MAC-ENC-PRO-060
EROSION AND SEDIMENT CONTROL PLAN

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1.0 Introduction

Hunter Valley Energy Coal Pty Ltd operates the Mt Arthur Coal Complex which consists of approved open cut and underground mining operations, a rail loop and associated rail loading facilities. The operations are located in the Upper Hunter Valley, NSW approximately five kilometres south west of Muswellbrook, refer to Figure 1.

Project Approvals and Environmental Protection Licences (EPLs) associated with Mt Arthur Coal mining operations are provided in Appendix 1 of the *MAC-ENC-MTP-034 Site water Management Plan*. The most recent Project Approval relates to development application number 09_0062, and was approved on 24 September 2010.
Activities that have the potential to cause or increase erosion, and subsequently increase the generation of sediment at the site, include exposure of soils during construction of mine infrastructure (i.e. during vegetation clearance, soil stripping and earthworks activities), ongoing mining activities involving clearing, and stripping and stockpiling mine materials. The following components have the potential to generate sediment:

- open cut coal mine pits;
- coal handling and preparation plant (CHPP);
- out of pit waste emplacements, bunds and topsoil stockpiles;
- coal stockpiles;
- infrastructure and activities at the export coal loader;
- access and haul roads;
- water management infrastructure (pumps, pipelines, dams, pits, sumps and drains);
- flooding; and
- general construction works on site.

Controls in these areas are discussed further in sections 3 and 4, and sediment control structures are shown on Figures 1 to 6. Further detail on the nature and extent of activities proposed as part of the Mt Arthur Coal mining process (including proposed sequence of mining, coal extraction program, overburden dumps and topsoil stockpile locations) is presented in the *Mt Arthur Coal Consolidation Project Environmental Assessment (2009)* and the current Mining Operations Plan.

This Erosion and Sediment Control Plan (ESCP) has been prepared to detail the relevant water quality impact assessment criteria and erosion and sediment control procedures for subsequent reporting in accordance with the Department of Planning and Infrastructure (DoPI) and the NSW Office of Environment and Heritage (OEH) requirements.

The locations of vegetation/habitat communities and other critical natural areas relevant to erosion and sediment control at Mt Arthur are presented in *Mt Arthur Coal Consolidation Project Environmental Assessment (2009)*, Appendix J – Ecological Assessment, Sections 3 and 4.

1.1. Objectives

The objective of this ESCP is to set out strategies to control soil erosion and sediment generation close to the source and thereby minimise the potential for mine activities to adversely affect downstream water quality. A secondary objective is to ensure that measures are in place to adequately manage flood risks.

1.2. Environmental Management System

Mt Arthur Coal has a firm commitment to minimising the impact of its operations on the local environment and community, and has a comprehensive Environmental Management System (EMS) in place to fulfil this commitment. This ESCP is a component of the Mt Arthur Coal EMS.

1.3. Consultation Process

This ESCP has been prepared in consultation with OEH and NSW Office of Water (NOW) Feedback from agencies is included in Appendix 1.

