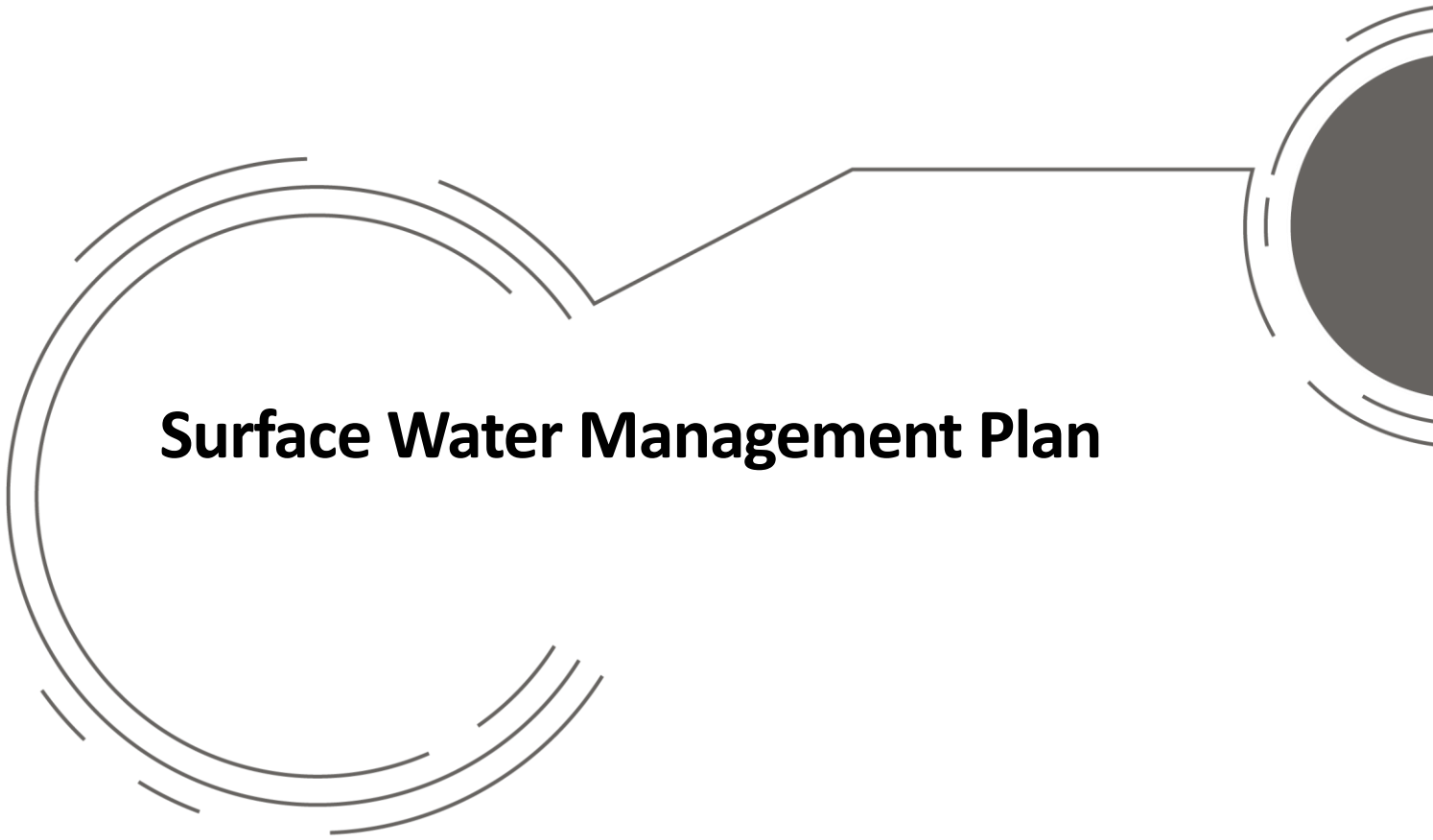




Surface Water Management Plan

Executive Summary

This Surface Water Management Plan (SWMP) has been developed to address surface water related requirements of SSD 7142 and Environment Protection Licence (EPL) 3141 and EPL 529 as relevant to open cut mining operations associated with the United Wambo Open Cut Coal Mine Project (United Wambo). This SWMP is part of a set of documents that, together, form the Water Management Plan (WMP) for the United Wambo Joint Venture.

The key management and mitigation measures contained within the SWMP are included in **Table 1-1**.

Table 1-1: Water Management and Mitigation Measures

No.	Mitigation/Management Measure	Section	Timing
1	Clean water drains are to be designed, installed and maintained to capture and convey the 1% AEP flood event.	Section 8.3	All clean water drains
2	Clean and mine water storages are to be designed, constructed and maintained to capture and convey the 1% Annual Exceedance Probability (AEP) 24 hour flood event.	Section 8.4	All water storages
3	Above-ground mine water storages are to be designed to minimise permeability and to avoid unlicensed or uncontrolled discharge of mine water.	Section 8.4	All mine water storages
4	Tailings storage areas are to be designed and maintained to encapsulate and prevent the release of tailings seepage/leachate.	Section 8.4	All tailings storage facilities
5	Design, install and maintain appropriate flood levees to protect mining areas from a 0.1% AEP flood event and to ensure no adverse effect on roads or privately-owned land. There is one flood levee approved for the Project located on Redbank Creek to the west of the Golden Highway.	Section 8.4	As required. Flood levee constructed with 12 months of commencement of mining
6	Overburden emplacement areas and rehabilitation will be designed, installed and maintained to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material.	Section 8.6	All overburden dumps
7	In the event that surface water performance is found to deviate from background trends and/or record levels outside the surface water performance indicators presented in Section 10.1 , United Wambo will be responsible for initiating further site-specific investigations when: in their professional judgement, the deviation from background trends and impact assessment criteria could result in environmental harm; or	Section 10.4	As required

No.	Mitigation/Management Measure	Section	Timing
	the performance indicators/triggers trigger a response protocol. A site-specific investigation will then be instigated in accordance with the protocols outlined <i>Section 10</i>.		
8	The findings of investigations into surface water system performance will be reported in the Annual Review.	<i>Section 10.4</i>	Annually
9	Generic training on the aspects of the SWMP is provided to all employees and contractors through the Site Familiarisation process. Regular workforce communication days and toolbox talks allow for discussion of the objectives and requirements of this and any other relevant Plans.	<i>Section 9.5</i>	All inductions
10	Selected site personnel, whose duties directly involve the management of water at United Wambo, will undertake specific training in regards to site Operational Procedures which incorporate water management measures. This training will be undertaken annually and when there is a change in personnel in key roles.	<i>Section 9.5</i>	Annually
11	No site specific surface water quality criteria has been generated, due to lack of data, for metals/metalloids for the monitoring locations. United Wambo propose to develop site specific criteria when sufficient data is available. In the interim, default 95% species protection ANZECC trigger values for slightly to moderately disturbed freshwater ecosystems will be applied as in-stream water quality objectives.	<i>Section 10.2.2</i>	When sufficient data is available
12	Surface water quality sampling and analysis is conducted in accordance with Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales (DEC, 2004); Australian Standard/New Zealand Standard (AS/NZS) 5667:1998 Parts 1, 4 and 6, and the requirements of the HRSTS.	<i>Section 10.3.1</i>	All monitoring events
13	Surface water monitoring will be undertaken in accordance with the program described in <i>Section 10.3</i> of this SWMP and the United Wambo Open Cut and Wambo Water Monitoring Program (<i>WMPProg</i>).	<i>Section 10.3</i>	As required
14	Monthly Monitoring Program Surface water monitoring is undertaken monthly at the monitoring locations shown in <i>Figure 10-1</i> and described in <i>Table 10-5</i> and the <i>WMPProg</i>. The following parameters are monitored and recorded: - pH; - electrical conductivity ($\mu\text{S}/\text{cm}$); - TSS (mg/L);	<i>Section 10.3.2.1</i>	Monthly

No.	Mitigation/Management Measure	Section	Timing
	- TDS (mg/L); and - flow conditions by observation (i.e. high, medium or low flow; or no flow).		
15	Annual Monitoring Program In addition to the monthly monitoring program, further speciation analysis will be undertaken for each monitoring location on an annual basis. This speciation analysis includes the analytes listed in Section 10.3.2.1 and the following: - Total Metals/Metalloids: Aluminium (Al), Arsenic (As), Cobalt (Co), Copper (Cu), Iron (Fe), Manganese (Mn), Nickel (Ni), Selenium (Se), Zinc (Zn), Mercury (Hg), Lead (Pb), Potassium (K), Silver (Ag), Flouride (Fl), Boron (B), Calcium (Ca), Barium (Ba), Magnesium (Mg), Cadmium (Cd), Sodium (Na) - Nutrients - Total phosphorous (P), Nitrite, Nitrate, Total Kjeldahl Nitrogen (TKN), Total nitrogen (Total N) - Ions - Chloride (Cl), Bicarbonate (CaCO₃), Sulphate (SO₄)	Section 10.3.2.2	Annually
16	Storage dams and pits listed in Table 10-5 and the WMPProg are sampled monthly. Data from this monitoring is used for operational purposes and is reported internally as required. This data is not reported publicly.	Section 10.3.2.3	Monthly
17	Wambo will monitor water quality and volume for licensed discharges in accordance with the licensed discharge limits and requirements relevant monitoring conditions of EPL 529 and the HRSTS. Results will be shared with United as required.	Section 10.3.6	As required
18	The water levels in the former United Underground will be monitored on a regular basis to maintain understanding of the volume of water stored with the workings.	Section 10.3.7	Quarterly
19	Validated data from the monitoring program will be entered into the GCAA Environmental Monitoring Database (EMD). This renders the data in a form suitable for analysis. United Wambo will record the following details for all surface water monitoring samples: - the date(s) on which the sample was taken; - the point at which the sample was taken; - the flow conditions of watercourses sampled; and - the name of the person who collected the sample.	Section 10.6	All monitoring results
20	In the event of an apparently anomalous result, United and/or Wambo will conduct a re-test as soon as is practicable to do so.	Section 10.6	As required

No.	Mitigation/Management Measure	Section	Timing
21	The outcomes of the investigations into any unforeseen impacts and the controls/remediation actions implemented will be reported in the Annual Review.	Section 10.7	Annually
22	The implementation of any mitigation measures will be undertaken in consultation with DPIE, DPIE Water and the EPA.	Section 10.7	As required
23	Details of complaints relating to surface water will be provided to relevant mine planning and production personnel to assist in the improvement of management practices, where relevant. A summary of the complaints received by the community will be reported in the Annual Review.	Section 10.8	Annually
24	United Wambo will be responsible for coordinating the monthly review of the monitoring results and associated trends in water quality. Measured values will be compared to background trends in water quality and an investigation of potential cause undertaken when a deviation from background trends is identified and/or when water quality parameters record levels outside the surface water impact assessment criteria presented in Section 10.2 . This investigation will be undertaken by the United Wambo E&C Department following the investigation protocol described in Section 10.4 .	Section 11.1.1	Monthly
25	United will publish the results from the monthly surface water quality monitoring of the local watercourses onto the United Wambo website (www.unitedproject.com.au). The results will form part of a quarterly environmental monitoring report that also includes results from groundwater, air quality, noise and blasting monitoring in accordance with the relevant site management plans.	Section 11.1.1	Quarterly
26	Monitoring results will also be reviewed annually and reported as required in the Annual Review, which is distributed to government agencies and the Community Consultative Committee. Reporting will include a comparison of water quality trends with those of previous years and will highlight any results that are inconsistent with trends in baseline data.	Section 11.1.1	Annually
27	The United E&C Manager will coordinate annual water stability monitoring. The results of this monitoring will be reported in the Annual Review.	Section 11.1.2	Annually
28	This SWMP will be reviewed and, if necessary, revised with any review of the United Wambo Water Management Plan. The SWMP will reflect any changes in environmental requirements, technology and operational procedures.	Section 11.2	As required, at least annually

