



Erosion and Sediment Control Plan

Table of Commitments

Commitment Reference	Commitment Description	Approval/EIS Reference	Status	Section
3.5.1_1	United Wambo will prepare an Erosion and Sediment Control Plan that identifies activities that could cause soil erosion, generate sediment or affect flooding.	SSD 7142 Condition B52(e)(iii) item 2	Ongoing Commitment	3.1
3.5.1.1_2	This plan must be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary.	SSD 7142 Condition B52(a)	Complete	3.5.1.1
3.5.1.2_1	The SWMP will be prepared in accordance with relevant statutory requirements in consultation with the NSW DPIE Water and the EPA.	SSD 7142 Condition B52(b)	Complete	3.5.1.2
4.3_1	United Wambo will implement Erosion and Sediment Control Plans that address specific objectives and measures for soil handling associated with disturbance and post mining rehabilitation activities.	SOC_6.13_Rehabilitation_054 SOC_8.0_Management Measures_040	Ongoing Commitment	4.3
4.3_2	Design, install and maintain erosion and sediment controls in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008)	SSD 7142 Condition B38 SSD 7142 Condition B49 Table 4 item 8 SSD 7142 Condition B52(e)(iii) Item 1 & 3 SOC_6.09_Ecology_008 SOC_8.0_Management Measures_040 SOC_6.08_Water_008 SOC_6.08_Water_018 SOC_6.08_Water_004 SOC_6.08_Water_003	Ongoing Commitment	4.3

Commitment Reference	Commitment Description	Approval/EIS Reference	Status	Section
4.3_3	Dirty water diversion drains will be sized to safely convey the 5% AEP storm event to prevent spills or runoff from hazardous materials storage areas entering surrounding land/waterways.	SOC_6.8_Water_017	Ongoing Commitment	4.3
4.3_4	Design, install and maintain any infrastructure within 40 metres of watercourses in accordance with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012)	SSD 7142 Condition B49 Table 4 item 9	Ongoing Commitment	4.3
4.3_5	Design, install and maintain any creek crossings generally in accordance with the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003), and decommission if necessary.	SSD 7142 Condition B49 Table 4 item 10 SSD 7142 Condition B52 (e)(iii) item 5 SOC_8.0_Management Measures_040 SOC_6.08_Water_018	Ongoing Commitment	4.3
4.3_6	The ESCP describes the location, function, and capacity of permanent erosion and sediment control structures and flood management structures, including the ROM coal stockpile containment sump detailed in Mod 1 and the <i>Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Minesites in the Hunter Coalfields.</i>	SSD 7142 Condition B52 (e) (iii) Item 4 SOC_6.08_Water_018 SOC_6.08_Water_004 SOC_6.09_Ecology_008 SOC_6.08_Water_019	Ongoing Commitment	4.3
5.1_1	United Wambo has established a monitoring program for erosion and sedimentation in accordance with the requirements of relevant approvals and EIS commitments.	SOC_6.08_Water_021-3	Ongoing Commitment	5.1

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1. Purpose

The purpose of this Erosion and Sediment Control Plan (ESCP) is to describe the management and mitigation strategies, procedures, controls and monitoring programs that will be implemented to manage erosion and sedimentation at the United Wambo Open Cut Coal Mine (United Wambo).

2. Scope and Objectives

2.1 Scope

United Wambo is situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 2-1**). United Wambo is a 50:50 joint venture between United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo). United is owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore) and five per cent by the Mining and Energy Union (MEU). Wambo is a subsidiary of Peabody Energy Australia Pty Limited.

United Wambo is managed by Glencore and has approval to extract up to 10 million tonnes per annum (mtpa) of Run of Mine (ROM) coal up until 31 August 2042. ROM coal is processed through the Wambo Coal Handling and Preparation Plant (CHPP) and transported by rail from Wambo to the Port of Newcastle for export.

This ESCP applies to all activities at United Wambo and addresses the relevant conditions of SSD 7142 and EPL 3141. It forms part of United Wambo's Environmental Management System (EMS) and should be read in conjunction with the **United Wambo Environmental Management Strategy (EM Strategy)**.

The ESCP applies to all United Wambo employees, and contractors working for, or on behalf of, United Wambo within the project approval boundary.



Figure 2-1 Mine location

2.2 Objectives

The objectives of this ESCP are to:

- Provide information on the water context of the area and the potential impacts associated with the operation
- Outline the obligations and commitment measures to be implemented to process to manage water impacts from the operation
- Identify activities that could cause erosion and generate sediment
- Describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and to manage flood risk
- Describe the location, function and capacity of ESC structures and flood management works

- Provide methods to assess compliance with conditions of development consents, environmental protection licences and legislation relating to surface waters
- Ensure erosion and sediment control management measures are effective and implementable at United Wambo, to reduce the potential for impacts on water, including source-specific controls and site-wide management systems and procedures
-

3. Planning

3.1 Baseline Data

3.1.1 Existing Erosion and Sedimentation Environment

3.1.1.1 Environmental Setting

The area surrounding United Wambo is dominated by existing mining operations, including the Wambo Mine, Hunter Valley Operations (HVO) and associated mine-owned land. Several other mining operations are located further south including Mount Thorley Warkworth and Bulga Mine. Outside of mine-owned land, the local area is dominated by agricultural land uses, predominantly grazing, and the Wollemi National Park to the West.

3.1.1.2 Catchments and Hydrology

The majority of the United Wambo project area is located within the catchment area of Wollombi Brook, a major tributary of the Hunter River. The Wollombi Brook catchment includes the sub-catchments of Wambo Creek, North Wambo Creek and Redbank Creek. Waterfall Creek is located in the north United Wambo, another minor tributary of the Hunter River.

The catchment boundaries for watercourses, within and surrounding United Wambo are shown in **Figure 3-1** and **Figure 3-2**. Historic mining operations within the area have modified local catchments by the diversion of upslope runoff (i.e. North Wambo Creek Diversion).

