JELLINBAH COAL MINE
EROSION AND SEDIMENT CONTROL PLAN

PREPARED FOR

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JELLINBAH COAL MINE
EROSION AND SEDIMENT
CONTROL PLAN

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LIST OF ABBREVIATIONS

°C	degree(s) Celsius
AARC	AARC Environmental Solutions Pty Ltd
CHRC	Central Highlands Regional Council
CPP	Coal Processing Plant
EA	Environmental Authority
ESCP	Erosion and Sediment Control Plan
ha	hectare(s)
IECA	International Erosion Control Association
IRC	Isaac Regional Council
JEJV	Jellinbah East Joint Venture
Jellinbah	Jellinbah Mining Pty Ltd
km	kilometre(s)
m^3	cubic metre(s)
ML	mining lease(s)
mm	millimetre(s)
Mtpa	million tonnes per annum
PCI	pulverised coal injection
QLD	Queensland
ROM	run-of-mine
the Mine	Jellinbah Coal Mine
WMP	Water Management Plan

1.0 INTRODUCTION

The Jellinbah Coal Mine (the Mine) is an open-cut coal operation, mining shallow, low stripping ratio coal reserves and producing approximately 4.5 – 5.0 million tonnes per annum (Mtpa) of pulverised coal injection (PCI) and a minor amount of thermal coal, primarily for export. The Project is authorised by Environmental Authority (EA) EPML00516813 and operated by Jellinbah Mining Pty Ltd (Jellinbah) on behalf of the Jellinbah East Joint Venture (JEJV). The participants of the JEJV are: Jellinbah Group Pty Ltd, Tremell Pty Ltd, Marubeni Coal Pty Ltd and Sojitz Coal Resources Pty Ltd.

The Mine is located within the Bowen Basin in Central Queensland, approximately 190 kilometres (km) west of Rockhampton. It is located within the Central Highlands Regional Council (CHRC) and Isaac Regional Council (IRC) areas and is approximately 24 km north of the township of Blackwater.

1.1 PURPOSE

This Erosion and Sediment Control Plan (ESCP) describes the erosion and sediment control measures to be implemented during construction and operational phases of the Jellinbah Coal Mine. This ESCP has been developed to meet the requirements of conditions C38 and C39 of the EA:

C38 An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

C39 Stormwater, other than mine affected water, is permitted to be released to waters from:

a) Erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition C38; and

b) Water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with conditions C30 to C35 inclusive, for the purpose of ensuring water does not become mine affected water.

1.1.1 Aims and Objectives

The purpose of the ESCP is to describe erosion and sediment control measures required to:

- Minimise the potential for erosion and sediment loss from the Jellinbah Mine; and
- Prevent contamination of the receiving environment.

1.2 SCOPE

This ESCP addresses the described management objectives through the following scope:

- Description of the existing environment, as it relates to erosion and sediment control risks;
- Identification of activities and locations at the Mine which are considered at risk of erosion and sediment loss;
- Recommending erosion and sediment control strategies appropriate for each identified source;
- Recommending a routine inspection and maintenance program for existing sediment control infrastructure; and

- Providing a routine monitoring program which targets high risk locations when environmental conditions are conducive to erosion and sediment runoff. The monitoring program aims to provide:
    - Early identification of sediment and erosion control issues; and
    - Confirmation of the effectiveness of the existing strategies in managing erosion and sediment control.

1.3 STANDARDS AND GUIDELINES

Key standards and guidelines that have been used to inform the preparation and implementation of this Erosion and Sediment Control Plan include:

Best Practice Erosion and Sediment Control (IECA 2008)

Environment Protection Guidelines for Construction and Land Development in the ACT (Environment Protection Authority: ACT Government 2011)

Erosion and Sediment Control During Land Development (Environment ACT 1998)

2.0 PROJECT DESCRIPTION

The Mine is located in the Bowen Basin in central Queensland (QLD). Current operations areas are located approximately 24 km north-north-east of Blackwater and 190 km west of Rockhampton, within both the CHRC and IRC areas. The Project is accessed via the Capricorn Highway and the Boonal Haul Road.

Low intensity cattle grazing, and coal mining operations form predominant land uses throughout the region of the Project site. Any areas within the Mine that are not required for mining activities or associated infrastructure are utilised for low intensity cattle grazing.

The Mine comprises the following approved areas:

- Jellinbah South (not currently operational);
- Jellinbah Central (operational);
- Jellinbah Plains (operational);
- Jellinbah Plains South (operational), Central North (operational/exploration) and the Central North Extension (approved); and
- Mackenzie North (operational).

2.1 PROJECT ACTIVITIES

The principal activities undertaken at the Mine are:

- Mining of a high-grade coal;
- Continuous assessment of the coal resource by exploration;
- Clearing of any remaining vegetation in advance of mining;
- Selective stripping of available topsoil under supervision to be immediately reused or stockpiled for future use in the rehabilitation program;
- Drilling and blasting of overburden to provide access to coal resources;
- Operation of a conventional open-cut truck and excavator mine to maintain production to meet market demands;
- Overburden used to form bunds, haul roads and hardstands or transported to out-of-pit spoil dumps located clear of the coal resource but within the boundary of the MLs or placed in the previous mining strip to backfill mined-out areas;
- Reshaping of spoil dumps, replacement of topsoil and revegetation of the mined out and backfilled area;
- Crushing and screening of run-of-mine (ROM) coal;
- Coal washing (if required) at the coal processing plant (CPP), located on ML 80053;

- Disposal of CPP rejects together with overburden (coarse rejects) and tailings (fine rejects) within existing mining voids;
- Transport of crushed and washed coal by private road to the existing rail loading area for rail transport to Gladstone;
- Operation of water management infrastructure such as regulated dams, sediment ponds, drains and bunds;
- Maintenance of levee banks at Jellinbah Plains and Mackenzie North to protect mining operations from flooding of the Mackenzie River;
- Utilisation of existing infrastructure facilities, including offices, power and water; and
- Continued direct and contract employment of operating workers and support personnel with flow-on employment through the provision of associated goods and services.

2.1.1 Jellinbah Central

Jellinbah Central is established as a central hub for the mining operations. Jellinbah Central contains the largest open-cut pit operations as well as the site offices, workshop and wash plant. The open cut pit occupies the central portion while some of the overburden has been placed to the east of the pit. The wash plant, workshop and ROM areas are located to the west of the open cut pit. The main site office is located in the far west of Jellinbah Central. The mine site haul road extends through the west of Jellinbah Central to Plains. The runoff dams and tailings dam are located to the south and west of the ROM areas.

2.1.2 Jellinbah Plains

The Jellinbah Plains operational area is located north of Jellinbah Central, immediately south of the Mackenzie River. The site consists of a centrally-located open-cut pit with active spoil stockpiles to the east and west. ROM ore is located towards the south-west of the site. The pit has reached its northern extent against the Plains levee, with plans in place to mine an additional strip to the east. Backfilling operations are occurring at the southern end of the pit. Spoil dumps are being progressively rehabilitated to minimise the area of active spoil.

2.1.3 Jellinbah South

The Jellinbah South site is not currently in operation. A small open-cut pit is located on the site and is currently used for excess water storage. When required, the water is pumped and returned to Jellinbah Central and Plains for use on-site.

2.1.4 Plains South / Central North

The Plains South / Central North area is located between Jellinbah Plains and Jellinbah Central. The Plains South void has been dewatered and work has begun extending the pit to the east and south-east towards Jellinbah Central. This has led to the creation of new spoil dumps and topsoil stockpiles to the east and north-east of the Plains South Void. A clean water diversion drain has been constructed along the eastern side of the spoil toe and flows overland to a sediment dam to the North. Additional sediment traps, drainage lines and clean water sediment dams will be established as mining progresses

2.1.5 Central North Extension

The Central North Extension area, currently in the initial stages of development, is a lateral extension to both the east and the west of the Plains South / Central North mining area. The Central North Extension area is planned to extend mining activities for current resource areas (extension to the east) and increase the area available for spoil dumping and topsoil stockpiling (extension to the west). The Central North Extension area will involve construction and operation of the following elements:

- Open-cut mining excavations;
- Access / haul roads;
- Sediment dams for water management;
- Water management drains; and
- Topsoil stockpiling and spoil dumping.