Table of Contents

1.	Purpose.....	1
2.	Scope	1
3.	Objectives of the Surface Water Management Plan	2
4.	Integration with Existing Surface Water Monitoring Programs	2
5.	Statutory Requirements	3
5.1	Development Consent	3
5.2	Environment Protection Licences	6
5.3	Surface Water Licences	6
5.4	GCAA Requirements.....	7
6.	Baseline Data	8
6.1	Surface Water Quality Monitoring.....	8
6.1.1	Existing Surface Water Quality Monitoring Programs	8
6.1.2	Existing Water Quality Data	12
6.2	Stream Flow Monitoring	15
6.2.1	Stream Flow Monitoring Locations	15
6.2.2	Existing Stream Flow	15
6.3	Channel Stability and Stream and Riparian Vegetation Health	16
6.3.1	Redbank Creek	16
6.3.2	Waterfall Creek	16
6.3.3	Wambo Creek and North Wambo Creek	16
6.3.4	Pre-Mining Monitoring.....	16
6.4	Water Supply for Other Surface Water Users.....	17
7.	Site Water Management System.....	17
8.	Planning	19
8.1	Creek Diversions.....	19
8.2	Creek Restoration and Works within 40m of a Watercourse	20
8.3	Water Catch Drains	20
8.4	Water Storages and Sediment Dams	20
8.5	Flood Protection Levee	20
8.6	Emplacement Areas	21
8.7	Final Voids	22
8.8	Reinstated Drainage Networks on Rehabilitated Areas.....	22
9.	Implementation	22
9.1	Surface Water Management Infrastructure	23
9.1.1	Erosion and Sediment Control Works	23
9.1.2	Water Storage Dams	23
9.1.3	Flood Protection Levee	23

9.2	Works within 40 metres of a Watercourse	23
9.3	Inspections	24
9.4	Annual Site Water Balance and Salt Balance	24
9.5	Training and Communication	24
10.	Measurement and Evaluation	24
10.1	Surface Water Performance Criteria	24
10.2	Surface Water Impact Assessment Criteria	26
10.2.1	Discharge Criteria	26
10.2.2	Surface Water Quality Criteria	26
10.2.3	Surface Water Flow Impact Assessment Criteria	27
10.3	Surface Water Monitoring Program	27
10.3.1	Surface Water Monitoring Methodology	28
10.3.2	Surface Water Quality	28
10.3.2.1	Monthly Monitoring Program	31
10.3.2.2	Annual Monitoring Program	31
10.3.2.3	Site Dam Water Quality	32
10.3.3	Surface Water Flows	32
10.3.4	Impacts on Water Supply for Other Water Users	32
10.3.5	Erosion and Sediment Control	32
10.3.6	Monitoring of Licensed Discharges under EPL 529 and the HRSTS	32
10.3.7	Monitoring of Flows into Open Cut and Underground Workings	32
10.3.8	Watercourse Stability Monitoring and Management	33
10.4	Investigation Protocol	33
10.5	Criteria Exceedance Protocol	34
10.6	Data Management Procedures	34
10.7	Unforeseen Impacts Protocol	34
10.8	Complaints Management Protocol	35
11.	Review and Improvement	36
11.1	Reporting and Review of Results	36
11.1.1	Surface Water Quality	36
11.1.2	Watercourse Stability	36
11.1.3	On-Site Water Management	36
11.1.4	Reporting of Exceedances	36
11.2	Plan Review	37
12.	Document Information	37
12.1	Relevant Guidelines and Legislation	37
12.2	Related Documents	37
12.3	Reference Information	38
12.4	Change Information	38
13.	Accountabilities	39

Appendix A - Stakeholder Consultation.....	40
Appendix B - Surface Water Management TARPs	42
Appendix C - Stakeholder Consultation	49

Figures

Figure 2-1: United Wambo Water Management Plan Structure	2
Figure 6-1: Existing Surface Water Monitoring Locations	11
Figure 6-2: Flow Duration Curves Wollombi Brook Upstream and Downstream of the Mine	15
Figure 7-1: Phase 2 Water Management System – 2020-2025	19
Figure 8-1: Flood Levee	21
Figure 10-1: Surface Water Quality Monitoring Locations	29

Tables

Table 1-1: Water Management and Mitigation Measures	1
Table 5-1: SSD 7142 Requirements for Surface Water Management	3
Table 5-2: Surface Water Management Performance Measures	5
Table 5-3: Surface Water Licences for United Collieries and Wambo Coal	7
Table 6-1: Existing Surface Water Monitoring Locations.....	9
Table 6-2: Baseline Water Quality Data – pH, ED TDS and TSS.....	13
Table 6-3: Baseline Water Quality Data – Metals – Wollombi Brook – SW02 (now WB03).....	14
Table 7-1: Water Storage Summary	18
Table 10-1: Surface Water Performance Criteria.....	24
Table 10-2: EPL529 Discharge Limits.....	26
Table 10-3: Surface Water Quality Criteria	26
Table 10-4: ANZECC Criteria for Metals and Metalloids	27
Table 10-5: Surface Water Monitoring Locations	30
Table 12-1: Related Documents.....	37
Table 12-2: Reference Information.....	38
Table 12-3: Change Information	39

1. Purpose

This Surface Water Management Plan (SWMP) has been developed to address surface water related requirements of SSD 7142 and Environment Protection Licence (EPL) 3141 and EPL 529 as relevant to open cut mining operations at United Wambo.

The key objectives of surface water management at United Wambo are to:

- satisfy regulatory requirements, including meeting required performance criteria;
- segregate clean waters away from active mining areas, where possible, to reduce the volume of mine affected water requiring subsequent storage and treatment;
- segregate mine impacted water and runoff from undisturbed and revegetated areas with better water quality to minimise the volume of mine impacted water that requires reuse;
- reuse mine impacted water within the Water Management System (WMS) to reduce reliance on raw/clean water; and
- minimise adverse effects on downstream waterways (including hydraulic and water quality impacts).

2. Scope

The SWMP applies to all operational activities at United Wambo (i.e. excludes Wambo underground, CHPP and train load facility) and addresses the relevant conditions of United Wambo's development consent SSD 7142, mining and exploration leases and licences as detailed in **Section 5**.

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

This SWMP also forms part of United Wambo's Environmental Management System (EMS) and should be read in conjunction with the United Wambo Environmental Management Strategy.

The SWMP excludes the operations at the Wambo mine, incorporating the Wambo CHPP, train loading facility and underground mine. These activities will continue to be managed by Wambo in accordance with the relevant development consent conditions and associated management plans.

This Surface Water Management Plan (SWMP) is part of a set of documents that, together, form the Water Management Plan for United Wambo Joint Venture (United Wambo) (refer to **Figure 2-1**). The Water Management Plan is one of a series of Environmental Management Plans that, together, form the Environmental Management System (EMS) for United Wambo.

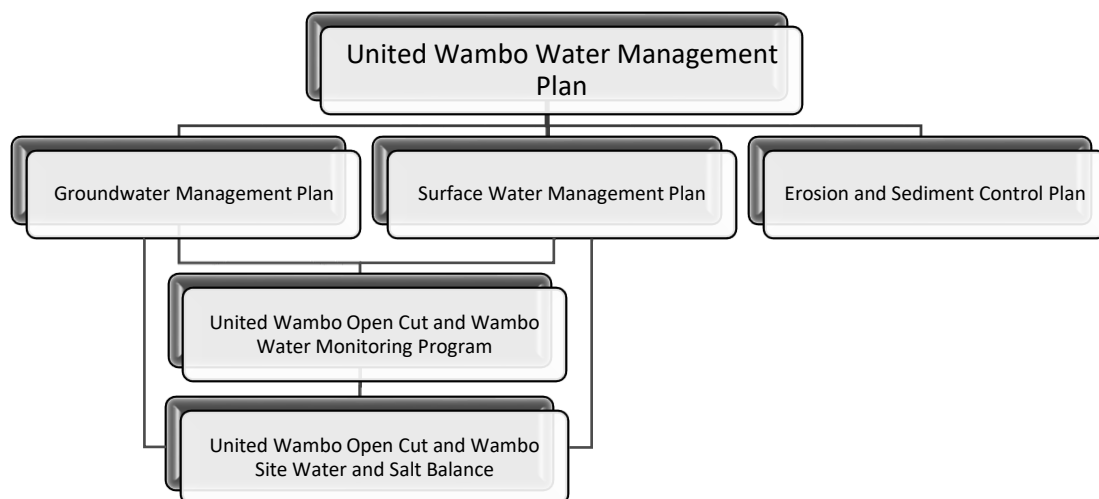


Figure 2-1: United Wambo Water Management Plan Structure

3. Objectives of the Surface Water Management Plan

The objectives of this SWMP are to:

- provide detailed baseline data on surface water flows and quality in creeks and other waterbodies at the development;
- detail the integrated surface water monitoring strategy for United Wambo that includes water quality and flows and any impacts on upstream and downstream users;
- outline relevant surface water impact assessment criteria;
- establish a protocol for the assessment, response and reporting of monitoring data; and
- provide methods to assess compliance with conditions of development consents, environmental protection licences and legislation relating to surface waters.

4. Integration with Existing Surface Water Monitoring Programs

The water management system for United Wambo has been designed to build on the existing United WMS and integrate with the existing water management systems for the separate United and Wambo mines.

Existing surface water monitoring systems have been consolidated and augmented for the United Wambo project within the United Wambo Open Cut and Wambo Water Monitoring Program (**WMPprog**). Data collected by the separate United and Wambo water monitoring programs will be incorporated into the **WMPprog** and shared between operations.

5. Statutory Requirements

5.1 Development Consent

Condition B52 of SSD 7142 stipulates requirements with regard to this SWMP as summarised in **Table 5-1**. Relevant water performance measures, as listed in SSD 7142, are shown in **Table 5-2**.

Table 5-1: SSD 7142 Requirements for Surface Water Management

Condition	Condition Details	SWMP Section
B52 e(iv)	The Water Management Plan must include a Surface Water Management Plan, that includes:	
B52 e(iv)	detailed baseline data on surface water flows and quality of watercourses and/or water bodies potentially impacted by the development, including:	Section 6
B52 e(iv)	stream and riparian vegetation health;	Section 6.3
B52 e(iv)	channel stability (geomorphology); and	Section 6.3
B52 e(iv)	water supply for other surface water users	Section 6.4
B52 e(iv)	a detailed description of the surface water management system;	Section 7 (see also the United Wambo Water Management Plan)
B52 e(iv)	detailed plans, design objectives and performance criteria for water infrastructure, including:	
B52 e(iv)	any approved creek diversions or restoration works associated with the development;	Section 8.1 and 8.2
B52 e(iv)	water runoff diversions and catch drains;	Section 8.3
B52 e(iv)	water storages and sediment dams;	Section 8.4
B52 e(iv)	emplacement areas; and	Section 8.6
B52 e(iv)	backfilled voids and any final voids for the development (see also Table 6 of SSD 7142).	Section 8.7
B52 e(iv)	reinstated drainage networks on rehabilitated areas of the site;	Section 8.8
B52 e(iv)	detailed performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts associated with the development for:	Section 10.1

Condition	Condition Details	SWMP Section
B52 e(iv)	downstream surface water flows and quality;	<i>Section 10.1</i>
B52 e(iv)	channel stability;	<i>Section 10.1</i>
B52 e(iv)	downstream flooding impacts;	<i>Section 10.1</i>
B52 e(iv)	stream and riparian vegetation health;	<i>Section 10.1</i>
B52 e(iv)	water supply for other water users and	<i>Section 10.1</i>
B52 e(iv)	post-mining water pollution from rehabilitated areas of the site;	<i>Section 10.1</i>
B52 e(iv)	a program to regularly monitor:	<i>Section 10.3 and WMProg</i>
B52 e(iv)	compliance with the relevant performance measures listed in Table 4 (of SSD 7142) and the performance criteria established above;	<i>Section 10.3 and WMProg</i>
B52 e(iv)	controlled and uncontrolled discharges and seepage/leachate from the site;	<i>Section 10.3 and WMProg</i>
B52 e(iv)	impacts on water supply for other water users;	<i>Section 10.3 and WMProg</i>
B52 e(iv)	surface water inflows, outflows and storage volumes to inform the Site Water Balance; and	<i>Section 10.3 and WMProg</i>
B52 e(iv)	the effectiveness of the surface water management systems and the measures within the Erosion and Sediment Control Plan;	<i>Section 10.3 and WMProg</i>
B52 e(iv)	reporting procedures for the results of the monitoring program; and	<i>Section 11.1</i>
B52 e(iv)	a plan to respond to any exceedances of the performance measures or performance criteria, and repair, mitigate and/or offset any adverse surface water impacts of the development.	<i>Section 10.4, 10.7</i> <i>Section 11</i> <i>Appendix B - Surface Water Management TARPs</i>

Table 5-2: Surface Water Management Performance Measures

Feature	Performance Measure	Document Reference
Erosion and sediment control works	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)	Sections 8 and 9.1 (see also ESCP)
	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)	Sections 8.2 and 9.2
	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)	Sections 8.2 and 9.2
Clean water diversion and storage infrastructure	- Design, install and maintain the clean water system to capture and convey the 100 year ARI flood event - Maximise, as far as reasonable, the diversion of clean water around disturbed areas on the site, except where clean water is captured for use on the site	Sections 8 and 9.1.1
Flood Levees	Design, install and maintain appropriate flood levees to protect mining areas from a 1,000 year ARI flood event and to ensure no adverse effect on roads or privately-owned land	Sections 8.5 and 9.1.3
Sediment dams	Design, install and maintain sediment dams in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008)	Section 8.4 (See also ESCP)
Mine water storages (including underground water storages)	- Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled discharge of mine water - Above-ground mine water storages designed to contain the 100 year ARI storm event and minimise permeability	Sections 8.4 and 9.1.2

Feature	Performance Measure	Document Reference
Creek diversion and restoration works	- Diverted creek lines are hydraulically and geomorphologically stable - Incorporate erosion control measures based on vegetation and engineering revetments - Incorporate persistent/permanent pools for aquatic habitat - Revegetate with suitable native species	Sections 8.1 and 8.2
Aquatic, riparian and groundwater dependent ecosystems (including GDE1 and GDE2)	Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c)	Section 6.3
	Maintain or improve baseline channel stability	Section 10.2.2
	Develop site-specific in-stream water quality objectives in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) and Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006)	Section 10.3.8

5.2 Environment Protection Licences

Condition L1.1 of Environment Protection Licence (EPL) 3141 (United) and EPL 529 (Wambo) requires compliance with Section 120 of the Protection of the Environment Operations Act 1997 (POEO Act), which prohibits pollution of waters.