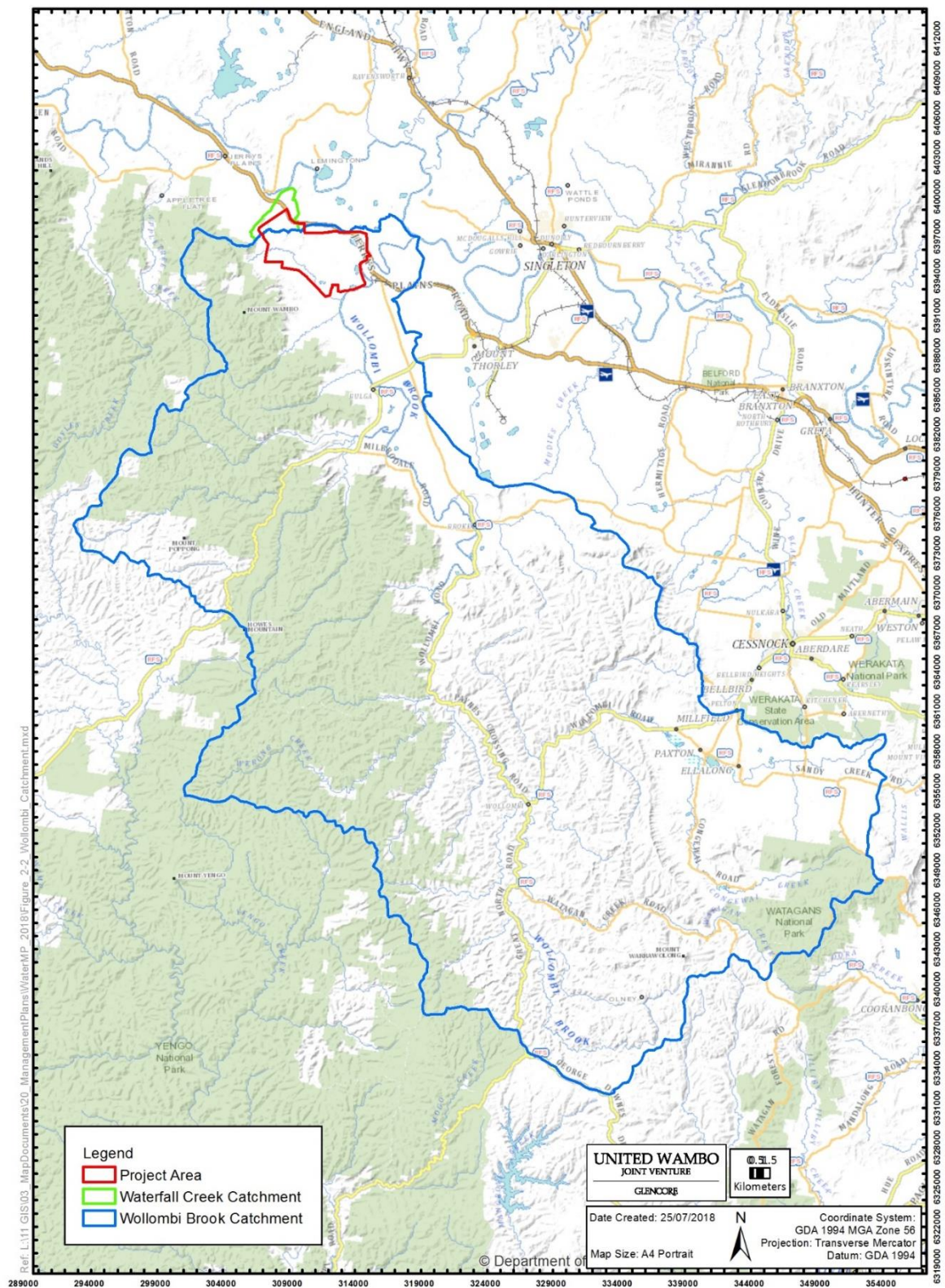


Figure 3-1 Catchment Context

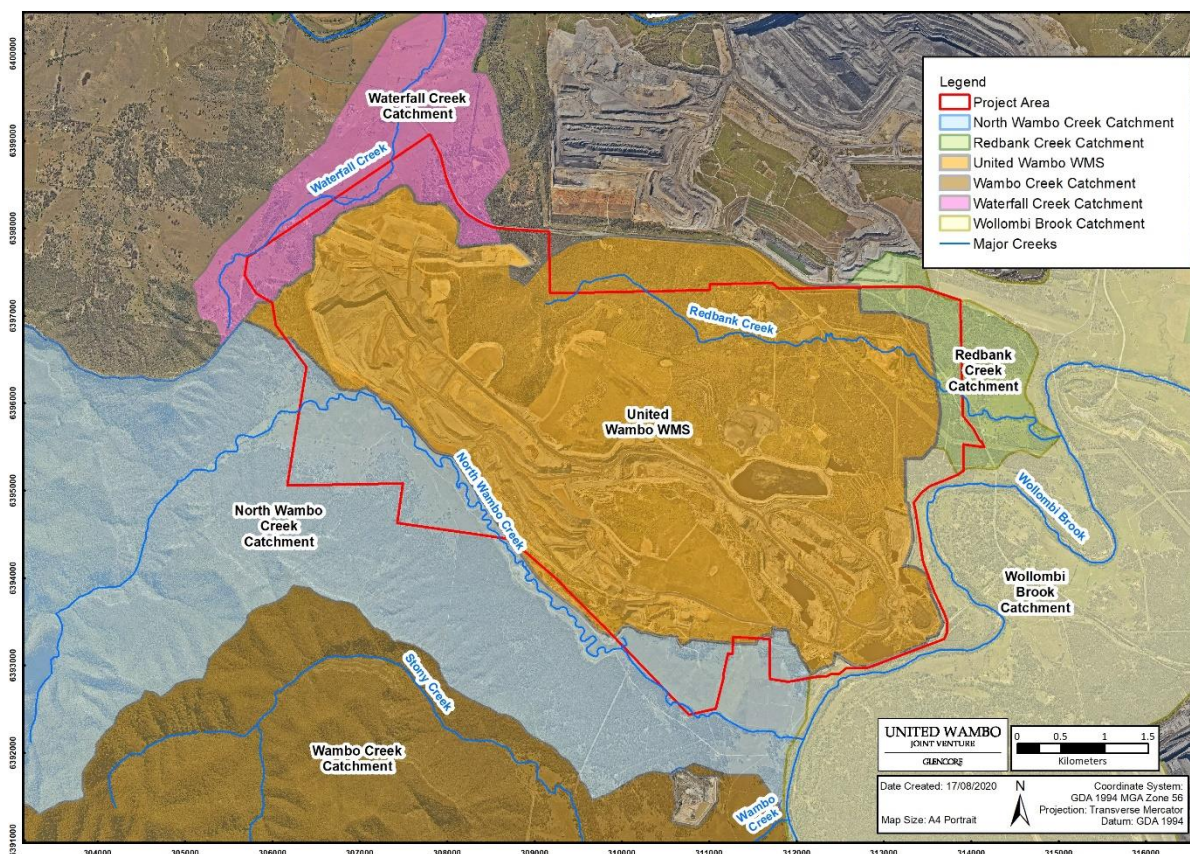


Figure 3-2 United Wambo catchment context

3.1.1.3 Soil Resources

Several soil landscapes are present within United Wambo. The Jerrys Plains Landscape dominates the site, with smaller areas of Bulga and Benjang landscapes in the west. The Jerrys Plains soil landscape comprises of mostly sandy soils (red and yellow soloths) of moderate erodibility with solodic soils on the lower slopes and in drainage depressions (Umwelt 2016).

Descriptions of the soil landscape characteristics are summarised in **Table 3-1**. The locations of the soil landscapes are shown on **Figure 3-3**.

Table 3-1 Soil landscape characteristics

Soil Landscape	Soil Profile Types	Other Characteristics
Jerrys Plains	Predominantly comprised of Soloths on the crests to midslopes. Solodic Soils on the lower slopes and in drainage depressions.	Susceptible to severe gully erosion in some drainage lines with occasional salt scalds. Minor sheet erosion can occur on some disturbed areas of hillslopes. Erodibility of topsoils ranges from moderate to low; subsoils range from high to low. Soil salinity ranges from high to low

Soil Landscape	Soil Profile Types	Other Characteristics
Bulga	Predominantly comprised of Yellow Soloths on the upper to mid slopes with associated Yellow and Brown Solodic Soils. Brown Earths on lower slopes.	Susceptible to minor to moderate sheet erosion. Recently disturbed areas show minor rilling. Erodibility of topsoils ranges from moderate to low; subsoils range from high to low.
Benjang	Predominantly comprised of Red, Yellow and Brown Solodic Soils on the steeper benched country. Brown Podzolic Soils on upper slopes. Non-calcic Brown Soils on lower portions of longer flat slopes. Siliceous Sands midslope on quartz sandstone	Susceptible to minor to severe sheet erosion on cleared hillslopes with Solodic Soils. Minor rill and gully erosion on mind to lower slopes. Erodibility of topsoils ranges from high to moderate; subsoils range from moderate to low. Soil salinity ranges from high to low
Warkworth	Predominantly comprised of Siliceous Sands.	Susceptible to minor sheet erosion when disturbed. Erodibility and salinity of both topsoil and subsoil is low.
Hunter	The main soils of this landscape are all formed in alluvium. These are mapped as BSAL in the Upper Hunter SLRUP.	Susceptible to minor stream bank erosion on present watercourses with minor sheet and gully erosion on adjacent terraces. Erodibility and salinity of both topsoil and subsoil is ranges from moderate to low.

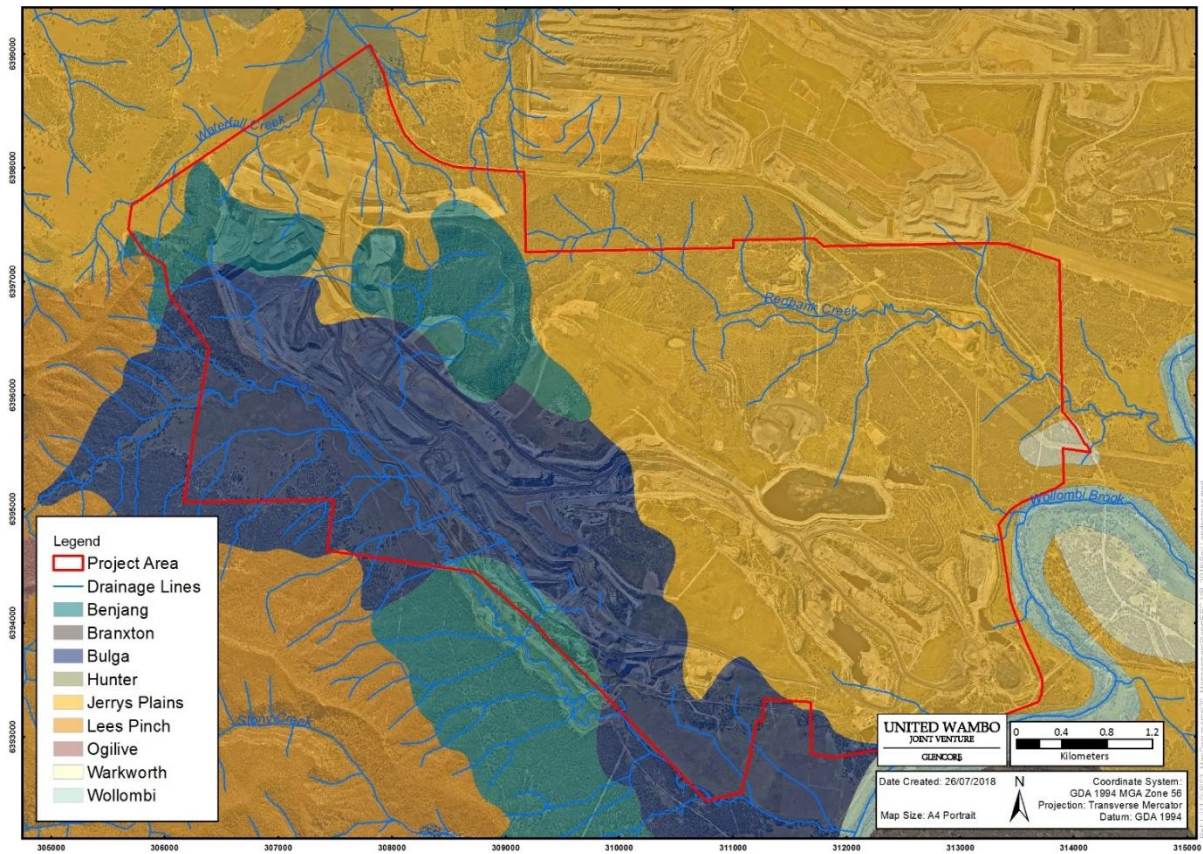


Figure 3-3 Soil Landscapes

3.1.1.4 Vulnerable Land

The NSW Environment and Heritage online mapping service had mapped Redbank Creek within the existing mining areas as 'vulnerable land' due to its erodibility / steepness of slopes, shown in **Figure 3-4**. Mapped 'steep or highly erodible soils' are shown as occurring over parts of the Project area.

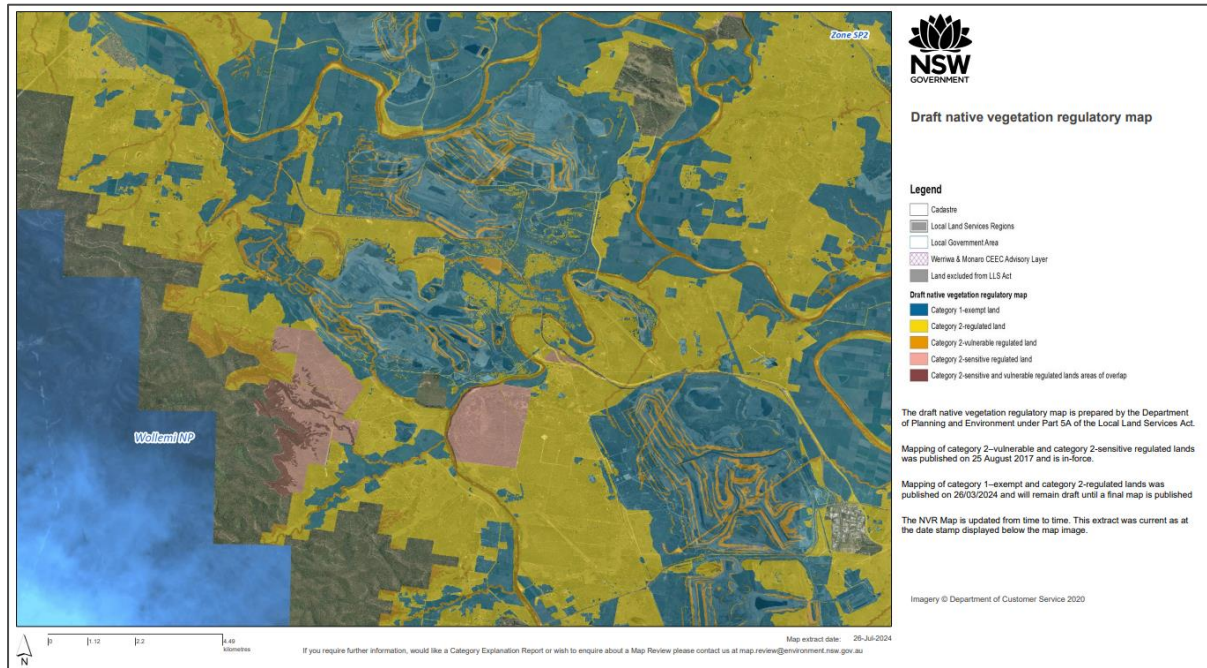


Figure 3-4 Mapped vulnerable lands

3.1.1.5 Vegetation

The landscape within the United Wambo project approval boundary is made up of:

- Approximately 1,893 ha of disturbed areas within the active mining or infrastructure footprints
- Approximately 330 ha of land under rehabilitation with pasture or native woodland species (ranging in age from juvenile to established)
- Approximately 897 ha of undisturbed lands, comprising six vegetation community types:
 - Bull Oak grassy woodland of the central Hunter Valley
 - Forest Red Gum grassy open forest on floodplains of the lower Hunter
 - Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin
 - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter
 - Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest slopes of the upper Hunter and Sydney Basin
 - Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley.

