. CUT AND FILL INDICATIVE ONLY BASED ON SURVEYED DAM TOP OF BANK FILL LEVEL OF APPROXIMATELY 286.700 mAHD.
2. SURVEY DATA USED TO INDICATE DAM AREA AND LEVELS (FYFE FIELD SURVEY SUPPLIED BY CLIENT).
3. EXISTING GROUND LEVELS AND CONTOURS BASED ON PUBLICLY AVAILABLE DATA (ELVIS @ HTTPS://ELEVATION.FSDF.ORG.AU/).
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FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	27.07.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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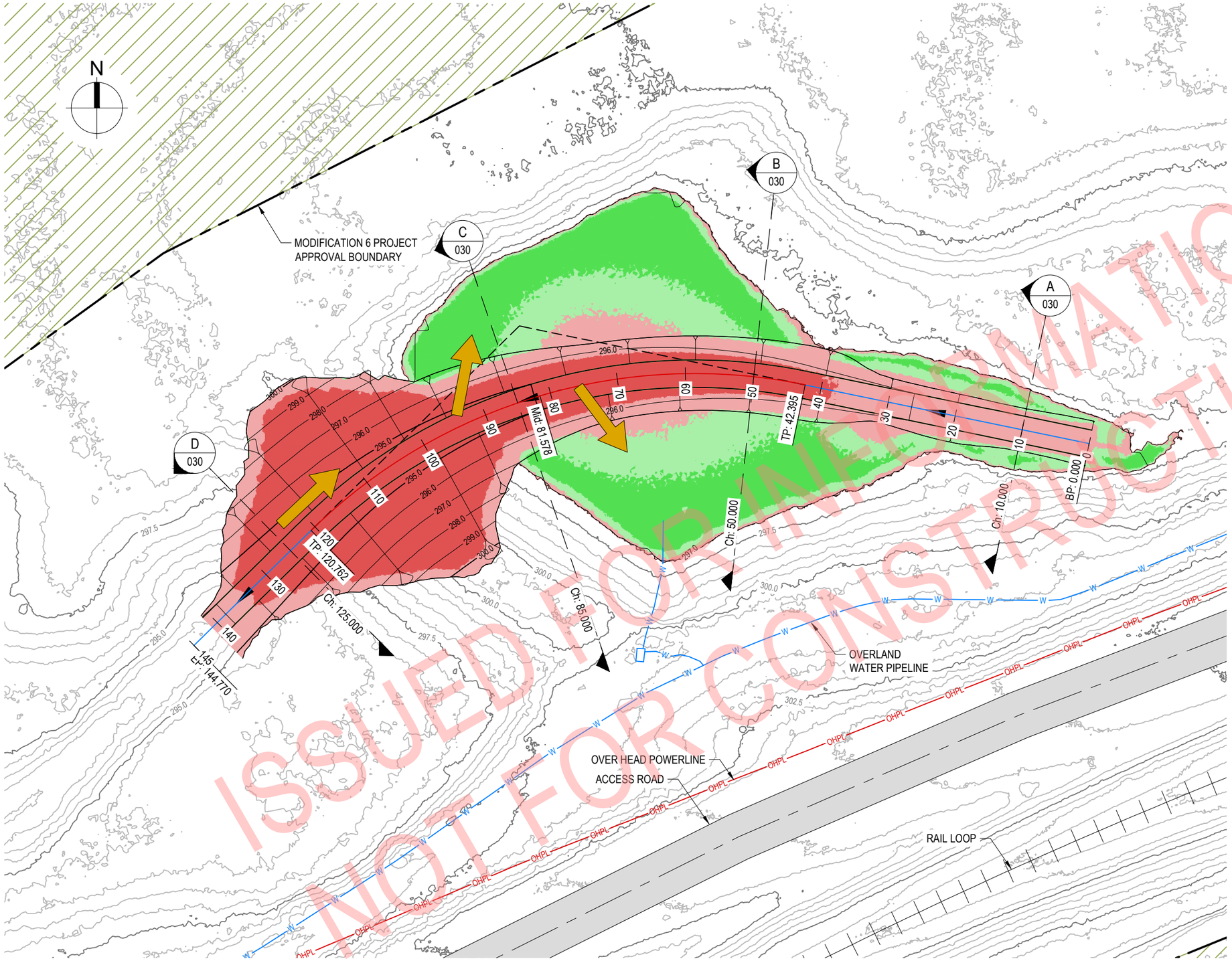
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC09 EARTHWORKS
CONCEPT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-034	A



0 30m

SCALE - 1 : 600 (A3)
MGA-94 Zone 56

EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-6.155	-0.700	CUT
	-0.700	0.100	CUT
	0.100	0.300	FILL
	0.300	0.600	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
SD7	3117.01	-519.09	2598
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- 250 DESIGN CONTOURS
- 250 EXISTING CONTOURS MAJOR
- 250 EXISTING CONTOURS MINOR
- OHPL EXISTING OHPL
- W EXISTING WATER PIPELINE
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

1. COMPACTION AND SWELL FACTORS NOT CURRENTLY ACCOUNTED FOR.
2. CUT/FILL FACTOR SET TO 1.00. (TO BE ADVISED BY CLIENT).
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FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-030	SD7 EARTHWORKS - SECTIONS
0644-44-029	SD7 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
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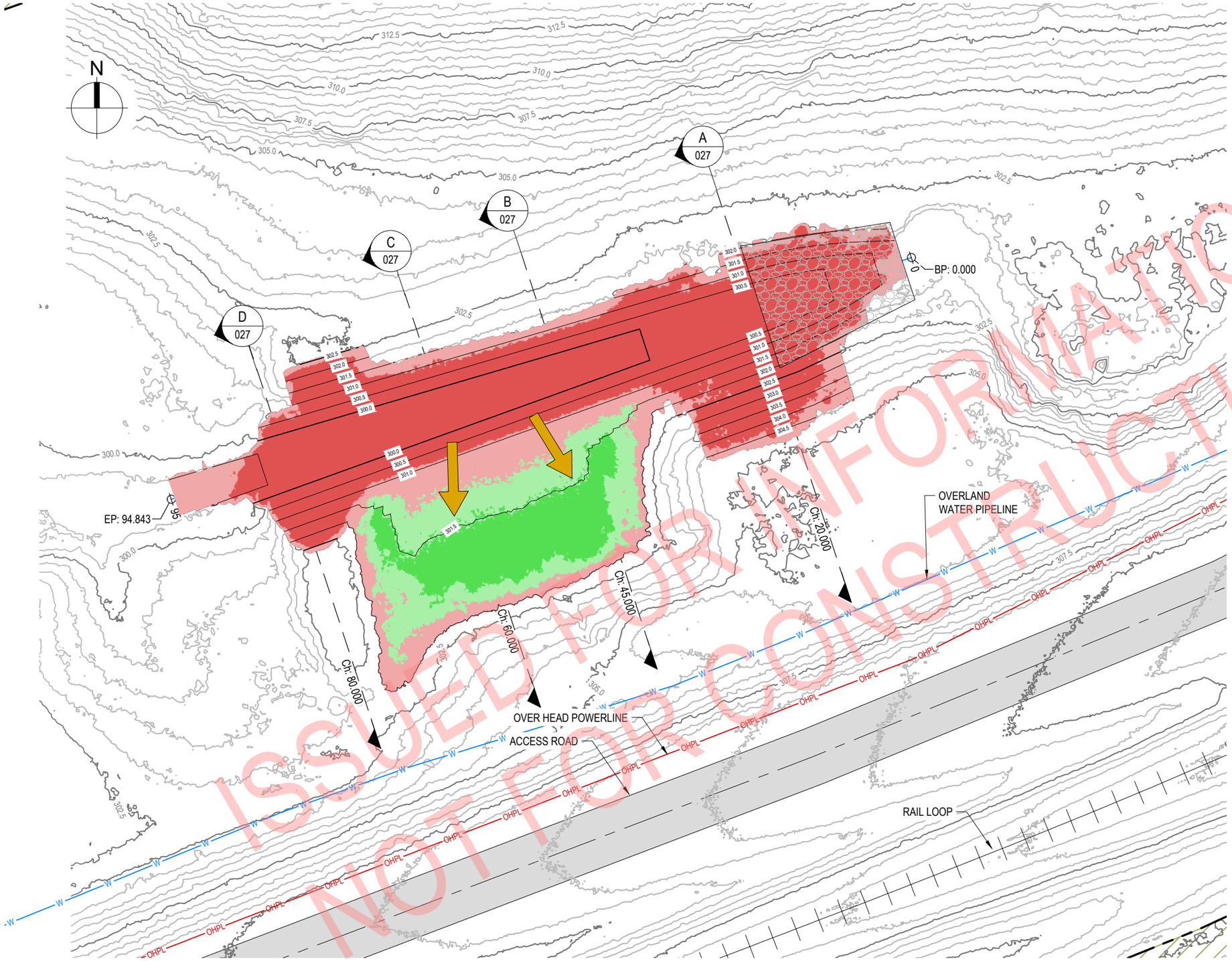
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
SD7 EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-028	A



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-3.021	-0.200	CUT
	-0.200	0.200	CUT
	0.200	0.400	FILL
	0.400	0.800	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC10	975.96	-219.43	757
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- EXISTING WATER PIPELINE
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP
- EROSION PROTECTION

NOTES:

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FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-027	MC10 EARTHWORKS - SECTIONS
0644-44-026	MC10 EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.

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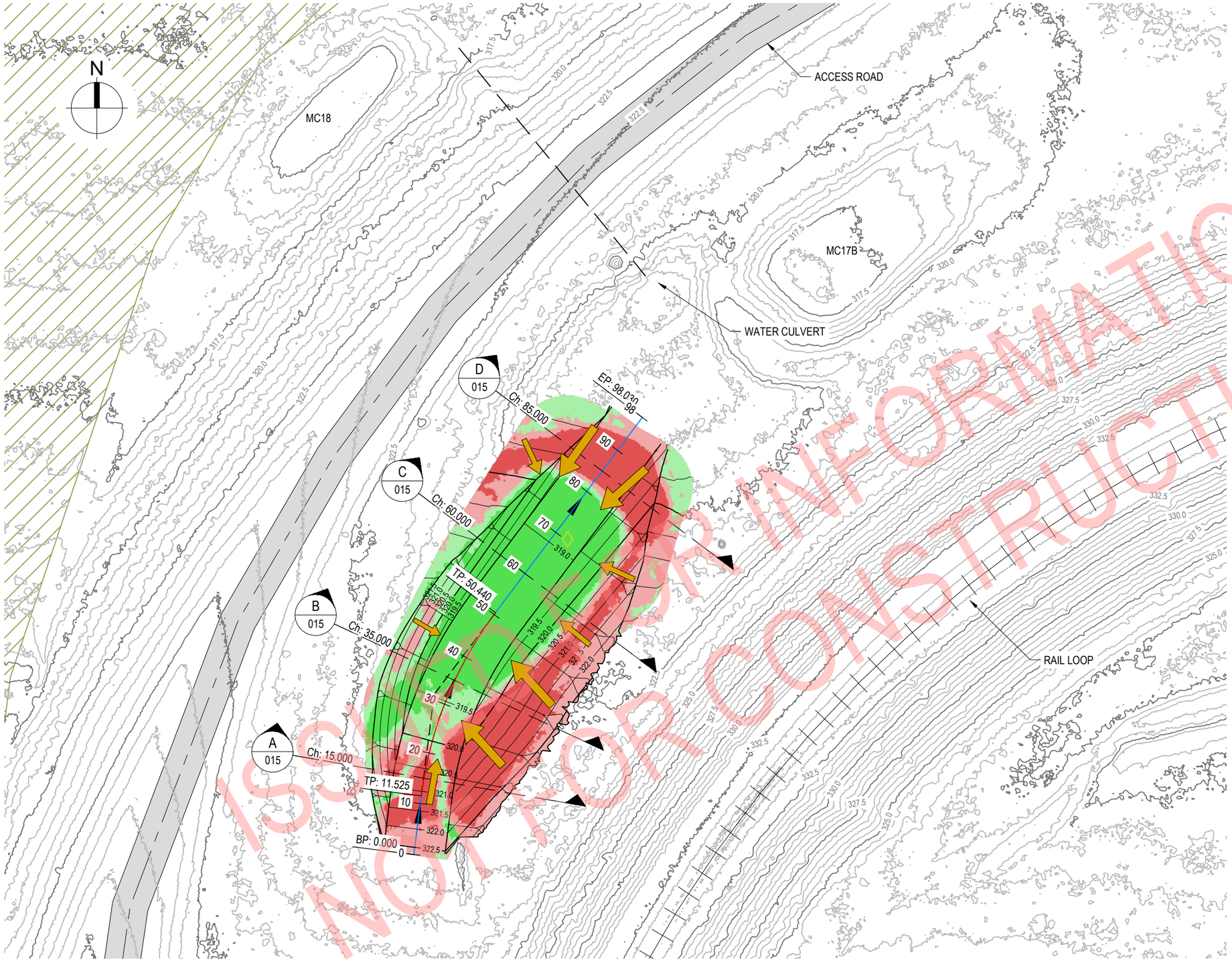
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC10 EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-025	A