Under EPL 529 and the Hunter River Salinity Trading Scheme (HRSTS), United Wambo is permitted to water to the Hunter River through a designated Licenced Discharge Point (LDP). Wambo currently holds 51 credits under the HRSTS.

There is currently no LDP nominated in the United EPL 3141; United does not hold credits under the HRSTS. Site discharges are managed by Wambo in accordance with the **Wambo Water Management Plan**.

5.3 Surface Water Licences

Both United and Wambo hold Water Access Licences (WALs) under the Water Sharing Plan for the Hunter Regulated River 2004 and the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 for extraction of water from the Wollombi Brook and Hunter River. **Table 5-3** presents the WALs held by United and Wambo.

Table 5-3: Surface Water Licences for United Collieries and Wambo Coal

Licence No	Water Source	Category	Holder	Share Component	Tenure Type
WAL718	Hunter Regulated River Water Source	Regulated River (High Security)	Wambo	1000 units	Continuing
WAL8599	Hunter Regulated River Water Source	Regulated River (High Security)	Wambo	6 units	Continuing
WAL8600	Hunter Regulated River Water Source	Regulated River (General Security)	Wambo	868 units	Continuing
WAL8604	Hunter Regulated River Water Source	Supplementary Water	Wambo	240 units	Continuing
WAL10541	Hunter Regulated River Water Source	Regulated River (High Security)	United	300 units	Continuing
WAL18445	Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)	Unregulated River	United	200 units	Continuing
WAL18549	Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)	Unregulated River	United	100 units	Continuing
WAL18437	Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)	Unregulated River	Wambo	350 units	Continuing
WAL 23897	Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)	Aquifer	Wambo	70 units	Continuing

5.4 GCAA Requirements

The Glencore Coal Assets Australia (GCAA) **Water Management Protocol** (CAA HSEC PCL 0022 11.03) outlines the following principles, which focus on effective water management critical to supporting operations. Water management planning assists in managing a number of aspects, such that:

- environmental obligations are met;

- United Wambo can demonstrate to external stakeholders that the local and regional surface and groundwater water resources are used efficiently;
- operations are protected from flooding; and
- adequate water supplies are available for mining and processing operations.

6. Baseline Data

A comprehensive review of the surface water monitoring data for United and Wambo was undertaken for the United Wambo Open Cut Coal Mine Project – Surface Water Impact Assessment (Umwelt, 2016) included as Appendix 11 of the United Wambo Open Cut Coal Mine Project – Environmental Impact Statement (EIS) (Umwelt 2016b).

These documents are available at: www.unitedproject.com.au

An additional review was undertaken for the Response to Submissions – Part B Report, which can be found on the NSW Major Projects website at http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=7142. A summary of existing water quality data is provided in **Section 6.1.2**.

The surface water catchment is described in the **United Wambo Water Management Plan**.

6.1 Surface Water Quality Monitoring

6.1.1 Existing Surface Water Quality Monitoring Programs

Surface water quality monitoring has been undertaken by Wambo and United since approximately 2003 in accordance with approved surface water monitoring programs. The monitoring programs at both operations cover all three relevant water categories: clean, dirty and mine water systems. The clean water system consists of runoff from undisturbed or rehabilitated areas. The dirty water system consists of runoff from disturbed areas (excluding mine water). The mine water system consists of runoff from areas exposed to coal or water used in coal processing or from coal stockpile areas.

Surface water quality monitoring has been undertaken monthly for the following parameters:

- pH
- electrical conductivity (EC);
- total suspended solids (TSS); and
- total dissolved solids (TDS).

Comprehensive monitoring has also been undertaken annually on the site dams for a broad range of analytes, including metals and nutrients.

United Wambo has undertaken a review of the surface water quality monitoring sites previously monitored at Wambo and United, and has refined the sites to be monitored as described in **Table 6-1**.

The existing surface water quality monitoring locations for both operations are shown on **Figure 6-1**.

Table 6-1: Existing Surface Water Monitoring Locations

Site ID	Description	Revised Site ID	Comments
WAMBO			
SW01	Wollombi Brook - Upstream	N/A	Located at Bulga Village – upstream location for United Wambo is SW40/WB01.
SW02	Wollombi Brook - Downstream	WB03	Wollombi Brook - Warkworth
SW03	Wollombi Brook - Pump-Out	WB02	Wollombi Brook - Pumps
SW04	North Wambo Creek - Upstream	NWC01	North Wambo Creek - Upstream
SW05	North Wambo Creek – Downstream	NWC03	North Wambo Creek - Downstream
SW06	South Wambo Creek - Upstream	N/A	Out of impact zone for United Wambo. Will remain in Wambo UG program
SW07	South Wambo Creek – Junction with Stony Creek	N/A	Out of impact zone for United Wambo. Will remain in Wambo UG program
SW08	Stony Creek	N/A	Out of impact zone for United Wambo. Will remain in Wambo UG program
SW12	West Cut Dam	W13	West Cut Dam
SW14	Box Cut Dam (Admin)	W11	Wambo MIA Box Cut Dam
SW15	Eagles Nest Dam – Licenced Discharge Dam (EPA ID No. 4)	W10	Process Water Dam
SW20	West Cut Holding Dam	N/A	Not required for United Wambo
SW27a	North Wambo Creek – Middle-Lower	N/A	Midstream for North Wambo Creek is monitored at SW32a/NWC02.
SW29	SW29	N/A	Not required for United Wambo
SW30	Chitter Dam	N/A	Dam removed for South Wambo UG
SW31	Gordon Below Franklin Dam	W09	CHPP Dams
SW32a	North Wambo Creek – Pump	NWC02	North Wambo Creek - Midstream
SW38	Homestead Open Cut	W12	Homestead Pit
SW39	Waterfall Creek	WFC01	Waterfall Creek
SW40	Wollombi Brook – Upstream of Wambo Creek	WB01	Wollombi Brook - Upstream

Site ID	Description	Revised Site ID	Comments
SW52	C11 Void	W08	C11 Void (removed in June 2021)
SW54	Montrose Pit Inflows	W14	Montrose Pit Inflows
UNITED			
SW02	North Wambo Creek Downstream	NWC03	North Wambo Creek - Downstream
SW03	Wollombi Brook Upstream	WB02	Wollombi Brook - Pumps
SW04	Wollombi Brook Downstream	WB03	Wollombi Brook - Warkworth
SW06	Redbank Creek Downstream	RC01	Redbank Creek - Downstream
Dam 2	Dam 2	W02	Dam 2
Dam 3	Dam 3	W04	Dam 3
Dam 7	Dam 7	W15	Dam 7
Dam 8	Tailings Dam 2	W17	Tailings Dam
Dam 12	Dam 12	N/A	Dam removed by Project
Dam 13	Dam 13	N/A	No longer required
Dam 14	Dam 14	W07	Dam 14
Dam 15	Dam 15	W16	Dam 15

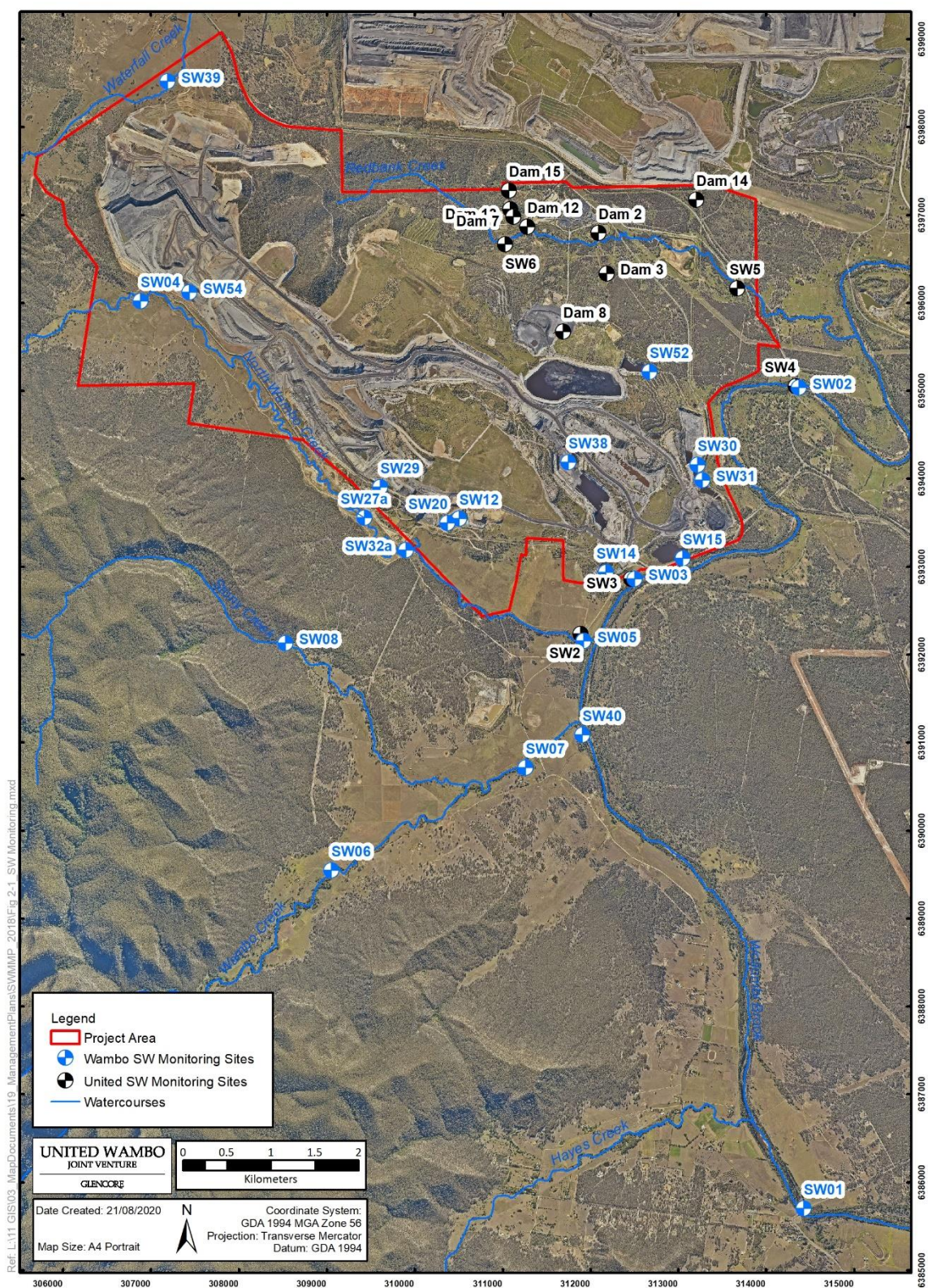


Figure 6-1: Existing Surface Water Monitoring Locations

6.1.2 Existing Water Quality Data

The full set of historical monitoring data was reviewed in 2016 during the preparation of the EIS and as part of the development of an integrated and comprehensive surface water quality monitoring program for United Wambo and Wambo operations. An additional review was undertaken for the Response to Submissions – Part B Report, which can be found on the NSW Major Projects website at http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=7142.

Results of surface water quality monitoring undertaken from 2004 to 2015 for Wollombi Brook, North Wambo Creek, Redbank Creek, and from 2012 to 2015 for Stony Creek and Waterfall Creek, as well as for the WMS, were examined as part of the surface water assessment for the EIS.

The monitoring data shows that the water quality parameters are highly variable across the monitoring network, as would be expected within ephemeral drainage systems. Wollombi Brook, being perennial, exhibits notably less variation in its water quality. The water quality in Wollombi Brook shows little variation at monitoring locations upstream and downstream of the existing operations, indicating that Wollombi Brook is not exhibiting any measurable impacts due to the existing operations.