The vegetation communities at United are shown in **Figure 3-5**.

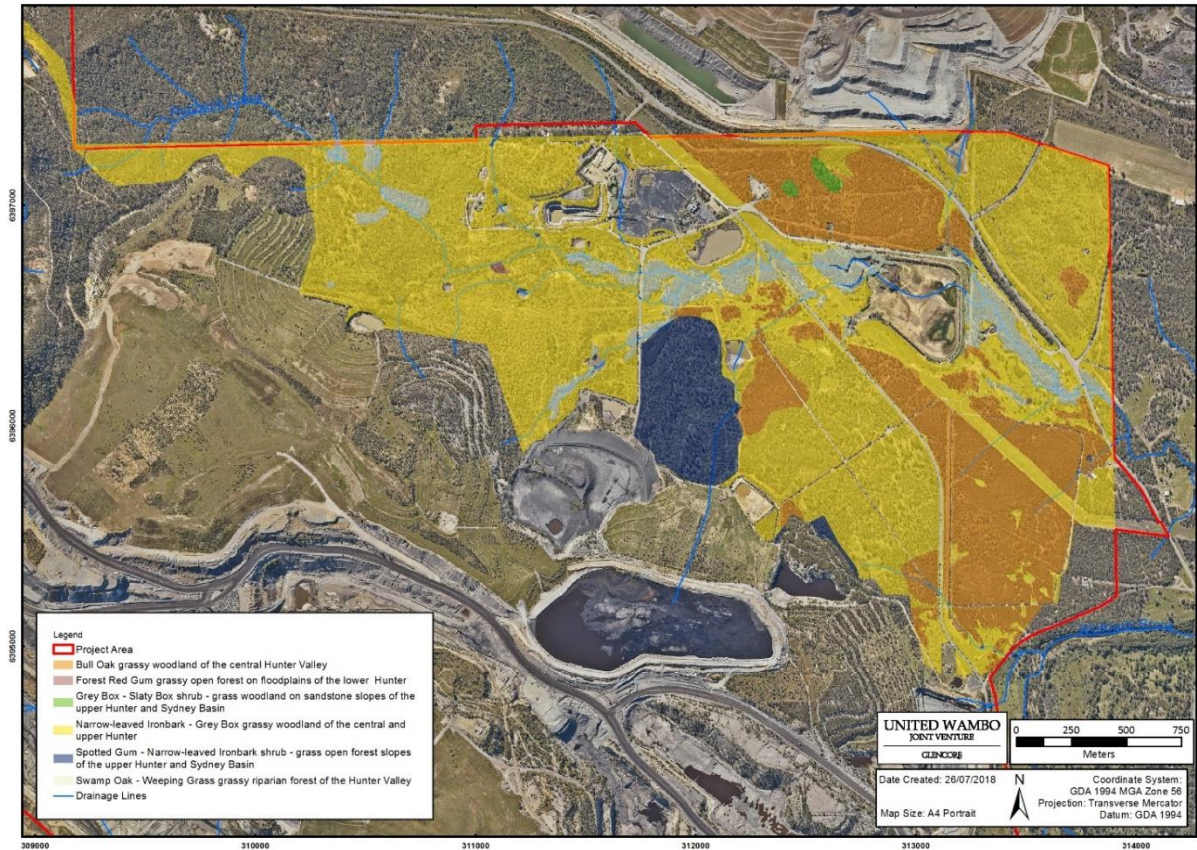


Figure 3-5 United Wambo Vegetation Communities pre-SSD 7142

3.1.2 Water Management Systems pre-SSD 7142

Prior to the approval of SSD 7142 in 2019, the open cut and associated water management infrastructure was managed by Wambo under DA 305-7-2003.

The system was based on separation of water into different quality categories, which informed the management and reuse options for those water resources. In general, these water categories included:

- clean water - runoff from undisturbed or rehabilitated areas
- dirty water - runoff from disturbed areas, such as active overburden emplacement areas or overburden emplacement areas where vegetation is not fully established.
- Mine water - water exposed to coal or used in coal processing and runoff within mining infrastructure areas or coal stockpile areas; and water associated with groundwater inflows into open cut pits

This ESCP is concerned with the management of 'dirty' water.

3.2 Erosion and Sedimentation Impacts

3.2.1 Site Generating Sources of Erosion and Sedimentation

Erosion and sedimentation impacts which may result from United Wambo include:

- Increased runoff volumes and velocities from the removal of vegetation, land disturbance and the introduction of impervious surfaces on hardstand areas
- Potential decline in water quality and degradation of local amenities through sediment transport to nearby watercourses
- Increased potential for sedimentation to occur from increased erosion and runoff associated with open cut mining, stockpiling of material and the construction of surface facilities, access roads/tracks and exploration drilling
- Potential for increased scouring during the construction of surface facilities adjacent to watercourses
- Reduction in soil resources available for revegetation purposes

3.2.1.1 Potential sources

Mining operations that have the potential to cause erosion or generate sediment and impact the surrounding catchment areas are:

- Continued mining operations and construction activities;
- Clearing or disturbance of land for mining or other activities;
- Construction of operational sediment control measures;
- Construction of overburden and emplacement areas and haul routes;
- Placement of overburden and topsoil;
- Vehicle and equipment movements;
- Coal stockpiles and coal handling equipment areas; and
- Mine site rehabilitation.

3.3 Criteria and Performance Metrics

There are no ESC specific performance metrics. Performance metrics for surface water are contained in the **SWMP**.

3.4 Requirements of this Plan

United Wambo operations and support teams undertake consistent approaches to ensure that all approvals and licences are obtained and managed in accordance with conditions. **Section 3.4** outlines those approvals, licences and other regulatory requirements on applicable to United Wambo, obligations are added to the compliance management system to ensure compliance is managed.

3.4.1 Statutory Requirements

3.4.1.1 Project Approval

United Wambo received **Development Consent (SSD 7142)** in accordance with Part 4 of the **Environmental Planning & Assessment Act 1979 (EP&A Act)** from the NSW Independent Planning Commission (IPC), on 29 August 2019. Conditions within **SSD 7142** relating to air quality management, and where these are addressed within this document, are provided in **Appendix A**.

Further commitments relating to erosion and sedimentation management were made during the environmental assessment phase of the project. These commitments are summarised in **Appendix B**.

3.4.1.2 Environment Protection Licence

United Wambo operates under **EPL 3141**, issued by the **NSW Environment Protection Agency (EPA)** under the authority of the **Protection of the Environment Operations Act 1997 (POEO Act)**. Conditions within **EPL 3141** that regulate water quality at United Wambo are provided in **Appendix A**.

Adjacent to United Wambo is the Wambo Underground Mine, approved under EPL 592. Requirements under the Wambo Mine EPL are managed by Peabody.

3.5 Preparation and Implementation of this Plan

3.5.1 Preparation of ESCP

The ESCP has been prepared for United Wambo was developed in consideration of requirements listed in the EIS Statement of Commitments and SSD 7142 Condition B52(e)(iii), including the identification of activities that could cause soil erosion, generate sediment or affect flooding.

3.5.1.1 Suitably Qualified Person

The Erosion and Sediment Control Plan (version 1) was prepared by suitably qualified and experienced persons, endorsed by the Planning Secretary on 11 December 2019. Further updates to the plan are made by UWJV, using support from other qualified and experienced consultants where required. A copy of the approval is attached in **Appendix C**.

3.5.1.2 Stakeholder Consultation

Condition B52 (b) of **SSD 7142**, requires this ESCP to be prepared in consultation with DPIE Water and EPA and submitted to the Planning Secretary for approval.

Records of consultation undertaken with DPHI, DPIE Water and EPA during reviews of this WMP version are included in **Appendix D**.

3.5.1.3 ESC Hold Points

There are no hold points relating to ESC management at United Wambo.

3.5.2 Implementation of ESCP

United Wambo will implement the approved ESCP, in accordance with relevant statutory requirements (including approvals and EIS commitments).

A copy of the currently approved ESCP is publicly available on the United Wambo website. The approval letter from DPE is included in **Appendix A**.

4. Implementation

4.1 Training and Awareness

Effective implementation and maintenance of this plan depends on the competency of the United Wambo Workforce and its Contractors.

Training is provided to relevant personnel in accordance with the site Training Needs Analysis and the **United Wambo EM Strategy**. For further details, refer to the **United Wambo EM Strategy**.

4.2 Response Mechanisms and Strategies

To effectively plan for the design and installation of control measures that will have minimal erosion and sediment associated impacts upon the surrounding environment, the following steps should be followed:

- Identify if the problem is associated with erosion or sedimentation:
 - Where erosion is the issue, identify if particles are being detached by raindrop impact or flowing water; or
 - Where sedimentation is the issue, identify if particles are being transported by sheet flow or concentrated flow; and
- Select appropriate erosion and sediment control techniques

The United Wambo WMS has been designed to control and manage erosion and sedimentation through the construction and maintenance of a range of permanent and temporary structures designed to prevent the discharge of sediment laden water offsite.