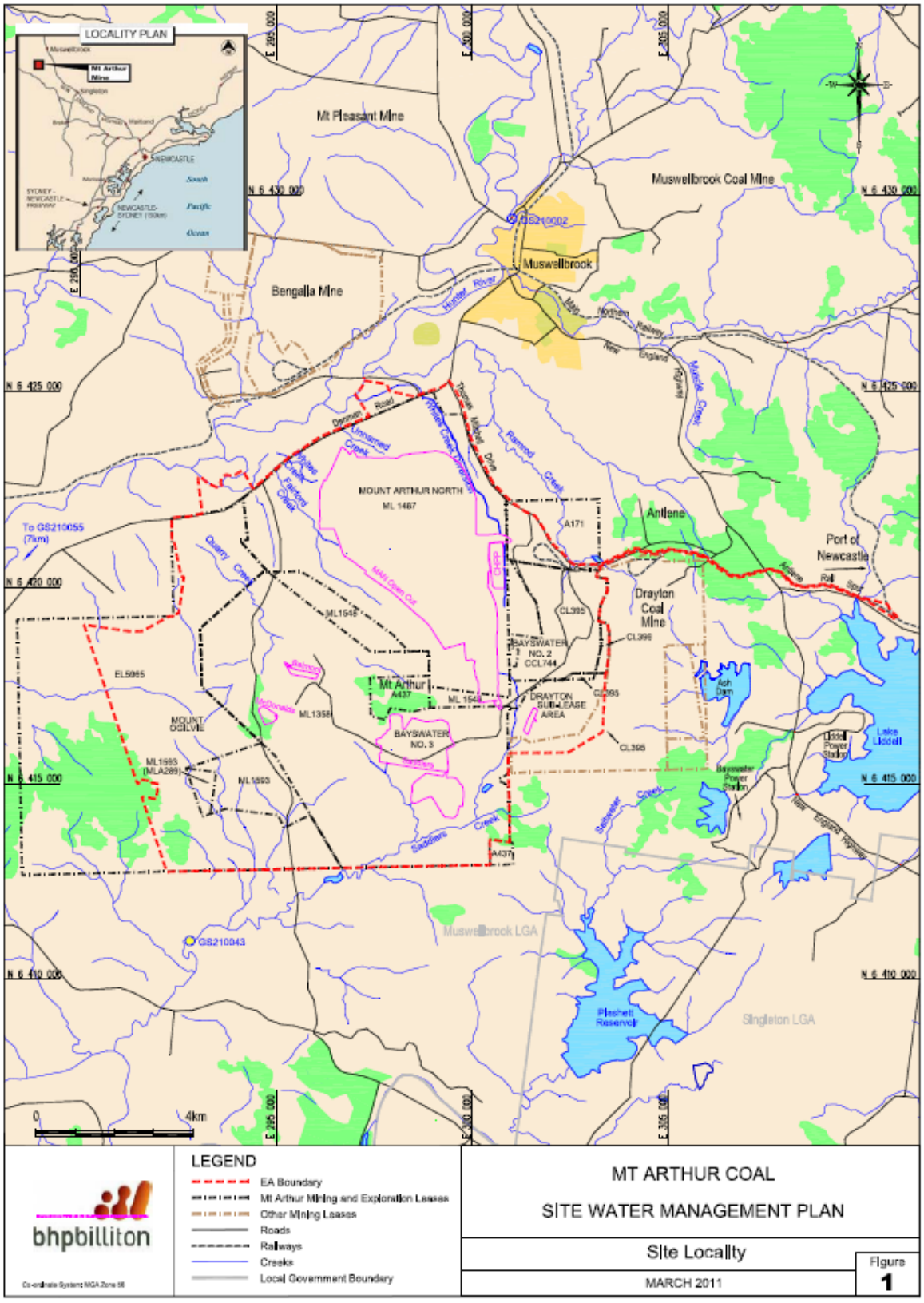

Figure 1: Mt Arthur Coal Site Locality

2.0 Impact Assessment Criteria

The erosion and sediment control impact assessment criteria applicable to the Mt Arthur Coal Complex are based on the 90th percentile of baseline Total Suspended Solids (TSS) results for samples collected as part of the surface water monitoring program. The surface water monitoring program and 90th percentile trigger values are presented in MAC-ENC-PRO-061.

The Managing Urban stormwater: soils and construction guidelines (Landcom guidelines) contain requirements for erosion control and water management which are detailed in the sub-sections below.

2.1 Principles

The following principles, which have been taken from the Landcom guidelines, underpin the approach to erosion and sediment control for the mine site:

- Minimising surface disturbance and restricting access to undisturbed areas.
- Progressive rehabilitation/stabilisation of mine infrastructure areas.
- Separation of runoff from disturbed and undisturbed areas where practicable.
- Construction of surface drains to control and manage surface runoff.
- Construction of sediment dams or use of existing/modified water storages to contain runoff up to a specified design criterion.

2.2 Timeline of Events

Development activities will generally occur in the following order:

1. Construction of diversion drains (typically upslope of disturbance areas) – these will only be constructed where they will significantly reduce the catchment reporting to disturbance areas.
2. Construction of sediment dams/sumps where required to provide for temporary retention of runoff from disturbance areas. Where practicable, existing dams, existing farm dams and non-operational open cut voids will be preferentially utilised for this purpose.
3. Construction of collection drains (downslope of or within disturbance areas) where required to convey runoff to sediment dams or other storages.
4. Construction of sediment fences and straw bale filters (downslope of disturbance and stockpile areas) where required.
5. Construction, pre-stripping or mining works will only take place once erosion and sediment control measures are in place.

2.3 Design Criteria

The design criteria for sediment control structures are summarised in Table 1.

Table 1: Design Criteria for Sediment Control Structures

Sediment Control Structure	Function	Design Capacity
Upslope diversion drains	Reduce runoff from undisturbed areas onto disturbed areas	Peak flow calculated for 1 in 10 year critical duration rainfall event (Landcom (2004), Section 5.4.3(b)-(d))
Downslope collection drains	Intercept and convey disturbed area runoff water to sediment dams/sumps	Peak flow calculated for 1 in 10 year critical duration rainfall event (Landcom (2004), Section 5.4.3(b)-(d))
Sediment dams	Containment of sediment-laden runoff from disturbed areas with more than 150m^3/yr estimated soil loss (Landcom (2004), Section 6.3.2(d))	**Settling Zone:** Capacity to store the runoff produced from the 80th percentile, 5-day rainfall event (Landcom (2004), Section 6.3.4(f) and (i))
		Sediment Zone: Two months calculated soil loss estimated using RUSLE* (Landcom (2004), Section 6.3.4 (i))
Sediment fences and/or straw bale filters	Retention/filtration of suspended sediments	Limit flow to less than 50L/s in the design 1 in 10 year critical duration rainfall event (Landcom (2004), Section 6.3.7(e))

*Revised Universal Soil Loss Equation (RUSLE)

The 90th percentile 5-day rainfall event, used in determining the sediment dam settling zone capacity, was calculated to be 39.35mm from the average of values for Scone and Cessnock as given in Table 6.3a in Landcom (2004).

2.4 Sediment Dam Design

Based on the methodology and parameters contained in Landcom (2004), the settling zone capacity and sediment storage zone capacity and hence required dam capacity are calculated using Equations 1, 2 and 3 below respectively:

$$\text{Settling Zone Capacity } (m^3) = V_{settling} = 82.25 \times A \quad (1)$$

$$\text{Sediment Zone Capacity } (m^3) = V_{sediment} = 27.16 \times A \quad (2)$$

$$\text{Required Dam Capacity } (m^3) = V_{total} = V_{settling} + V_{sediment} \quad (3)$$

Where; $V_{settling}$ = settling volume
$V_{sediment}$ = sediment volume
V_{total} = total volume
A = catchment area of the sediment dam (ha)

Sediment dam batters should be covered with topsoil and/or seeded with a cover crop to assist with minimising the potential for erosion of the dam batters.

2.5 Sediment Dam Dewatering

If the available freeboard volumein sediment dams is approaching the required design capacity between rainfall events, water will be released only if the total suspended sediment (TSS) content meets the recommended criterion of 50mg/L (Landcom, 2004). Dewatering would occur to well-grassed areas where sufficient grassed buffer exists to prevent the migration of sediments to watercourses. Flocculant addition will be used, if required, to meet the recommended Landcom (2004) criterion. Alternatively, sediment dams would be dewatered to mine water storages or stored water used directly for mine activities such as dust suppression, irrigation and moisture conditioning of earthworks.

3.0 Control Measures

The Mt Arthur Coal Erosion and Sediment Control Management System includes a comprehensive set of both proactive and reactive control measures designed to minimise the impact of sediment on water sources. The primary management measure for erosion and sediment is the control of initial ground disturbance, and the timely land rehabilitation following disturbance. Where disturbance is unavoidable, erosion and sediment control structures will be constructed.

Further information on soil types (depths and erodibility), as well as site topography, is presented in current Mining Operations Plan and *Land Management Plan* (MAC-ENC-MTP-030).

3.1 Control Methods

Mt Arthur Coal will employ the use of the following methods to control erosion and manage sediment laden runoff:

- Excavation Permit – permit system to manage and minimise disturbance to undisturbed or rehabilitated land. The procedure *Clearing and Topsoil Stripping MAC-ENC-PRO-12* contains further information on the Excavation Permit process.