2.1.6 Mackenzie North

The Mackenzie North operational area, is located immediately north of the Mackenzie River and supplements production from Jellinbah Plains as it nears the end of its economic life, in order to maintain overall mine production rates. Crushed coal will be hauled to existing processing facilities at Jellinbah Central.

The Mackenzie North operational area contains the following infrastructure:

- Open-cut mining excavations;
- Crusher, loading and stockpile area (no ROM coal actually stockpiled yet);
- Flood levee and dams;
- Water management dams and sediment control traps.
- Haul road and bridge across the Mackenzie River and Mackenzie River Anabranch;
- Administration area and workshops; and
- Access roads and tracks;

2.2 WATER MANAGEMENT OBJECTIVES

The principal objective of the Jellinbah Mine Water Management Plan (WMP) (Engeny, 2020) is to effectively manage the separation of clean water, sediment water and mine-affected water. The different types of water on site and their associated management strategies are summarised in Table 1 below:

Table 1 Site Water Management Strategies

Type of Water	Definition	Management Strategy
Clean Runoff	Runoff from all areas that are not affected by coal or operational facilities	Drains and bunds are used to keep clean water separate and ultimately divert clean catchment runoff to receiving waterways.
Sediment Runoff	Runoff in which the only contaminants are dissolved or suspended sediments, e.g. spoil dumps	Runoff with a sediment load is directed through sediment dams to minimise solid content prior to exiting the site.
Mine Affected Water	Includes any water (including groundwater) that comes into contact with coal stockpiles, coal pads, plants areas, pit areas and coal seam groundwater. Typically, elevated salinity.	Objective is to keep this water separate from the other water types, recycle and evaporate as much as possible and discharge as per EA release conditions.
Raw Water	The site has a license to supplement water supply by pumping from Mackenzie River. This water is untreated and mainly used for vehicle wash down.	Minimise consumption where possible – constrained by 300 ML/yr extraction license.
Potable Water	Water for drinking and sanitation purposes	Water is trucked to site as required

In accordance with the Mine's continuous improvement and review processes a review of the ESCP has been undertaken to ensure that erosion and sediment impacts from the Mine are managed and minimised where possible.

3.0 EXISTING ENVIRONMENT

3.1 REGIONAL CLIMATE

The Mine is located in sub-tropical central QLD where climatic conditions comprise a wet season period from November to February and a dry season from March to October. Average annual rainfall for the region is approximately 570 millimetres (mm).

Average maximum temperatures range from 23.4 degrees Celsius (°C) to 34.1 °C. The average summer evaporation rate is more than double the average winter evaporation rate. On average the evaporation rate is 5.7 mm per day.

3.2 SURFACE WATER AND DRAINAGE

The Mine is located within the catchment of Blackwater Creek and the Mackenzie River, a major tributary of the Fitzroy River which flows to the Coral Sea at Rockhampton. The topography on the Mine consists of flat to gently undulating plains.

Jellinbah South drains directly eastward into the ephemeral Twelve Mile Creek, before discharging into the Mackenzie River 60 km downstream of the Jellinbah site. Twelve Mile Creek also flows through the centre of the neighbouring Yarrabee Coal Mine approximately 20km downstream of Jellinbah South.

Jellinbah Central drains westward into the ephemeral Blackwater Creek, before discharging into the Mackenzie River 10 km north-west of Jellinbah Central (upstream of the mine). Blackwater Creek passes to the south of the neighbouring Curragh North Coal Mine; however, the waterway does cross beneath a coal transfer conveyor connecting Curragh North to the Curragh Coal Mine 15 km south.

Plains South, Central North and the Central North Extension drain to 3 Mile Lagoon to the north-west, Twelve Mile Creek to the east, and to Five Mile Lagoon and an unnamed tributary of the Mackenzie River to the north-east. The unnamed tributary joins the Mackenzie River approximately 2km downstream of the mine.

Jellinbah Plains drains to the Mackenzie River to the north and 5 Mile Lagoon to the east. 5 Mile Lagoon empties into the same unnamed tributary of the Mackenzie River which receives flows from Plains South, Central North and the Central North Extension.

Mackenzie North drains to the Mackenzie River (and the Mackenzie River Anabranch), which joins the Fitzroy River approximately 220 km downstream of the mine. The Mackenzie River supports surface flows throughout the year, including controlled releases from Fairbairn Dam, along the Nogoa River, upstream of the Mine.

Sediment dams/traps have been strategically located to capture sediment-laden runoff before it exits the mine, and ensure the protection of receiving environment water quality,

3.3 SOILS

Despite variation across the Project, soil types are primarily derived from three parent materials including (Ison 1998):

- Soils developed over Cainozoic unconsolidated materials of clay, silt and sand which overlie Permian sedimentary rocks;

- Soils developed directly over sedimentary rocks, mainly sandstone and siltstone of Permian and Tertiary age; and

- Soils developed in recent alluvium.

Generally, soils within the project area are structurally competent in their natural setting, such as strongly structured alluvial clays or soils of sandy texture on gentle slopes, and are not considered at high risk of dispersion. A proportion of the soils display characteristics identified as increasing the susceptibility of the soil to erosion and dispersion (i.e. high exchangeable sodium percentage and low calcium to magnesium ratio).

3.4 OVERBURDEN

The bulk of the overburden is typically comprised of clays and sands above siltstones and mudstones. Weathered overburden / interburden materials may be partly sodic and subject to surface crusting and high erosion rates if exposed directly to rainfall. Fresh overburden and interburden is typically sodic but non-dispersive. However, this fresh material has potential to become dispersive when under certain weathering conditions after mining. It should be noted that the overburden material is not considered acid forming or containing known contaminants.

4.0 SOURCES OF EROSION AND SEDIMENT LOSS

Activities considered to be a potential source of erosion and sediment loss have been identified across the Jellinbah site.

Table 2 describes these sources along with the nature of the hazard and the potential risk associated. It is intended that Table 2 is updated with additional sources which may become apparent with progressing mine life and changing environmental conditions.

Table 2 Potential Sources of Erosion and Sediment Loss

Activity	Description	Nature of Risk (No Mitigation)
Rehabilitated spoil	Rehabilitated spoil consisting of unconsolidated overburden / interburden with varying levels of saline and sediment pre-disposition. Exposed areas above the natural ground level without vegetation cover are susceptible to water erosion.	**Low – moderate risk** of sheet, rill and gully erosion on slopes and tunnel erosion on flats. Risk is greatest where areas of exposed topsoil remain with poor vegetation cover.
Active spoil	Stockpiles of overburden / interburden containing unconsolidated material with varying levels of saline and sediment pre-disposition. Exposed areas susceptible to storms and weathering.	**High risk** of sheet, rill and gully erosion form active dumping areas.
Mine infrastructure areas: • Pre-strip areas • Topsoil stockpiles • Infrastructure areas • Exploration • Access tracks / haul road • ROM pad • Hardstand	Exposed soil surfaces on disturbed land leads to increased runoff velocities with greater potential for erosion and sediment loss.	**Low – moderate risk** of sheet and rill erosion. Risk is greatest on uncompacted and exposed land such as pre-strip areas.
Coal stockpiles	Stockpiles of coal are susceptible to wind and water erosion.	**High risk** of sheet, rill and gully erosion on slopes and wind erosion from elevated stockpiles.
Flood levee	Water erosion can result from concentrated runoff on the slopes of the levee and flood erosion.	**Moderate risk** of sheet, rill and gully erosion on slopes of the levee. Gully and tunnel erosion can occur when flooding results in water movement along the levee. Risk is greatest during significant flood events.

Activity	Description	Nature of Risk (No Mitigation)
Drains and embankments	Water erosion can result from concentrated runoff on the slopes of constructed embankments and in drainage channels (natural and constructed).	**Low – moderate risk** of sheet, rill and gully erosion on slopes of embankments and stream bank erosion in channels. Risk is elevated where vegetation cover is poorest and/or where runoff is most concentrated, including the constructed clean water diversion channel.

5.0 EROSION AND SEDIMENT CONTROL MEASURES

The erosion and sediment management strategy for the Mine is designed to:

- Minimise the potential for erosion and sediment loss from the Mine; and
- Prevent contamination of the receiving environment.