0 40m

SCALE - 1 : 800 (A3)
MGA-94 Zone 56

MC17A PLAN CUT/FILL EXHIBIT

EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-2.447	-0.500	CUT
	-0.500	0.000	CUT
	0.000	0.500	FILL
	0.500	1.500	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC17A	1143	-997	146
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

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FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-015	MC17A EARTHWORKS - SECTIONS
0644-44-014	MC17A EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	03.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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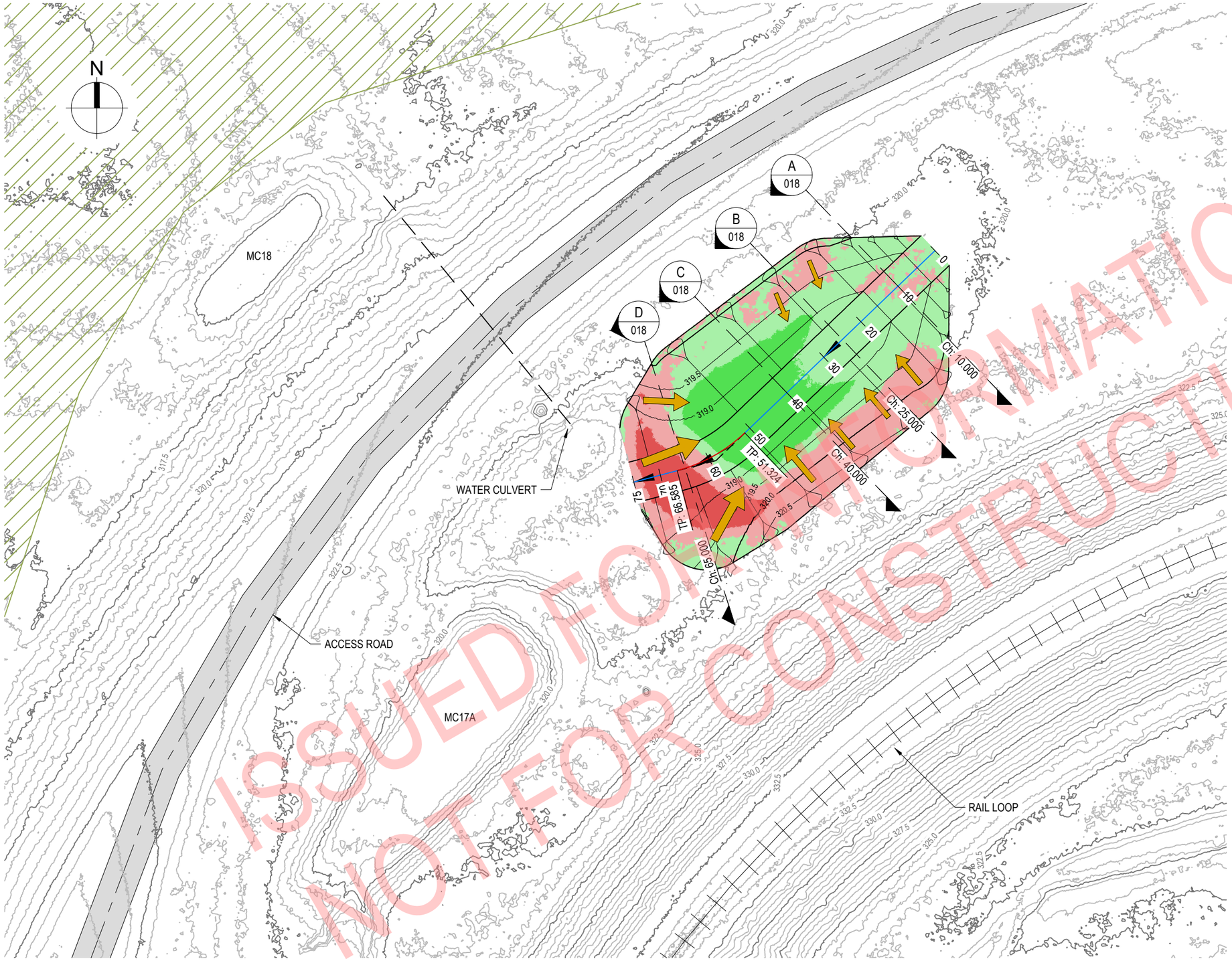
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC17A EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:800	0644-44-013	A



EARTHWORKS CUT / FILL			
COLOUR	MIN (m)	MAX (m)	
	-2.167	-1.000	CUT
	-1.000	0.000	CUT
	0.000	1.000	FILL
	1.000	2.100	FILL

EARTHWORKS VOLUMES (m³)			
	CUT	FILL	NET
MC17B	627	-1142	-515
NEGATIVE NET VALUE DENOTES FILL REQUIRED.			

LEGEND

- EARTHWORKS PUSH
- DESIGN CONTOURS
- EXISTING CONTOURS MAJOR
- EXISTING CONTOURS MINOR
- EXISTING OHPL
- FLOW DIRECTION
- BIODIVERSITY OFFSET
- ACCESS ROAD
- RAIL LOOP

NOTES:

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3. NO ALLOWANCE CURRENTLY MADE FOR TOPSOIL STRIP IN CUT/FILL VOLUMES. (TO BE ADVISED BY CLIENT).
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0 40m

SCALE - 1 : 800 (A3)
MGA-94 Zone 56

MC17B PLAN CUT/FILL EXHIBIT

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-018	MC17B EARTHWORKS - SECTIONS
0644-44-017	MC17B EARTHWORKS - PROFILE

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	25.02.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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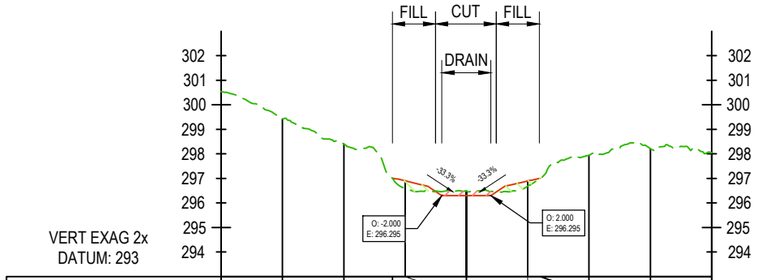
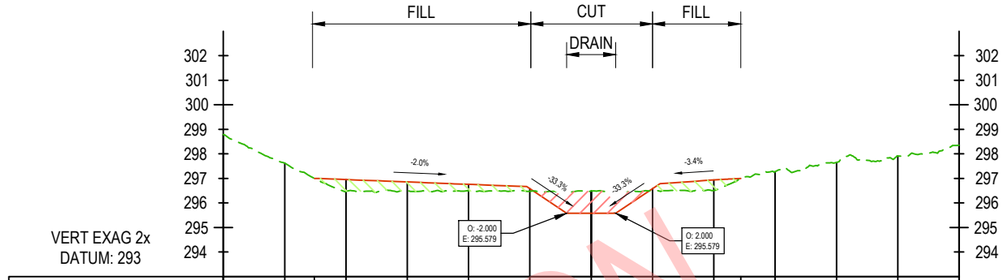
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC17B EARTHWORKS
LAYOUT

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:800	0644-44-016	A



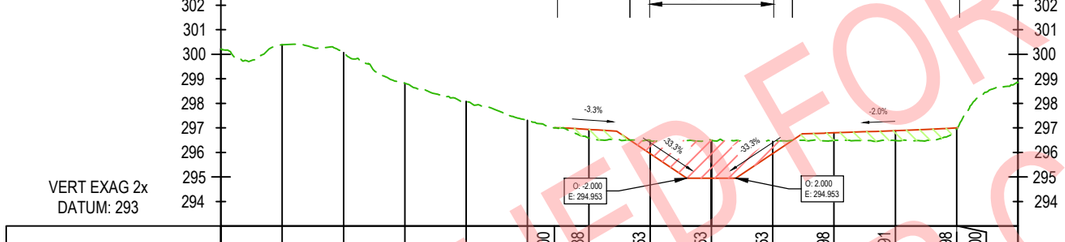
PROPOSED LEVELS			297.000	296.900	296.295	296.897	297.000			
EXISTING LEVELS	300.539	299.418	298.402	297.000	296.576	296.491	296.684	297.000	297.943	298.208	298.048
LEVEL DIFFERENCE				0.000	0.324	-0.195	0.213	0.000			
OFFSETS	-20.000	-15.000	-10.000	-6.029	-5.000	0.000	5.000	6.036	10.000	15.000	20.000

A 028 SECTION CH. 10.00
SCALE 1:500



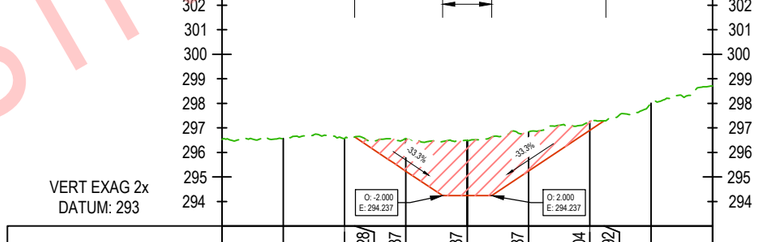
PROPOSED LEVELS			297.000	296.951	296.852	296.755	296.579	295.579	296.579	296.934	297.000			
EXISTING LEVELS	298.788	297.622	297.000	296.472	296.497	296.478	296.473	296.486	296.486	296.510	297.000	297.276	297.646	297.910	298.355
LEVEL DIFFERENCE			0.000	0.479	0.355	0.277	0.106	-0.907	0.094	0.424	0.000				
OFFSETS	-30.000	-25.000	-22.578	-20.000	-15.000	-10.000	-5.000	0.000	5.000	10.000	12.200	15.000	20.000	25.000	30.000

B 028 SECTION CH. 50.00
SCALE 1:500



PROPOSED LEVELS						297.000	296.938	295.953	294.953	295.953	296.798	296.891	296.998	297.000	
EXISTING LEVELS	300.216	300.394	300.077	298.821	298.078	297.308	297.000	296.584	296.490	296.496	296.451	296.491	296.483	296.956	297.000	298.841
LEVEL DIFFERENCE							0.000	0.354	-0.537	-1.543	-0.498	0.308	0.407	0.042	0.000	
OFFSETS	-40.000	-35.000	-30.000	-25.000	-20.000	-15.000	-12.806	-10.000	-5.000	0.000	5.000	10.000	15.000	20.000	20.076	25.000