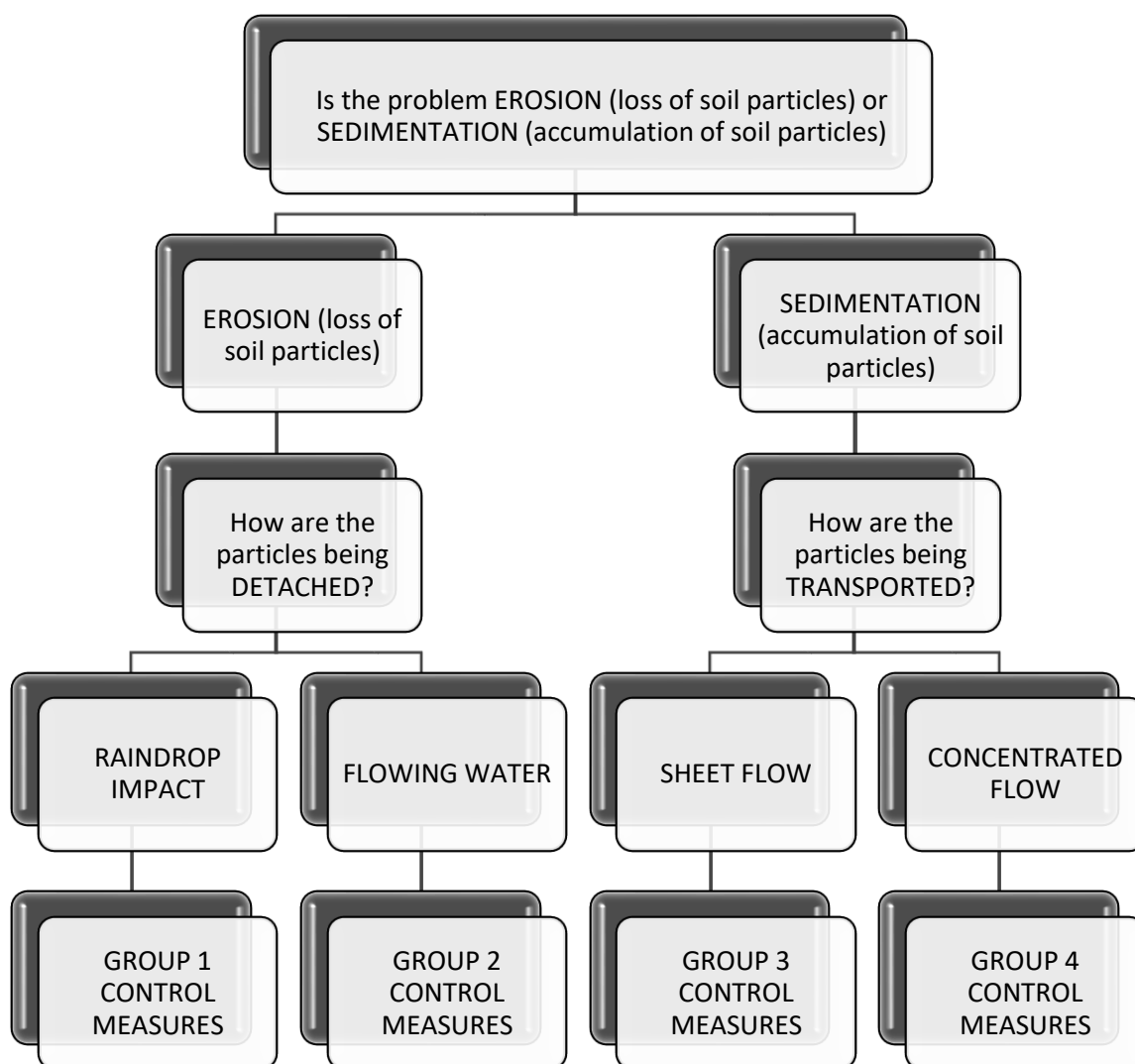


Figure 4-1 Erosion and Sediment Control Selection Process

Group 1 – Erosion Control (Raindrop Impact)

The following erosion control techniques are recommended for implementation where soil particles are being detached by raindrop impacts:

- Vegetation
- Batter blankets
- Soil surface mulching
- Surface roughening
- Geo-binders

Group 2 – Erosion Control (Flowing Water Impact)

The following erosion control techniques are recommended for implementation where soil particles are being detached by the impacts of flowing water:

- Up-slope diversions
- Mid-slope diversions

- Soft armour channels
- Hard armour channels
- In-stream diversions
- Check dams
- Batter drains
- Grade control structures and flumes
- Outlet dissipation structures

Group 3 – Sedimentation Control (Sheet Flow)

The following sediment control techniques are recommended for implementation where soil particles are being transported by sheet flow:

- Vegetative buffers
- Sediment barriers/filter
- Catch drains to direct sediment laden runoff to an appropriate sediment trap
- Site exit points

Group 4 – Sedimentation Control (Concentrated Flow)

The following sediment control techniques are recommended for implementation where soil particles are being transported by concentrated flow:

- Sediment curtains/turbidity barriers
- Sediment traps
- Sediment dams

4.2.1 Proactive Mechanisms

Proactive erosion and sedimentation management involves the planning of activities in advance of potentially adverse conditions. Proactive erosion and sedimentation management includes:

- General ESC Principles
- Planning of overall site ESC structures
- Ground disturbance permit and erosion and sediment control plans (ESCP)
- Planned vegetation management
- Progressive rehabilitation

4.2.1.1 General ESC Principles

All disturbance activities are guided by principles focusing on minimising erosion, as per the **GCAA Erosion and Sediment Control Procedure** (CAA HSEC PRO 0016):

- Minimise disturbance where possible;
- Minimise upslope catchment and manage disturbed area runoff;
- Limit erosion and manage sediment; and
- Recover and save topsoil to progressively rehabilitate disturbed areas.

GCAA has adopted the design standard of the Blue Book, specifically ***Managing Urban Stormwater: Soils and Construction Volume 2E (DECC 2008)***.

United Wambo implement a range of general erosion and sediment controls, designed to control and manage erosion and sediment that may result from mining and related activities. The measures that will be implemented include the following:

- Prior to site disturbance, site specific Erosion and Sediment Control Plans must be established and approved by the Environment and Community Department via the Ground Disturbance Permit (GDP)
- Install erosion and sediment control measures as the first step in the process for land disturbance;
- Minimise the extent of disturbance and stabilise disturbed areas by progressive rehabilitation as soon as practicable in accordance with the Mining Operations Plan;
- Clearly identifying and delineating areas required to be disturbed and ensuring that disturbance is limited to those areas, clearing as little vegetation as required and minimising machinery disturbance outside of these areas;
- Construction of diversion drains upslope of areas to be disturbed to direct clean runoff away from disturbed areas, where practicable. The diversion drains will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to natural watercourses;
- Construction of other ESC works, such as silt fences and sediment dams, prior to works commencing within the area;
- Construction of catch drains to capture runoff from disturbed areas and rehabilitation areas and direct runoff into sediment dams;
- Progressively stripping and stockpiling topsoil for later use in rehabilitation;
- topsoil stockpiles stored for more than three months will be fertilised and grassed to reduce the potential for weed contamination and erosion;
- Stockpiles will generally be less than three metres high and will be set out in windrows to maximise surface exposure and biological activity;
- Level or gently sloping areas will be selected as stockpile sites to minimise erosion and potential soil loss where possible;
- Appropriate drainage controls will be installed upslope of stockpiles to divert water around the stockpiles and downslope of stockpiles to prevent soil loss;
- Construction of all temporary drains as earthen drains at typical grades no steeper than 5% (giving maximum peak velocities in the order of 1.5 m/s) to minimise scouring, otherwise ensuring that adequate scour protection is provided. All drains are to be grassed to minimise erosion;
- Placement of rock check dams in drains to reduce water velocities in steeper grade channels and provision of additional scour protection by lining as required,
- Construction of graded banks on reshaped overburden areas reducing slope lengths to minimise erosion and re-direct runoff to catch drains and water disposal areas;
- Location of stockpiled material away from concentrated water flows;
- Construction of road and earthworks cut and fill batters at slopes of 1V:3H (vertical: horizontal) or less (where possible) to maximise long term stability;

- Inspection and maintenance of all sedimentation controls and rehabilitation areas after storm events (greater than 25 mm of rainfall in 24 hours) to ensure ESC's are performing adequately; and follow up repair or redesign of ESC's that are not performing adequately;
- Maintenance of design capacity of sediment dams by removing built-up sediment;
- Regular maintenance of silt traps in the truckwash area;
- Establishment of vegetative cover on all rehabilitation areas as a priority to minimise the duration of soil exposure and the control of weeds through selective herbicide application and the reseedling of areas that fail to establish as soon as practicable;
- Restricting access to rehabilitated areas through the use of fencing and/or sign-posting;
- Flocculation of sediment dams as necessary to improve settlement of entrained sediment and to reduce total suspended solids (TSS) concentrations to less than 50 mg/L prior to release offsite;
- Construction of drainage controls, such as table drains at roadsides and on hardstand areas and toe drains on stockpiles; and
- Immediate repair or redesign of erosion and sediment controls that are not performing adequately, as identified in field inspections.

4.2.1.2 Planning of ESC structures

There is an overall site plan for erosion and sediment control features at UWJV, which is integrated into the broader site water management system. Figure 4-2 shows the key ESC measures on site, with further detail on other water management system items in the **UWJV Water Management Plan** and **UWJV Surface Water Management Plan**.