These objectives are achieved through implementation of the following erosion and sediment control measures:

- Diversion drains and banks – designed to divert clean runoff into sediment detention basins before release to natural watercourses in the receiving environment;
- Catch drains – designed to capture mine affected water which is then conveyed to settlement detention ponds for recycling;
- Rock-lined drains – installed on rehabilitated landforms to manage runoff and prevent sediment loss particularly on spoil dumps above the natural ground surface;
- Final landform design – spoil areas above the natural ground surface will be design to <17% slope with batters. Levee banks will be designed to <33% slope.
- Sediment fences – designed to slow the flow of water and catch sediments in erosion susceptible locations;
- Sediment control dams – designed to intercept runoff and allow sediments in runoff to settle out before release to the receiving environment or recycling;
- Progressive rehabilitation of disturbed lands such that a stable, vegetated landform is achieved, minimising the area of exposed surface to erosion; and
- Regular inspections of sediment control structures and monitoring of locations known to be at risk of erosion, particularly during the wet season and following rainfall events. An erosion hazard inspection checklist is provided in Appendix A.

Table 3 below describes the erosion and sediment management strategies, which have been prepared for identified at-risk areas at each of the operational areas (refer to Appendix B for general diagrams of the erosion and sediment control measures). Monitoring and maintenance programs have also been described. Locations of sediment control dams are displayed in Figure 1 through to Figure 5.

Table 3 Mitigation Measures

Activity / Location	Mitigation Measures	Inspection and Maintenance Program
Rehabilitated spoil	• Landform design <17% slope with batters. • Rock-lined drains installed in locations susceptible to erosion. • Runoff from rehabilitated spoil is collected in diversion drains and dams/traps, where it is either evaporated, reused or released. Specific structures are listed below: o Plains Clean Water Dam, OOP Main Dam and unnamed sediment traps at Jellinbah Plains; o South West Dam, ROM West Dam, Son of Max Pit Dam, South Dam and unnamed sediment traps at Jellinbah Central (West); o Unnamed sediment traps at Jellinbah Central (East); o Jellinbah South Dam, JS South East Dam, and unnamed sediment traps at Jellinbah South; o Sediment traps and dams will be constructed at Plains South, Central North and Central North Extension; o MN North West Dam and MN North Dam at Mackenzie North	• Sediment dams and open drains are inspected prior to the wet season to assess condition, water retention and transport capacity. Where design capacity is reduced to less than 70%, sediment deposits are to be removed prior to the wet season. • Drains, sediment dams and other control devices should be inspected during the wet season, in particular following heavy rainfall events to monitor for failures. • Spoil areas are inspected to assess erosion impacts (e.g. rills, gullies or tunnels). • Exposed areas to be stabilised through revegetation. • Eroded areas (e.g. rills, gullies or tunnels) to be re-instated / repaired with non-dispersive materials; and • As required sediment fences, straw bale filters or upslope diversion drains should be installed in locations of observed erosion.

Activity / Location	Mitigation Measures	Inspection and Maintenance Program
Active spoil	• Runoff from active spoil is collected in diversion drains and dams where it is either evaporated, reused or released. Specific structures are listed below: o Overflow Dam 1, Overflow Dam 2 and unnamed sediment traps at Jellinbah Plains; o ROM West Dam, 108 Dam, Russell's Dam and unnamed sediment traps at Jellinbah Central (West); o Vegetated catchment buffers and unnamed sediment traps at Jellinbah Central (East); o Diversion drain at Plains South draining to East Dam at Jellinbah Plains. o Diversion drains and sediment dams/traps will be constructed at Central North and Central North Extension; o MN North West Dam, MN North Dam and MN West Dam at Mackenzie North. • Progressive rehabilitation as areas become available	• Sediment dams and open drains are inspected prior to the wet season to assess condition, water retention and transport capacity. Where design capacity is reduced to less than 70%, sediment deposits are to be removed prior to the wet season. • Drains, sediment dams and other control devices should be inspected during the wet season, in particular following heavy rainfall events to monitor for failures. • Spoil areas are inspected to assess erosion impacts (e.g. rills, gullies or tunnels). • Exposed areas to be stabilised; and • As required sediment fences, straw bale filters or bunds should be installed in locations of observed erosion.

Activity / Location	Mitigation Measures	Inspection and Maintenance Program
Mine infrastructure areas: • Pre-strip areas • Topsoil stockpiles • Infrastructure areas • Exploration • Access tracks / haul road • Hardstand / Workshop	• Runoff from infrastructure areas is collected in diversion drains and dams, allowing sediment to settle out prior to being recycled or evaporated. Specific structures are listed below: o Overflow Dam 1 and Overflow Dam 2, and Workshop Dam at Jellinbah Plains; o Workshop Dam, Quickfill Dam, 108 Dam, Russell's Dam, Max Bypass Dam, and Max Pit at Jellinbah Central (West); o Jellinbah South Dam, LCR Dam and Jellinbah South Void at Jellinbah South. o Sediment traps and dams will be constructed at Plains South, Central North and Central North Extension. o MN Mine Water Dam, MN West Dam, and dams north of crusher at Mackenzie North.	• Sediment dams and open drains are inspected prior to the wet season to assess condition, water retention and transport capacity. Where design capacity is reduced to less than 70%, sediment deposits are to be removed prior to the wet season. • Drains, sediment dams and other control devices should be inspected during the wet season, in particular following heavy rainfall events to monitor for failures. • Existing roads and infrastructure should be inspected for erosion damage. • Exposed surfaces to be stabilised with non-dispersive materials. • Eroded kerbside areas should be regraded or re-shaped to facilitate runoff. • As required, roadside turf filter strips should be planted to stabilise topsoil and filter sediments from runoff.

Activity / Location	Mitigation Measures	Inspection and Maintenance Program
Coal stockpiles / ROM Pad	• Runoff from coal stockpiles collected in mine-affected water diversion drains and dams prior to being recycled or evaporated. Specific structures are listed below: ○ Unnamed mine-affected dam at Jellinbah Plains; ○ Son of Max Pit, ROM West Dam, Max Bypass Dam, Max Pit and smaller unnamed mine-affected water dams at Jellinbah Central; ○ Diversion drains and a dam will be constructed/converted at Central North / Central North Extension; ○ MN Mine Water Dam, and dams north of crusher at Mackenzie North.	• Sediment dams and open drains are inspected prior to the wet season to assess condition, water retention and transport capacity. Where design capacity is reduced to less than 70%, sediment deposits are to be removed prior to the wet season. • Drains, sediment dams and other control devices should be inspected for coal deposits during the wet season, in particular following heavy rainfall events to monitor for failures. • Existing roads and infrastructure should be inspected for erosion damage. • Exposed surfaces to be stabilised with non-dispersive materials. • Eroded kerbside areas should be regraded or re-shaped to facilitate runoff. • As required, roadside turf filter strips should be planted to stabilise topsoil and filter sediments from runoff.
Flood levee	• Landform design <33% slope • Progressive revegetation	• Pre wet season monitoring of levee condition by Registered Professional Engineer of Queensland. • Monitoring of levee following flood events and routinely during the wet season for early identification of erosion. • Major modifications should be inspected by a qualified engineer.
Drains and embankments	• Drain design minimises water velocity	• The diversion drain and embankments should be inspected for bank erosion and sediment accumulation prior to and following heavy rainfall events during the wet season.