C 028 SECTION CH. 85.00
SCALE 1:500



PROPOSED LEVELS			296.628	295.237	294.237	295.237	296.904	297.292			
EXISTING LEVELS	296.528	296.571	296.572	296.628	296.561	296.489	296.839	297.263	297.292	298.007	298.702
LEVEL DIFFERENCE				0.000	-1.324	-2.252	-1.602	-0.359	0.000		
OFFSETS	-20.000	-15.000	-10.000	-9.174	-5.000	0.000	5.000	10.000	11.165	15.000	20.000

D 028 SECTION CH. 125.00
SCALE 1:500

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

REFERENCE

DRG No.	TITLE
0644-44-029	SD7 EARTHWORKS - PROFILE
0644-44-028	SD7 EARTHWORKS - LAYOUT

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

CLIENT DRG No.
-

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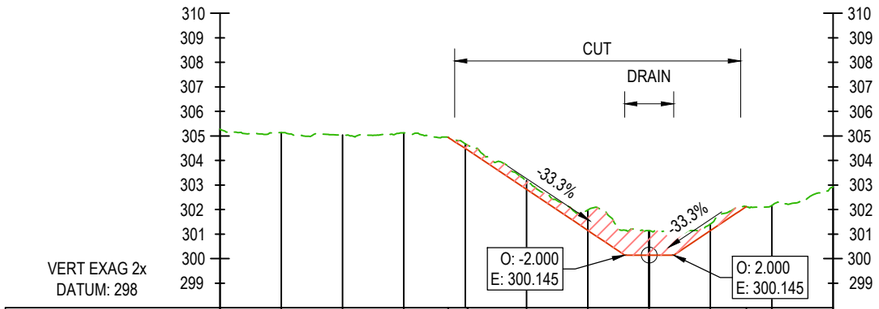
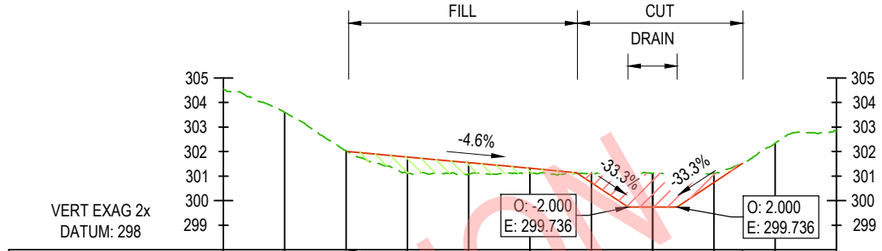
MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
SD7 EARTHWORKS
SECTIONS

A3 FULL SIZE	SCALE 1:500	WRM DRG No. 0644-44-030	REV A



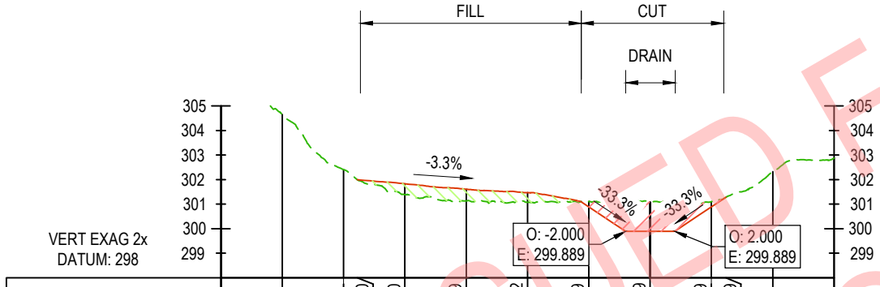
PROPOSED LEVELS					304.941	304.493	302.825	301.153	300.145	301.146	302.122			
EXISTING LEVELS	305.279	305.130	305.134	305.036	305.121	304.679		303.189	301.982	301.142	301.412		302.166	302.924
LEVEL DIFFERENCE						0.000	-0.186	-0.365	-0.829	-0.997	-0.265	0.000		
OFFSETS	-35.000	-30.000	-25.000	-20.000	-16.389	-15.000	-10.000	-5.000	0.000	5.000	7.934	10.000		15.000

A 025 SECTION CH. 20.00
SCALE 1:500



PROPOSED LEVELS					302.000	301.777	301.549	301.323	300.736	299.736	300.736	301.514		
EXISTING LEVELS	304.546	303.612	303.597	302.033		301.128	301.071	301.112	301.131	301.118	301.135		302.344	302.876
LEVEL DIFFERENCE					0.000	0.649	0.478	0.211	-0.395	-1.382	-0.399	0.000		
OFFSETS	-35.000	-30.000	-25.000	-24.884	-20.000	-15.000	-10.000	-5.000	0.000	5.000	7.336	10.000		15.000

B 025 SECTION CH. 60.00
SCALE 1:500



PROPOSED LEVELS				302.000	301.830	301.609	301.472	300.889	299.889	300.889	301.279			
EXISTING LEVELS	305.703	304.665	304.655	302.414	301.389	301.132	301.079	301.108	301.088	301.104		302.329		302.881
LEVEL DIFFERENCE				0.000	0.441	0.476	0.392	-0.219	-1.198	-0.215	0.000			
OFFSETS	-35.000	-30.000	-25.000	-23.887	-20.000	-15.000	-10.000	-5.000	0.000	5.000	6.171	10.000		15.000

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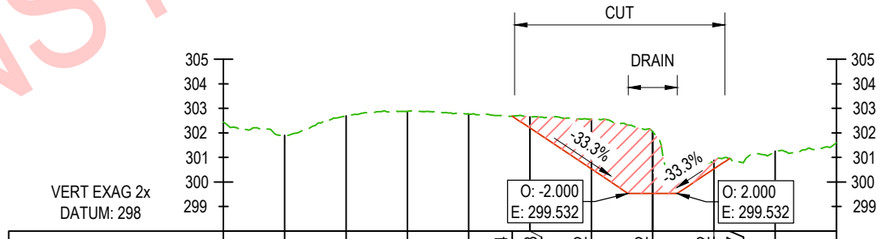
SCALE 1:500



PROPOSED LEVELS						302.684	302.198	300.532	299.532	300.532	300.957			
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LEVEL DIFFERENCE							0.000	-0.454	-2.029	-2.522	-0.360	0.000		
OFFSETS	-35.000	-30.000	-25.000	-20.000	-15.000	-11.458	-10.000	-5.000	0.000	5.000	6.276	10.000		15.000

D 025 SECTION CH. 80.00
SCALE 1:500

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REFERENCE

DRG No.	TITLE
0644-44-026	MC10 EARTHWORKS - PROFILE
0644-44-025	MC10 EARTHWORKS - LAYOUT

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

WHITEHAVEN COAL

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-

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MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC10 EARTHWORKS
SECTIONS

A3 FULL SIZE	SCALE	WRM DRG No.	REV
	1:500	0644-44-027	A

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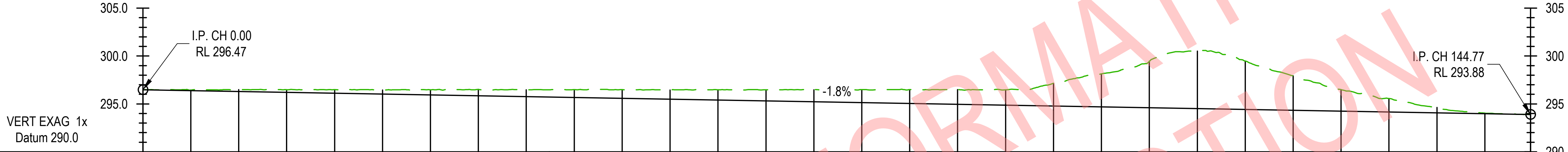

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15.000	296.206	296.479	-0.273
20.000	296.116	296.498	-0.381
25.000	296.027	296.446	-0.420
30.000	295.937	296.477	-0.540
35.000	295.848	296.507	-0.659
40.000	295.758	296.482	-0.723
42.395	295.716	296.472	-0.757
45.000	295.669	296.497	-0.829
50.000	295.579	296.486	-0.907
55.000	295.490	296.444	-0.954
60.000	295.400	296.480	-1.079
65.000	295.311	296.476	-1.165
70.000	295.221	296.469	-1.247
75.000	295.132	296.490	-1.358
80.000	295.042	296.496	-1.453
85.000	294.953	296.496	-1.543
90.000	294.863	296.470	-1.607
95.000	294.774	297.151	-2.377
100.000	294.684	298.136	-3.451
105.000	294.595	299.453	-4.858
110.000	294.506	300.522	-6.017
115.000	294.416	299.475	-5.059
120.000	294.327	297.937	-3.610
120.762	294.313	297.699	-3.386
125.000	294.237	296.489	-2.252
130.000	294.148	295.559	-1.411
135.000	294.058	294.628	-0.570
140.000	293.969	294.033	-0.065
144.770	293.883	293.883	0.000

HORIZONTAL: L: 42.395, B: 281° 39' 34" | 42.395 | L: 78.367, R: 80.000 | 120.762 | L: 24.008, B: 225° 31' 58"

VERTICAL: G: -1.8%, L: 144.770

SD7 PROFILE

0 — 25m
SCALE - 1 : 500 (A3)
MGA-94 Zone 56

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REFERENCE

DRG No.	TITLE
0644-44-030	SD7 EARTHWORKS - SECTIONS
0644-44-028	SD7 EARTHWORKS - LAYOUT

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

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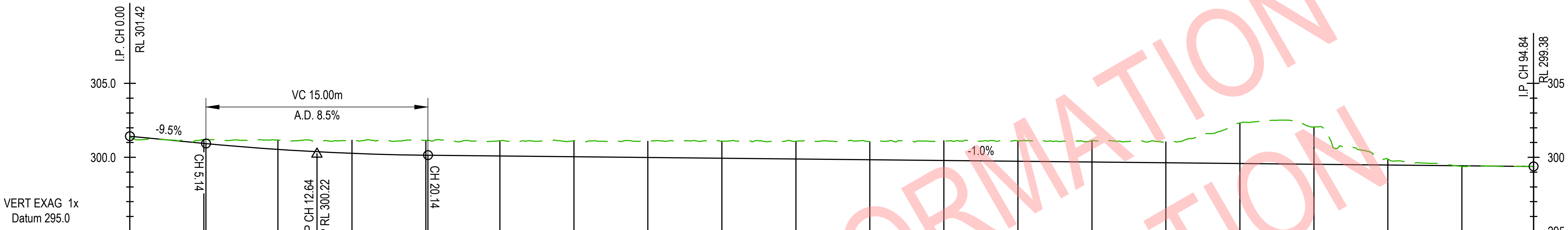
SD7 EARTHWORKS
PROFILE

A3 FULL SIZE | SCALE 1:500 | WRM DRG No. 0644-44-029 | REV A



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10.000	300.537	301.172	-0.635
15.000	300.270	301.161	-0.891
20.000	300.145	301.142	-0.997
20.138	300.143	301.141	-0.998
25.000	300.094	301.122	-1.028
30.000	300.042	301.132	-1.090
35.000	299.991	301.087	-1.095
40.000	299.940	301.094	-1.154
45.000	299.889	301.088	-1.198
50.000	299.838	301.073	-1.235
55.000	299.787	301.118	-1.331
60.000	299.736	301.118	-1.382
65.000	299.685	301.132	-1.447
70.000	299.634	301.047	-1.413
75.000	299.583	302.329	-2.746
80.000	299.532	302.054	-2.522
85.000	299.481	299.881	-0.400
90.000	299.430	299.376	0.054
94.838	299.380	299.380	0.000
94.843		299.380	

HORIZONTAL: L: 94.843 B: 251° 54' 50"

VERTICAL: G: -9.5% L: 5.138 | R: 177.2 K: 1.8 L: 15.000 | G: -1.0% L: 74.700

MC10 PROFILE

0 15m
SCALE - 1 : 300 (A3)
MGA-94 Zone 56

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REFERENCE

DRG No.	TITLE
0644-44-027	MC10 EARTHWORKS - SECTIONS
0644-44-025	MC10 EARTHWORKS - LAYOUT

REVISIONS

REV	DATE	DESCRIPTION	DRN	CHK	ENG	APP
A	01.03.21	ISSUED FOR REVIEW	SJU	MGB	MGB	

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CLIENT DRG No. -

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MAULES CREEK MINE
DAM DECOMMISSIONING PROJECT
MC10 EARTHWORKS
PROFILE