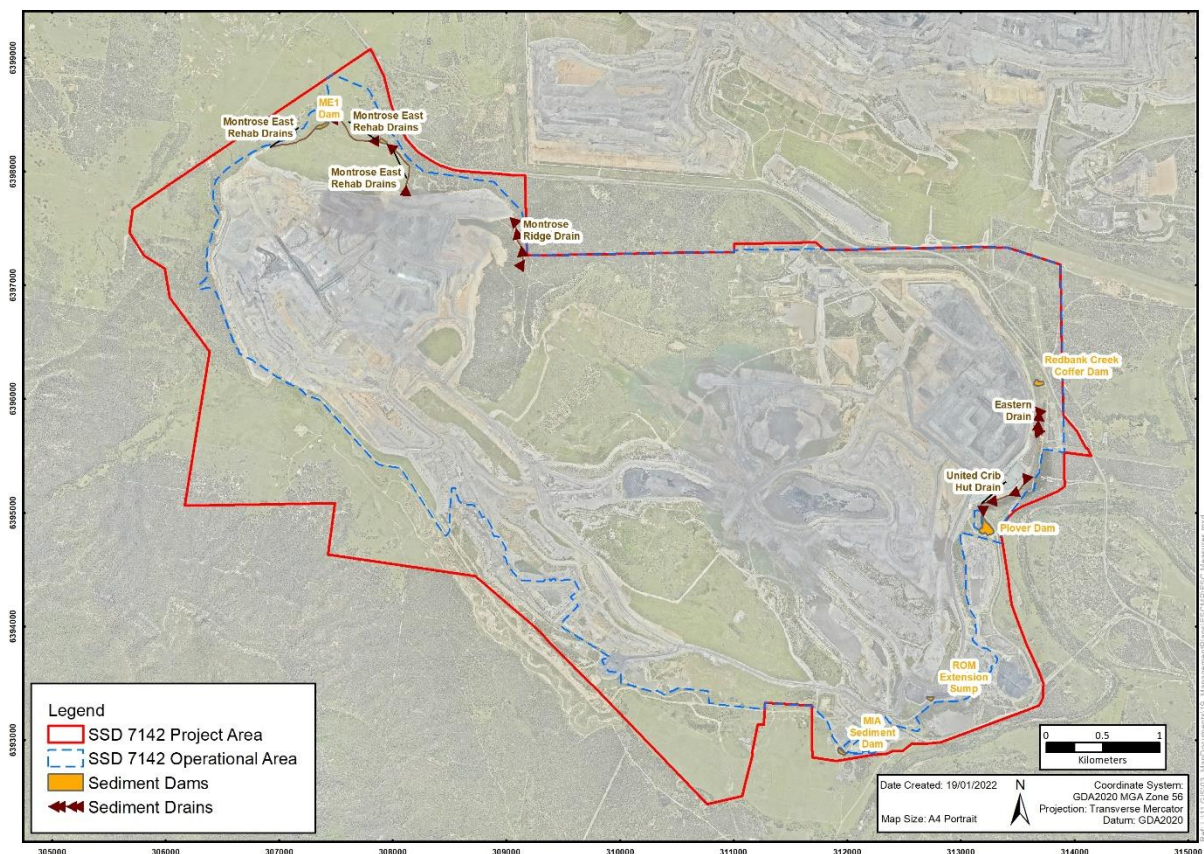
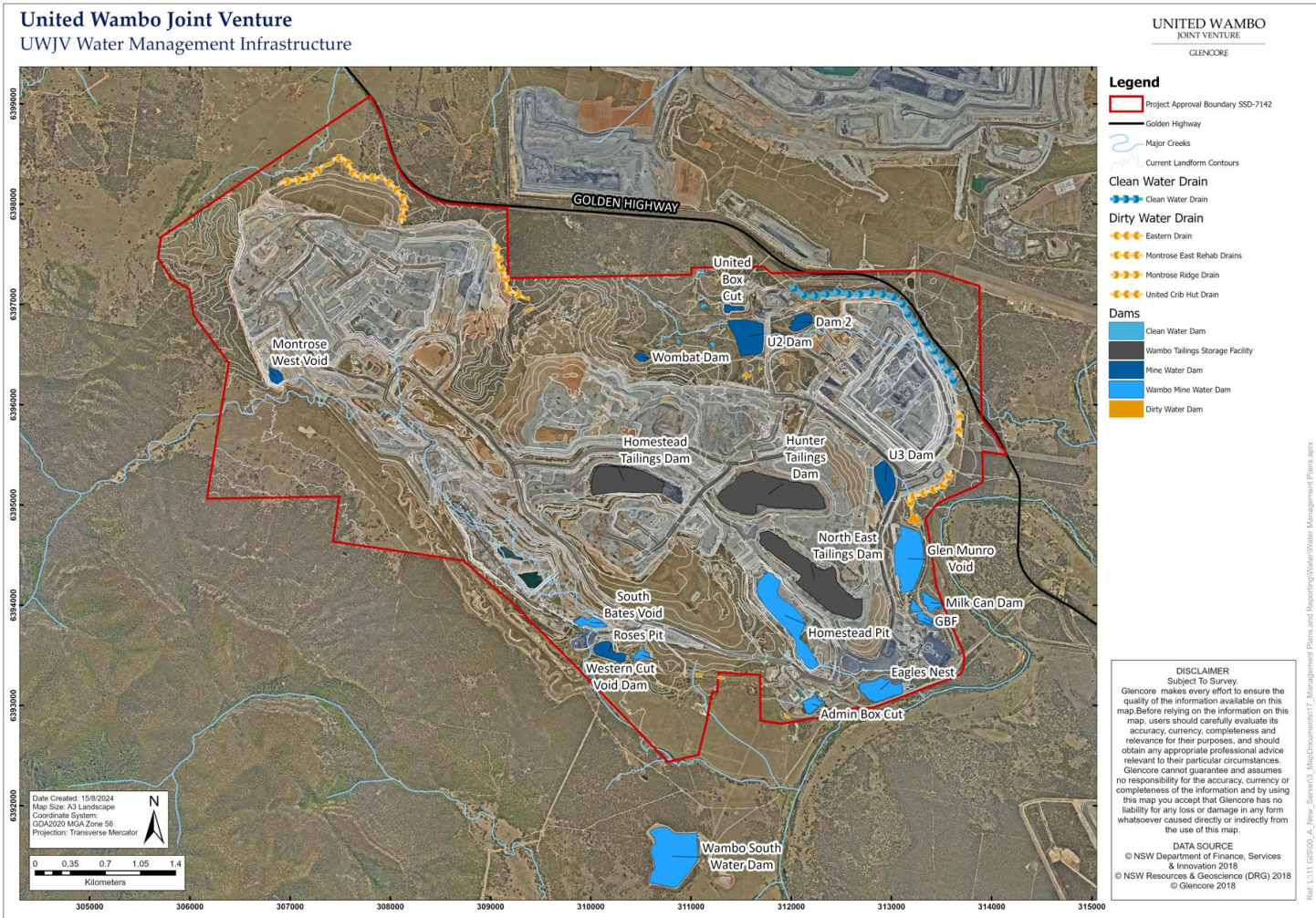


Figure 4-2 Key erosion and sediment control measures



4.2.1.3 Ground disturbance permit and erosion and sediment control plans (ESCP)

Prior to any disturbance activities being undertaken by the site, a **Ground Disturbance Permit (GDP) CAA-HSEC-PER-0004** is completed. The purpose of the GDP is to identify environmental hazards associated with the proposed work, including erosion and sediment risks.

GDPs that require a location-specific ESCP considers the following water management elements:

- The proposed staging of the works and the proposed controls. Subject to operational constraints, the works should be staged to minimise the area disturbed at any period during the works;
- The limit of disturbance is to be shown and adequate controls required on the ground (e.g. exclusion fencing, pegs).
- Designated access zones and controls including wheel washes and shaker mats;
- Watercourses, catchments and licensed discharge points. Vegetation provides an effective buffer zone between watercourses and ground disturbing works, and where feasible, should not be reduced to incorporate constructed controls such as sediment basins;
- The location and extent of all stockpiles and the controls proposed to divert clean water around the stockpiles and the containment system;
- Clean water diversions drains and energy dissipaters. The details to be included in the plan are the design storm, peak flow rates, catchment area, channel velocities and any proposed channel linings (grass, rock or jute mat);
- The proposed staged erosion and sediments controls. The plans need to include the location, dimensions, details and staging of all works for all stages of the activity;
- Details of the operation of the controls including any water treatment measures for sediment basins or any other controls. The plan is also to detail the required water transfers necessary to restore containment capacity of sediment traps and basins;
- Details of release criteria and the proposed monitoring program, including any notifications required by regulatory authorities;
- Potential for stormwater reuse to limit discharge. Note, reuse from the sediment basins should only be considered when all options to reuse mine water have been utilised;
- Details of the proposed topsoil stripping, stockpiling and resspreading;
- The revegetation strategy including any proposed temporary works to establish a cover and the proposed long term rehabilitation strategy.

4.2.1.4 Vegetation Management

United Wambo has sought to avoid and minimise potential impacts on the ecological values of the surrounding lands throughout the project planning process. Further to this, United Wambo has committed to the design and implementation of a comprehensive strategy to mitigate the residual impacts of the approved mining operations. These strategies are currently detailed in the **United Wambo Biodiversity Management Plan** and Biodiversity Offset Strategy. Some of the strategies and controls, which support the objectives of this ESCP, include:

- Feral animal and weed control;
- Rehabilitation/revegetation of disturbed areas with species characteristic of extant vegetation communities;

- Management of erosion and sedimentation to ensure that adjoining vegetation communities and aquatic systems are not adversely impacted; and
- Ongoing monitoring and maintenance of revegetation works and habitat enhancement activities

4.2.1.5 Progressive Rehabilitation

United Wambo has committed to progressive rehabilitation of post-mining areas. Rehabilitation of disturbed areas is planned as soon as practicable. Most of the site will be rehabilitated to woodland vegetation. Refer to the ***Rehabilitation Management Plan*** for an overview of the proposed rehabilitation for United Wambo.

4.2.1.6 Control Techniques Design Criteria

Drainage Channels (Dirty Water)

Dirty water drains are used to convey dirty water runoff to sediment dams. Dirty water drains are designed in accordance with GCAA standards and ***Best Practice Erosion and Sediment Control Guidelines, IECA – Books 1-4 and Managing Urban Stormwater – Soils and Construction Vol 1, 4th Ed (Landcom, March 2004)*** and ***Vol 2E Mines and Quarries (DECC, 2008)*** and the design criteria provided in ***0 Appendix D – Approval of ESCP***

To be updated when plan approved.

Appendix E - Design Standards for ESC Measures.

In general, the drains are trapezoidal in shape with maximum side slopes of 1V:2H and grass lined. Where the grade of the drain will result in water velocities that exceed 1.5 m/s, rock check dams are to be installed every 100 metres to limit velocities to 1.5 m/s or less. Rock protection and energy dissipation structures will be installed at the downstream outlets, where required, to prevent runoff causing scour or erosion in downstream drainage systems.

Drainage Channels (Clean Water)

Suitably designed and constructed clean water drains will be implemented, where practical, around United Wambo in accordance with GCAA standards and ***Best Practice Erosion and Sediment Control Guidelines, IECA – Books 1-4 and Managing Urban Stormwater – Soils and Construction Vol 1, 4th Ed (Landcom, March 2004)*** and ***Vol 2E Mines and Quarries (DECC, 2008)*** and the design criteria provided in ***0 Appendix D – Approval of ESCP***

To be updated when plan approved.

Appendix E - Design Standards for ESC Measures.

Clean water drains are designed to convey the peak flows from the required design rainfall event. In general, the drains are trapezoidal in shape with maximum side slopes of 1V:2H and vegetated and/or rock lined banks. Where peak design water velocities exceed 1.5 m/s in a 5% AEP storm event, the drains are protected from scour using rock bars every 100 metres. Rock protection and energy dissipation structures will be installed at the downstream outlets, where required, to prevent runoff causing scour or erosion in downstream drainage systems.

Sediment Fences and Other Temporary Sedimentation Control Methods

Sediment fences, sediment traps, rock check dams and other temporary erosion and sediment control measures described in the Blue Book will be installed in advance of, or in conjunction with, earthworks to prevent sediment laden water leaving the site or entering clean water systems. These temporary controls are intended to be used for short periods whilst more permanent erosion and sediment control structures are being constructed or during emergency scenarios where permanent structures are not deemed appropriate.

Where necessary, sediment fences or other temporary controls are constructed immediately downslope of areas to be disturbed to minimise the potential for sediment transport into receiving waterways.