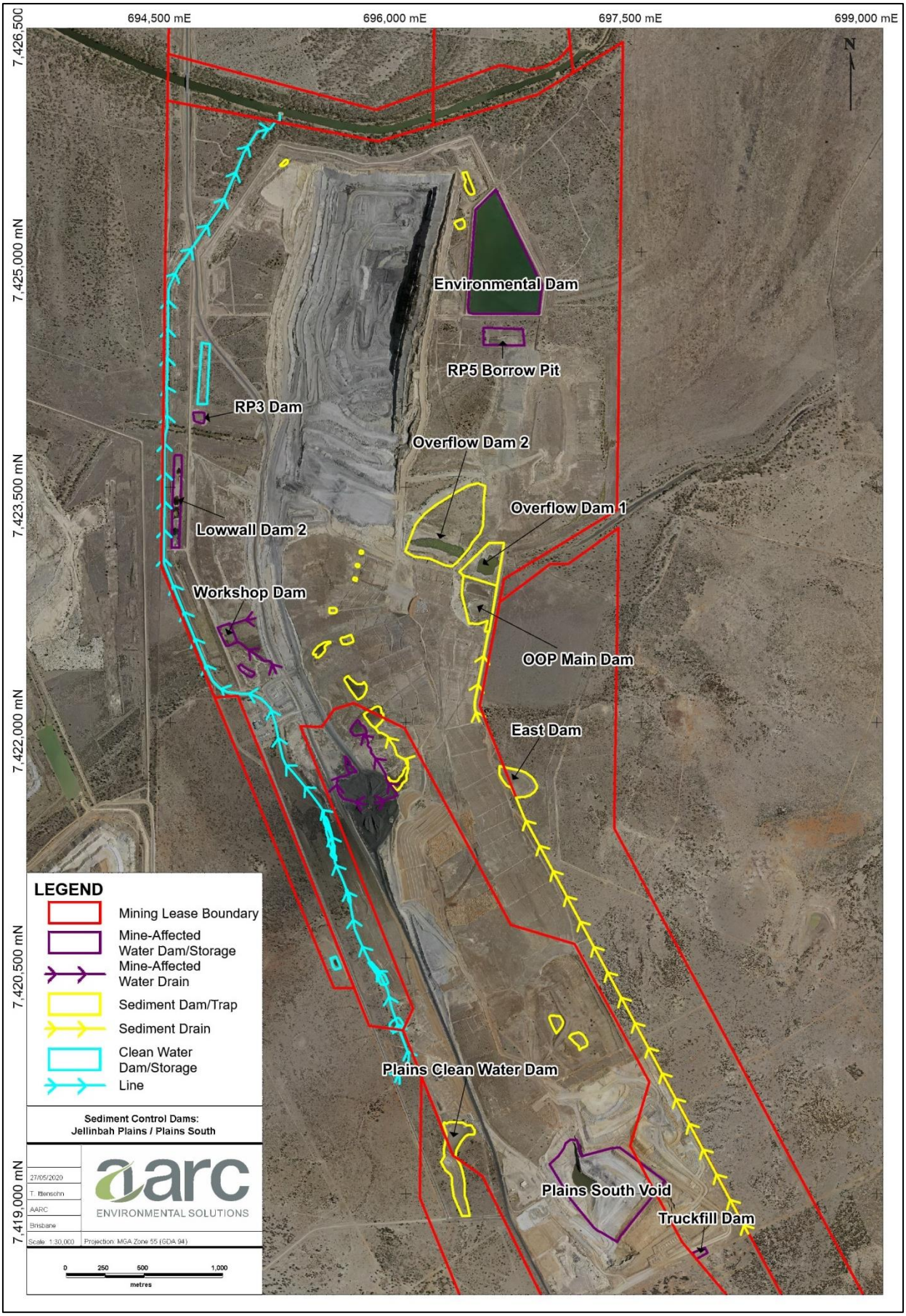

Figure 1 Sediment Control Dams – Jellinbah Plains and Plains South

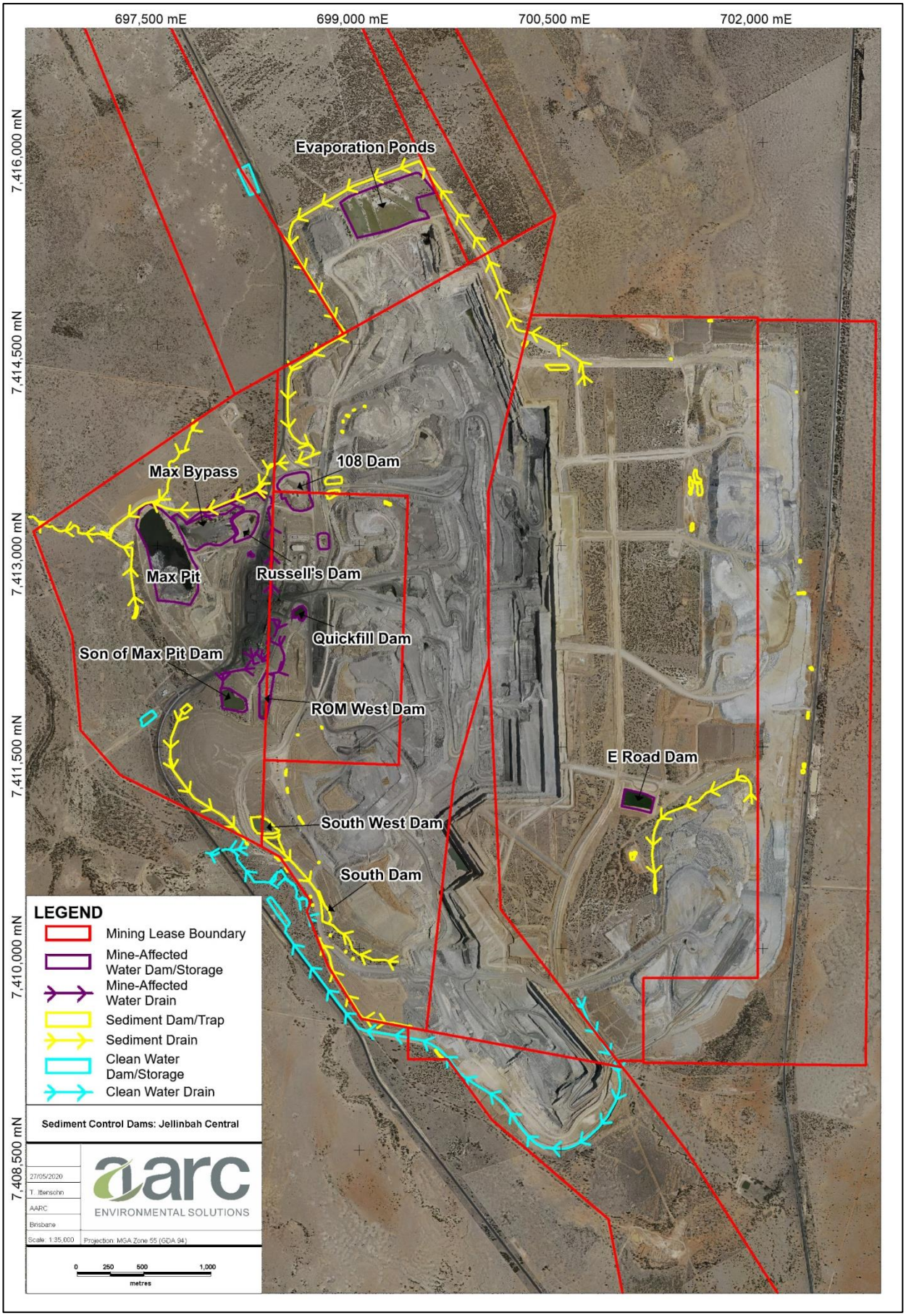

Figure 2 Sediment Control Dams – Jellinbah Central

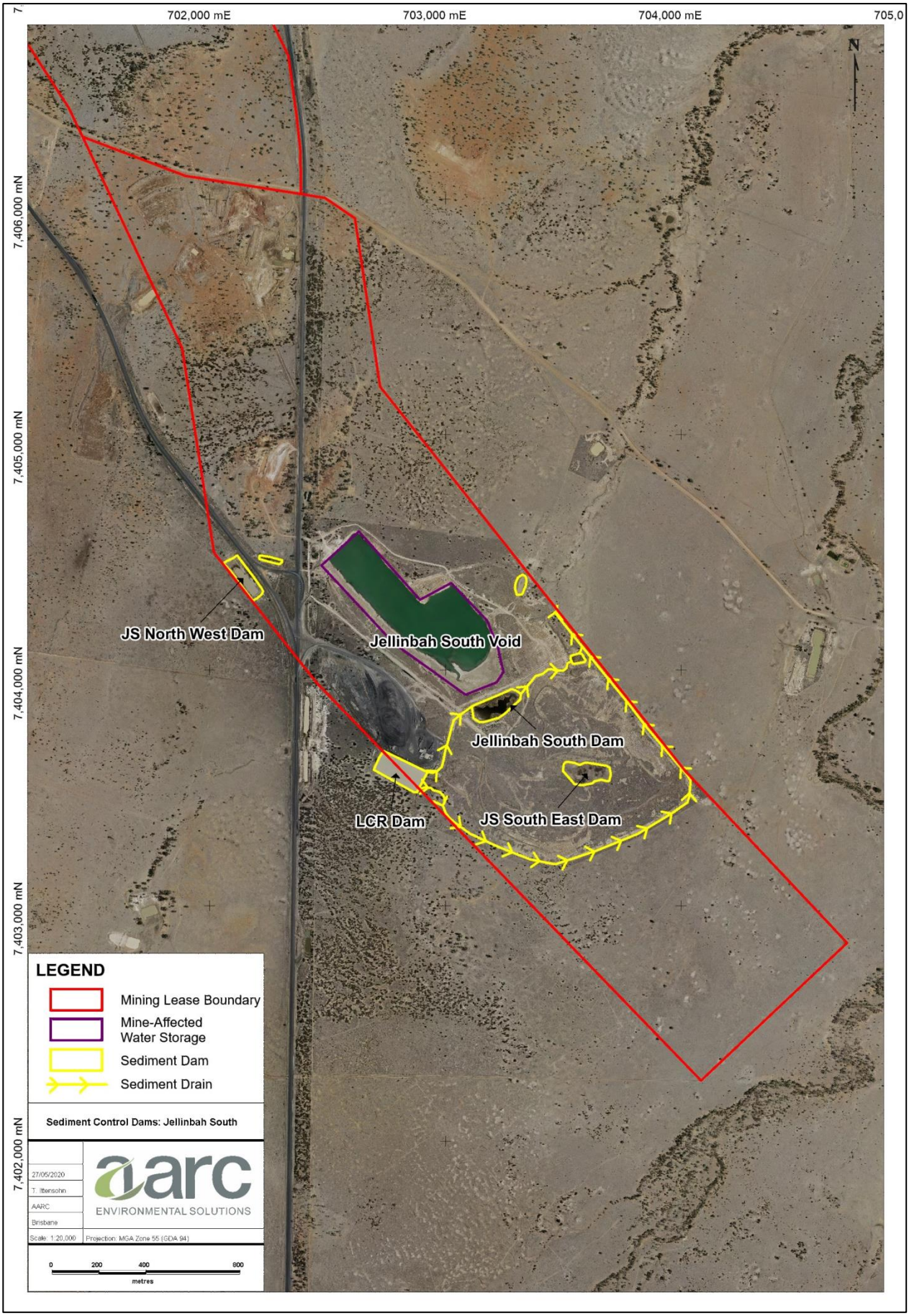

Figure 3 Sediment Control Dams – Jellinbah South

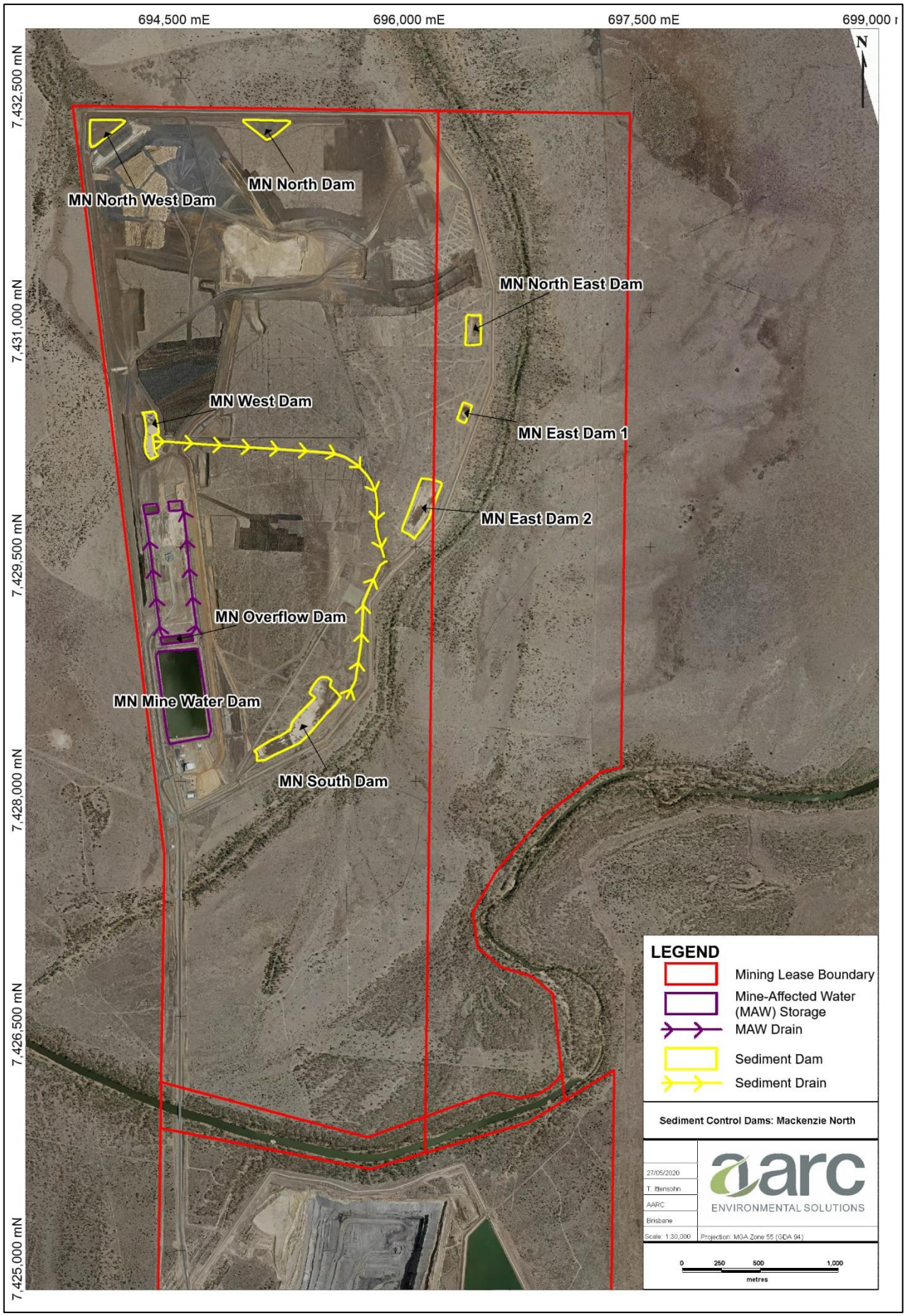

Figure 4 Sediment Control Dams – Mackenzie North

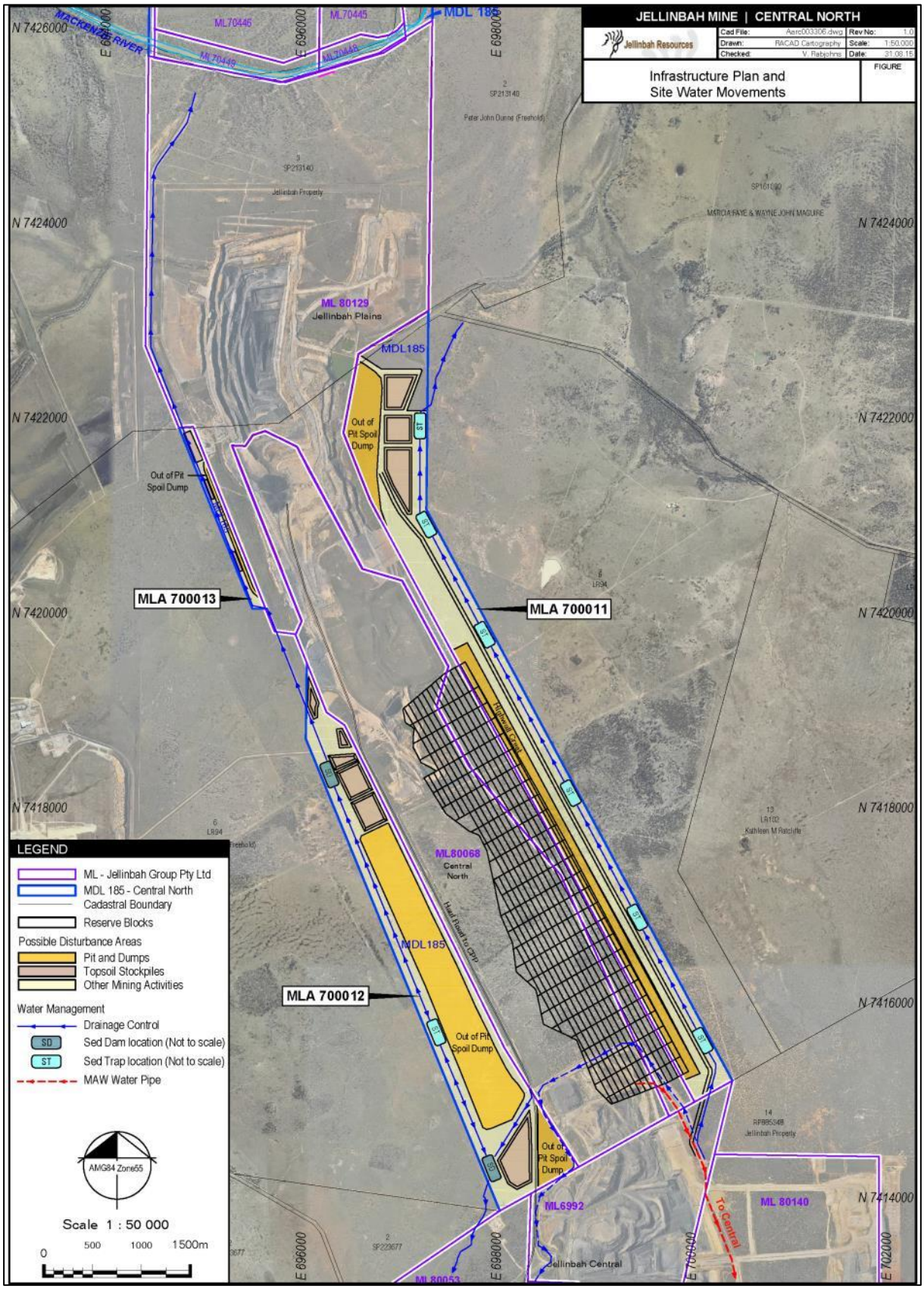

Figure 5 Proposed Sediment Control Dams – Central North / Central North Extension

5.1 SEDIMENT CONTROL STRUCTURE DESIGN CHARACTERISCTICS

Numerous sediment control structures are located across the different operational areas of the Jellinbah Coal Mine. Table 4 below describes the design characteristics for the larger sediment dams present on site. There are also numerous smaller sediment traps (see Figure 1 to Figure 5 above) that have not been described in Table 4 below. The sediment traps are generally smaller in size (operational capacity <5 megalitres) and are mostly located at the base of (rock) drains to reduce the sediment load within runoff exiting spoil dumps and rehabilitated areas. The sediment traps can be temporary and are often reclaimed as mining progresses and spoil dumps and rehabilitated areas expand.

Table 4 Sediment Dam Design Characteristics

Sediment Dam	Total Area (ha)	Total Operational Capacity (megalitres)
Overflow Dam 1	4.526	141
Overflow Dam 2	16.55	221
OOP Main Dam (HW Dam)	5.328	252
Plains (Clean) Water Dam	6.809	63