A3 FULL SIZE	SCALE	WRM DRG No.	REV
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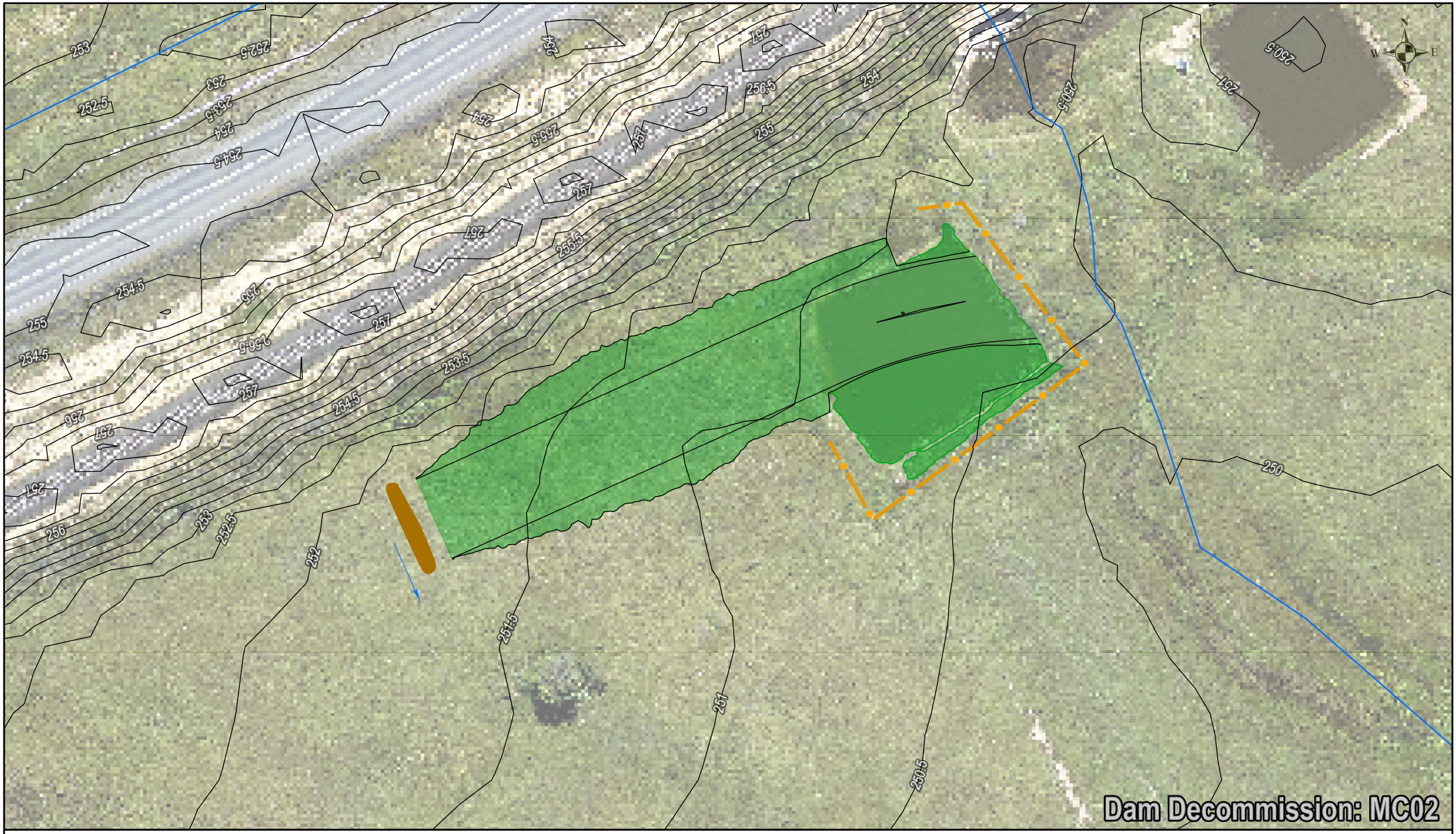

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Metres

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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography
- Contour 1m

Hydrolines
- Non-minor

Sediment & Erosion Control Structures
- Sediment Fence
- Clean water diversion bund

- Revegetation

WHITEHAVEN COAL PTY LTD

Name of Map: MCCM : Sediment & Erosion Control Plans

DISCLAIMER

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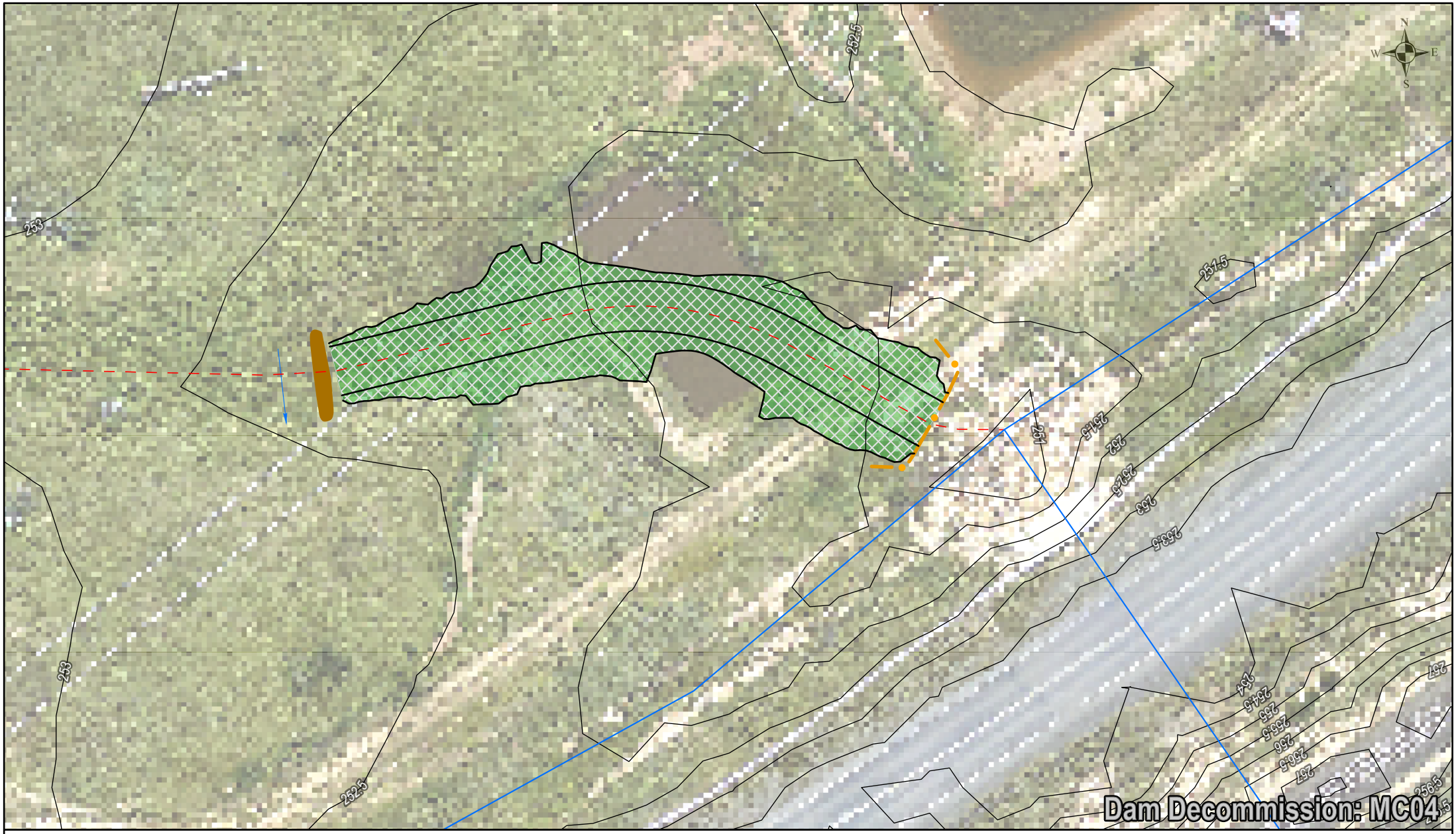

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5 0 5 10 15

Metres

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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography

Contour 1m

Hydrolines

Minor

Non-minor

Sediment & Erosion Control Structures

Sediment Fence

Jute Matting

Clean water diversion bund

Revegetation

MC04 Dam Decomission Design

MC04 Dam Decomission Design

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Name of Map: MCCM : Sediment & Erosion Control Plans

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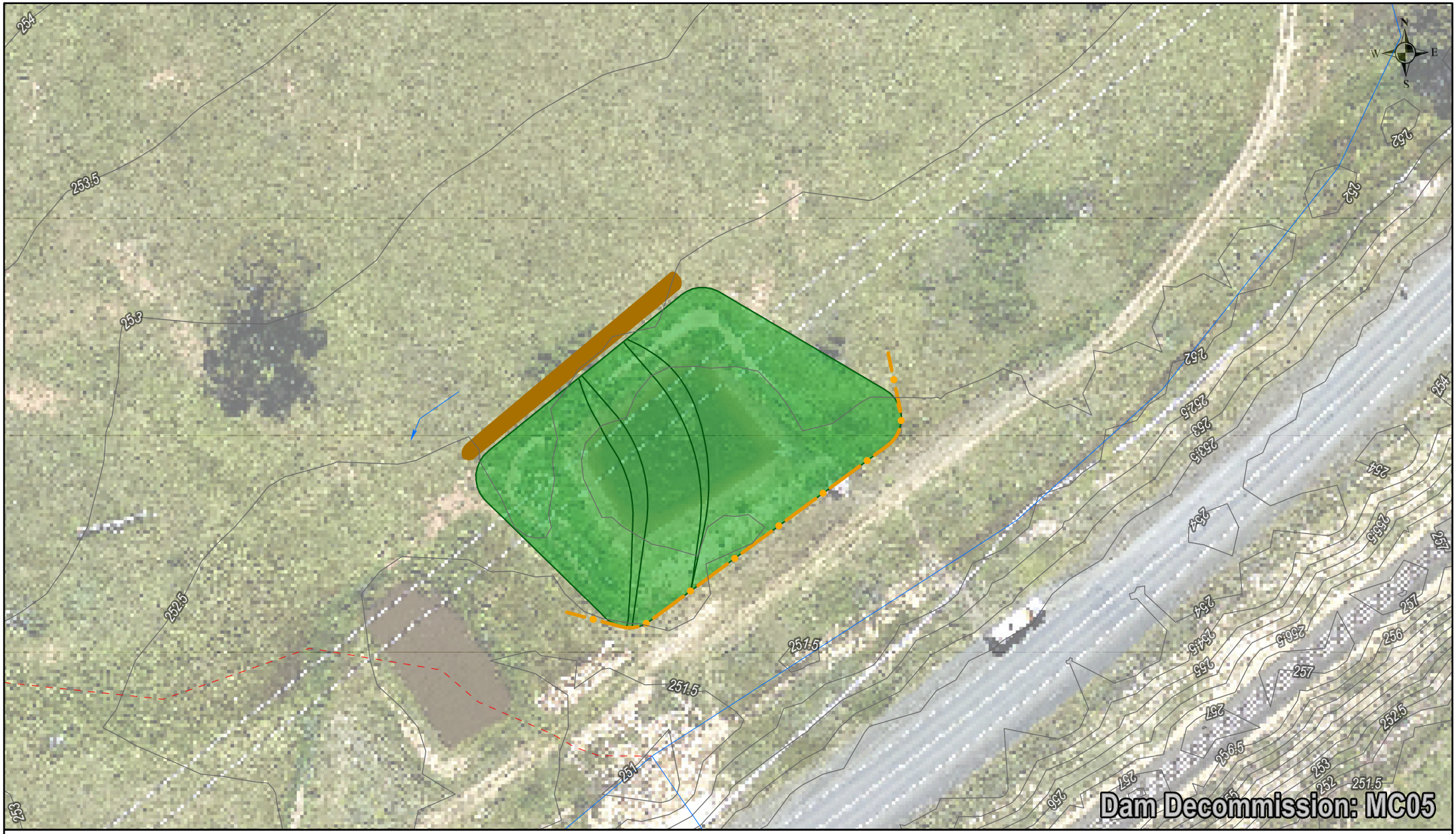