Sediment filter fences are constructed in line with the design criteria provided in Appendix B. They are generally comprised of a woven fabric that will trap coarse particles with structural posts. Where practicable, the fences are erected along contours with small returns at approximately 20 metre intervals to limit the catchment size. This is necessary as sediment fences and other temporary controls are prone to failure in larger storm events and should be designed to ensure a maximum of 50 L/s passes through the sediment fence during a storm event. Sediment fences are not to be installed in concentrated flows where the effectiveness of the fences may be impeded (e.g. perpendicular across waterways or drains).

Sediment Dams

Sediment dams are constructed within dirty water catchments to capture and treat sediment laden water for treatment prior to discharge or reuse. Sediment dams will be installed where appropriate prior to any land disturbance activities occurring and maintained following completion of land disturbance activities. The design of each sediment dam will take into consideration the topsoil characteristics of the catchment, as well as the presence of any other potential pollutants.

The design basis for sediment dams is as follows:

- settling zone design to comply with the following:
 - Soil Hydrological Group – D
 - 95% - 5-day rainfall depth = 54.7 mm
 - Runoff coefficient – 0.74 (pervious areas)
 - Runoff coefficient – 0.90 (impervious, hardstand & road areas)
- sediment zone capacity to be sized based on:
 - 12 months of soil loss calculated using the Revised Universal Soil Loss Equation (RUSLE) method; OR
 - Undisturbed catchment areas – 10% of settling zone;
 - Disturbed catchment areas – 50% of settling zone; and
 - Rehabilitated catchment areas – 30% of settling zone.

To calculate the Sediment Zone using RUSLE, the following calculation is utilised:

$\text{Sediment Zone (m}^3\text{)} = A (R \times K \times LS \times P \times C) / 1.3$ (assumes 12 months soil loss)

The variables within the RUSLE are:

- A = Area (ha) (Disturbed Catchment Area only)
- R = Rainfall erosivity factor (Obtained from maps in Vol. 1 App B)
- K = Soil erodibility factor (Based on soil laboratory testing data)
- LS = Slope length gradient factor (Table A-1, Blue Book Vol 1 - App A)
- P = Erosion control practice factor (Table A2, Blue Book Vol 1 - App A)
- C = Ground cover factor (Figure A5, Blue Book Vol 1 – App A)

The RUSLE method is the more comprehensive as it utilises site specific catchment data to calculate the sediment zone volume. The RUSLE method as presented above is also more realistic to most mine site sediment dams as it assumes 12 months soils loss, which means that dams on average are de-silted every 12 months, whereas the earlier method assumes 2 months soils loss, which means that dams on average are de-silted every 2 months.

Where the dams form part of permanent infrastructure, they will be designed with spillways suitable for conveyance of the 1% AEP peak flow event, with 300 mm freeboard above the maximum water level in the sediment basin (i.e. the predicted water level during the design storm event) provided, assuming dams are full.

The settling zone volumes will be managed by dewatering following runoff generating rain events with the objective of restoring design settling zone capacity within five days of the rainfall event. The sediment zones will also be actively managed with periodic removal of accumulated sediment to maintain the required design settling zone capacity.

Where sediment is known/expected to be dispersive, United Wambo will investigate flocculation options to assist in settling fine particles. All sediment dams will be maintained in a drawn down state as far as practicable. Any water with less than adequate water quality (with TSS concentration greater than 50 mg/L) will be pumped back to the mine WMS and reused onsite.

4.2.1.7 Works within Watercourses

Works within 40 m of watercourses will be undertaken generally in accordance with the *DPI-Water Guidelines for Controlled Activities* (2012). For work within 40 m of a watercourse, the design, construction and maintenance will be undertaken generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land, Policy and Guidelines for Fish Friendly Waterway Crossings* and *Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings* or their latest versions.

The following key measures will be implemented:

- minimising the design and construction footprint and extent of disturbance as far as practicable;
- maintaining the existing or natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourse;
- protecting against scour as necessary, such as using rock rip-rap and vegetation;
- stabilisation and rehabilitation of all disturbed areas as soon as practicable;
- schedule works during periods of low rainfall erosivity (refer to Table 4.3 of Volume 1 of the Blue Book) and forecast dry weather periods. Where scheduling of works on waterfront land during low rainfall erosivity is not possible or is impractical, erosion control measures should be implemented to ensure disturbed lands only have C-factors in excess of 0.1 (i.e. approximately

60% ground cover) when the three day forecast indicates that rain is unlikely. Management regimes should be established to ensure that the site can be stabilised (i.e. C-factor 0.1 or less) within 24 hours if the forecast is incorrect; and

- inspection and maintenance of the works until the site is stable.

4.2.2 Reactive Mechanisms

Reactive erosion and sediment management includes the modification of activities in response to triggers, such as the selection of erosion and sediment control techniques.

4.2.2.1 Temporary ESC Structures (Sediment Filter Fences)

Regular visual checks and repairs of temporary ESC structures, such as sediment filter fences, to maintain adequate function will be undertaken. Temporary structures will be removed and disposed of appropriately when no longer required (e.g. when permanent controls have been implemented or the area serviced has been adequately stabilised).

4.2.2.2 Decommissioning of Control Structures

The erosion and sediment control measures implemented during the course of the Project will be reviewed regularly to determine whether they are still required. Should specific control measures be identified as no longer needed (i.e. the area of disturbance has been rehabilitated and is stable), the measures that will be implemented include:

- Filling and rehabilitating sediment dams;
- Removal of drains and catchment bunds; and
- Removal and appropriate disposal of temporary sediment fencing and other control measures.

All decommissioning works will be managed to minimise potential erosion risks during the undertaking of the works.

Some sediment dams will remain as farm dams (subject to harvestable rights entitlement and surface water licensing considerations) to enhance the value of the resultant land for agricultural purposes and biodiversity value. Depending on the chosen final land use, issues that will be addressed as part of post-mining water management system will likely include:

- Removal of excess sediment from the surface dams for future use by the subsequent land-owner or alternatively filling or removing the dams if they are no longer required;
- Reshaping dams (where required) in accordance with their intended use. This may involve resizing, facilitating stock access or reshaping to enhance habitat functionality for specific fauna species; and
- Where dams are to be retained, drainage structures will be designed to capture runoff from sufficient catchment area so that the dam can be utilised for its intended use and comply with harvestable rights and surface water licensing requirements.

4.3 Mitigation and Management Measures

Erosion and sediment management measures applicable to United Wambo are shown in **Table 4-1**. United Wambo implement the controls in **Section 4.2** as per the ESCP.

Table 4-1 Erosion and sediment mitigation and management measures

Control Type	Impact Type	Management Measure	Trigger / Evidence / Status
Rehabilitation and Disturbance Planning	Water Quality	United Wambo will implement Erosion and Sediment Control Plans that address specific objectives and measures for soil handling associated with disturbance and post mining rehabilitation activities.	Ground Disturbance Permit Procedure Completed Ground Disturbance Permits
ESC Infrastructure Planning	Water Quality	United Wambo will design, install and maintain suitable erosion and sediment control measures on the site, in accordance with the requirements in the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008), the site Approvals and EIS commitments.	Various erosion and sediment control works have been installed across site, including sediment dams and catch drains (Section 4.3.3). Sediment dams are designed for the five day, 95th percentile rainfall event. Controls are maintained as triggered by inspections. (Section 4.3.2) Dam Designs/Dam Construction Reports. Visual Inspection/Completed Inspections
		Dirty water diversion drains will be sized to safely convey the 5% AEP storm event to prevent spills or runoff from hazardous materials storage areas entering surrounding land/waterways.	Dam & Drain Designs (Section 4.3.1) Construction Reports
		Design, install and maintain any infrastructure within 40 metres of watercourses in accordance with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012)	Dam & Drain Designs Construction Reports
		Design, install and maintain any creek crossings generally in accordance with the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003)	Dam & Drain Designs Construction Reports
	Water Quality	UWJV install and maintain permanent erosion and sediment control structures, also considering the <i>Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Minesites in the Hunter Coalfields.</i>	Details of location, function, and capacity of structures is in 4.3.1 , including the ROM coal stockpile containment sump.

4.3.1 Sediment dams installed

Sediment dams require regular maintenance to retain their function as per design criteria (i.e. the Blue Book). The required maintenance is determined through the visual inspections undertaken of the sediment dams on a routine basis or following runoff generating rainfall (refer to SWMP).

The sediment dams will be drawn down to a level which ensures that the full settling zone volume is available within the dam, within five days after the rainfall event occurred. This is typically undertaken by transferring water back into the mine water management system.

The sediment dams are also regularly de-silted when their storage capacity is reduced by the sediment storage zone volume (refer to design criteria in **Appendix D**). The de-silting frequency is based on the amount of sediment being delivered into the sediment dam.

An assessment of dam design and capacity for the active sediment dams at United Wambo is provided in **Table 4-2**, which confirms overall sediment dam capacity is sufficient at United Wambo.

Table 4-2 United Wambo Sediment Dam Capacity Assessment Data

Sediment Dam	Disturbed Catchment Area (ha)	Impervious Catchment Area (ha)	Clean Water Catchment Area (ha)	5 Day Dam Design Criteria	Settling Zone Volume Required (ML)	Sediment Zone Volume Required (ML)	Total Dam Storage Volume Required (ML)	Existing Dam Storage Capacity (ML)	Sufficient Capacity in Dam? ¹
MIA Sediment Dam	3.5	1.07	2.45	95 th %ile	2.93	0.20	3.13	3.47	YES
Plover Dam	7.7	0.22	2.52	95 th %ile	3.63	1.81	5.44	13.639	YES
ME1 ²	0	0	35.96	95 th %ile	5.9	0.70	6.60	6.70	YES
ME2 ²	0	0	14.64	95 th %ile	2.4	0.28	2.68	2.90	YES
Redbank Creek Coffe Dam	6.63	0	0	95 th %ile	2.68	1.34	4.03	6.92	YES
ROM Pad Sump ³	0	3.9	0	95 th %ile	1.76	0.88	2.64	TBC ³	TBC ³

¹ The assessment is based on whether the dam has an overall capacity that is sufficient to contain runoff from the upslope catchment. It does not consider any water held in the dams for operations purposes and whether the dams have a sufficient effective storage capacity above this stored water.

² The catchments of ME1 and ME2 have been rehabilitated and are now well vegetated and have been classified as clean rather than disturbed. The sediment dams were initially constructed under DA 305-7-2003 for an 80%ile design rainfall event due to the temporary disturbance.

³ – The ROM Pad Sump is under construction as of April 2022. It will be constructed to a 95%ile design rainfall event, however its main purpose is to act as a sediment trap to reduce the sediment load entering into the Wambo Process Water Dam.