The ephemeral creek systems within and adjacent to the Project Area also generally exhibit similar water quality results upstream and downstream of the existing operations. Again, this suggests little to no measurable impact on the surrounding ephemeral watercourses as a result of the mining operations. Notably, the measured total suspended solids (TSS) load actually decreases downstream of the existing operations in Redbank Creek and Stony Creek, and is similar in North Wambo Creek, indicating that the existing WMS is effective at managing TSS within the site.

Analysis of the concentrations of various metals and metalloids reveals a generally wider spread in the concentrations detected in the samples from the existing operations compared with the samples from the surrounding surface water systems. There are several parameters monitored within the existing WMS for which the mean and median values exceed the default 95% species protection ANZECC trigger value for slightly to moderately disturbed freshwater ecosystems, including cadmium, chromium, copper, lead, nickel and zinc. However, these exceedances are not reflected in downstream receiving waters, supporting the view that the existing WMSs are effective in containing and managing poorer quality water.

A summary of the baseline data is provided in **Table 6-2** and **Table 6-3**.

The results of water quality monitoring are reported annually in the Annual Review for United and Wambo and have been utilised in the development of the site specific trigger levels detailed in **Section 10**.

Table 6-2: Baseline Water Quality Data – pH, ED TDS and TSS

Site ID	Site Description	Sampling Period	Former Wambo Site ID	Former United Site ID	pH			EC (µS/cm)			TDS (mg/L)			TSS (mg/L)		
					Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
WB01	Wollombi Brook - Upstream	July 2008 – December 2018	SW40	-	6.4	7.6	8.8	36	718	2940	18	354	1090	1	17	179
WB02	Wollombi Brook - Pumps	July 2008 – December 2018	SW03	SW03	6.3	7.6	7.8	106	1319	6280	<1	681	2924	<1	43	1630
WB03	Wollombi Brook - Warkworth	July 2008 – December 2018	SW02	SW04	6.3	7.6	9.0	148	1179	5290	<5	684	3238	1	15	308
WB04¹	Wollombi Brook - Downstream	July 2008 – December 2018	-	-	6.9	7.0	7.1	502	606	707	289	362	406	8	8	8
NWC01	North Wambo Creek - Upstream	July 2008 – December 2018	SW04	-	6.8	7.7	8.7	256	351	563	<5	855	2712	1	41	154
NWC02	North Wambo Creek - Midstream	July 2008 – December 2018	SW32a	-	7.2	8.0	9.2	199	794	6970	<6	779	4400	1	472	5440
NWC03	North Wambo Creek - Downstream	July 2008 – December 2018	SW05	SW02	6.6	7.7	9.5	111	1828	4770	<5	996	2162	1	41	1110
RC01	Redbank Creek - Downstream	July 2008 – December 2018	-	SW05	7.2	8.1	8.7	475	5653	9450	8	370	640	<5	43	1500
WFC01	Waterfall Creek	July 2008 – December 2018	SW39	-	6.6	7.6	9.3	92	337	1268	82	514	2220	8	391	2600

1 – New proposed site for United Wambo, no existing water quality data

Table 6-3: Baseline Water Quality Data – Metals – Wollombi Brook – SW02 (now WB03)

Analyte	Sampling Period	Sample Count	Min	Mean	Max	80th percentile	ANZECC 80th percentile
Aluminium (ug/L)	January 2015 - April 2016	21	20.00	871.91	9560.00	682.00	150.00
Cadmium (ug/L)	January 2015 - April 2016	21	0.02	0.13	0.20	0.20	0.80
Copper (ug/L)	January 2015 - April 2016	21	0.20	1.23	4.00	1.30	2.50
Iron (ug/L)	January 2015 - April 2016	21	490.00	2100.48	4760.00	3170.00	N/A
Lead (ug/L)	January 2015 - April 2016	21	0.20	0.87	2.00	1.00	9.40
Nickel (ug/L)	January 2015 - April 2016	21	0.20	1.51	4.00	2.00	17.00
Zinc (ug/L)	January 2015 - April 2016	21	1.80	4.81	9.00	6.00	31.00
Aluminium (ug/L)	January 2015 - April 2016	21	20.00	871.91	9560.00	682.00	150.00
Cadmium (ug/L)	January 2015 - April 2016	21	0.02	0.13	0.20	0.20	0.80
Copper (ug/L)	January 2015 - April 2016	21	0.20	1.23	4.00	1.30	2.50

6.2 Stream Flow Monitoring

6.2.1 Stream Flow Monitoring Locations

Stream flow monitoring has been, and continues to be, undertaken by Wambo at eight continuous flow gauging stations, which are located along North Wambo Creek, South Wambo Creek and Stony Creek. Additional flow monitoring data is sourced from the DPIE Water operated flow gauging stations located at Warkworth and Bulga. Stream flow monitoring locations are shown in the **WMProg** and described further in the **Wambo Surface Water Management Plan**.

6.2.2 Existing Stream Flow

Flow monitoring data shows that Wollombi Brook is perennial and has a persistent baseflow between rainfall events. In comparison, site drainages are ephemeral and typically only flow in response to intense rainfall events. Flow monitoring data has been used to characterise the flow regime of the monitored watercourses.

Figure 6-2 shows the flow duration curves for Wollombi Brook at the DPIE Water gauging stations at Warkworth and Bulga (GS 210004 and GS 210028) which have been derived from flow recorded between 1908 and 2018. It is apparent that the distribution of flows in Wollombi Brook upstream and downstream of Wambo has generally been similar but with an increased frequency of low flows at the downstream station.

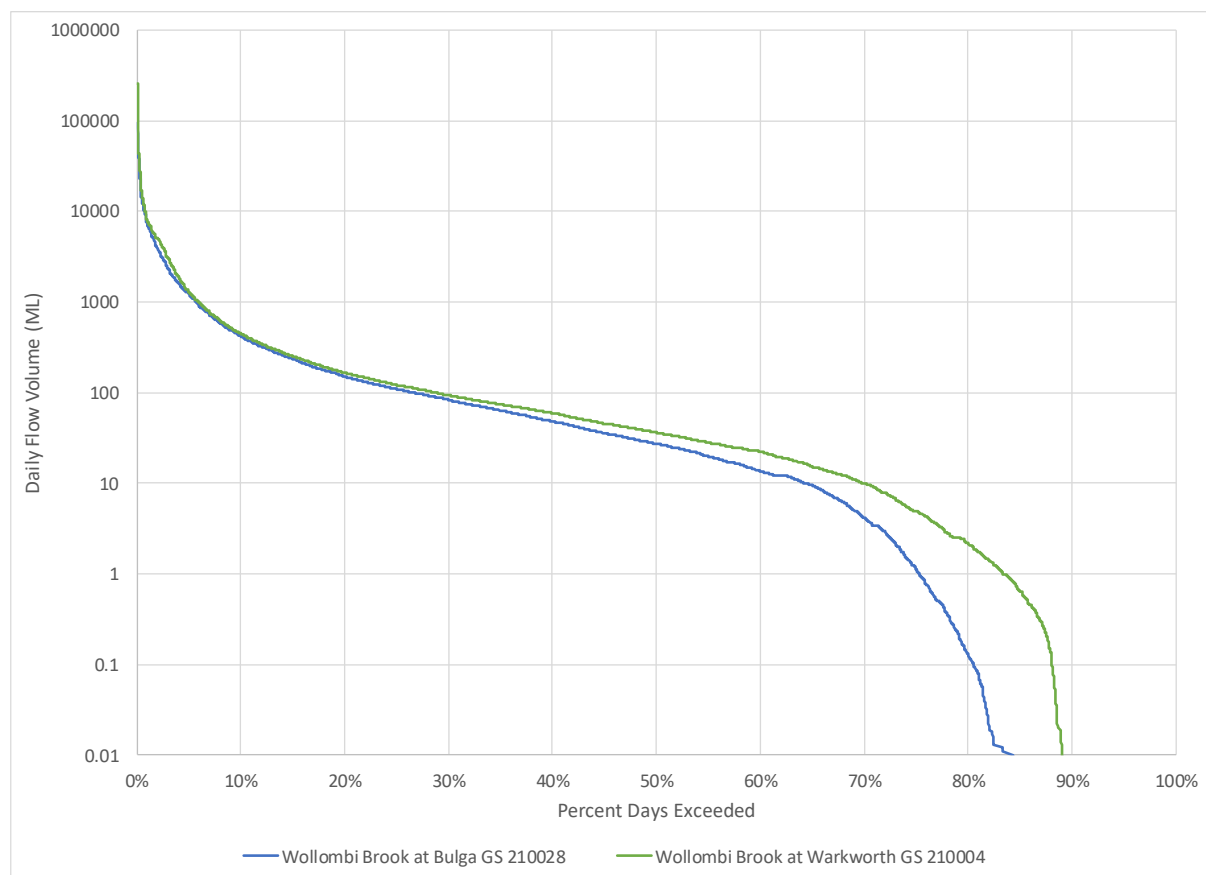


Figure 6-2: Flow Duration Curves Wollombi Brook Upstream and Downstream of the Mine

Flow monitoring undertaken on North Wambo Creek shows that the creek is ephemeral, typically only flowing in response to intense rainfall with multi-year, no-flow periods. The flow gauges were installed following the June 2007 flood event. Due to the limited period that the flow gauges have been installed (i.e. under nine years) and that this creek system is ephemeral, there is insufficient data to accurately characterise flows in North Wambo Creek.

There are no long term flow gauges on Wambo Creek or Redbank Creek, which are also tributaries of Wollombi Brook; nor on Waterfall Creek, which is a tributary of the Hunter River.

Surface water flows will continue to be monitored by Wambo with the results shared with United Wambo.

6.3 Channel Stability and Stream and Riparian Vegetation Health

6.3.1 Redbank Creek

There is an approved clean water holding dam located in the middle reaches of Redbank Creek (United Dam 1). Upstream of the dam, Redbank Creek typically has an ill-defined channel, a wide floodplain and sparse riparian vegetation. This area will be mined through as part of the Project. The mid and downstream portions of Redbank Creek typically have a well-defined channel and wide floodplain. Redbank Creek is ephemeral and frequently dry. In the downstream portion of Redbank Creek, the riparian zone of the creek banks is lightly to moderately vegetated and existing erosion is minimal.

6.3.2 Waterfall Creek

Waterfall Creek is ephemeral and frequently dry. Its channel is generally shallow and poorly defined along its length as its catchment is predominantly drained by overland sheet flow. As such, Waterfall Creek's riparian zone is also poorly defined.

6.3.3 Wambo Creek and North Wambo Creek

Wambo Creek has undergone little modification from existing operations. Wambo Creek has a generally well-defined channel and its upper reaches have a more heavily vegetated riparian zone than its lower reaches. The Project will not impact on the catchment area or watercourse of Wambo Creek.

North Wambo Creek has been significantly modified due to the existing approved diversion around the mining operations. This diversion has a well-defined channel and the rehabilitated riparian zone is moderately vegetated. Downstream of the diversion, the channel is likewise well-defined, with a lightly to moderately vegetated riparian zone.

Wambo currently monitors the channel stability of Wambo Creek and North Wambo Creek. The baseline Riparian Vegetation and Bed Bank Stability Monitoring Program commenced in October 2006 to monitor potential subsidence impacts. The program aims to separate natural erosion from mine subsidence associated instability, through pre-mining and post-mining survey of North Wambo Creek and South Wambo Creek. Monitoring of channel stability will continue to be undertaken by Wambo in accordance with the **Wambo Surface Water Management Plan**.

6.3.4 Pre-Mining Monitoring

Due to a lack of baseline channel stability and riparian vegetation data, United Wambo completed photographic monitoring at suitable locations along Wollombi Brook, Redbank Creek and Waterfall Creek prior to commencement of mining. Photographic records were taken at locations selected

based on observations of stream and riparian vegetation cover, bed condition, active erosion points and potential areas of instability determined by the creek line inspections. This monitoring will be continued annually as described in **Section 10.3.8**.

6.4 Water Supply for Other Surface Water Users

Surface and alluvial water take within the unregulated watercourses surrounding the Project Area (i.e. Wollombi Brook catchment and Waterfall Creek catchment) is regulated under the Water Management Act 2000 (WM Act) and Water Management (General) Regulation 2018. Water take from the Hunter River is also regulated under the WM Act and Water Management (General) Regulation 2018.

Water is extracted from both Wollombi Brook and the Hunter River by United and Wambo. Extraction of water from the Wollombi Brook is managed under the WSP Hunter Unregulated and Alluvial Water Sources 2009 and Hunter River extraction is managed under the Water Sharing Plan (WSP) for the Hunter Regulated River Water Source 2016.