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Metres

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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography
- Contour 1m

Hydrolines
- Minor
- Non-minor

Sediment & Erosion Control Structures
- Sediment Fence

- Clean water diversion bund
- Revegetation

MC05 Dam Decomission Design
- MC05 Design

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Metres

Spatial Reference
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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography
- Contour 1m

Hydrolines
- Minor
- Non-minor

Sediment & Erosion Control Structures
- Sediment Fence
- Jute Matting
- Clean water diversion bund

- Revegetation

SD09 Dam Decomission Design
- SD09 Design

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Name of Map: MCCM : Sediment & Erosion Control Plans

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Metres

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Projection: Transverse Mercator

Legend

Topography
Contour 1m

Sediment & Erosion Control Structures
Sediment Fence

Revegetation

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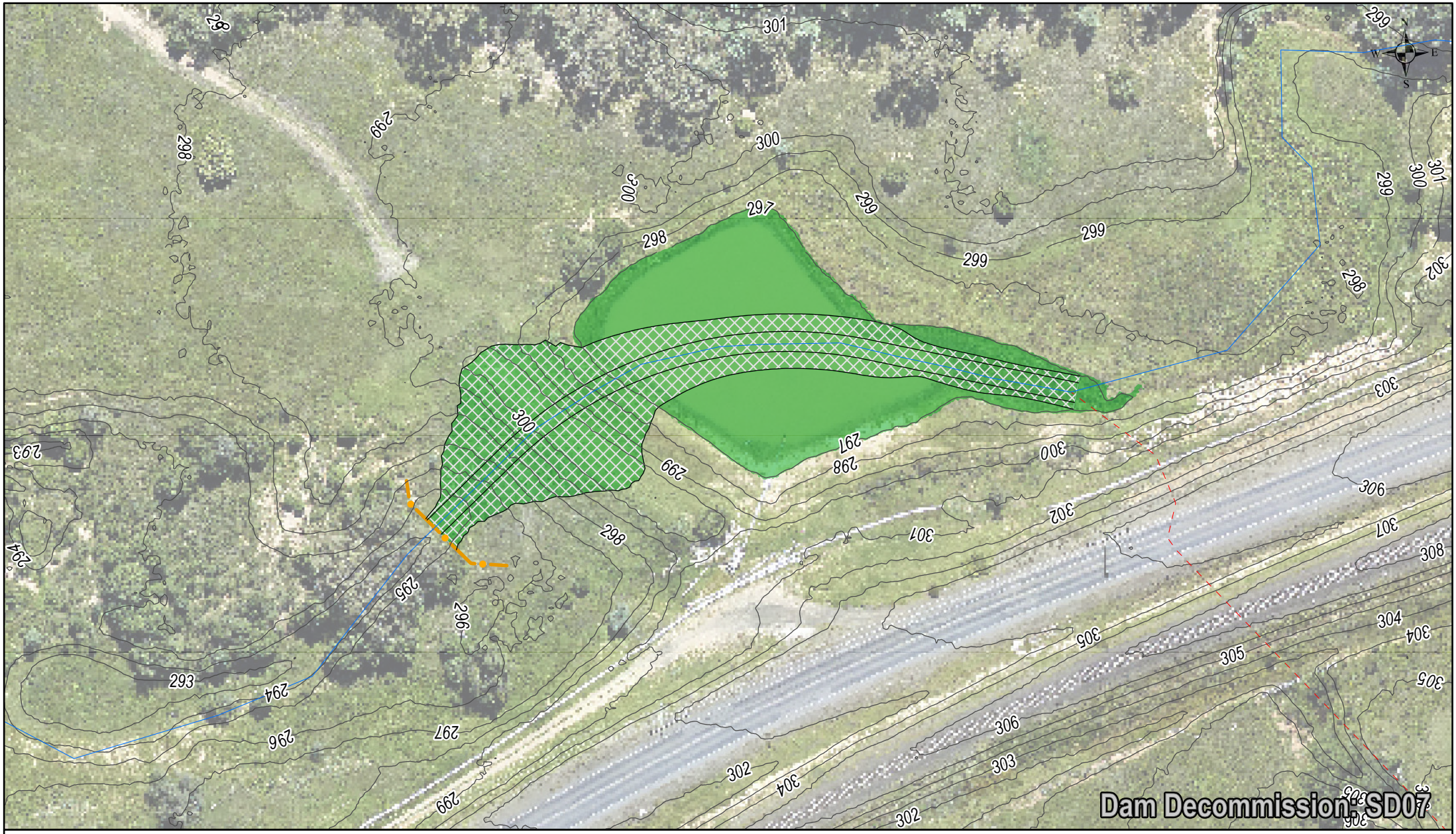

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Metres

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Projection: Transverse Mercator

Legend

Topography
- Contour 1m

Hydrolines
- Minor
- Non-minor

Sediment & Erosion Control Structures
- Sediment Fence
- Jute Matting
- Revegetation

SD7 Dam Decomission Design
- SD7 Dam Design

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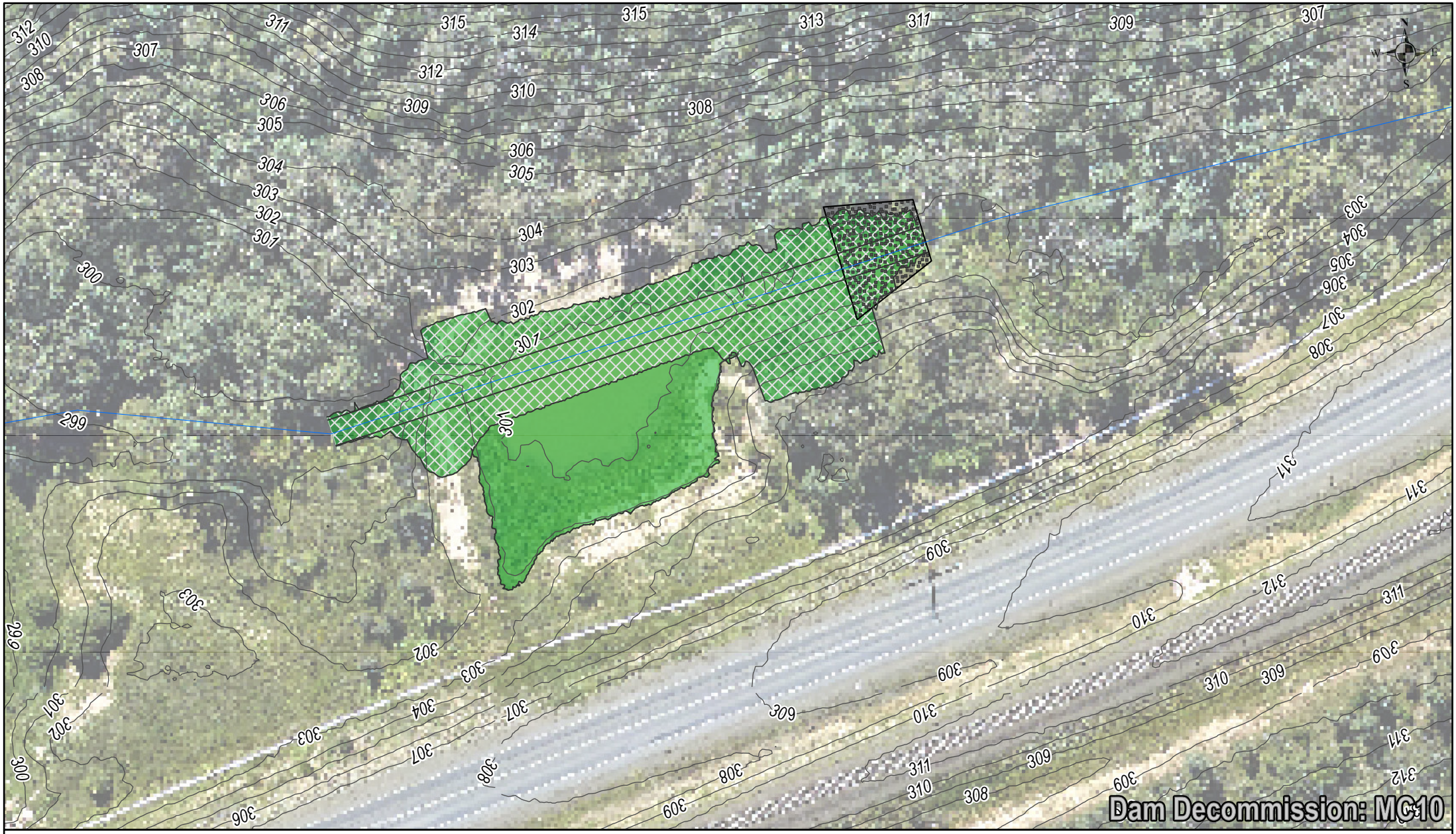

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Scale: 1:750

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Metres

Spatial Reference
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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography
Contour 1m

Hydrolines
Non-minor

Sediment & Erosion Control Structures
Jute Matting
Rock Lining

Revegetation

MC10 Dam Decomission Design
MC10 Dam Design

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Paper size A4

Scale: 1:1,609

10 0 10 20

Metres

Spatial Reference
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Datum: GDA 1994
Projection: Transverse Mercator

Legend

Topography
- Contour 1m

Hydrolines
- Minor

Sediment & Erosion Control Structures
- Sediment Fence
- Revegetation

Dam Decomission Design
- MC17B Dam Decomission Design
- MC17 Dam Decomission Design

WHITEHAVEN COAL PTY LTD

Name of Map: MCCM : Sediment & Erosion Control Plans

Date Exported: 8/06/2022 4:07 PM

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ATTACHMENT 4
ECO LOGICAL AUSTRALIA
MAULES CREEK COAL MINE DEWATERING PROTOCOL

Maules Creek Coal Mine Dam Dewatering Protocol

Maules Creek Coal Mine

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Maules Creek Coal Mine Dam Dewatering Protocol
Project Number	1683
Project Manager	Peter Hancock
Prepared by	Peter Hancock
Reviewed by	Ian Dixon
Approved by	Ian Dixon
Status	**Draft**
Version Number	**2**
Last saved on	**3 June 2022**

This report should be cited as 'Eco Logical Australia Click here to enter a year. *Maules Creek Coal Mine Dam Dewatering Protocol*. Prepared for Maules Creek Coal Mine.'

Template 2.8.1

Contents

List of Tables

1. Background

Maules Creek Coal Mine (MCCM) plans to decommission approximately 10 sediment dams (Table 1) within its project boundary in the Namoi River catchment. The dams have water quality similar to that of the Namoi River and are connected to naturally occurring tributaries of the Namoi River, so potentially provide habitat for aquatic fauna. As such, MCCM require a protocol for managing fauna in the dams that will mitigate the impacts of dam dewatering prior to the decommissioning of the dams on fish and aquatic ecosystems in and downstream of the dams.

This document lays out the steps required for dam dewatering and fauna relocation, as they will apply to MCCM.