- progressive rehabilitation – mining disturbed land is rehabilitated to a stable, vegetated landform following completion of mining related activities. Rehabilitation of mining disturbed land is completed in accordance with the rehabilitation sequence and methodology contained in the current Mining Operations Plan.
- sediment dams – retain runoff volume from a rainfall event such that suspended solids can settle to the base of the dam.
- collection drains - constructed downslope of, or within, disturbed areas where required to convey runoff to sediment dams or other storages.
- sediment fences – vertical support pickets are spaced at a maximum of 2.5m intervals and are placed parallel to contours with limited contributing catchment area to any one section, self-supporting geotextile is placed on the upslope side of the posts.
- straw bale filters – similar to sediment fences with straw bales used instead of geotextile.
- kerbside turf filter strips – kerbs are surrounded by strips of turf such that sediment laden runoff from upslope has the opportunity to be filtered by the grass before discharging to the stormwater system.
- Humeceptors – proprietary devices aimed at removing sediment as well as oil and grease from stormwater runoff.
- post-rain inspections – sediment management structures are inspected following rain events of 25mm, or greater, in 24 hour period. Details of these inspections are contained in Section 3.3.

Runoff from most disturbed areas on site reports to water management containment storages or to mine open cut pits which are part of the mine water management system. Runoff from coal stockpile areas is managed within the mine site containment storages.

Details of current erosion and sediment control structures are provided in Section 4.1. **Error! Reference source not found.**4 provides a summary of design and as-built sizing of sediment control structures.

3.2 Flood Management

Flood bunding will be constructed between Denman Road and the EA Boundary to at least the recorded 1955 peak flood level in the Hunter River plus 0.5m freeboard. In order to achieve this minimum level, the height of such a flood bund will therefore be approximately 1.4m within the former Whites Creek channel, with only a small (less than 0.5m high) bund away from the channel. Based on available topographic information, flood bunding will be required in the Fairford Creek area. The calculated loss of flood storage in a 1955-magnitude flood as a result of this bunding is estimated at approximately 20 ML. In the context of the flood storage of a large river such as the Hunter, this loss of storage is considered negligible.

In the context of local flooding along Denman Road, the catchment area of Whites and Fairford Creeks will continue to be reduced as a result of Project-related open cut development westwards (refer Sections 2.3 and 5.1). As a result of catchment area reductions, flows and local flooding in these creeks will likewise be reduced.

4.0 Current Sediment Control Structures

Design and function of the major site erosion and sediment control structures is discussed in the following sub-sections, and summarised in Table 2. Further information on general site drainage catchments is presented in the *Site Water Management Plan* (MAC-ENC-MTP-034), Section 3.1.2.

4.1 Export Coal Loader Area

The export coal loader is located to the east of the Bayswater Main Dam (refer Figure 2). Surface water runoff from the coal stockpile areas flows generally from south to north until it reaches the Export Coal Loader Sediment Dam (ECLSD). The ECLSD is located in the north-east corner of the catchment (refer Figure 2) and has a total capacity of 23ML. The total catchment area reporting to the ECLSD is approximately 37.5ha.

4.2 Industrial Area

The industrial area incorporates the administration buildings, workshops, bathhouse and vehicle wash bays and covers an area of 48.1ha. Surface water runoff from the industrial area drains to a chain of sediment dams (refer Figure 3). Industrial Area Sediment Dam 1 (IASD1) spills to Industrial Area Sediment Dam 2 (IASD2). IASD1 and IASD2 have individual storage capacities of approximately 3ML and 68ML respectively. These dams are currently being expanded, with works expected to be complete by the end of 2012. Storage capacities will require updating upon completion of these works.

4.3 Visual Bund 1 Area

Visual Bund 1 (VB1) is a partially rehabilitated waste emplacement which contains a number of contour drains which convey runoff from the hillside to the Visual Bund 1 Sediment Dam (VB1SD) (refer Figure 4). The contour drains flow in a general south-east to north-west direction passing under the access road to VB1SD via two separate sets of culverts. VB1SD has a capacity of 16.6ML and has a total catchment area of 18.8ha.

4.4 North-Western Pit Progression Area

The current progression of the open cut pit is in a generally south-west direction with the northern areas confined by the boundary with Denman Road (refer **Error! Reference source not found.**). Upslope diversions are in place to control runoff entering at the highwall side. In the southern sections of the pit progression, runoff from pre-strip areas reports into the pit. This differs in the northern-most section of the pit because pit progression is in a north-west direction and, as the natural surface is sloping towards the Hunter River, any runoff from pre-strip areas has the potential to flow offsite. Whites Creek Sediment Dam (WCSD) is an existing dam positioned in the original Whites Creek channel. The estimated catchment area reporting to WCSD is 55ha, decreasing with pit progression, and the dam has a current storage capacity of

approximately 50ML. The following additional dams are required to capture runoff from planned pre-strip areas as the mine progresses:

- Fairford Creek Sediment Dam (FCSD) – proposed dam positioned in the Fairford Creek channel, with an estimated maximum catchment area of 119.6ha (see Figure 5).
- North Pit Sediment Dam 1 (NPSD1) – proposed dam positioned between the planned disturbance extent and Denman Road, with an estimated maximum catchment of 14ha (see Figure 5).
- North Pit Sediment Dam 2 (NPSD2) – proposed dam positioned to the northeast of NPSD1, with an estimated maximum catchment of 36.3ha (see Figure 4).

4.5 Ayredale South Link Road

The major haul road from the CHPP to Saddlers Pit has been extended to the south to allow for open cut expansion. Erosion control for the road includes revegetated downslope batters and sediment control structures. A sediment dam (Ayredale South Sediment Dam) has been constructed on the north eastern side of the haul road. The dam has a capacity of approximately 0.5ML, with an estimated catchment of 2.8ha.

4.6 Saddlers Sediment Dam

To manage runoff from the ground disturbance associated with the extension of Saddlers Pit, a sediment dam (Saddlers Sediment Dam) has been constructed to the south of the pit. The dam has a capacity of approximately 5.2ML, with an estimated catchment of 12.4ha (see Figure 7).

4.7 Maintenance of Erosion and Sediment Control Structures

Routine inspections of sediment control structures, as well as inspections following rainfall events of 25mm or more in a 24 hour period, will be conducted by Mt Arthur Coal personnel. During these inspections, sediment control structures are inspected for capacity, structural integrity and effectiveness. Inspections will be documented using a check sheet adapted from Landcom (2004) (refer Volume 1, Tables 8.1 and 8.2).