East Dam	2.938	35
South West Dam	1.773	40
South Dam	0.8554	11
Jellinbah South Dam	1.632	25
LCR Dam	2.026	35
JS North West Dam	1.253	12
JS South East Dam	1.484	20
MN North Dam	2.139	180
MN North West Dam	2.275	180
MN West Dam	1.945	22
MN North East Dam	1.809	
MN East Dam 1	0.6982	14
MN East Dam 2	4.893	54
MN South Dam	8.307	30

6.0 REFERENCES

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Appendix A Routine Erosion Hazard Inspection List

Routine Erosion Hazard Inspection Check Sheet

Erosion management, maintenance and repair is most effective on the mine site if hazards are identified early before the problem worsens. Generally, areas of sheet and rill erosion should be identified before the wet season and re-seeded to establish root growth before erosion becomes more severe.

Activity	Erosion Hazard Trigger	Maintenance Required
Rehabilitated Spoil	Gullies > 0.5m deep Sinkholes > 1m deep	Earthworks required to repair the landform. Preventative measure to avoid pooling water or to slow or redirect runoff should be installed (fences, hay bales, bunds & drains). Clean sediment out of channels.
Mine infrastructure areas (Hardstand and ROM pad; Pre-strip areas, topsoil stockpiles, infrastructure areas, exploration and access tracks)	Gullies > 0.3m deep Evidence of coal fines in uncontained runoff	
Active Spoil	Gullies > 0.7m deep Evidence of bulk earth movement or sediment flow from dump	
Coal stockpiles	Gullies > 0.3m deep Evidence of coal fines in uncontained runoff.	