There are no known licensed non-mining water users on waterways directly downstream of the Project Area along Wollombi Brook, its tributaries (Wambo Creek, North Wambo Creek and Redbank Creek) or Waterfall Creek. There are licensed water users downstream of the Project Area on the Hunter River, which is a regulated river with extraction managed by WaterNSW. Water is also extracted downstream of the Project Area from the Hunter River for stock and domestic purposes.

7. Site Water Management System

Section 10.1 of the **WMP** describes the proposed strategy for the management of clean and dirty water for United Wambo for Phase 2. This strategy is based on the containment and re use of mine water and on the control of sediment that may be potentially carried with runoff from disturbed areas such as the waste rock emplacements.

The United Wambo site water management system is integrated with the Wambo WMS. This system manages water generated within the development and operational areas while diverting runoff from upstream undisturbed catchments around such areas. It includes both permanent structures that will continue to operate post closure and temporary structures that will only be required until the completion of rehabilitation works.

The surface water management system includes:

- Up-slope catchment diversion structures;
- Water storage dams;
- Tailings storage facilities
- Sediment dams;
- Water transfer infrastructure (i.e. pumps and pipelines); and
- Licenced Discharge Points.

The site water management system operates predominately as a closed self-contained system. The water balance of the system fluctuates with climatic conditions and as the extent of the mining operations evolves over time.

A network of storages and drains has been established to capture runoff from mine water catchment areas. Runoff from areas disturbed by mining (including the CHPP and associated industrial areas) is collected in open cuts and mine water storages. These storages are used as priority sources of water for the CHPP and dust suppression. Runoff from haul roads is captured in sediment traps or is diverted to mine water storages.

CHPP tailings are discharged to approved tailings storage facilities. Decant water from the facilities is reclaimed and reused within the WMS.

An extensive reticulation system has been developed to:

- transfer water between open cuts, Wambo's underground operations and mine water storages;
- source water from Wollombi Brook and the Hunter River; and
- facilitate controlled releases to Wollombi Brook (in accordance with Wambo's EPL 529 and the Hunter River Salinity Trading Scheme).

Runoff from rehabilitated and establishing revegetated mine areas is directed to sediment retention storages. This water is then directed to mine water storages.

The existing water storages listed in **Table 7-1** within the Wambo and United water management system will be utilised. These dams are shown on **Figure 7-1**.

Table 7-1: Water Storage Summary

Storage	Max Capacity (ML)
Main Homestead	5,922
Wambo Cut Water Dam WCWD	105
South Dam ¹	500
Process Water Dam (PWD)	180
CHPP Dams	82
Glen Munro	989
Wombat Dam	16
MIA Dam	305
Milk Can Dam	21
U2 Dam/United Box Cut and Dam 2	652
U3 Dam	223
United Underground	5,000

1 To be commissioned in 2025

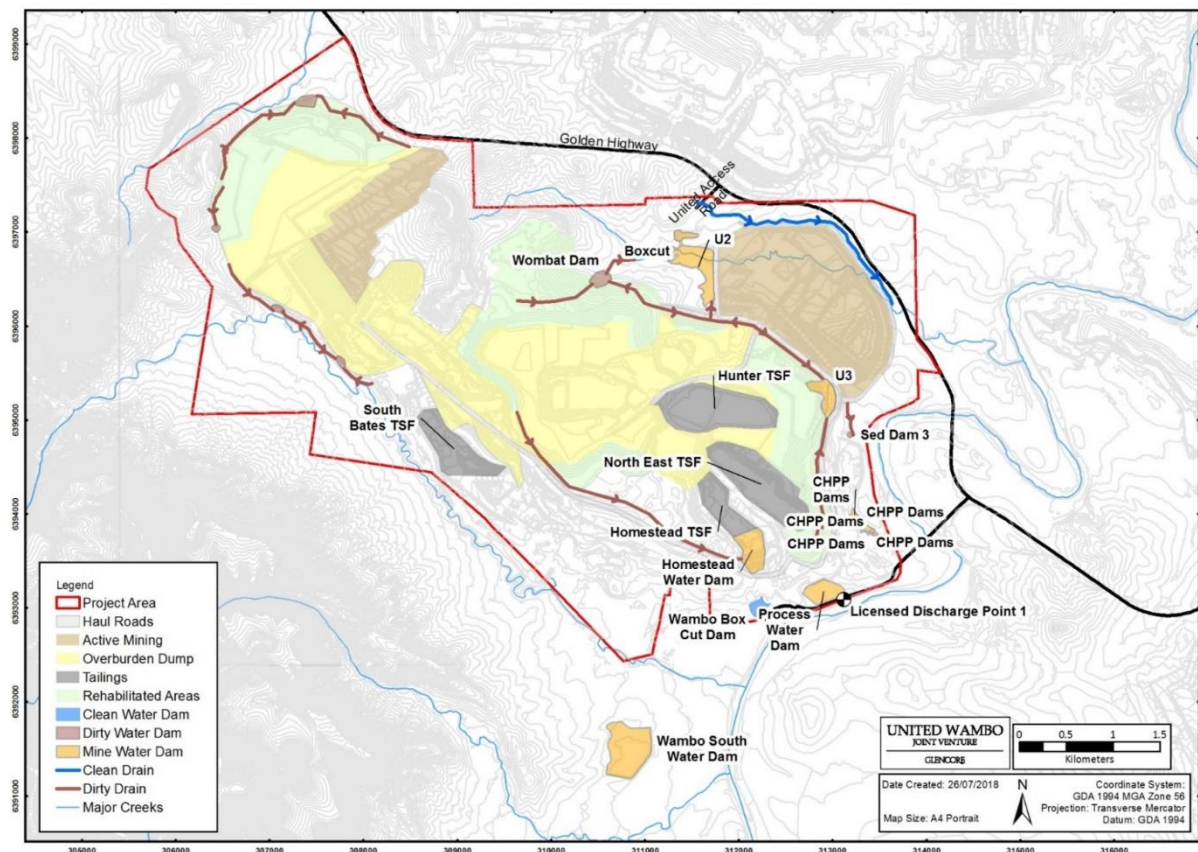


Figure 7-1: Phase 2 Water Management System – 2020-2025

8. Planning

This section provides details on the designs and planning for surface water management infrastructure and rehabilitation for United Wambo.

Further information on the installation and maintenance of surface water management infrastructure is included in **Section 9**.

Performance criteria for these items can be found in **Section 10.1**.

8.1 Creek Diversions

There are no new creek diversions planned or approved as part of the United Wambo Joint Venture Project. The only creek diversions in the Project Area have been approved under previous development consents, as described below.

North Wambo Creek, which also has its headwaters in the Wollemi escarpment, drains the central parts of the mining lease. A section of North Wambo Creek has been diverted to avoid mining operations. The North Wambo Creek Diversion was constructed in accordance with the approved North Wambo Creek Diversion Plan (WCPL, 2007b). The management of the diversion is the responsibility of Wambo (refer **Wambo Water Management Plan**).

In the event that creek diversion works are required in the future, the following performance measures will be used in the planning of any works:

- diverted creek lines are to be hydraulically and geomorphologically stable;
- incorporation of erosion control measures based on vegetation and engineered revetments;
- incorporation of pool and riffle sequences with persistent/permanent pools for aquatic habitat that are consistent with the geomorphology of the creek to be diverted; and
- revegetation with suitable native species.

8.2 Creek Restoration and Works within 40m of a Watercourse

There are no planned creek restoration works for United Wambo.

If creek restoration works are required in the future, the following performance measures will be incorporated into the planning of any works:

- erosion control measures based on vegetation and engineered revetments;
- pool and riffle sequences with persistent/permanent pools for aquatic habitat that are consistent with the geomorphology of the creek to be diverted; and
- revegetation with suitable native species.

All works within 40 metres of a watercourse will be undertaken generally in accordance with the DPI-*Water 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.

8.3 Water Catch Drains

Clean water drains are to be designed (see Section 9) to capture and convey the 1% AEP flood event.

Dirty water drains are to be designed in accordance with the specifications of the ***United Wambo Erosion and Sediment Control Plan***.

Details of the proposed drains for United Wambo are provided in the ***United Wambo Water Management Plan*** and ***United Wambo Erosion and Sediment Control Plan***.

8.4 Water Storages and Sediment Dams

Clean and mine water storages are to be designed to capture and convey the 1% AEP 24-hour flood event. Above-ground mine water storages are to be designed to minimise permeability and to avoid unlicensed or uncontrolled discharge of mine water.

Sediment dams are to be designed in accordance with the ***United Wambo Erosion and Sediment Control Plan*** and the guidance series *Managing Urban Stormwater: Soils and Construction* – Volume 1 (Landcom, 2004), and *2E Mines and Quarries* (DECC, 2008).

Tailings storage areas are to be designed to encapsulate and prevent the release of tailings seepage/leachate.

Details of the proposed water storages and infrastructure to be installed for United Wambo are provided in the ***United Wambo Water Management Plan***.

8.5 Flood Protection Levee

The flood levee for Redbank Creek (west of the Golden Highway) has been designed to protect mining areas from a 0.1% AEP flood event and to ensure no adverse effect on roads or privately-owned land.

The flood levee has been designed as follows:

- to suit the 1,000-year ARI flood level in Redbank Creek, which is governed by backwater from flooding in the Wollombi Brook and the Hunter River;
- with a minimum design crest of RL60.9, which is nominally one metre freeboard above the peak 1 000-year ARI flood level (RL59.9); and
- to be incorporated into the design of the proposed Light Vehicle Access Road that is located to the north-east of the United Open Cut.

The extent of the flood levee is shown on **Figure 8-1**. Construction of the levee was completed in 2020.

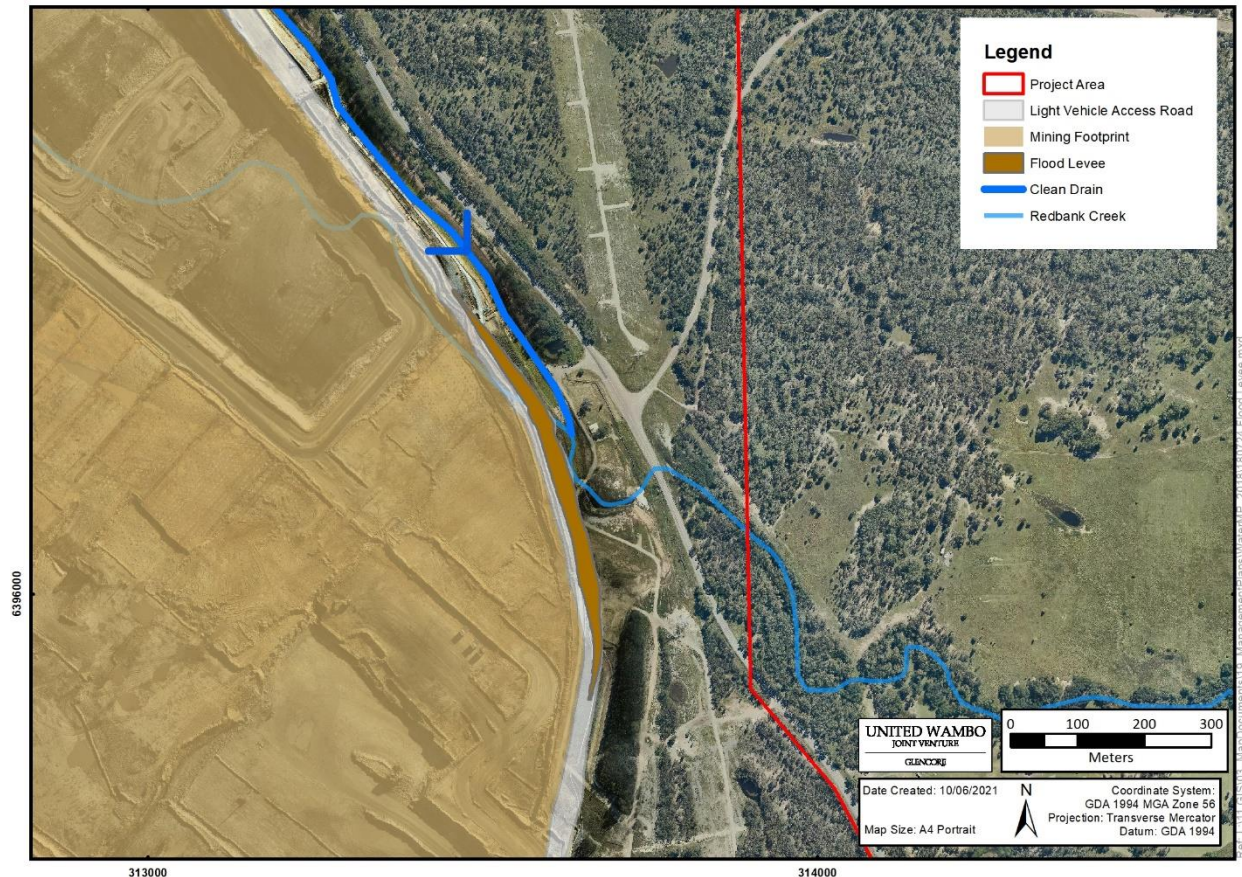


Figure 8-1: Flood Levee

8.6 Emplacement Areas

Overburden emplacement areas and rehabilitation will be designed to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material.