Where inspections indicate that sediment accumulation is approaching or exceeding the sediment zone of a dam, desilting will be undertaken so as to reinstate the minimum volumes given in Table 2. Silt fences and straw bale filters will be inspected and trapped sediment removed or straw bales replaced as necessary. Removed sediment will be placed within the mine water management footprint.

Table 2: Summary of Erosion and Sediment Control Design Parameters

Sediment Dam Name	Code	As Built Capacity (ML)*	Catchment Area (ha)	Required Settling Zone Capacity (m^3)**	Required Sediment Zone Capacity (m^3)**	Required Total Capacity (ML)**	Comments
Export Coal Loader Sediment Dam	ECLSD	23.0	37.5	5171	1020	6.2	Sufficient capacity for erosion and sediment control purposes
Industrial Area Sediment Dam	IASD	71.0	48.1	6619	1305	7.9	Sufficient capacity for erosion and sediment control purposes
Visual Bund 1 Sediment Dam	VB1SD	16.6	18.8	2588	510	3.1	Sufficient capacity for erosion and sediment control purposes
North Pit Sediment Dam 1	NPSD1	-	14.0	1928	380	2.3	Dam to be constructed (refer to Figure 5), Base RL=152m, Spill RL=155.3m, Capacity=2.4ML
North Pit Sediment Dam 2	NPSD2	-	36.3	4997	986	6.0	Dam to be constructed (refer to Figure 4), Base RL=172m, Spill RL=175.5m, Capacity=6.1ML
Whites Creek Sediment Dam	WCSD	50.0	55.0	7575	1494	9.1	Sufficient capacity for erosion and sediment control purposes
Fairford Creek Sediment Dam	FCSD	-	119.6	16472	3249	19.8	Dam to be constructed (refer to Figure 5), Base RL=137m, Spill RL=139.2m, Capacity=19.9ML
Ayredale South Sediment Dam	ASSD	0.5	2.8	382	75	0.5	Sufficient capacity for erosion and sediment control purposes
Saddlers Sediment Dam	SSD	12.4	31.2	4299	878	5.2	Sufficient capacity for erosion and sediment control purposes

* All capacities supplied by Mt Arthur Coal
** Calculated using methods outlined in Section 2.4