4.3.2 Maintenance

All ESC measures will be maintained in a functioning condition until individual areas have been deemed successfully rehabilitated. Where controls are observed to be not functioning correctly, the controls will be restored to meet the required standard. Where significant erosion is observed to be occurring on a regular basis, additional controls will be constructed.

4.3.3 Drains

Any signs of erosion along the length of either clean water or dirty water drains will be noted and remedial works undertaken as required. Where significant erosion is observed, additional erosion controls will be constructed, which may include the re-establishment of vegetative cover, installation of an erosion blanket or rock armouring.

5. Measurement and Evaluation

5.1 Monitoring

United Wambo has established a monitoring program for erosion and sedimentation in accordance with the requirements of relevant approvals and EIS commitments. Refer to the ***UWJV Surface Water Management Plan***.

5.2 Compliance Management

Compliance is an ongoing process and is conducted in accordance with the ***United Wambo EM Strategy*** – which provides the process for planning and executing the assurance program. The main compliance management processes conducted by United Wambo include:

- Workplace interactions and planned task observations
- Inspections
- Audits
 - validation of monitoring data
 - internal audits
 - external audits

For further details, refer to the ***United Wambo EM Strategy***.

Specific details relating to surface water inspections (including erosion sediment controls), see the ***SWMP***.

5.3 Complaint Management

All complaints received by United Wambo are managed in accordance with the ***United Wambo EM Strategy***, which details the process to ensure complaints are properly documented and handled in accordance with statutory requirements and company policy. A summary of complaint and grievance management includes:

- acknowledging all complaints by contacting the complainant to discuss the details of the complaint within 24 hours of receipt, where requested/practicable;
- investigating complaints impartially giving proper consideration to the facts and the circumstances prevailing at the time;
- implementing corrective actions if required;
- reporting investigation outcomes and corrective actions taken to the complainant; and
- all complaints are recorded in the compliance management system.
- Community members can raise a complaint/grievance 24 hours/7 days a week by calling the community response line on 1800 801 440.

For further details, refer to the **United Wambo EM Strategy**.

5.4 Incident and Non-Compliance Management

All incidents recorded at United Wambo are managed in accordance with the **United Wambo EM Strategy**, which details the process to ensure incidents are properly documented, investigated and reported in accordance with statutory requirements and company policy. Incident and non-compliance management includes:

- all personnel (United Wambo employees and contractors) are required to report environmental incidents/non-compliances to their immediate supervisor/site contact;
- the Supervisor or site contact contacts a member of the United Wambo Environment and Community Department (E&C Department), immediately after becoming aware of the incident/non-compliance;
- the E&C Department determines the appropriate corrective or preventative action required to remediate or prevent a reoccurrence of the incident/non-compliance; and
- the details and final investigation results from all environmental incidents/non-compliance are recorded in the site compliance system

For further details, refer to the **United Wambo EM Strategy**.

Refer to **WMP** for water related reportable incidents.

5.5 Reporting / Access to Information

Reporting of erosion and sediment control performance will be undertaken in accordance with the schedule outlined in the **EM Strategy**.

5.6 Record Keeping

All environmental monitoring data is maintained in accordance with the **EM Strategy** and maintained on the premise for a period of four years.

6. Review and Improvement

6.1 Continuous Improvement

Where possible, United Wambo will implement all reasonable and feasible best practice erosion and sedimentation impact mitigation measures. The basis for continuous improvement of those measures will be through the ongoing monitoring of water impacts and the corrective/preventative action process outlined in **Section 5.4.1.3** of the **United Wambo EM Strategy**.

The main avenues for continuous improvement are through site evaluation processes, which includes:

- Monitoring (**Section 5.1**)
- Compliance Management (**Section 5.2**)
- Complaint Management (**Section 5.3**)
- Incident and Non-compliance Management (**Section 5.4**)

6.2 Plan Review

This ESCP and associated documents will be reviewed in accordance with **SSD 7142**, the United Wambo **EM Strategy** and the **United Wambo Water Management Plan**. Where changes to the ESCP (including management measures or monitoring programs) are required, the DPHI will approve the proposed changes prior to implementation.

6.3 Change Management

All changes to operations, facilities, plant equipment and production processes are required to be assessed in accordance with the change management process.

Change management will be undertaken at United Wambo in accordance with the **United Wambo EM Strategy**, which provides the process for managing the risks associated with change. For further details, refer to the **United Wambo EM Strategy**.

7. Accountabilities

Table 7-1 summarises the accountabilities of personnel involved in the implementation of this ESCP.

Table 7-1 ESCP Accountabilities

Role	Responsibilities
Operations Manager	• Provide adequate resources for the implementation of this Plan.
Environment & Community Manager	• Implement the ESCP. • Responsible for ensuring that monitoring, periodic environmental inspections and visual assessments after high rainfall events are undertaken.
Environment & Community Coordinator/Officer	• Assist the E&C Manager as required in implementation of this Plan.

Role	Responsibilities
	Investigate and report all incidents involving the failure or damage to Erosion and Sediment Control Structures.
All personnel	- Undertake works in accordance with the objectives and principles of this Plan (where relevant). - Report all incidents involving the failure or damage to Erosion and Sediment Control Structures.

8. Acronyms and Definitions

Table 8-1 summarises the acronyms and definitions relating to this ESCP.

Table 8-1 ESCP Acronyms and Definitions

Term	Description
DPE	NSW Department of Planning and Environment
EPA	NSW Environment Protection Authority
EPL 3141	Environment Protection Licence 3141
SSD7172	Development Consent SSD7142
TARP	Trigger Action Response Plan
ESCP	Erosion and Sediment Control Plan

9. Document Information

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

9.1 Related Documents

Related documents, listed in **Table 9-1** below, are *documents* directly related to or referenced from within this document.

Table 9-1 Related documents

Number	Title
UWOC-1689771511-360	United Wambo Environmental Management Strategy
SSD7142	Development Consent
EPL3141	Environment Protection Licence
CAA HSEC PRO 0016	Erosion and Sediment Control Procedure
GRP-STD-HSEC-028-v1.0	Glencore Group Social Performance Standard
GRP-STD-HSEC-022-v1.0	Glencore Environment Standard
GRP-STD-IRM-001-v1.0	Glencore Enterprise Risk Management Standard 10.0
UWOC-1689771511-365	United Wambo Water Management Plan
UWOC-1689771511-364	United Wambo Surface Water Management Plan
UWOC-1689771511-370	United Wambo Groundwater Management Plan
UWOC-1689771511-360	United Wambo Environmental Management Strategy
UWOC-1689771511-374	United Wambo Pollution Incident Response Management Plan

9.2 Reference Information

Reference information, listed in **Table 9-2** below, is *information* that is directly referred to for the development of this document.

Table 9-2 Reference information

Reference	Title
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
POEO Act	Protection of the Environment Operations Act 1997

Reference	Title
POELA Act	<i>Protection of the Environment Legislation Amendment Act 2011</i>
Umwelt 2016a	<i>United Wambo Open Cut Coal Mine Project – Surface Water Assessment (Umwelt, 2016a)</i>
AGE 2016	<i>United Wambo Open Cut Coal Mine Project – Groundwater Impact Assessment (AGE, 2016)</i>
Umwelt 2016b	<i>United Wambo Open Cut Coal Mine Project – Environmental Impact Statement (EIS) (Umwelt 2016b)</i>
Umwelt 2017a	<i>United Wambo Open Cut Coal Mine Project – Response to Submissions (RTS) (Umwelt, 2017a)</i>
Umwelt 2017b	<i>United Wambo Open Cut Coal Mine Project – Response to Request for Further Information (RtRfI) (Umwelt, 2017b).</i>

9.3 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 9-3** below.

Table 9-3 Change information

Version	Date	Change Details
D1.0	September 2019	New document developed by Engeny and United
D1.1	December 2019	Updated to address comments received from Department of Planning, Industry and Environment. Reviewed by Engeny
1.0	July 2019	New Document Approved 16/12/2019
2.0	May 2020	Glencore format change, updated template. Included RUSLE calculation for sediment dam design. Minor updates to sentence structure Approved 13/7/2020
3.0	August 2020	Updated for Phase 2 operations. Reviewed by Umwelt Approved 20/11/2020
4.0	June 2021	Reviewed and updated following reportable incident and submission of Independent Environmental Audit and Annual Review. Updated in response to DPIE comments Approved 17/01/2022
5.0	April 2022	Updated to include details of the ROM Pad Sump in Section 9 following approval of Modification 1 of SSD 7142
6.0	September 2022	Minor formatting and revision of version number
7.0	July 2024	New management plan template.

Appendix A – Statutory Requirements Relating to the ESCP

Table A1: SSD7142 Conditions and where they are addressed in the ESCP

Condition	Condition Details
SSD 7142 Condition B38	The Applicant must install and maintain suitable erosion and sediment control measures on the site, in accordance with the relevant requirements in the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008).
SSD 7142 Condition B49	The Applicant must ensure that the development complies with the performance measures in Table 4. Table 4: Water management performance measures - Design, install and maintain erosion and sediment controls in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008) - Design, install and maintain any infrastructure within 40 metres of watercourses in accordance with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012) - Design, install and maintain any creek crossings generally in accordance with the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003), and decommission if necessary.
SSD 7142 Condition B52(a)	The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: (a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
SSD 7142 Condition B52(b)	The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must: (b) be prepared in consultation with DPIE Water and the EPA;
SSD 7142 Condition B52 (e)(iii)	(iii) Erosion and Sediment Control Plan that: - is consistent with the requirements of Managing Urban Stormwater: Soils and Construction - Volume 1: Blue Book (Landcom, 2004) and Volume 2E: Mines and Quarries (DECC, 2008); - identifies activities that could cause soil erosion, generate sediment or affect flooding; - describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; - describes the location, function, and capacity of permanent erosion and sediment control structures and flood management structures, including the ROM coal stockpile containment sump detailed in Modification Report (Mod 1); and - describes what measures would be implemented to maintain (and if necessary decommission) the structures over time;

Table A2: EPL3141 Conditions and where they are addressed in the ESCP

Schedule	Condition
Not Applicable	Not Applicable

Table A2: Commitments from the Environmental Assessment relating to Erosion and Sediment Control Plan