Table 1. Dams identified for removal at MCCM

Dam name	Capacity (ML)
SD10	0.76
SD9	0.64
MC05	1.1
MC04	0.4
MC02	1
MC09	1.2
MC08	0.5
MC15	1.7
MC17B	2.1
MC17C	2.1
MC10/SD7	18.3

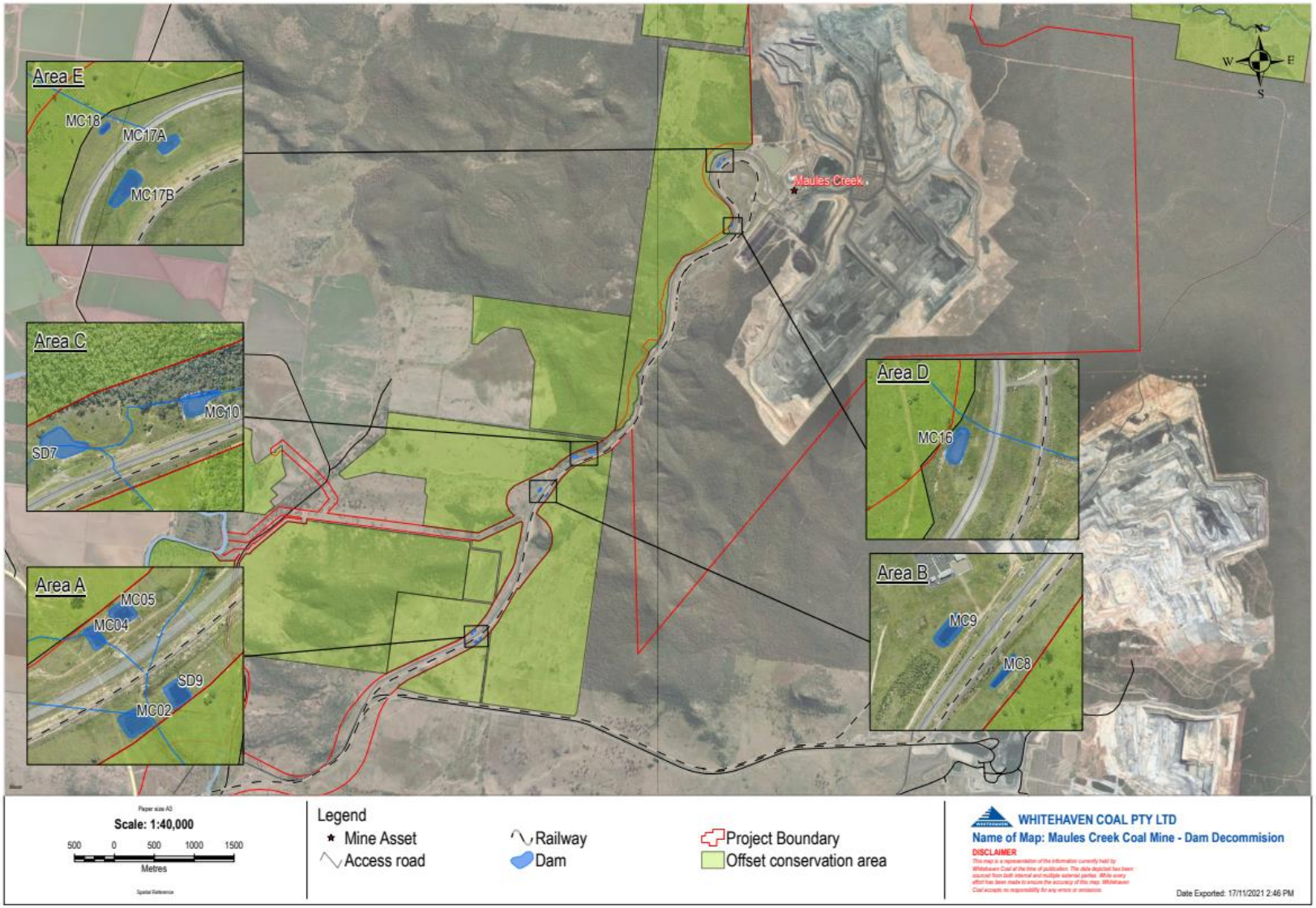

Figure 1. Location of dams listed in Table 1 (plus two additional dams (MC16, MC18)).

2. Preliminary assessment

Prior to the commencement of dewatering, a preliminary site inspection by an aquatic ecologist is required to determine the extent of habitat features in the dam, as well as the species likely to occur in the dam. This information will assist in planning the logistics of fauna capture and transportation, such as the number of days needed for dewatering and fauna relocation, and whether more than one site is needed for fauna release.

If a dam is empty at the time of dewatering, or there are no fish present that require relocating, this plan will not apply to that dam.

The site inspection will identify locations for the release of fauna. Optimal sites will contain deep pools, be of similar water quality to dams, and be large enough to accommodate new fauna or allow ready dispersal of fauna to other areas. The release sites need to be accessible by vehicle (within about 20 minutes drive). These sites would likely be in Maules Creek, Namoi River, or Barbers Lagoon as these are the nearest bodies of permanent water and are in the same catchment as the dams. However, other large dams, billabongs, lagoons, or rivers may also be considered. Prior to release of aquatic fauna, approval will be required from DPI Fisheries. Fisheries will need to know the expected numbers of each species to be released and details of the release (target) waterway, and will seek assurance that:

- No exotic fish species, or aquatic weeds will be released into the target waterway
- The species released will not weaken the genetic diversity of fish already resident in the target waterway
- Sick or injured fauna would not be released into the target waterway
- Aquatic species would not be released into the target waterways in numbers so high that they have a negative impact on resident fauna, either through predation or competition.

Any diseased fish or exotic species, such as Carp, Goldfish or Mosquitofish should be humanely euthanised at the dewatered dam, and not transported to the release site.

Water quality measurements (dissolved oxygen, temperature, pH, electrical conductivity) will be measured at the dams and potential release sites during the inspection. Water chemistry samples will also be collected and analysed for heavy metals. The purpose of these measurements is to ensure that physico-chemistry of the release site does not differ significantly to that of the capture site. Another set of measurements (especially dissolved oxygen, pH and conductivity) will be taken on the day of fish release.

3. Potential aquatic species present

3.1. At release sites

The Namoi River between Gunnedah and Narrabri includes habitat for the following threatened species:

- Murray Cod (*Maccullochella peelii*)
- Eel-tailed Catfish (*Tandanas tandanas*)
- Silver Perch (*Bidyanus bidyanus*)
- Olive Perchlet (*Ambassis agassizii*).

Given favourable flow and conditions, these species may also move up into Maules Creek. Maules Creek has been mapped as having potential habitat for the threatened Purple-spotted Gudgeon (*Mogurnda adspersa*), but this is not mapped as occurring in the Namoi River.

Other species that may occur on rivers and lagoons in the region are listed in Table 2.

Table 2. Fish and turtles with potential to occur in the Namoi River, Maules Creek, and associated lagoons. Fish data compiled from Lintermans (2007)

Common Name	Scientific name	Status
Fish		
Bony Bream	*Nematalosa erebi*	
Australian Smelt	*Retropinna semoni*	
Freshwater Catfish	*Tandanas tandanas*	Endangered population (NSW)
Darling River Hardyhead	*Craterocephalus amniculus*	
Unspecked Hardyhead	*Craterocephalus stercusmuscarum fulvus*	
Murray-Darling Rainbowfish	*Melanotaenia fluviatillis*	
Olive Perchlet	*Ambassis agassizii*	Endangered population (NSW)
Golden Perch	*Macquaria abmbigua ambigua*	
Murray Cod	*Maccullochella peelii peelii*	Threatened (Commonwealth)
Silver Perch	*Bidyanus bidyanus*	Vulnerable (NSW)
Spangled Perch	*Leiopotherapon unicolor*	
Purple-spotted Gudgeon	*Mogurnda adspersa*	Endangered (NSW)
Carp Gudgeon	*Hypseleotris* spp	
Carp	*Cyprinus carpio*	Exotic
Goldfish	*Carassius auratus*	Exotic
Eastern Gambusia	*Gambusia holbrooki*	Exotic
Turtles		
Murray River Turtle	*Emydura macquarii*	
Eastern Long-necked Turtle	*Chelodina longicollis*	

3.2. Sediment dams

The sediment dams are likely only to include hardy fish species with some capability of disbursing overland, or during larval stages when attached to waterbirds. Species present may include carp, goldfish, gambusia, carp gudgeon and spangled perch. Of these, only some of the spangled perch and carp gudgeon can practically be relocated, as the remainder are pest species requiring euthanising. It is possible that other species listed in Table 2 may occur in larger dams, although this is unlikely unless they were introduced or there is a strong hydrological connection. The exact composition of the fish community will depend on what habitat is available in the sediment dam and the level of connectivity between the sediment dam and nearby natural waters. Eastern long-necked turtle is also likely to occur in the dams as they often walk overland and occupy dams.

4. Permits required

A properly trained and qualified ecologist or wildlife carer must be present during the final stages (when water is <0.6 m deep) of the dewatering process to relocate fauna, take animals into care, or euthanise them as required. The ecologist should hold the appropriate licences, including NSW Fisheries Section 37 Scientific Collection Permit, NSW Biodiversity Conservation Licence and Animal Research Authority (Animal Care and Ethics) to catch and relocate fish, turtles, frogs, and other aquatic fauna ethically.

A Fish Stocking Permit under s.216 of the *Fisheries Management Act 1994* must be obtained from the NSW Department of Primary Industries prior to relocating and releasing any fish into waterways. The permit is free but can take 6 weeks to process so this timing should be factored into dewatering plans. The form 'Stocking Permit Application' along with a pro-forma for a Review of Environmental Factors to address the Guidelines for Environmental Assessment of Fishing Related Activities is available at:

https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/639113/Section-37-Permit-Stocking-12V1.pdf

https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/296066/Guidelines---Environmental-Assessment-of-Fishing-Activities.pdf?msclkid=7bb1c730d00811ec8d09f745002e6b10

Consultation with DPI Fisheries is strongly recommended before submitting the fish stocking application, as there are certain circumstances where Fisheries may not authorise fish relocation (e.g. if genetic/disease spread is of concern) or may waive the permit requirement (e.g. if moving fish to another dam on site). Another consideration is if the species present in the dam are abundant in the surrounding catchment, so the relocation would not add benefit to the overall fish community. Some dams at MCCM may fall into this category, since many of the residents would be exotic (to be euthanised) or common through the catchment. Fisheries are more likely to accept a proposal that relocates fish into another dam rather than a natural waterway.

5. Develop dewatering plan

Prior to dewatering, a plan should be developed to inform site staff and ecologists of site-specific considerations. The plan can include all dams to be dewatered, but for each dam should include:

- a map of the dam, showing the best location for water disposal/irrigation
- a summary of water quality and water chemistry results, and a comparison to water quality guidelines (ANZG 2018)
- a set of instructions on how the native species are to be captured, transported, and released; or how exotic species are to be euthanised
- a proposed location for release of fauna (requires discussion with DPI Fisheries and a permit to release fish)
- an estimate of dam volume to determine how long each dam may take to dewater, and recommendations on how water should be disposed of
- a risk assessment that considers the potential impact of releasing fauna into a receiving environment, as well as the potential impacts of releasing water from the dam into downstream environments
- detailed roles of staff involved in fauna relocation.

If the dam is already dry prior to initiating dewatering, the ecologist will inspect the area to determine if any fauna needs relocating. No further actions will then be required.

6. Dewatering

The process of dewatering the dam is to be outlined in the dewatering plan, and should occur in a way that causes minimal disturbance to downstream environments. If the water quality of the dam complies with the mines EPL conditions, it shall be released to the environment. If the water quality is not suitable, the water shall be pumped back to the mines water management system Rapid dewatering of the final ~0.6 m is required otherwise fauna will be stressed from lack of dissolved oxygen, resulting in a mass fish kill event. For the early stages of dewatering, an aquatic ecologist does not need to be on-site, but they should be on-call. If the dewatering supervisor requests an ecologist, dewatering should cease until they arrive on site.

While the dam water level is still high and undisturbed, the containers in which fish are to be transported should be filled with water. Alternatively, this water can be stored in a water tanker and used as needed once fish relocation commences.