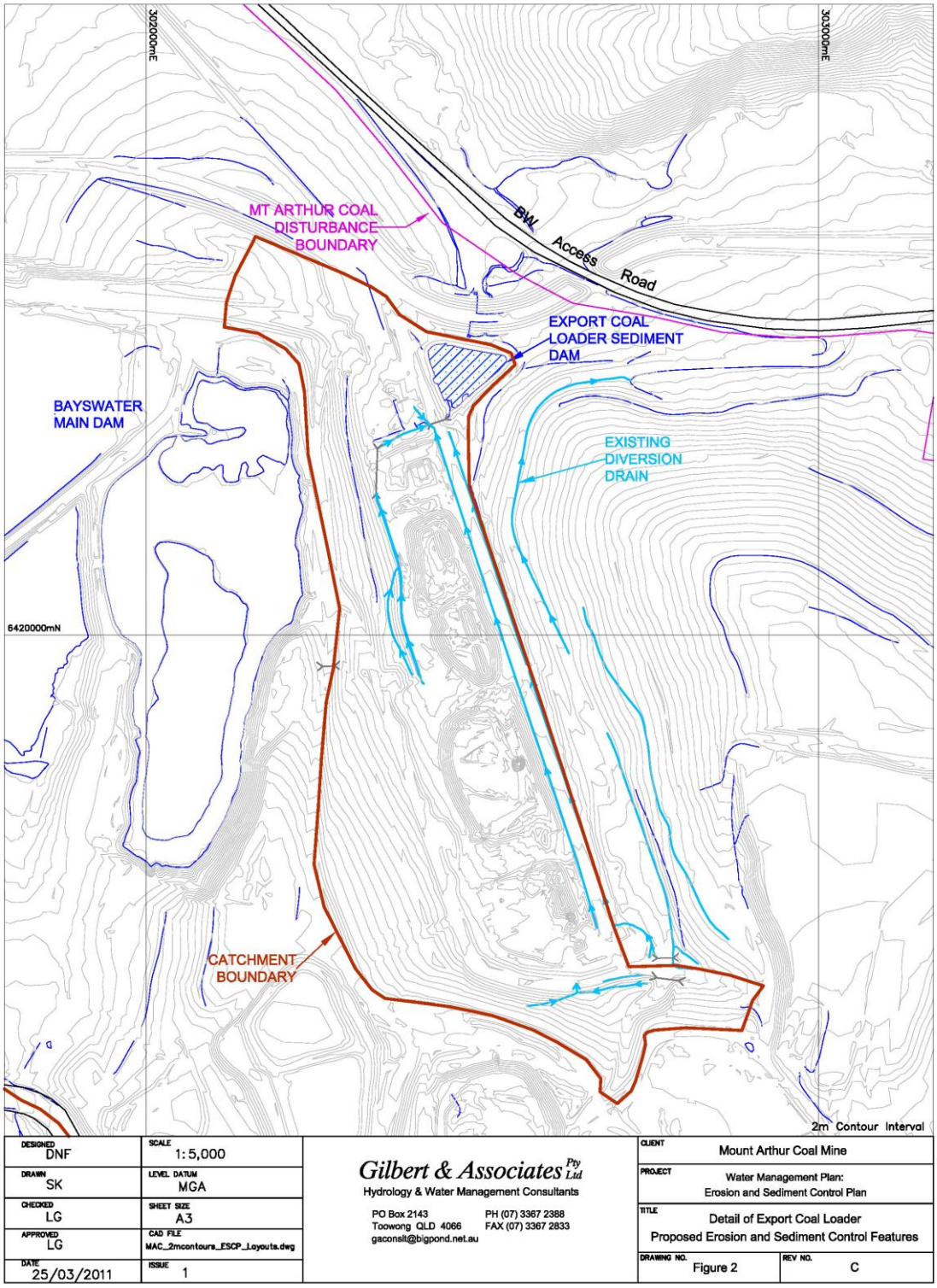

Figure 2: Detail of Export Coal Loader Erosion and Sediment Control Features

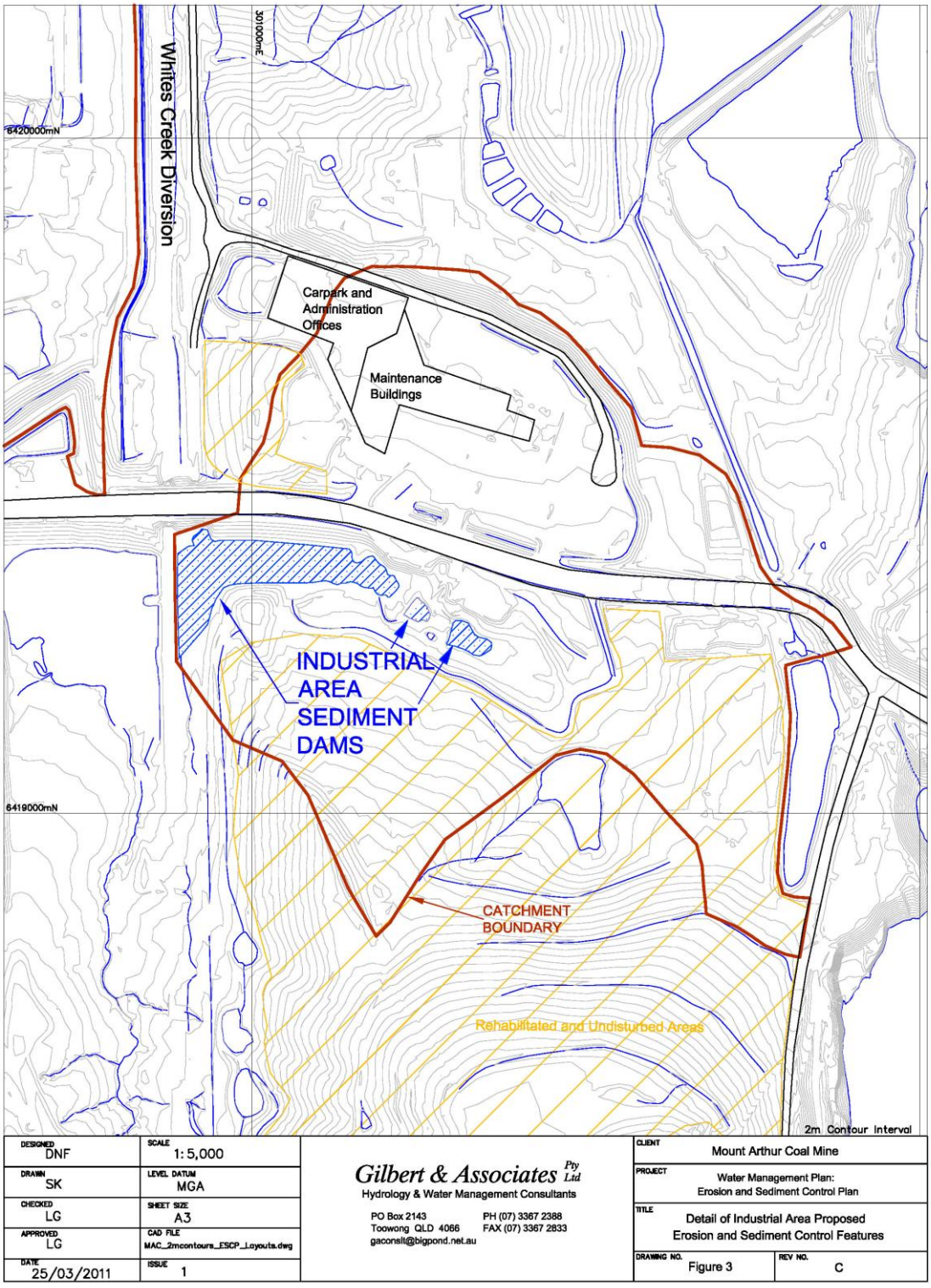

Figure 3: Detail of Industrial Area Erosion and Sediment Control Features