The Project will utilise existing and approved tailings storage facilities at Wambo, including the approved Homestead and Main Homestead tailings storage facilities during the Rehabilitation Management Plan (RMP) term. In addition, the Project will utilise the South Bates void for tailings storage once available.

Other mine voids or suitable locations within the open cut mining footprint may be used as tailings storage over the life of the Project if feasible.

All tailings storage facilities take time to dry sufficiently to allow them to be capped by emplacement of overburden. To provide sufficient time for the Homestead and Main Homestead tailings storage facilities to dry prior to capping, it is proposed to initially emplace overburden adjacent to the storage facilities in an elevated bund, prior to later using this material to cap the storage facilities.

As part of the Response to Submissions report, a geochemical assessment of the overburden and tailings to be emplaced, as part of the Project, was undertaken. The results determined that the waste rock leachate within the Project Area will have relatively low salinity and is not likely to generate acidic leachate.

Prior to the commencement of rehabilitation of the shaped overburden surface, representative samples will be taken to characterise the nature of the spoil and topsoil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. The chemical and physical properties from natural analogue sites will be used to assess whether specific amelioration techniques (e.g. addition of gypsum, lime, organic matter, deep ripping, etc.) are required to overcome potential limitations for landform stability, plant establishment and growth.

Further details on the management of rehabilitation areas is provided in the ***United Wambo Rehabilitation Management Plan***.

8.7 Final Voids

The final landform for United Wambo will retain two final voids designed as long term groundwater sinks to maximise groundwater flows across back filled pits to the final void. This, in effect, reduces the discharge of poorer quality water from the coal seam aquifers into Wollombi Brook.

Detailed design of the final landform, including final voids, will be undertaken progressively throughout the life of the operation. The final voids will be designed to minimise to the greatest extent practicable:

- the size and depth of final voids;
- the drainage catchment of final voids;
- any high wall instability risk; and
- the risk of flood interaction.

The designs for the final voids will be refined over the life of the Project and will be incorporated in the ***United Wambo Rehabilitation Management Plan***.

8.8 Reinstated Drainage Networks on Rehabilitated Areas

Drainage structures (including drainage lines established in the final landform) will be designed and constructed to be safe, stable and non-polluting. The final landform will utilise a natural landform design process incorporating micro-relief principles. This process will be undertaken as part of the rehabilitation planning process and completed through the ***United Wambo Rehabilitation Management Plan***.

9. Implementation

This section provides details on the surface water management measures to be implemented at United Wambo, including:

- Infrastructure installation and maintenance requirements;
- Measures relating to works within 40 metres of a watercourse;
- Inspections;
- Site water and salt balance; and
- Training and communication.

9.1 Surface Water Management Infrastructure

This section provides details on the installation and maintenance requirements for surface water management infrastructure.

9.1.1 Erosion and Sediment Control Works

The installation and maintenance of erosion and sediment control works, including sediment dams and catch drains, is described in the **ESCP**.

Monitoring of the effectiveness of these controls is achieved through inspections (**Section 9.3**) and the surface water monitoring program (**Section 10.3.5**).

9.1.2 Water Storage Dams

Clean and mine water storage dams will be installed and maintained to meet the design guidelines and criteria specified in the **ESCP**.

9.1.3 Flood Protection Levee

The flood protection levee (for Redbank Creek) has been constructed in accordance with the design drawings (refer **Section 8.5**).

The flood levee will be inspected prior to and after a predicted rainfall event of 25 mm or greater is forecasted and at least or biannually. Any issues, such as failure of temporary erosion and sediment controls, will be documented and maintenance carried out as required.

9.2 Works within 40 metres of a Watercourse

Management measures to be implemented when working within 40 metres of a watercourse will be specified in the Ground Disturbance Permit (GDP) for the works (refer **ESCP**), and may include:

- minimising the design and construction footprint and extent of disturbance as far as practicable (see also **Section 8.2**);
- 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;
- stabilising and rehabilitating disturbed areas as soon as practicable;
- scheduling works for dry weather periods; and
- inspecting the works and maintaining adequate erosion and sediment controls until the site is stable.

9.3 Inspections

Inspections of water management infrastructure, such as dams, sumps and sediment control structures are undertaken in accordance with the ESCP. These inspections enable United Wambo to monitor the effectiveness of the management measures implemented (as described in the sections above and in the **ESCP**).

9.4 Annual Site Water Balance and Salt Balance

A site water and salt balance will be completed each year as part of the Annual Review. The site water and salt balance incorporates and assesses all of the data collated from the water monitoring programs including surface water inflows, outflows and storage volumes (refer **Section 10.3**).

9.5 Training and Communication

General training on the aspects of the SWMP is provided to all employees and contractors through the Site Familiarisation process.

Regular workforce communication days and toolbox talks allow for discussion of the objectives and requirements of this and any other relevant Plans.

Selected site personnel, whose duties directly involve the management of water at the United Wambo, will undertake specific training in regards to site Operational Procedures which incorporate water management measures. This training will be undertaken annually and when there is a change in personnel in key roles. Examples of site personnel that may require training are as follows:

- Personnel involved in water management, including pumping and moving pipelines;
- personnel involved in the construction and maintenance of erosion and sediment controls;
- personnel involved in supervisory roles; and
- personnel involved in supervising ground disturbance activities.

10. Measurement and Evaluation

10.1 Surface Water Performance Criteria

Surface water performance criteria are outlined in **Table 10-1** below with further descriptions provided in the sections below.

Table 10-1: Surface Water Performance Criteria

Aspect	Performance Measures	Performance Indicator/Trigger	Response
Downstream surface water quality	Negligible change in surface water quality (compared	Surface water quality monitored is outside of the adopted trigger values (refer below) for at least	TARP – Surface Water Quality - Watercourses

Aspect	Performance Measures	Performance Indicator/Trigger	Response
	to predicted impacts)	one parameter for more than two consecutive monitoring rounds	
Channel stability	No increase in areas of instability within watercourses	Channel stability monitoring indicates one or more areas of decreasing stability in watercourses	TARP – Channel Stability
Downstream flooding impacts	Negligible change in downstream flood access (compared to predicted impacts)	No change to flood inundation of downstream properties in major flood events	Unforeseen Events Protocol in Section 10.7
Stream and riparian health	Riparian health	No evidence of significant weed growth or death of vegetation	Unforeseen Events Protocol in Section 10.7
	Condition of channel	No evidence of significant scour, undercutting or slumping	TARP – Channel Stability
	Deposition of sediment and debris	No evidence of significant accumulation or deposition, large blockages in channel	Unforeseen Events Protocol in Section 10.7
	General conditions	No evidence of significant hazards presented to the public, poor aesthetics or feral animals, or geomorphic instability	Unforeseen Events Protocol in Section 10.7
Surface Water User Supplies	Negligible impact to downstream surface water users (compared to predicted impacts)	Mining extents/disturbance areas lie within approved boundaries. Surface water take is licensed and undertaken in accordance with available water determinations issued by WaterNSW No complaints from downstream water users regarding loss of surface water (quality and/or quantity)	TARP – Downstream Water Users
Post-mining water pollution from rehabilitated areas of the site	Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation	Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and/or baseline data and does not pose a threat to downstream water quality	Rehabilitation TARP United Wambo Rehabilitation Management Plan

Aspect	Performance Measures	Performance Indicator/Trigger	Response
		Drainage structures (including drainage lines established in the final landform) are stable and there is no evidence of overtopping or significant scouring as a result of runoff	

10.2 Surface Water Impact Assessment Criteria

10.2.1 Discharge Criteria

In accordance with EPL 529, Wambo is permitted to discharge mine water through LDP No. 4, located at Eagles Nest Dam. EPL 529 prescribes water volume and quality discharge limits in accordance with the HRSTS Guidelines as shown in **Table 10-2**.

Table 10-2: EPL529 Discharge Limits

Parameter	Unit of Measure	Limits
Volume	ML/day	250
pH	pH	6.5-9.5
Total Suspended Solids	mg/L	120

The discharge of water through LDP 4 is managed by Wambo in accordance with the **Wambo Water Management Plan**.

10.2.2 Surface Water Quality Criteria

The impact assessment criteria for surface water quality are summarised in **Table 10-3**. The criteria have been set based on the 20th and 80th percentile for the available dataset for pH, and the 80th percentile for EC, TSS and TDS.

WB04 is a new site not previously sampled by United or Wambo. United Wambo propose to develop site specific criteria when sufficient data is available. In the interim, default ANZECC physical and chemical stressor trigger values for slightly disturbed lowland river systems in south-east Australia have been adopted as the impact assessment criteria for WB04.

No site specific surface water quality criteria has been generated for metals/metalloids, due to limited data set for the monitoring locations. United Wambo propose to develop site specific criteria when sufficient data is available. In the interim, default 95% species protection ANZECC trigger values for slightly to moderately disturbed freshwater ecosystems Australia have been adopted as the impact assessment criteria (refer to **Table 10-4**).

Table 10-3: Surface Water Quality Criteria

Site ID	Site Description	Sample Count	pH		EC (µs/cm)	TSS (mg/L)	TDS (mg/L)
			Lower	Upper			
WB04	Wollombi Brook – Downstream	-	6.5	8.5	2200	50 ¹	- ¹
NWC03	North Wambo Creek - Downstream	57	7.3	8.0	2350	15	1270
RC01	Redbank Creek - Downstream	70	7.9	8.3	8456	26	- ¹
WFC01	Waterfall Creek	39	7.3	7.9	435	582	646

1 – There is no historical data available for TDS for RC01. As there is no ANZECC criteria set for TDS, no limits have been identified for this RC01. A default of 50 mg/L TSS has been utilised for WB04 until the site specific criteria is developed.

Table 10-4: ANZECC Criteria for Metals and Metalloids

Parameter	ANZECC Criteria (µg/L)	Parameter	ANZECC Criteria (µg/L)	Parameter	ANZECC Criteria (µg/L)	Parameter	ANZECC Criteria (µg/L)
Aluminium (Al)	55	Manganese (Mn)	1900	Lead (Pb)	3.4	Calcium (Ca)	N/A
Arsenic (As)	24	Nickel (Ni)	11	Potassium (K)	N/A	Barium (Ba)	N/A
Cobalt (Co)	N/A	Selenium (Se)	11	Silver (Ag)	0.05	Magnesium (Mg)	N/A
Copper (Cu)	1.4	Zinc (Zn)	8	Flouride (Fl)	N/A	Cadmium (Cd)	0.2
Iron (Fe)	N/A	Mercury (Hg)	0.6	Boron (B)	370	Sodium (Na)	N/A

NA – No ANZECC criteria available

10.2.3 Surface Water Flow Impact Assessment Criteria

Wollombi Brook is perennial and the impact assessment criterion for Wollombi Brook has been set to zero flow at the Warkworth gauging station.

Flow impact assessment criteria for the local mine site ephemeral creeks (Stony Creek, South Wambo Creek and North Wambo Creek) are included in the **Wambo Water Management Program**.

10.3 Surface Water Monitoring Program

The surface water monitoring program is designed to monitor surface water quality and levels to detect potential impacts on surrounding catchment users and to ensure that relevant legislative and policy requirements are met. Monitoring locations, parameters, frequency and methodology of monitoring are outlined in this section.

Data collected will:

- Be used in the continued development and refinement of surface water investigation triggers (**Section 10.2.2**); and
- Provide input to annual reviews of surface water monitoring data and the site water balance and salt balance (**Section 9.4**).

A general description of the surface water monitoring program for United Wambo is included in this section. The surface water monitoring locations, parameters, frequency and methodology of monitoring for the United Wambo Open Cut Mine (and Wambo Mine) are outlined in the combined **WMProg**.

10.3.1 Surface Water Monitoring Methodology

Surface water quality sampling and analysis is conducted in accordance with *Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales* (DEC, 2004); *Australian Standard/New Zealand Standard (AS/NZS) 5667:1998* Parts 1, 4 and 6; and the requirements of the HRSTS. Surface water monitoring methodology is detailed in Section 3.3 of the **WMProg**.

10.3.2 Surface Water Quality

Surface water quality monitoring will be undertaken at the locations shown in **Figure 10-1** and listed in **Table 10-5** and included in the **WMProg**. The responsibility for monitoring each site is also included in the **WMProg**.