Commitment Reference	Commitment Details
SOC_8.0_Management Measures_040	United will prepare and implement a Water Management Plan (WMP) for the Project in consultation with DPI Water and DPE. Subject to the requirements of the conditions of consent, the WMP will include: an Erosion and Sediment Control Plan that is consistent with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries, or its latest version
SOC_6.08_Water_003	Section 6.8.1.6 Sediment dams are managed in line with the Blue Book and designed to manage runoff from the 5 day, 95th percentile rainfall event. Some sediment dams have secondary containment measures downstream.
SOC_6.08_Water_004	Section 6.8.1.7 SWA 9.1 Page 87 A Project Water Management Plan (WMP) will be prepared to guide the overall management of water as part of the Project. This plan will also consider the integration of the water management of the Project with the Wambo Mine. The Project WMP and associated sub plans will be developed in consultation with DPI Water and DPE. Subject to the requirements of the conditions of consent, the WMP will include: - a water balance including details of water supply, use, management and transfers; - an Erosion and Sediment Control Plan that is consistent with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries, or its latest version; - a Surface Water Management Plan, including: - o relevant baseline data on channel stability and water quality - o a description of the water management system on site including design objectives and performance criteria - o trigger levels for investigating any potentially adverse impact to a surface water monitoring program. - a Groundwater Management Plan.
SOC_6.08_Water_008	Section 6.8.1.7 In addition, there will be a series of erosion and sediment control measures utilised during the construction and operation phases of the Project. These measures will be undertaken in accordance with the relevant volumes of the Blue Book (Volumes 1 and 2).
SOC_6.08_Water_018	SWA 8.1 Page 85 Erosion and sediment control measures to be implemented as part of the Project will be described in the Project Erosion and Sediment Control Plan (ESCP). These measures will be undertaken in accordance with the Blue Book (Volumes 1 and 2). The Project ESCP will provide a framework for the management of erosion and sedimentation for the Project. The objective of the ESCP will be to ensure that appropriate structures and programs of work are in place to: - Identify activities that could cause erosion and generate sediment - Describe the location, function and capacity of erosion and sediment control structures required to minimise soil erosion and the potential for transport of sediment downstream - Ensure erosion and sediment control structures are appropriately maintained - Fulfil the statutory conditions of the project approval - Meet the requirements of the Blue Book (Landcom 2004 and DECC 2008) and the Draft Guidelines for the Design of Stable Drainage Lines on Rehabilitated Minesites in the Hunter Coalfields (DIPNR undated).

Commitment Reference	Commitment Details
SOC_6.08_Water_021	Review and monitor the performance of erosion and sediment controls.
SOC_6.09_Ecology_002	- Ensuring appropriate environmental management measures are in place as part of the mining operations to minimise the potential for indirect impacts including: - Water management systems that seek to minimise the potential for damage to flora and fauna and their habitats from erosion and unnatural flooding events
SOC_6.09_Ecology_008	SoC 10.1 Page 70 The following mitigation controls will be undertaken to mitigate such potential impacts: - Appropriate drainage will be integrated in the design of rehabilitation areas to effectively manage drainage of the final landform without resulting in adverse impacts - Identified areas of moderate to severe erosion will be remediated as soon as practicable.
SOC_RTS_A_068	Section 3.5 As outlined in Section 6.8 of the EIS, a Project Water Management Plan (WMP) will be prepared to guide the overall management of water as part of the Project. This plan will also consider the integration of the water management of the Project with Wambo. The Project WMP and associated sub plans will be developed in consultation with DPI Water and DPE. Subject to the requirements of the conditions of consent, the WMP will include: - a water balance including details of water supply, use, management and transfers - an Erosion and Sediment Control Plan that is consistent with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries, or its latest version - a Surface Water Management Plan, including: - relevant baseline data on channel stability and water quality - a description of the water management system on site including design objectives and performance criteria - trigger levels for investigating any potentially adverse impacts - a surface water monitoring program.
SOC_6.08_Water_019	SWA 8.1.2 Page 86 Specific erosion and sediment control measures proposed to be implemented for the Project will also include those measures outlined in Section 4.2 and the Mine Closure and Rehabilitation Assessment.
SOC_6.13_Rehabilitation_054	AIS 6.1.3 Page 114 An Erosion and Sediment Control Plan will be prepared and implemented for the Project, addressing objectives and methods for soil handling, and post mining rehabilitation. These management plans will be prepared in consultation with and be approved by Department of Trade and Investment – Division of Resources and Energy (DRE).
SOC_6.8_Water_017	SWA 4.1.2 Page 36 Dirty water diversion drains will be sized to safely convey the 5 per cent AEP storm event.

Appendix B – Original Approval



Planning,
Industry &
Environment

Planning and Assessments
Energy and Resource Assessments
Contact: Melanie Hollis
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Ms Aislinn Farnon
Approvals Manager
United Wambo Coal JV Project

By email: Aislinn.Farnon@glencore.com.au

Dear Ms Farnon,

**United Wambo Open Cut Coal Mine (SSD 7142)
Environmental Management Plans**

I refer to your recent correspondence submitting the revised Noise Management Plan (NMP) for Phase 1A, in accordance with condition B5, and the revised Water Management Plan (WMP) for Phase 1A, in accordance with condition B52 of the United Wambo Open Cut Coal Mine development consent (SSD 7412).

The Department has reviewed the revised plans and considers that they adequately address the requirements of SSD 7412 in relation to Phase 1A operations. Consequently, the Department has approved these plans for the duration of Phase 1A.

The Department notes DPIE Water's comments (dated 9 December 2019) in relation to North Wambo Creek and considers that these comments should be addressed in future revisions of the WMP (insofar as these comments relate to the operational phases of the project).

The Department also notes that the revised NMP required prior to commencing Phase 1B of the operations will need to reflect the Noise Compliance Assessment Methodology (detailed in Appendix 1 of United Wambo's Response to the Request for Further Information dated September 2017) and be approved by the Secretary.

Should you have any enquiries in relation to this matter, please contact Melanie Hollis on the details listed above.

Yours sincerely,

16/12/2019
Matthew Sprott
Director
Resource Assessments
as nominee of the Secretary

Department of Planning, Industry & Environment
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Appendix C – Stakeholder Consultation

DPE Consultation Records to be update if received

Section	Comment	Response/Change

Appendix D – Approval of ESCP

To be updated when plan approved.

Appendix E - Design Standards for ESC Measures

Project Design Rainfall

The design rainfall that shall be used for the design of erosion and sediment control measures for the Project is outlined in **Table D-1**.

Table D-1 Design Rainfall for the Project

Percentile	5-day Rainfall Depth Value	Source
85 th	31.7mm	GCAA HSEC PCL 0025 Erosion and Sediment Control
90 th	40.8mm	GCAA HSEC PCL 0025 Erosion and Sediment Control
95 th	54.7mm	Derived from analysis of the South Wambo gauge for from 1959 – 2017 (from GCAA Water Infrastructure Manager)

Design Standards for ESC Measures

The applicable design standards are listed in **Table D-2**.

Table D-2 GCAA Design Standards for Selected ESC Measures

ESC Measure	Design Standard	Reference Documents
Sediment Basins	Specific design requirements summarised in Table B-4 and based on the soils classification and the procedures set out in Managing Urban Stormwater Soils and Construction Dry freeboard of 300 mm above maximum basin water level during spill event, spillway capacity of 1 in 100 year ARI critical duration event	Managing Urban Stormwater – Soils and Construction Vol 1, 4 th Ed (Landcom, March 2004) Managing Urban Stormwater – Mines and Quarries, Vol 2E (DECC, June 2008) Best Practice Erosion and Sediment Control Guidelines, IECA (November 2008) United Wambo Project EPL and Development Consent
Sediment Fences	Support post spacing max 2 m, sediment fence material keyed into ground to 200 mm or secured with 300mm of aggregate on the surface to the upstream	Best Practice Erosion and Sediment Control Guidelines, IECA – Books 1-4 Managing Urban Stormwater – Soils and Construction Vol 1, 4 th Ed (Landcom, March 2004) and Vol 2E Mines and Quarries
Drainage Channels	Maintain channel velocity to < 1.5 m/s where possible, 500 mm dry freeboard above design event	
Rock check dams	Toe of check dam to be level with crest of next downstream check dam, centre of crest to be minimum 150mm lower than edges, check dam to be keyed into drain 150 mm minimum, maximum 2H:1V for faces of check dams.	
Chutes	Chutes to be lined with appropriate material to accommodate predicted velocities and	

ESC Measure	Design Standard	Reference Documents
	discharge structure to limit exit velocity to < 1.5 m/s or less if discharging onto steep slopes.	
Temporary Watercourse Crossings	Design to acceptable ARI with upstream and downstream erosion protection.	Managing Urban Stormwater – Soils and Construction Vol 1, 4 th Ed (Landcom, March 2004) and Vol 2E Mines and Quarries

Construction and Design Matrix for Erosion and Sediment Control Structures

The matrix in **Table D-3** and **Table D-4** provides design details for the construction of erosion and sediment control structures outlined in the ESCP.

Table D-3 Drainage Channel Design Criteria (for permanent drains that are to be in place for 3+ months)

Drain Type	Location	AEP Storm Event	Storm Duration	Free-board	Typical Grade	Side Batters	Comments
Clean ²	Entire site	5%	Time of concentration ¹	Minimum of 0.5 m	0.5% to 1.0%	No steeper than 1:2 (v:h)	Where velocity >1.5 m/s in 20 year ARI storm event place rock bars every 100 metres to reduce scour potential. All drains to be vegetated and/or rock lined. Level spreaders to be located at ends of all drains.
Dirty ²	Entire site	5%	Time of concentration ¹	Minimum of 0.5 m	0.5% to 1.0%	No steeper than 1:2 (v:h)	Where velocity >1.5 m/s place rock bars every 100 metres to reduce scour potential. Level spreaders to be located at ends of all drains.

Table D-4 Sediment Dam Design Criteria

Parameter	Requirement	Source
Sediment Basing Type	Type D/F	Based on typical soil properties at United
Settling Zone	Refer to Table B-1 for design rainfall and use runoff coefficient (Cv) = 0.9 (hardstand)/runoff coefficient (other areas) = 0.79	Blue Book Vol. 1

Parameter	Requirement	Source
Sediment Storage Zone	50% Settling Zone Volume OR 12 months soil loss as calculated using the RUSLE method	Based on assessment of potential erosion hazard being 'Low' for slopes <13% (Blue Book Vol. 1, Figure 4.6)
Dam Length: Width Ratio	3:1 minimum (unless site constraints prevent otherwise)	Standard Drawing SD6-4 Blue Book Vol.1
Minimum Freeboard	750 mm between spillway and crest of dam	Standard Drawing SD6-4 Blue Book Vol.1
Batter Slopes	1v:2h (internal) 1h:3h (external)	Standard Drawing SD6-4 Blue Book Vol.1
Minimum water depth	1.5m from toe of dam wall to crest of spillway (0.6 m for Settling Zone)	Standard Drawing SD6-4 Blue Book Vol.1
Entry/Exit Points	To be stabilised to prevent excessive erosion	Standard Drawing SD6-14 Blue Book Vol.1