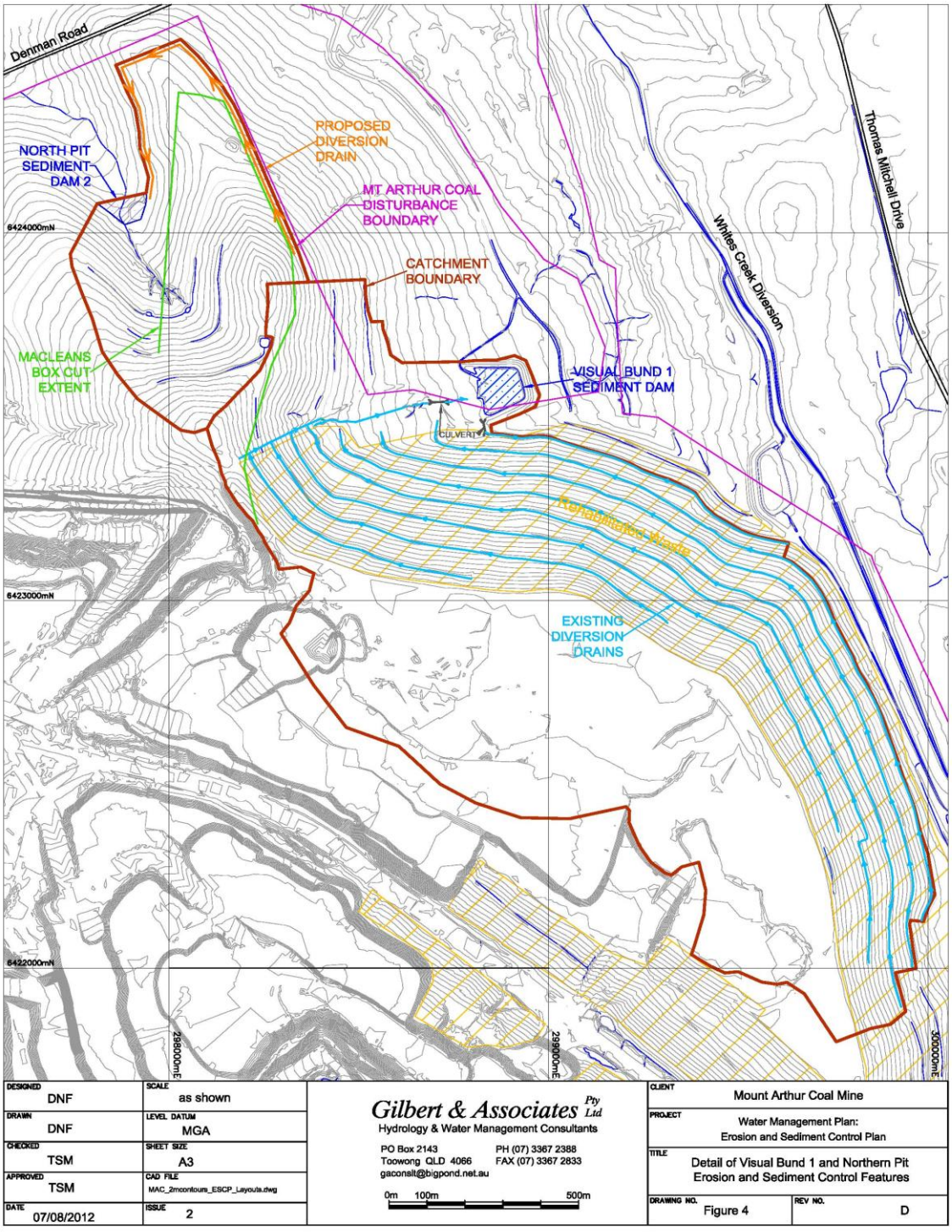

Figure 4: Detail of Visual Bund 1 Erosion and Sediment Control Features

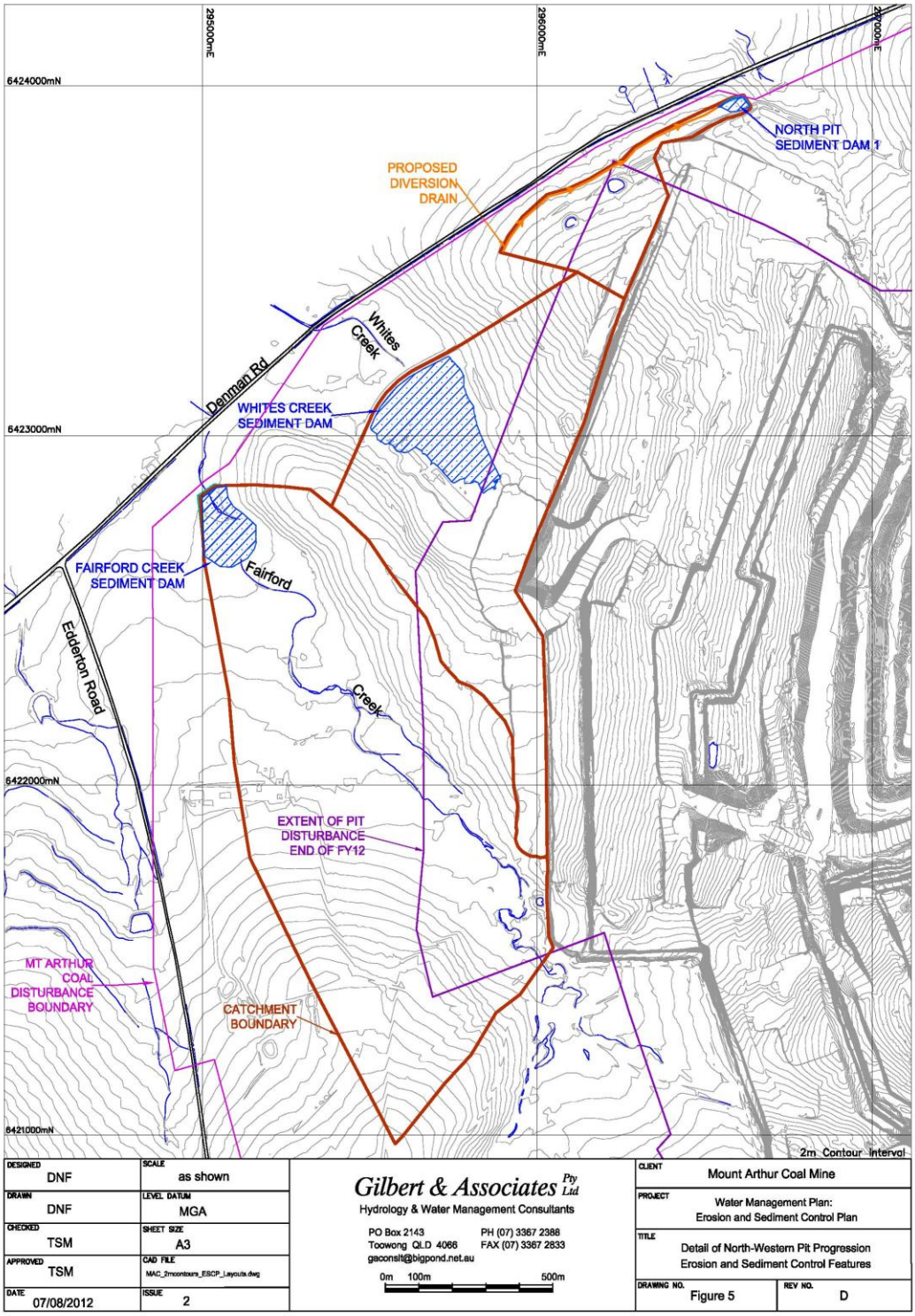

Figure 5: Detail of North-Western Pit Progression Erosion and Sediment Control Features