Long-term sediment dams have been added into the surface water quality monitoring program following a recommendation made in the Independent Environmental Audit undertaken in 2020.

The frequency of monitoring and analytes to be monitored is described in **Sections 10.3.2.1 and 10.3.2.2** below and included in the **WMProg**.

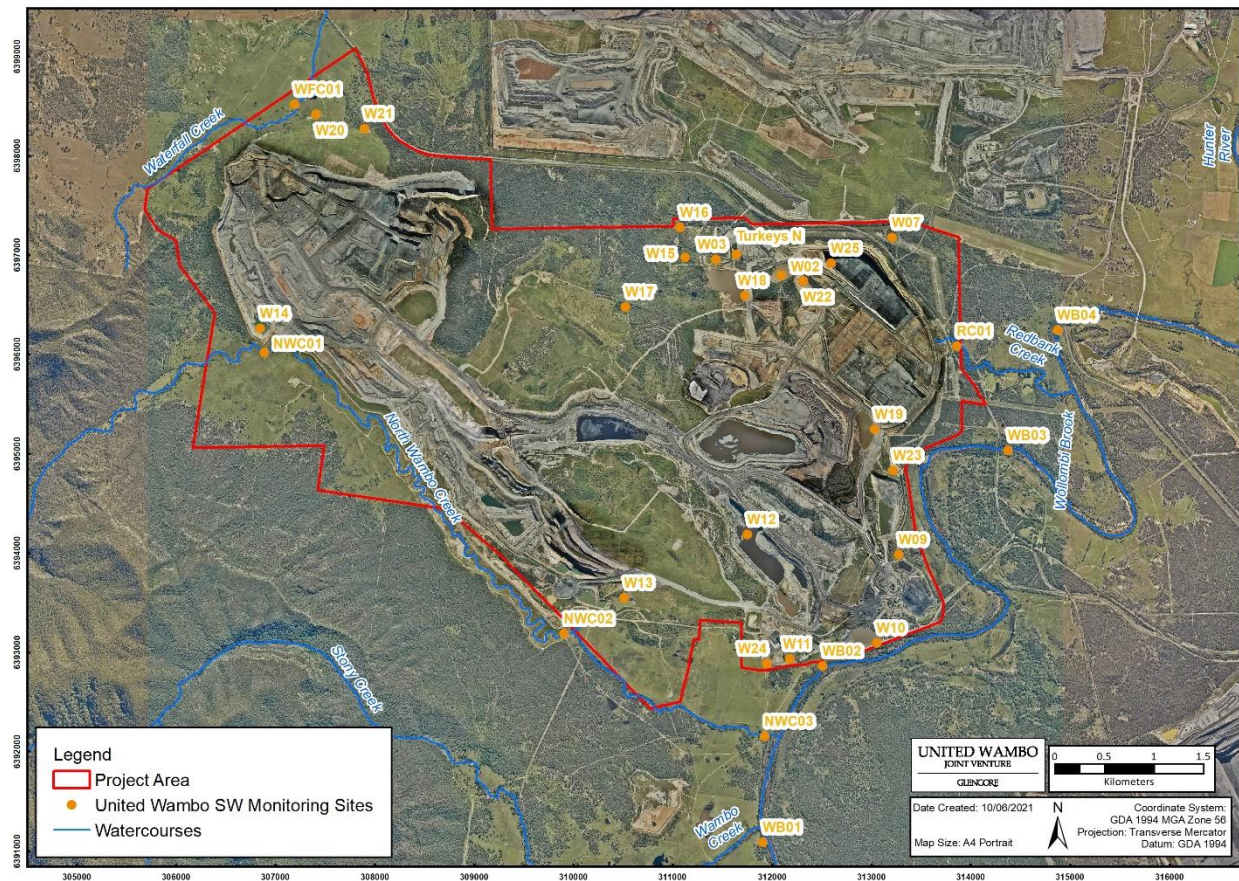


Figure 10-1: Surface Water Quality Monitoring Locations

Table 10-5: Surface Water Monitoring Locations

Site ID	Site Description	Easting	Northing	Former Wambo Site ID	Former United Site ID
WB01	Wollombi Brook - Upstream	311910	6391093	SW40	-
WB02	Wollombi Brook - Pumps	312509	6392866	SW03	SW03
WB03	Wollombi Brook - Warkworth	314376	6395037	SW02	SW04
WB04	Wollombi Brook - Downstream	314874	6396247	-	-
NWC01	North Wambo Creek - Upstream	306887	6396024	SW04	-
NWC02	North Wambo Creek - Midstream	309905	6393191	SW32a	-
NWC03	North Wambo Creek - Downstream	311927	6392157	SW05	SW02
RC01	Redbank Creek - Downstream	313672	6396168	-	SW05
WFC01	Waterfall Creek	307194	6398519	SW39	-
W02	Dam 2	312097	6396796	-	Dam 2
W03	United UG Boxcut	311432	6396959	-	-
W07	Dam 14	313207	6397177	-	Dam 14
W09	CHPP Dams	313276	6393987	SW31	-
W10	Process Water Dam	313055	6393097	SW15	-
W11	Wambo MIA Box Cut Dam	312179	6392939	SW14	-
W12	Homestead Pit	311750	6394190	SW38	-
W13	West Cut Dam	310510	6393550	SW12	-
W14	Montrose Pit Inflows	307440	6396120	SW54	-
W15	Dam 7	311126	6396981	-	Dam 7
W16	Dam 15	311075	6397280	-	Dam 15
W17	Wombat Dam	310526	6396481		-

Site ID	Site Description	Easting	Northing	Former Wambo Site ID	Former United Site ID
W18 ¹	U2	311727	6396595	-	-
W19 ¹	U3	313035	6395248	-	-
W20	Montrose ME1 Sed Dam	307409	6398418	-	-
W21	Montrose ME2 Sed Dam	307897	6398274	-	-
W22	Drain 9	312315	6396742	-	-
W23	Plover Dam	313222	6394832	-	-
W24	MIA Sediment Dam	311947	6392892	-	-
W25	United Pit	312595	6396920	-	-
W26	Turkeys Nest Dam	311642	6397011	-	-

10.3.2.1 Monthly Monitoring Program

Surface water monitoring is undertaken monthly at the monitoring locations shown in **Figure 10-1** and described in **Table 10-3** and the **WMProg**. The following parameters are monitored and recorded:

- pH;
- electrical conductivity ($\mu\text{S}/\text{cm}$);
- TSS (mg/L);
- TDS (mg/L); and

Flow conditions by observation (i.e. high, medium or low flow; or no flow).

10.3.2.2 Annual Monitoring Program

In addition to the monthly monitoring program, further speciation analysis will be undertaken for each monitoring location listed in **Table 10-3** on an annual basis. This speciation analysis includes the analytes listed in **Section 10.3.2.1** and the following:

- total metals/metalloids: Aluminium (Al), Arsenic (As), Cobalt (Co), Copper (Cu), Iron (Fe), Manganese (Mn), Nickel (Ni), Selenium (Se), Zinc (Zn), Mercury (Hg), Lead (Pb), Potassium (K), Silver (Ag), Fluoride (F), Boron (B), Calcium (Ca), Barium (Ba), Magnesium (Mg), Cadmium (Cd), Sodium (Na);
- nutrients - total phosphorous (P), Nitrite, Nitrate, Total Kjeldahl Nitrogen (TKN), Total nitrogen (Total N); and
- ions - Chloride (Cl), Bicarbonate (CaCO_3), Sulphate (SO_4).

10.3.2.3 Site Dam Water Quality

Storage dams and pits listed in **Table 10-5** and the **WMProg** are sampled monthly. Data from this monitoring is used for operational purposes and is reported internally as required. This data is not reported publicly.

10.3.3 Surface Water Flows

Wambo will continue to monitor flow in the North Wambo Creek, Stony Creek and South Wambo Creek using continuous flow monitoring stations in accordance with the **WMProg**. Surface water flow monitoring data for Wollombi Brook is sourced from DPIE Water operated flow gauging stations, located at Warkworth (FM10) and Bulga (FM11).

Surface water flows will continue to be monitored by Wambo with the results shared with United Wambo.

No additional flow monitoring sites are proposed by United Wambo.

10.3.4 Impacts on Water Supply for Other Water Users

As discussed in **Section 6.4**, there are no known licensed non-mining water users on waterways directly downstream of the Project Area along Wollombi Brook, its tributaries (Wambo Creek, North Wambo Creek and Redbank Creek) or Waterfall Creek. As such, no monitoring program of impacts on water supply for other water users is required.

Should non-mining waters users commence taking water on waterways directly downstream of the Project Area, United Wambo will develop a program to monitor any mining related impacts.

10.3.5 Erosion and Sediment Control

As well as collecting background water quality data and identifying potential mining impacts, surface water quality monitoring sites are strategically located so as to enable the effectiveness of erosion and sediment control measures (implemented in accordance with the **United Wambo Erosion and Sediment Control Plan (ESCP)**) to be assessed. Inspection, maintenance and management of erosion and sediment control structures is undertaken in accordance with the requirements of the **ESCP**.

10.3.6 Monitoring of Licensed Discharges under EPL 529 and the HRSTS

Wambo will monitor water quality and volume for licensed discharges in accordance with the licensed discharge limits and requirements relevant monitoring conditions of EPL 529 and the HRSTS. Results will be shared with United as required.

10.3.7 Monitoring of Flows into Open Cut and Underground Workings

Monitoring of flows into the open cut pits will be undertaken through the monitoring of pumped water, recorded rainfall and modelled evaporation and monthly water stored within the pit. The inputs will be used to model the volume of groundwater inflow into the pit.

Flows into the open cut pits will be monitored on a monthly basis to understand the water make onsite and inform the United Wambo water balance. The results will be compared against predicted groundwater inflows and will be used to ensure compliance with groundwater licencing requirements.

The water levels in the former United Underground will be monitored on a regular basis to maintain understanding of the volume of water stored within the workings.

Monitoring of flows into the Wambo underground mines will be managed by Wambo in accordance with regulatory requirements and the **Wambo Water Management Plan**.

10.3.8 Watercourse Stability Monitoring and Management

Wambo currently monitors the channel stability of Wambo Creek and North Wambo Creek in accordance with the Riparian Vegetation and Bed Bank Stability Monitoring Program. This will be continued in accordance with the separate **Wambo Water Management Plan** and results will be shared with United as required.

As discussed in **Section 6.3.4**, United Wambo will develop undertake a photo monitoring program for Wollombi Brook, Redbank Creek and Waterfall Creek. The program will involve taking photos at each location upstream and downstream and identifying any changes in any of the following:

- stream and riparian vegetation cover;
- bed condition;
- active erosion points; and
- potential areas of instability determined by the creek line inspections.

This monitoring will be undertaken annually and all photos will be filed on the United Wambo server of comparison. If upon a desktop review, there is noticeable changes further investigations will take place. Investigations will take place in the field, on location, and must include (But not limited to.):

- Current met. Conditions
- Met conditions for the last 12 months
- Any identified structure changes (i.e fallen trees, erosion, evidence of a high flow event)
- Has there been any unauthorised anthropogenic activities

If through a field investigation the cause of the changes can not be determined. A suitably qualified individual will be engaged to assist in the investigation.

All changes will be noted and compared to the TARP in Appendix B -. If United Wambo are identified as the sources of the impacts, the Unforeseen Impacts Protocol will be implemented as per **Section 9.6**. Once this program has been developed, the SWMP will be updated with site details and monitoring requirements. This monitoring will be undertaken annually.

10.4 Investigation Protocol

In the event that surface water performance is found to deviate from background trends and/or record levels outside the surface water performance indicators presented in **Section 10.1**, United Wambo will be responsible for initiating further site-specific investigations when:

- in their professional judgement, if the deviation from background trends and impact assessment criteria could result in environmental harm; or
- the performance indicators/triggers trigger a response protocol.

A site-specific investigation will then be instigated in accordance with the protocols outlined **Section 10.5**.

The findings of investigations into surface water management system performance will be reported in the Annual Review.

10.5 Criteria Exceedance Protocol

If the monitoring results are outside the impact assessment criteria outlined in **Section 10.2**, further investigations are required and United Wambo will refer to the associated Trigger Action Response Plans (TARP) in **Appendix B** and the following Criteria Exceedance Protocol.

As per the TARPs within **Appendix B**, if the criteria exceedance protocol is enacted, further investigations are required. United Wambo will:

- confirm the timing and general location of the exceedance(s);
- confirm the meteorological conditions at the time of the exceedance(s) (where relevant);
- identify any potential contributing factors;
- assess the monitoring results against background trends and relevant modelling predictions to identify any anomalies or causes;
- if the exceedance is not attributable to United Wambo, the routine monitoring program will be assessed for its effectiveness;
- where the exceedance is potentially attributable to United Wambo, appropriate mitigation and management strategies will be developed and implemented;
- where mitigation and management strategies have been implemented, additional monitoring and regular reviews will be undertaken to measure the effectiveness of the strategies undertaken; and,
- the exceedance will be reported in accordance with the reporting mechanisms outlined in **Section 11.1.3**.