When water is approximately 0.6 m deep, an excavator should be used do dig a sump in the bottom of the dam adjacent to one of the sides. Water and fish will drain into this sump and provide a focal area for ecologists to scoop them out with hand-held nets. The sump should be located beside stable ground that provides firm footing. This may mean that soft sediment needs to be removed first and steps/ramp excavated down the bank.

7. Capture and relocation of fauna

Fauna capture will commence when water level in the dam is at approximately 0.6 m from the bottom. By this time the water may be turbid from the disturbance of bottom sediments, but fish should be able to swim relatively freely.

High temperatures lead to a rapid decline in dissolved oxygen, so fish capture and transportation should not occur if ambient temperature exceeds 36 °C.

For safety, at least two ecologists must be present, and a throw-rope with float on the end should be within reach. Ecologists are rarely able to wade in shallow dams, as the sediment is too deep and thick. As the water level drops, the sediment slides towards the deepest end causing a dangerous environment to walk in, but this depends on the shape of the dam floor and land-use (high or low sedimentation). Therefore, the safest position for the ecologist is around the firm steps/landing excavated for the sump. Here, ecologists can scoop out fish heading towards the pump and transfer them into pre-filled containers. Containers should contain portable aerators, not be over-stocked, and have a secure lid. Turtles can be kept in a deep, lidded container with wet hessian or cloth.

Fauna in containers should be continually monitored and should be delivered to release location by 4WD as soon as possible (preferably within an hour of capture). If there are a lot of fish, an additional pair of ecologists would be needed to drive the vehicle and release fauna.

At the release site, excess water from containers should be incrementally drained onto the ground, and water from the release site slowly introduced (poured by bucket) to the container to help fish acclimate. After several minutes (time will vary with species and condition of fish), fish can be slowly released into the destination waterway via aquarium net or hand (i.e. the water from the dam must not enter the target waterway).

8. Post-dewatering

Once fauna relocation is complete, the dam should be left for 72 hours. This will allow any turtles buried in the mud to relocate themselves. If the dam has steep banks, a shallow grade ramp should be constructed to allow exit towards a favourable destination. Lastly, sediment can be excavated and stockpiled to dry (if required) and/or the dam wall removed for restoration of the site.

After the completion of each dam dewatering and fauna relocation, a brief summary report will outline the species and number relocated or euthanised, a map showing the release location, and notes on other relevant aspects of relocation.

9. References

Lintermans, M. 2007. *Fishes of the Murray-Darling Basin: An introductory guide.* Murray-Darling Basin Authority.

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ATTACHMENT 5
ASSESSMENT OF SD7 AND SD9 WATER QUALITY IN SUPPORT OF MCM EPL VARIATION REQUEST

0644-53-B1

Emma Bulkeley
Whitehaven Coal Ltd
via email: EBulkeley@whitehavencoal.com.au

3 November 2021

Subject: Assessment of SD7 and SD9 water quality in support of the MCM EPL variation request

Dear Emma,

1 INTRODUCTION

Maules Creek Coal Pty Ltd (MCCPL) is currently undertaking investigations in support of decommissioning a number of water storages in the vicinity of the Maules Creek Mine (MCM), in an effort to restore the pre-mining drainage paths. Two of the dams flagged for decommissioning are SD7 and SD9, both located along the rail line to the south west of the mining operations (see Figure 1). SD7 would spill into Southwest Tributary, which joins the Namoi River approximately 4.5 km downstream. SD9 overflows south, into an unnamed tributary of the Namoi River.

SD7 and SD9 are both identified as Discharge Water Quality Monitoring Points in P1.3 of MCM's current EPL (20221). NSW EPA have advised that SD7 and SD9 must first be removed from the EPL before they can be decommissioned.

This document presents an assessment of the recorded water quality in SD7 and SD9, to demonstrate that the quality of runoff that these dams collect is of good quality and does not require future monitoring. The recorded SD7 and SD9 water quality has also been benchmarked against background water quality data collected in the Namoi River.

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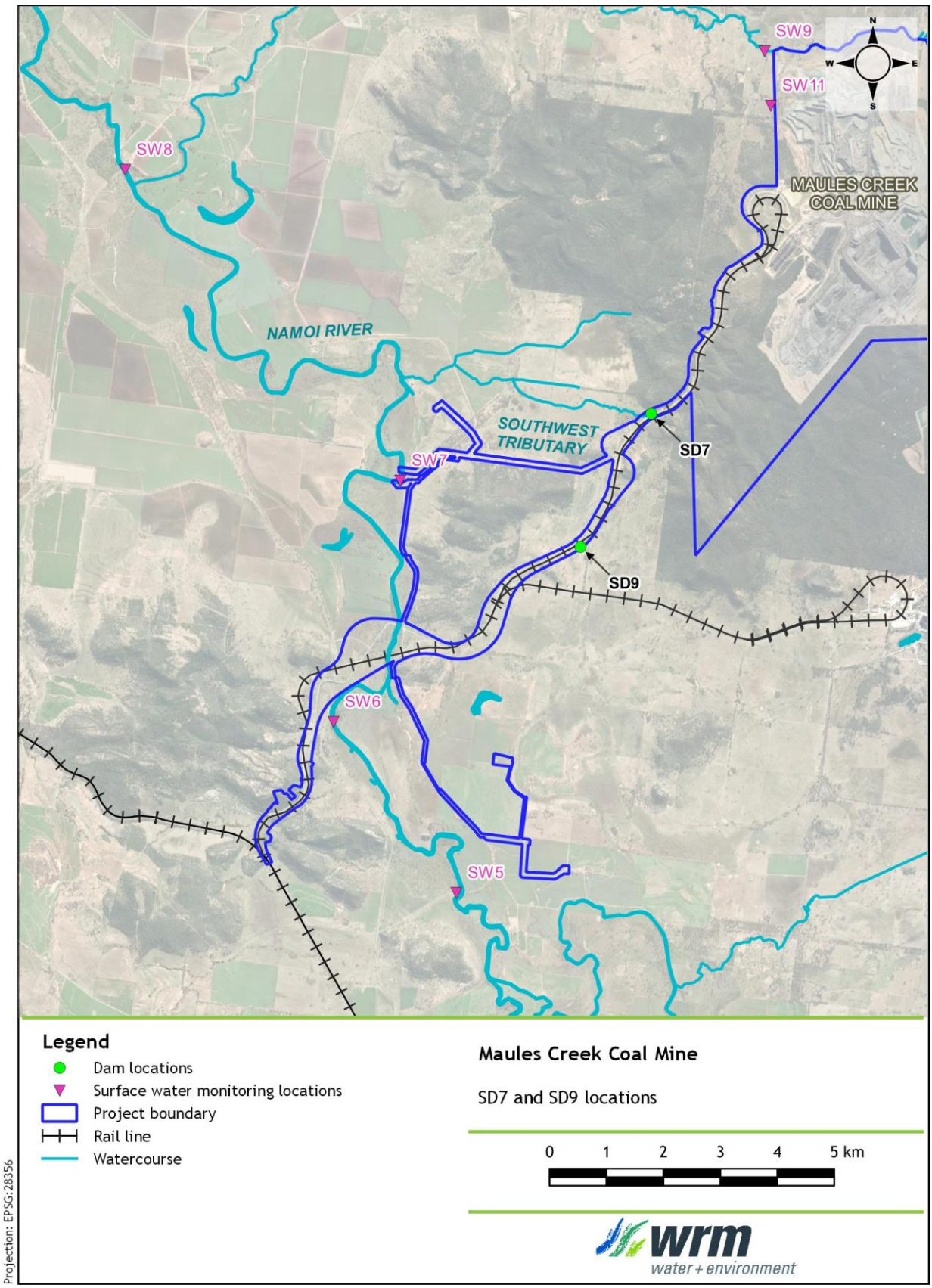

Figure 1 – Assessment locations

2 BACKGROUND WATER QUALITY IN THE NAMOI RIVER

Figure 2 shows the recorded water quality in the Namoi River at SW5, SW6, SW7 and SW8 for the following analytes:

- Field pH;
- Total suspended solids (TSS); and
- Laboratory electrical conductivity (EC).

Table 1 shows a summary of the recorded water quality data for the period between 2010 and 2021.

Table 1 – Summary of pH background water quality in the Namoi River (SW5, SW6, SW7, SW8)

Parameter	No. Samples	Min.	20%ile	50%ile	80%ile	Max.
Field pH	64	6.5	8.01	8.28	8.59	10.4
TSS (mg/L)	62	5	20	38	64	1,270
Lab EC (uS/cm)	45	192	327	511	665	1,100

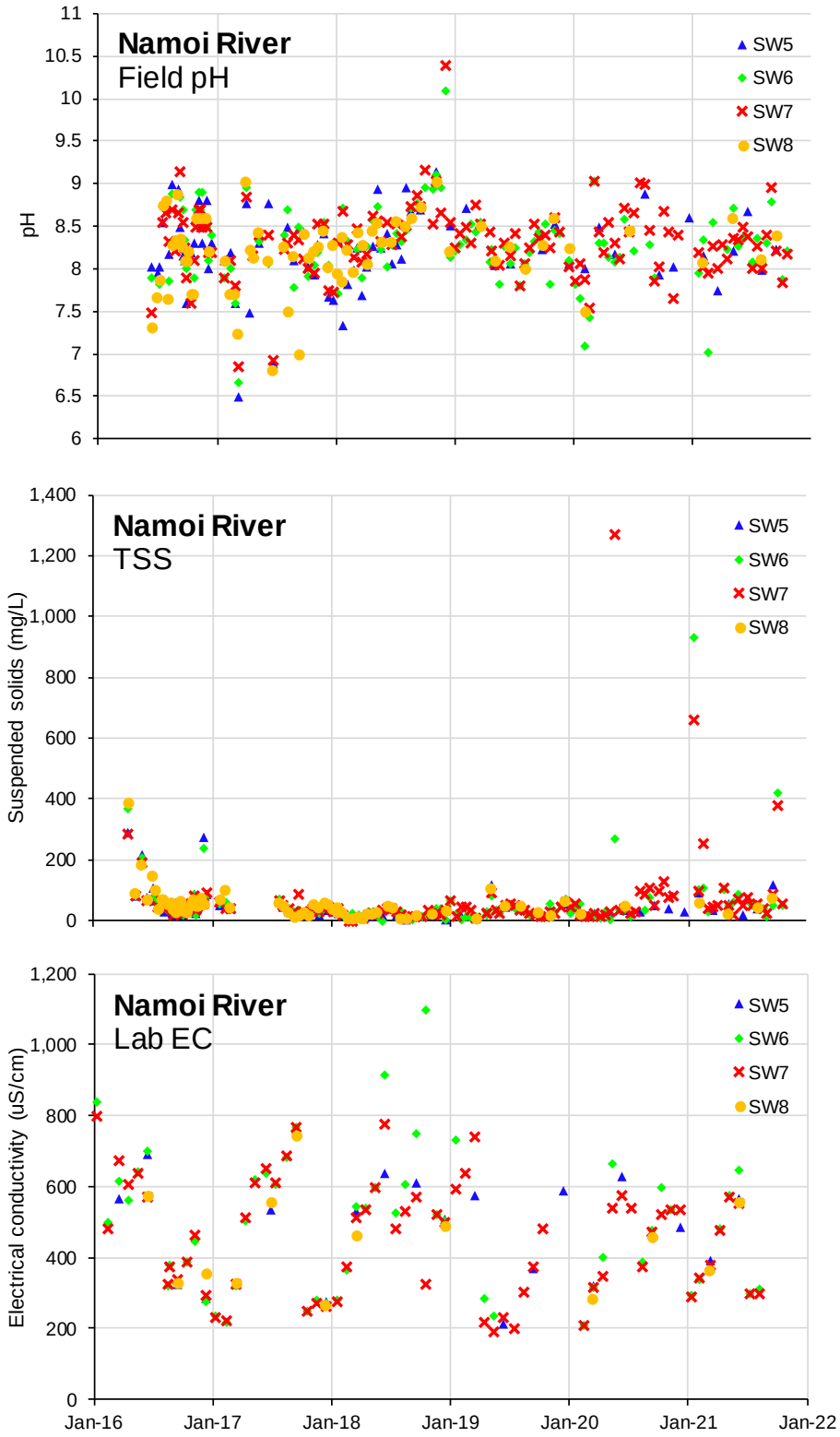

Figure 2 - Namoi River water quality

3 SD7 AND SD9 WATER QUALITY

The water quality recorded in SD7 between 2016 and 2021 is shown in Figure 3. This figure shows water quality recorded both in the dam itself, as well as in the waters overtopping the spillway during wet weather discharge events.