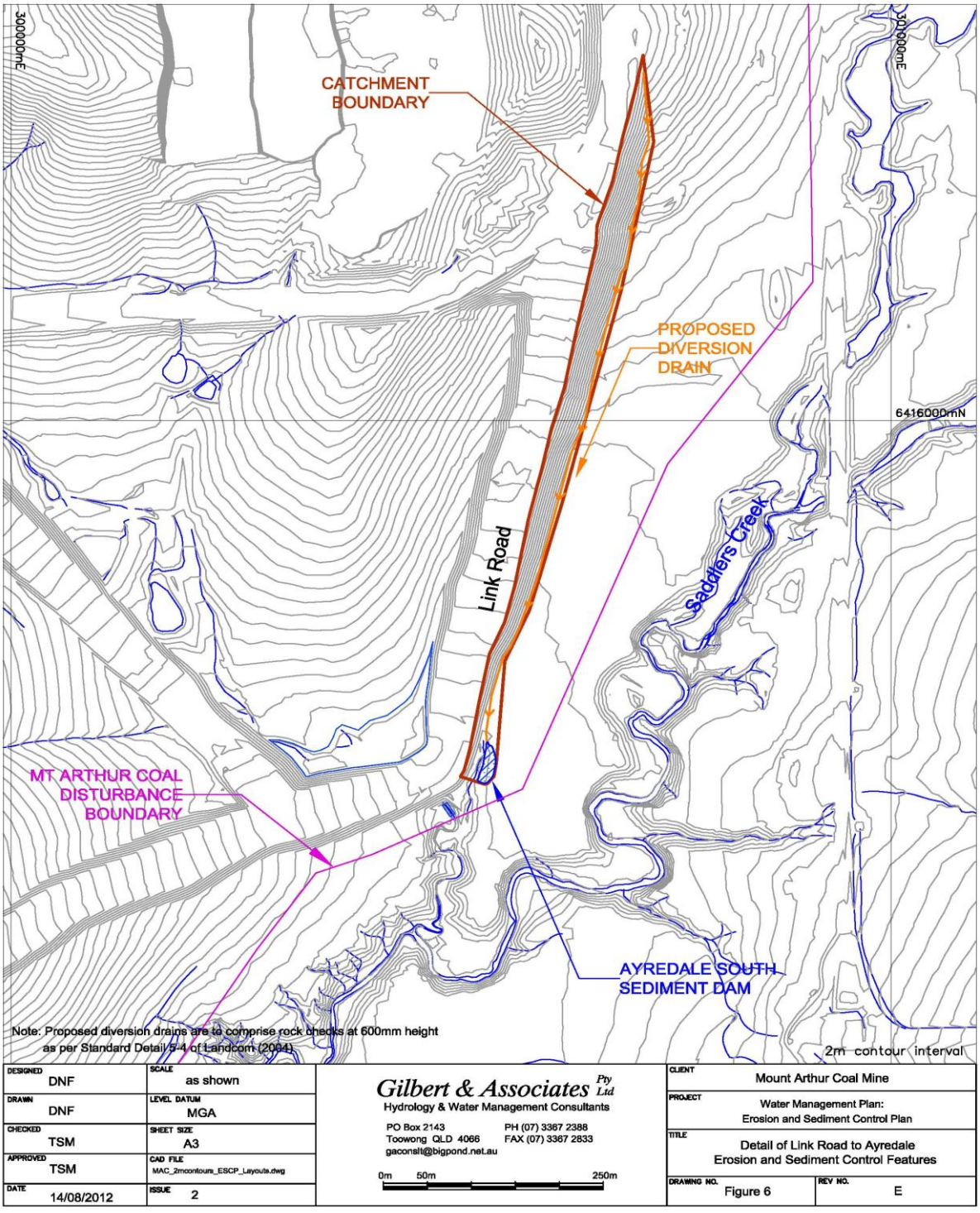

Figure 6: Detail of Link Road to Ayredale Erosion and Sediment Control Features

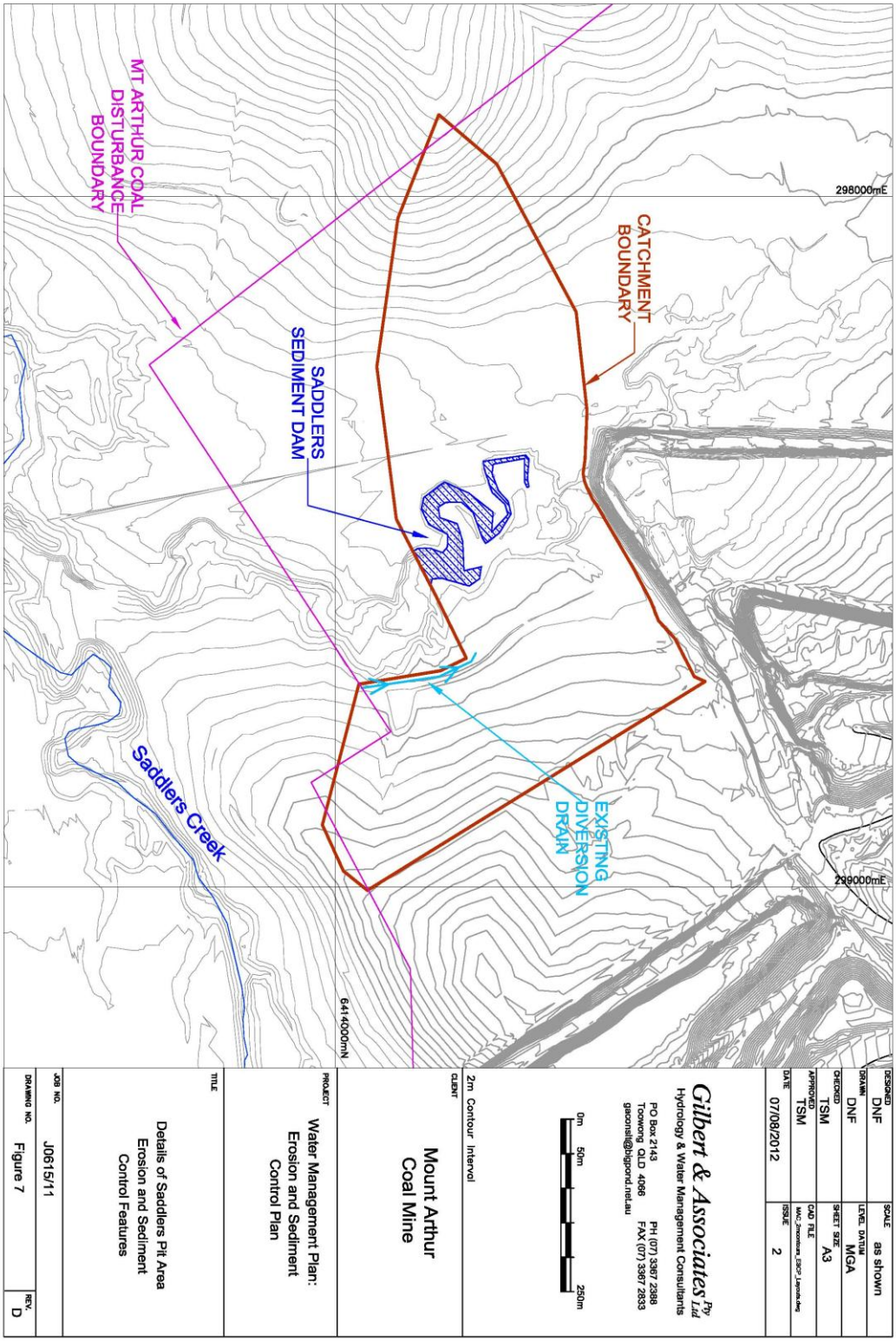

Figure 7: Detail of Saddlers Pit Erosion and Sediment Control Features

5.0 Response Procedures

5.1 Operational Response Process

In situations where surface water sampling results (following 25mm or more of rain in 24 hours) are identified as exceeding the impact assessment criteria, the following actions will be undertaken:

- The Environmental Coordinator and appropriate operational supervisor will assess the source and extent of the exceedence;
- If the exceedence is attributable to Mt Arthur Coal, the DoPI, OEH and any other relevant agencies will be contacted as soon as practicable, in accordance with Condition R2 of the EPL, and Schedule 5, Condition 7 of the Project Approval.
- Mt Arthur Coal will initiate an investigation and provide a detailed investigation report to DoPI, OEH and any other relevant agencies, with the report within 7 days of the incident, in accordance with Schedule 5, Condition 7 of the Project Approval.
- Any corrective action will be recorded in the site event management database and reported to the Environmental Coordinator.

5.2 Complaint Response

All complaints received in relation to erosion and sedimentation will be responded to in accordance with *MAC-ENC-PRO-042 Community and Environmental Incident Response and Reporting* and Condition M7 of the EPL. These provide details on how to receive, handle, respond to, and record and action any community complaints.

Upon receipt of a complaint from the community, preliminary investigations will commence as soon as practicable to determine the likely causes of the complaint using information such as rainfall data, location of erosion or sediment and recent water quality monitoring results. A response will be provided as soon as practicable, which may include the provision of relevant monitoring data.

5.3 Complaints Register

Mt Arthur Coal will record all community complaints into the site event management database. The database is maintained to include reporting, incident/event notification, close out action tracking, inspections, and audits.

6.0 References

6.1 External Documents

Hansen Bailey (2009), Mt Arthur Coal Consolidation Project Environmental Assessment. Prepared for Hunter Valley Energy Coal Pty Ltd.

Landcom (2004), Managing Urban Stormwater: Soils and Construction, Volume 1, NSW Government, 4th ed., March.

Standards Australia (1998), Water quality - Sampling - Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples, Australian/New Zealand Standard AS/NZS 5667.1:1998, Sydney.

URS Australia Pty Limited (2000) The Mount Arthur North Coal Project, Environmental Impact Statement. Prepared for Coal Operations Australia Limited.

6.2 Mt Arthur Coal Internal EMS Documents

Current Mt Arthur Coal EMS Documents
MAC-ENC-PRO-042 Community and Environmental Incident Response and Reporting
MAC-ENC-MTP-034 Site Water Management Plan
MAC-ENC-PRO-059 Site Water Balance
MAC-ENC-PRO-061 Surface Water Monitoring Program
MAC-ENC-PRO-062 Groundwater Monitoring Program
MAC-ENC-PRO-063 Surface and Ground Water Response Plan

Appendix 1: Correspondence Records

Email correspondence on 25 March 2011, 4.49pm

From: Perkins, Steven R
Sent: Friday, 25 March 2011 4:49 PM
To: steve.clair@environment.nsw.gov.au
Subject: Erosion & Sediment Control Plan
Attachments: Erosion and Sediment Control Plan.docx

Good afternoon Steve,

Please find attached the Erosion & Sediment Control Plan.

Regards,
Steve

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Steven Perkins
Environmental Superintendant
Mt Arthur Coal
NSW Energy Coal

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NSW GOVERNMENT | Office of Environment & Heritage

Our reference: DOC11/20441, LIC07/2093-06
Contact: Karen Marler 02 4908 6803

26 MAY 2011

Mr Steven Perkins
Environmental Superintendent
Mt Arthur Coal
Thomas Mitchell Drive
MUSWELLBROOK NSW 2333

Dear Mr Perkins

Environmental Management Plans for Mt Arthur Coal

Thankyou for forwarding a copy of the document "MAC_ENC-PRO-060 Erosion and Sediment Control Plan" for our records.

The Office of Environment and Heritage (OEH) encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, OEH does not review these documents as our role is to set environmental objectives for environmental management, not to be directly involved in the development of strategies to achieve those objectives.

Should you have any questions please phone me on 02 49086803.

Yours sincerely

KAREN MARLER
Head Regional Operations Unit – Hunter
Environment Protection and Regulation
Office of Environment and Heritage
Department of Premier and Cabinet

NSW GOVERNMENT | Planning & Infrastructure

Contact: Ben Harrison
Phone: 02 6575 3402
Fax: 02 6575 3515
Email: benjamin.harrison@planning.nsw.gov.au

Our ref: 10/20755

Michael White
General Manager Operations
Mt Arthur Coal
PMB 8
MUSWELLBROOK NSW 2333

Dear Mr White,

Mt Arthur Coal Mine – PA 09_0062
Environmental Monitoring and Management Plans

Thank you for forwarding the following management plans required under project approval 09_0062 for the Department's consideration:

- Aboriginal Heritage Management Plan (Condition 45 of Schedule 3);
- Site Water Balance (Condition 30 of Schedule 3);
- Erosion and Sediment Control Plan (Condition 31 of Schedule 3)
- Surface Water Monitoring Program (Condition 32 of Schedule 3);
- Ground Water Monitoring Program (Condition 33 of Schedule 3);
- Surface and Ground Water Response Plan (Condition 34 of Schedule 3)

The Department has reviewed these plans (as amended following previous correspondence) and is satisfied that they generally address the requirements set out in the relevant conditions of the project approval. Consequently, I would like to advise you that the Director-General has approved the plans.

Could you please forward finalised copies of the above plans for the Department's records at your earliest convenience.

Should you have any enquiries on this matter please contact Ben Harrison on (02) 6575 3402.

Scott Brooks
Team Leader Compliance
20 - 8 - 2012
As Nominee for the Director-General