Drains and embankments	Gullies > 0.3m deep on embankments Evidence of shearing or wall failure in channels Build-up of coal fines or sediment in channel > 25% capacity	
Flood Levees	Gullies > 0.3m deep on embankments Any observed tunnel erosion or gouging	

Appendix B Use and Design of Sediment Control Structures

Diversion Banks and Drains

The purpose of diversion structures is to intercept water runoff (either clean or mine water) and to divert it at low velocities either around disturbed land or into sediment control\ structures for treatment. To minimise the level of erosion, the velocity of runoff water can be reduced by implementing controls such as hay bales and rock structures which are described below.

Design and dimensions of diversion banks and drains in relation to slope are shown below.

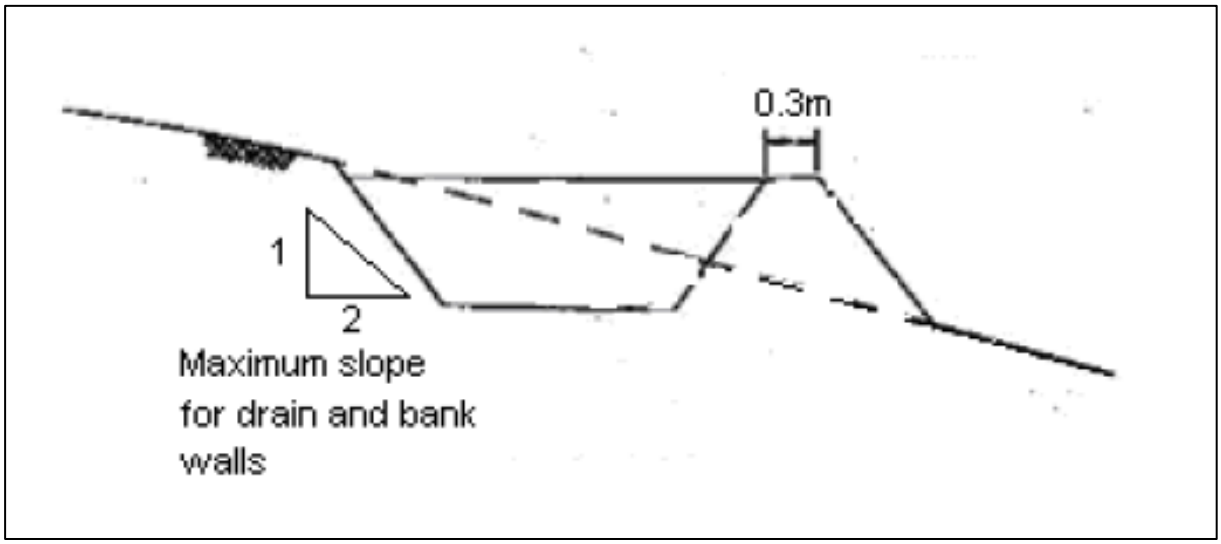

Figure B-1 Diversion Bank and Drain Design Dimensions

Sediment Dams

There are two types of sediment dams, those that are for temporary use (less than 6 months), and those that are larger and expected to be used for a longer period of time.

Small, temporary sediment dams are used to capture water and sediment runoff from disturbed areas to allow the sediment to settle and the clean water to evaporate or released from the system. These temporary dams are constructed to treat runoff water from rehabilitation or disturbed land for sediment until vegetation establishes.

Typical design is shown below.