The following is of note regarding the SD7 water quality:

- Field pH:
    - The pH in SD7 typically ranges between 8 and 8.9 (20%ile to 80%ile), which is generally similar to the range observed in the Namoi River.
    - All of the pH levels observed in the SD7 discharges are within in the specified limits in EPL 20221.
    - The pH level in water discharged from SD7 is lower than levels recorded in the dam, on the same date.
- TSS:
    - TSS concentrations are generally low in SD7, typically ranging between 20 mg/L and 124 mg/L (20%ile to 80%ile).
    - There are number of spikes in TSS concentrations, usually during wet weather events. These spikes are likely due to settled materials being disturbed and re-suspended during heavy rainfall. A similar response to heavy rainfall is also observed in TSS readings collected in the Namoi River.
    - Each of these spikes in concentration coincide with a 5-day rainfall depth which is greater than the 5-day 90% percentile rainfall depth for Gunnedah (38.2 mm).
- Lab EC:
    - EC concentrations in SD7 generally range between 270 uS/cm and 570 uS/cm (20%ile to 80%ile), which is within the range observed in the Namoi River.
    - The recorded EC concentrations in SD7 show a district trend of evapo-concentration during dry periods and dilution during wet period. This outcome suggests that the typically quality of the runoff collected by SD7 is typically good, however, the quality worsens as it is contained for long periods of time within SD7.

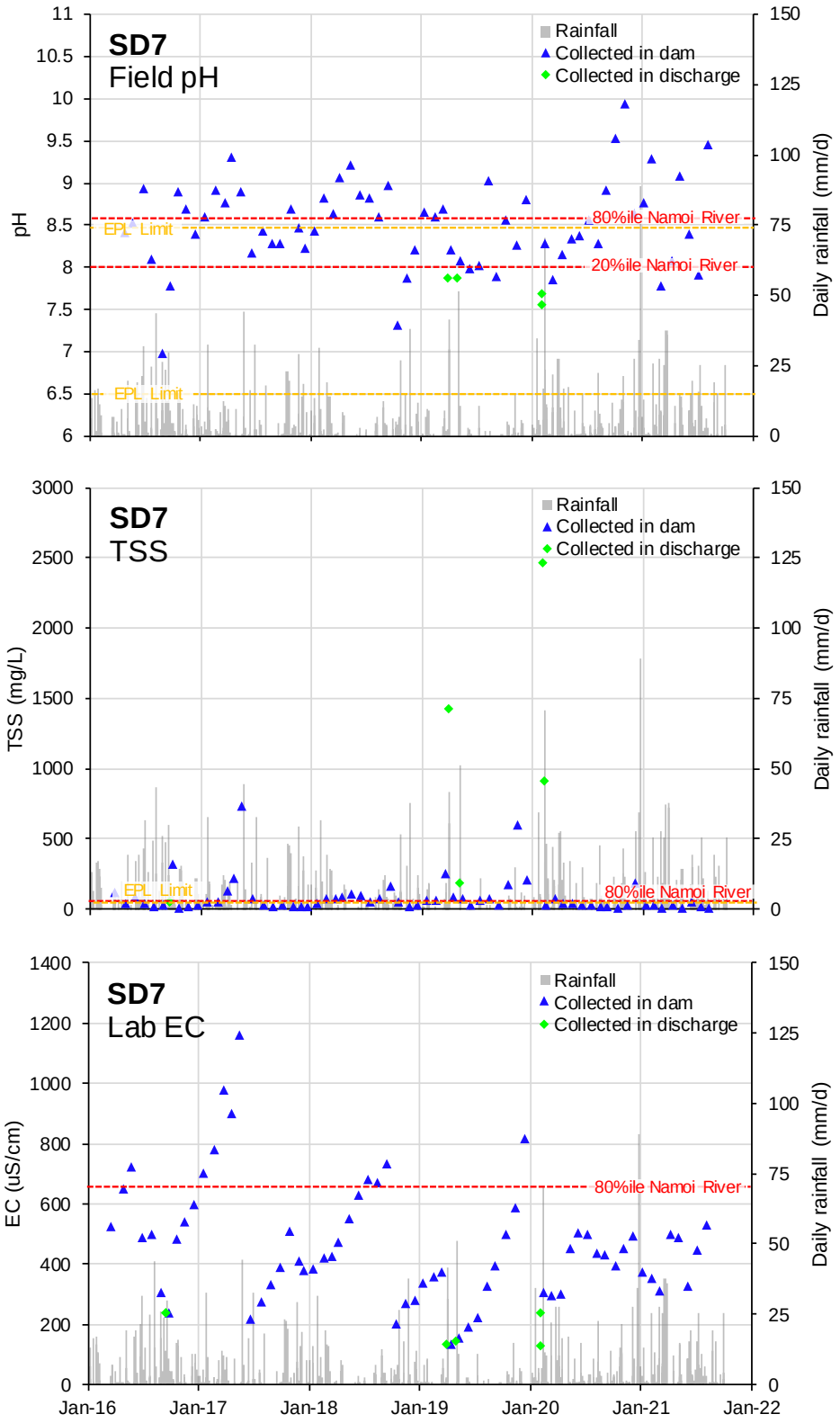

Figure 3 - SD7 recorded water quality

The water quality recorded in SD9 between 2016 and 2021 is shown in Figure 4. This figure shows water quality recorded both in the dam itself, as well as in the waters overtopping the spillway during wet weather discharge events.

The following is of note regarding the SD9 water quality:

- Field pH:
    - The pH in SD9 would typically range between 8.3 and 9.1 (20%ile to 80%ile), which slightly higher than what is observed in the Namoi River.
    - All of the pH levels observed in the SD9 discharges are within the specified limits in EPL 20221, aside from one record in June 2017. This point was found to be erroneous – the laboratory pH level of 8.18 is consistent with typically observed values.
    - The pH levels in SD9 discharges are notably lower than what is observed in SD9, with pH levels typically ranging between 7.9 and 8.5.
- TSS:
    - TSS concentrations are generally low in SD9, typically ranging between 18 mg/L and 90 mg/L (20%ile to 80%ile).
    - Similar to SD7, there are number of spikes in TSS concentrations, usually during wet weather events. Each of these spikes in concentration coincide with a 5-day rainfall depth which is greater than the 5-day 90% percentile rainfall depth for Gunnedah (38.2 mm).
- Lab EC:
    - EC concentrations in SD9 generally range between 539 uS/cm and 1,334 uS/cm (20%ile to 80%ile), which generally higher than the range observed in the Namoi River.
    - Similar to the pH readings, the EC concentrations in the SD9 discharges are significantly lower than what is observed in the dam, ranging between 296 uS/cm and 656 uS/cm.
    - The EC concentrations in SD9 exhibit a similar dry period/wet period trend to that observed in SD7. This suggests that the elevated EC concentrations are likely a result of evapo-concentration.

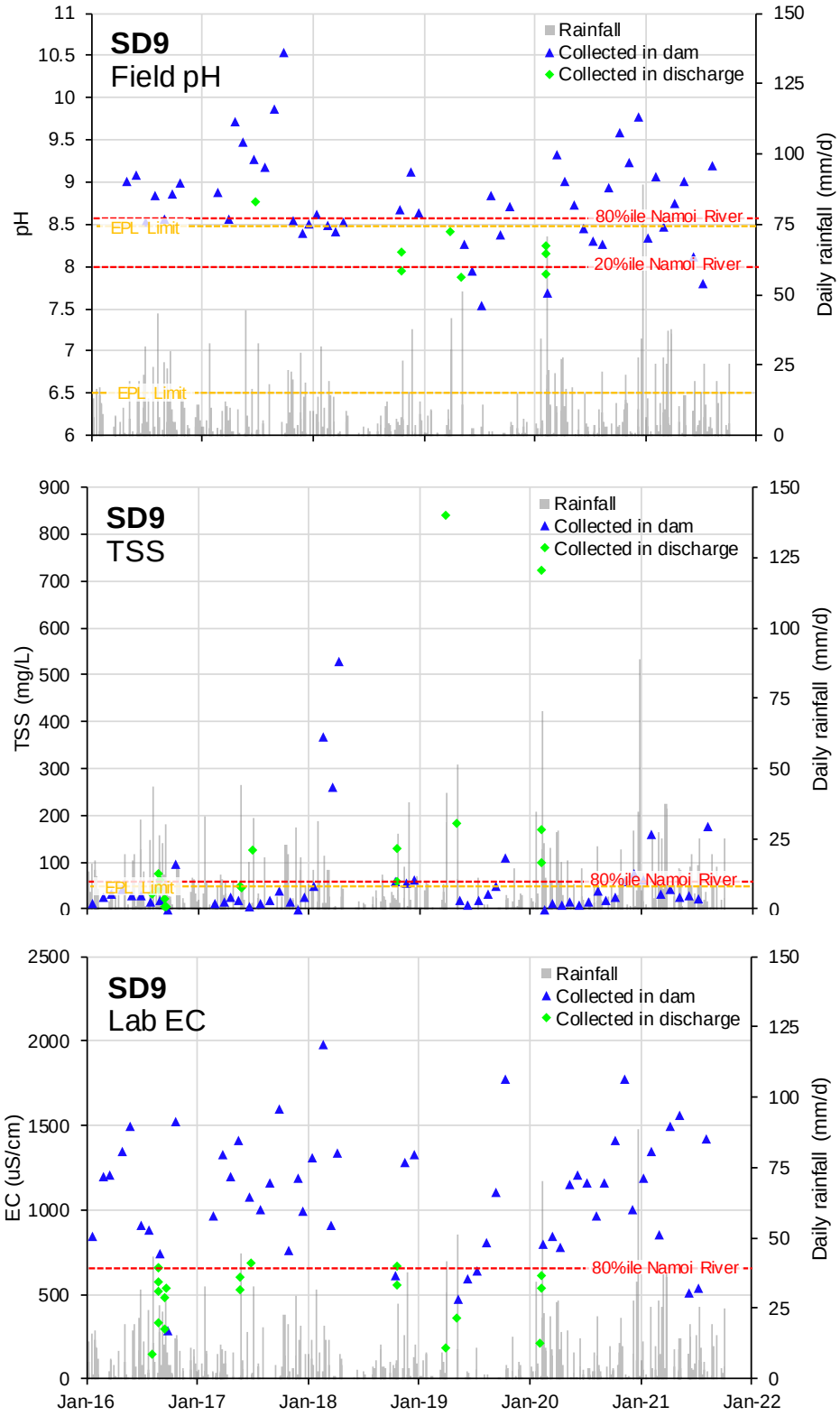

Figure 4 - SD9 recorded water quality

4 CONCLUSION

This assessment demonstrates that decommissioning SD7 and SD9 within EPL 20221 would have a negligible impact on the receiving environment, and these dams are not required to protect the downstream environmental values. The reasons to support this change include:

- Water quality recorded in SD7 and SD9 is generally similar to the Namoi River water quality and the EPL limits.
- Water quality in SD7 and SD9 would only exceed typical Namoi River concentrations during extended dry periods, when no spills are occurring.
- The quality of the SD7 and SD9 discharges to the receiving environment are always within the range of observed quality in the Namoi River, with no discharge concentrations exceeding the maximum observed quality in the Namoi River.

For and on behalf of

WRM Water & Environment Pty Ltd

Matthew Briody

Principal Engineer