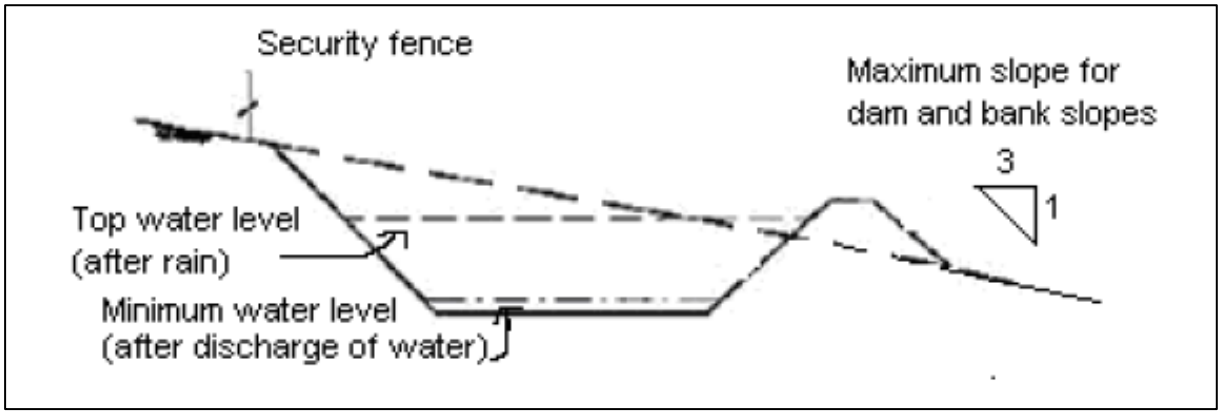

Figure B-2 Temporary Sediment Dam Design

Larger, long term sediment dams are used to intercept sediment laden runoff. The sediment is retained in the dam while the water is allowed to be released from a pipe outlet wrapped in the same geotextile fabric used for sediment fencing.

The typical design is shown below.

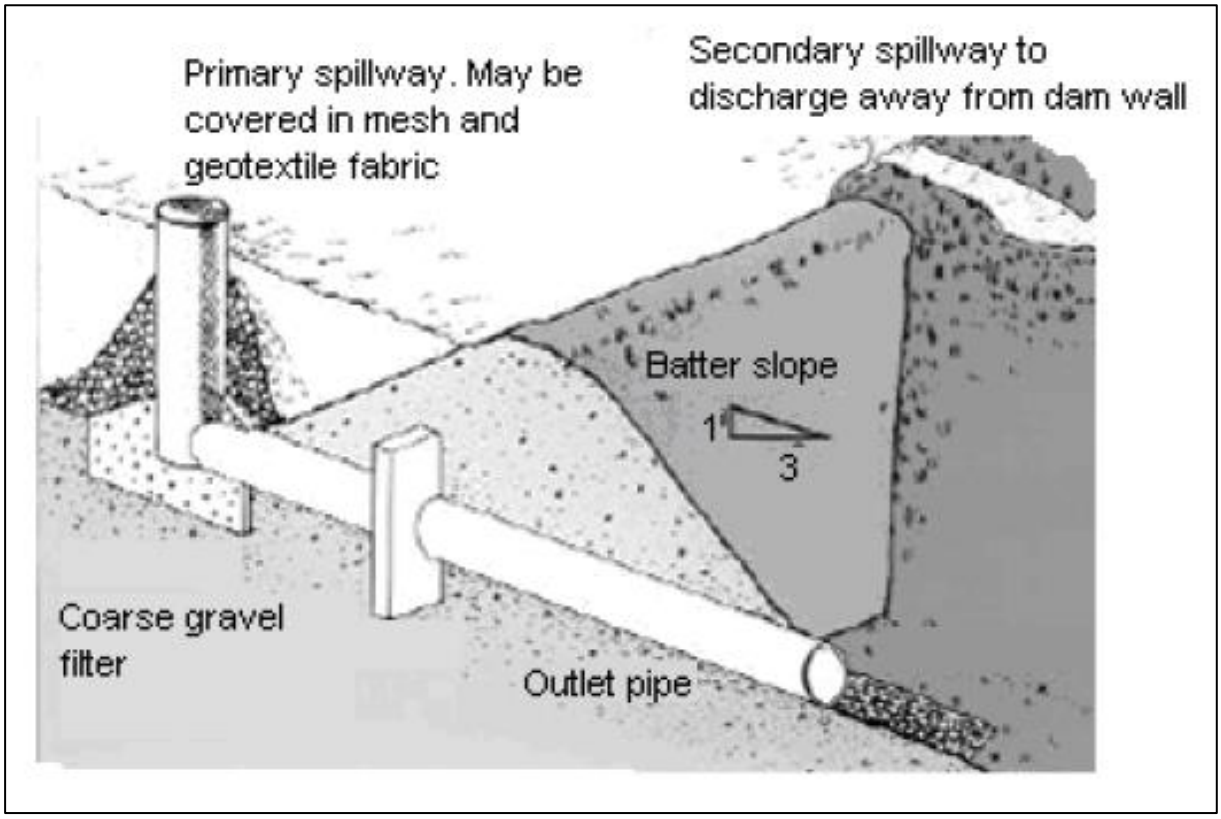

Figure B-3 Large, Long Term Sediment Dam Design

Sediment Fences

Sediment fences are used to intercept sheet flow runoff from disturbed areas containing sediment. Sheet flow is flow which is parallel to the sediment fence, not hitting the fence directly. Green geotextile fabric made specifically for sediment fencing is pegged at least every 3 m and the bottom of the cloth is buried 150 mm into the ground. Black geotextile fabric is a weed mat, and is not an effective sediment control. Green textile fabric is designed to capture the sediment in runoff but allow the clean water through the fabric at a rate which will not destroy the sediment structure.

Design is shown below.

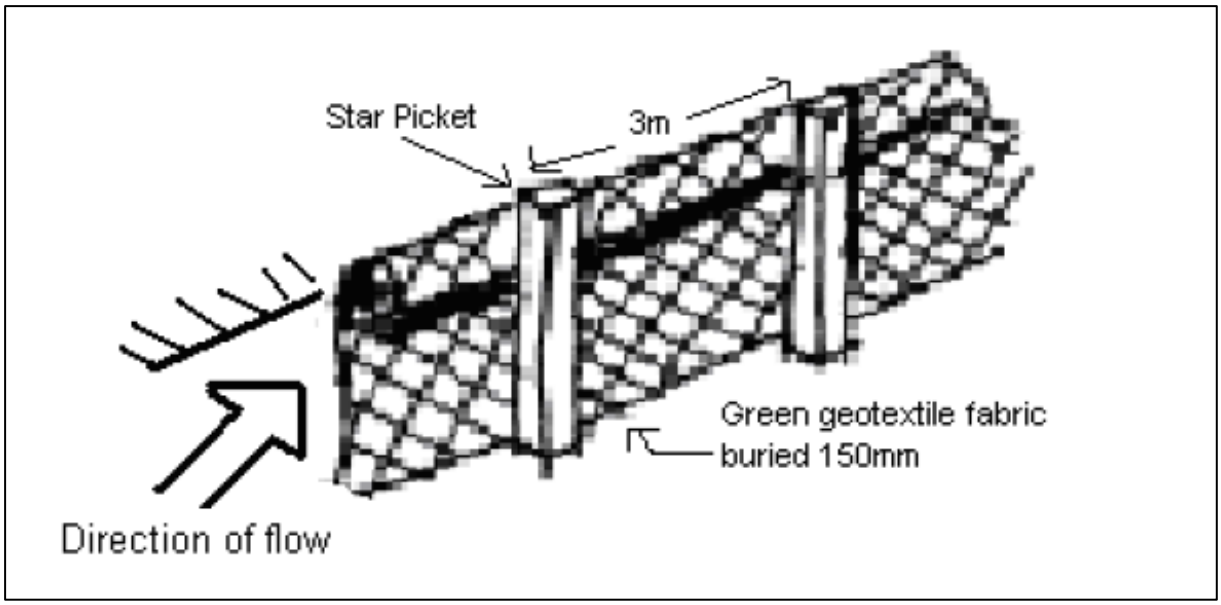

Figure B-4 Sediment Fence Design Hay Bales and Rock Structures

Hay bales and rock structures are used on drainage lines or upstream of other controls (such as sediment dams), and often in conjunction with sediment fences to minimise erosion. Hay bales are used in areas where a temporary form of control is required until vegetation establishes to provide natural erosion and sediment control.

The typical design is shown below.

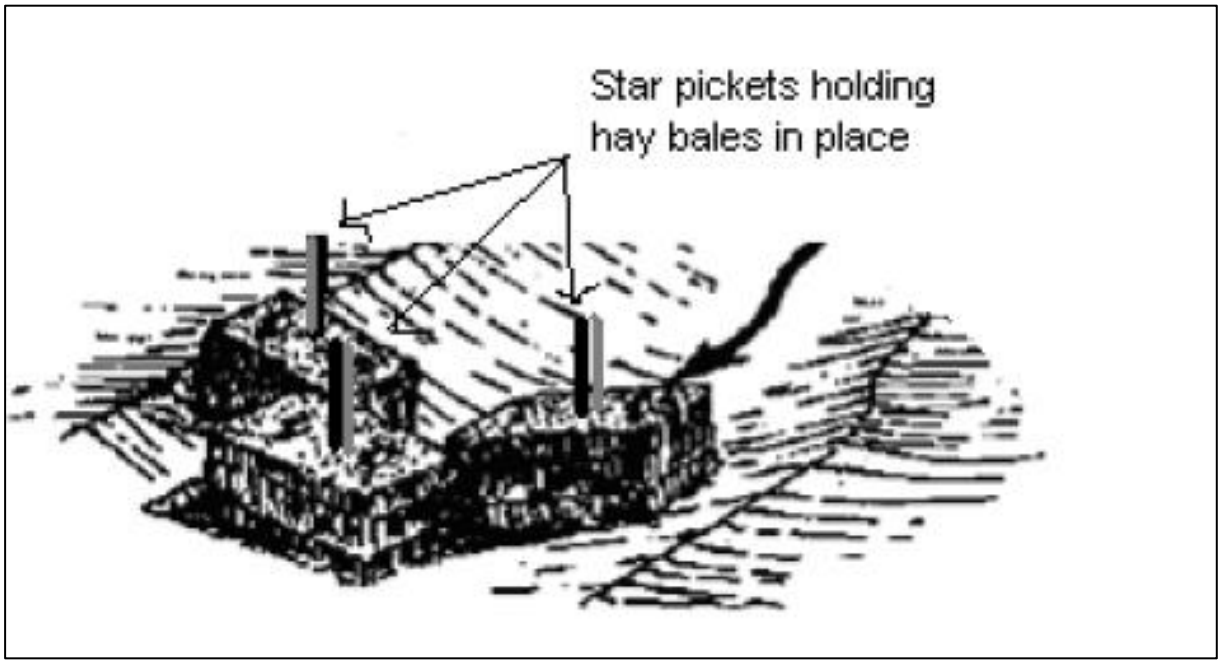

Figure B-5 Use of Hay Bales in Diversion Drain

Rock structures can also be used in areas where temporary control is required but can also be used as a permanent erosion and sediment control. The rocks receive the initial force of the flow and disperse it, slowing down the flow and therefore minimising the erosion potential, similar to the hay bales. Rock structures can be used in two ways, one is at the outlet of pipes or culverts where the rocks are simply

placed under and around the outlet, and the other is in a kind of embankment wrapped in geotextile fabric at intervals to slow the flow further.

Designs are shown below.

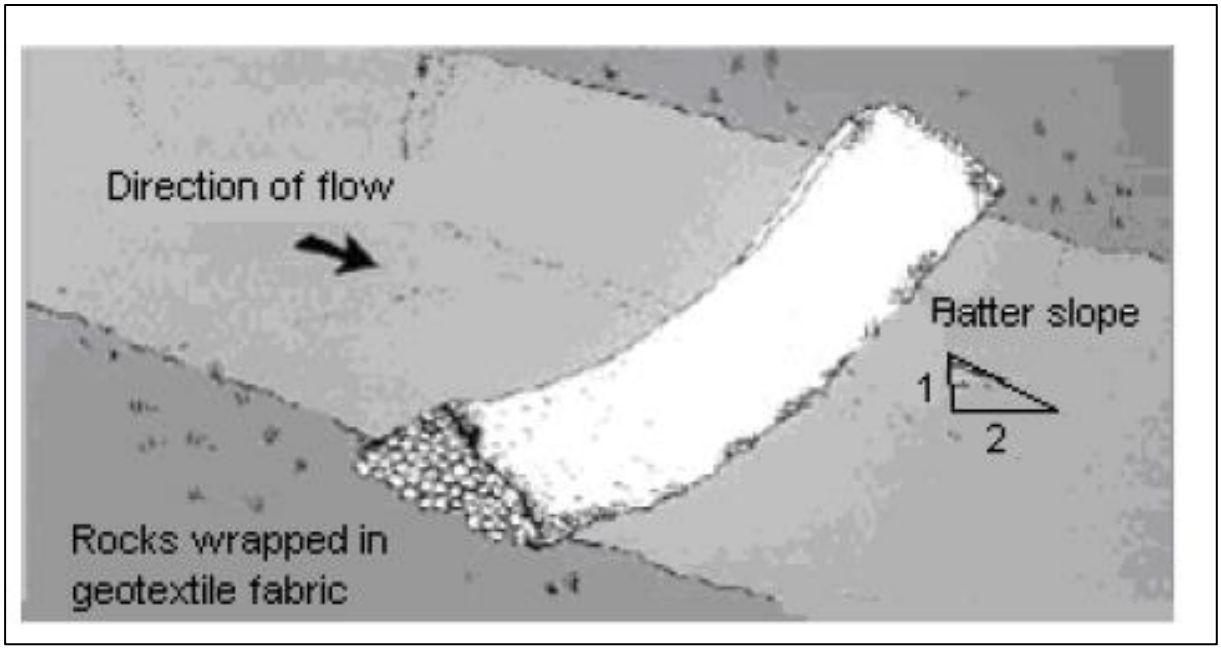

Figure B-6 Rock Structure as an Embankment

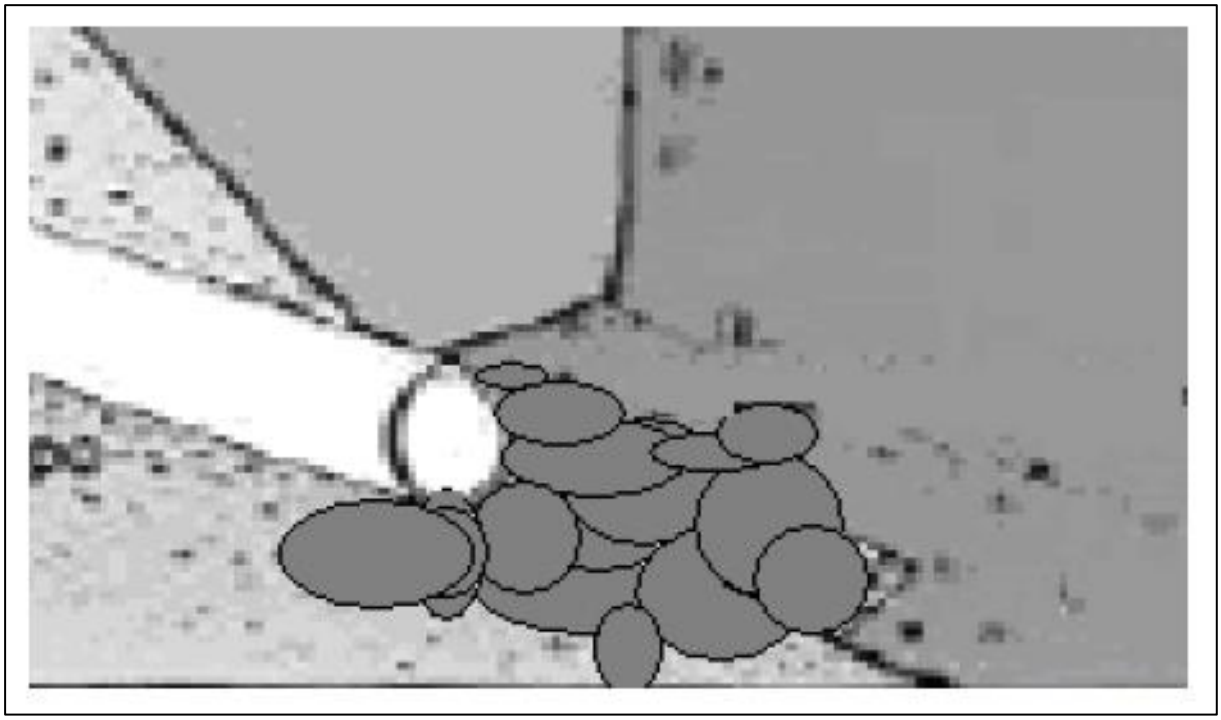

Figure B-7 Rock Structure at the Outlet of Pipe

Referenced from Environment ACT, Erosion and Sediment Control During Land Development, Canberra, 1998 and EPA 2011.