10.6 Data Management Procedures

Validated data from the monitoring program will be entered into the GCAA Environmental Monitoring Database (EMD). This renders the data in a form suitable for analysis.

United Wambo will record the following details for all surface water monitoring samples:

- date(s) on which the sample was taken;
- the point at which the sample was taken;
- flow conditions of watercourses sampled; and
- the name of the person who collected the sample.

In the event of an apparently anomalous result, United and/or Wambo will conduct a re-test as soon as is practicable to do so.

10.7 Unforeseen Impacts Protocol

Due to the low likelihood of surface water and groundwater incidents occurring, any associated impacts have been characterised as unforeseen impacts.

Surface water incidents, which may be addressed by the unforeseen impacts protocol, include mine water discharge, non-compliances with erosion and sediment control practices, and generally any non-compliance to surface water conditions within the Project Approval conditions not covered by an associated protocol or TARP.

Notification and incident response should be conducted in line with the United Wambo **Pollution Incident Response Management Plan** (PIRMP).

If the incident is considered to have caused, or threatens to cause, material environmental harm, all relevant authorities must be notified immediately after the person becomes aware of the incident. Notification must be made verbally by telephoning the Environment Line service on 131 555, with written details of the notification within 7 days as in accordance with condition R2 of EPL 3141.

Material environmental harm is defined in section 147 of Protection of the Environment Operations Act 1997.

Notification must be made for all incidents defined under the Project Approval to the Secretary and any other relevant agencies as immediately after becoming aware of the incident in writing to compliance@planning.nsw.gov.au. The notification must identify the development and set out the location and nature of the incident.

In the event of unforeseen impacts associated with the surface water management system at United Wambo, the following protocol will be implemented:

- conduct a preliminary review of the nature of the impact, including:
 - initial assessment of environmental harm;
 - any relevant monitoring data; and
 - current mine activities and land use practices.
- commission an investigation by a suitably qualified expert into the unforeseen impact to confirm cause and effect and consider relevant options for amelioration of impact(s) as appropriate;
- prepare an action plan in consultation with the relevant stakeholders;
- mitigate causal factors where possible; and
- implement additional monitoring as necessary to measure the effectiveness of the controls implemented.

The outcomes of the investigations into any unforeseen impacts and the controls/remediation actions implemented will be reported in the Annual Review. The implementation of any mitigation measures will be undertaken in consultation with DPIE, DPIE Water and the EPA.

10.8 Complaints Management Protocol

United Wambo operates a dedicated complaints hotline. The details of this hotline are advertised in the newsletter and on the United Wambo website.

A procedure for handling complaints has been implemented as part of the United Wambo EMS to ensure a consistent approach to handling any complaint. All legitimate complaints will be thoroughly investigated by the United Wambo Environment and Community (E&C) Manager. With respect to complaints regarding surface water the investigations will include, as a minimum:

- records of the timing and general location of the issue initiating the complaint;
- details of the meteorological conditions at the time of the issue initiating the complaint;
- identification of any potential contributing factors; and
- a review of any monitoring results relevant to the complaint.

Where the complaint is potentially attributable to United Wambo, appropriate mitigation and management strategies will be developed, implemented and monitored for the effectiveness of the strategies undertaken.

Feedback to the complainant will be provided within 24 hours of receiving the complaint.

Details of complaints relating to surface water will be provided to relevant mine planning and production personnel, to assist in the improvement of management practices, where relevant. A summary of the complaints received by the community will be reported in the Annual Review.

11. Review and Improvement

11.1 Reporting and Review of Results

11.1.1 Surface Water Quality

United Wambo will be responsible for coordinating the monthly review of the monitoring results and associated trends in water quality. Measured values will be compared to background trends in water quality and an investigation of potential cause undertaken when a deviation from background trends is identified and/or when water quality parameters record levels outside the surface water impact assessment criteria presented in **Section 10.2**. This investigation will be undertaken by the United Wambo E&C Department following the investigation protocol described in **Section 10.4**.

United will publish the results from the monthly surface water quality monitoring of the local watercourses onto the United Wambo website (www.unitedproject.com.au). The results will form part of a quarterly environmental monitoring report that also includes groundwater, air quality, noise and blasting monitoring results in accordance with the relevant site management plans.

Monitoring results will also be reviewed annually and reported as required in the Annual Review, which is distributed to government agencies and the Community Consultative Committee. Reporting will include a comparison of water quality trends with those of previous years and will highlight any results that are inconsistent with trends in baseline data.

All monitoring data will be retained in an appropriate format onsite and will be used to review the effectiveness of the United Wambo water management system on an ongoing basis.

11.1.2 Watercourse Stability

The United E&C Coordinator will coordinate annual monitoring. The results of this monitoring will be reported in the Annual Review.

11.1.3 On-Site Water Management

United Wambo will review all water management data annually and these results will be included as part of the Annual Review for the site. This review will include details of rainfall onsite, water used onsite, overflows from sedimentation dams and transfers to, from and around the site.

11.1.4 Reporting of Exceedances

Where monitoring results identify an exceedance of the performance criteria outlined in **Section 10.1** of this Plan, this will be reported as part of the Annual Review. Where it is deemed that an exceedance

constitutes an incident (causes or threatens to cause actual environmental harm), reporting will be as per the PIRMP.

11.2 Plan Review

This SWMP will be reviewed and, if necessary, revised with any review of the **United Wambo Water Management Plan**.

The SWMP will reflect any changes in environmental requirements, technology and operational procedures.

12. Document Information

12.1 Relevant Guidelines and Legislation

The following legislation is relevant to this Plan:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000);
- Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales (DEC, 2004);
- Australian Standard/New Zealand Standard (AS/NZS) 5667:1998 Parts 1, 4 and 6;
- Environmental Planning and Assessment Act 1979;
- Fisheries Management Act 1994;
- Local Government Act 1993;
- Protection of the Environment Operations Act 1997;
- Water Act 1912;
- Water Management Act 2000;
- Water Management (General) Regulation 2018
- Water Sharing Plan for the Hunter Regulated River Water Source 2016; and
- Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.

12.2 Related Documents

Related documents, listed in **Table 12-1** below, are *documents* directly related to or referenced from within this document.

Table 12-1: Related Documents

Number	Title
GCAA-625378177-10320	GCAA 11.03 Water Management Protocol
GCAA-625378177-10596	GCAA 11.03 Water Accounting Framework Procedure
GCAA-625378177-10248	GCAA 11.02 Pipeline Management Protocol

Number	Title
UWOC-1689771511-360	United Wambo Environmental Management Strategy
UWOC-1689771511-374	United Wambo Pollution Incident Response Management Plan
UWOC-1689771511-365	United Wambo Water Management Plan
UWOC-1689771511-370	United Wambo Groundwater Management Plan
UWOC-1689771511-369	United Wambo Erosion and Sediment Control Plan
UWOC-1689771511-1358	United Wambo Open Cut and Wambo Water Monitoring Program

12.3 Reference Information

Reference information, listed in **Table 12-2** below, is *information* that is directly referred to for the development of this document.

Table 12-2: Reference Information

Reference	Title
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>
Arkhil Engineers 2018	<i>United Wambo Open Cut Surface Water Management – Operating Strategy (Arkhil Engineers, 2018).</i>

12.4 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 12-3**.

Table 12-3: Change Information

Version	Date	Change Details
1.0	September 2019	New document developed by Engeny and United
1.1	December 2019	Updated to address comments received from Department of Planning, Industry and Environment. Reviewed by Engeny
1.2	May 2020	Glencore format change, updated template. Minor changes to document including sentence structure and definitions, references in Appendix A.
2.0	August 2020	Updated for Phase 2 operations. Reviewed by Umwelt.
2.1	June 2021	Updated following submission of Independent Environmental Audit Report and Annual Review. Changes made to SW monitoring program to remove redundant sites and to add long term sediment dams.

13. Accountabilities

Refer United Wambo Water Management Plan.

Appendix A - Stakeholder Consultation

Department	Comment	Response/Change
DPIE	Individual management plans need to make it clear what phases of the development and mining activities they apply (Phases 1A, 1B, 2 and 3 as defined in Development Consent SSD7142). Section 3 of the Water Management Plan indicates that the plan applies to “all operational activities at United Wambo”, however, Section 3 indicates that the Wambo site Management Plan documents will continue to apply during Phase 1A and 1B. It is not clear if this is the intention for the other sub-water related management plans.	Further discussion and explanation on Phases of the development the management plan applies to has been provided in the Scope of each Management Plan.
DPIE	Provide evidence that the plans have been prepared by a suitably qualified and experienced person/s endorsed by the Planning Secretary (condition B52a).	Letter of endorsement has been added to the Appendix.
DPIE Surface Water Management Plan	Section 6.3 – baseline data on channel stability and riparian vegetation is considered inadequate, particularly in relation to Waterfall Creek, Redbank Creek and Wollombi Brook. If baseline data is not available for these creeks, then a commitment should be made to undertake riparian vegetation monitoring and a photo monitoring program prior to mining operations. This will allow any observable changes in channel stability and riparian vegetation as a result of mining operations to be identified and managed.	Added in Section 6.3.4 that makes a commitment to undertake a pre-mining monitoring and develop an ongoing monitoring program.
DPIE Surface Water Management Plan	Section 9.2.1 – specify water volume and quality discharge limits prescribed in EPL 529.	Table 9-2 added with this information.
DPIE Surface Water Management Plan	Section 9.2.2 – specify the default ANZECC criteria for metals/metalloids which will apply until site specific criteria is developed.	Table 9-3 added with this information.

Department	Comment	Response/Change
DPIE Surface Water Management Plan	Section 5.3.2.1 – incorrect reference to Table 5-1.	Reference has been corrected.
DPIE Surface Water Management Plan	Section 9.3.8 – include a commitment to undertake periodic channel stability and riparian vegetation monitoring along Waterfall Creek, Redbank Creek and Wollombi Brook.	Commitment made to develop program and undertake monitoring annually.

Appendix B - Surface Water Management TARPs

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Surface water quality – Watercourses	Surface water quality within trigger values for all parameters.	Trigger: Surface water quality concentrations outside of the adopted trigger values (refer <i>Section 10.2.2</i>) for at least one parameter for two or more consecutive monitoring rounds. Response: Implement Criteria Exceedance Protocol (<i>Section 10.4</i>). Repeat sampling. Investigate the source for the change in surface water quality and whether it was caused by mining-related activities.	Trigger: Surface water quality concentrations trending outside of the adopted trigger value (refer <i>Section 10.2.2</i>) for at least one parameter for three or more monitoring rounds. Response: Implement Criteria Exceedance Protocol (<i>Section 10.4</i>). Increase investigations to determine if the source for the change in surface water quality is mining-related. Undertake additional monitoring until water quality improves or source/cause is identified.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify E&C Coordinator/Manager. If exceedance mining related, notify external agencies in accordance with PIRMP requirements.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Surface water quality – On-site water storages	Surface water quality within historical range for all parameters.	Trigger: One or more monitoring results for pH outside of historical range. Response: Repeat sampling. Monitor for expanded suite of water quality parameters (metals and metalloids).	Trigger: Two or more monitoring results outside of the historical range. Response: Repeat sampling. Monitor for expanded suite of water quality parameters (metals and metalloids). Investigate the source for the change in surface water quality and whether it was caused by mining-related activities.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify E&C Manager.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Erosion and sediment control	No transfer of sediment from the site to downstream watercourses. All controls are appropriately in place and well maintained. Site inspections do not identify any unstable disturbance areas or migration of sediment away from disturbance areas.	Trigger: Controls are in place, however are not maintained. One or more areas have indicated surface erosion in the form of riling, bank erosion or other movement of sediment from an area of disturbance. Response: Seek to stabilise the area to stop the erosion process. Investigate works undertaken prior to the disturbance activities. Review adequacy of controls and inspection/maintenance schedule.	Trigger: Stage 1 trigger or other incident leading to sedimentation of a watercourse or off-site discharge (excluding discharges from sediment basins during rainfall events exceeding basin design capacity). Response: Isolate the problem area through diverting contributing surface flows to another appropriate storage, while the cause for the water quality exceedances are determined. Review adequacy of controls and inspection/maintenance schedule.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify external agencies in accordance with consent requirements.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Channel stability	Watercourse monitoring indicates no areas of decreased stability from visual inspections compared to the previous inspection.	Trigger: Channel stability monitoring indicates one or more areas of decreased stability in watercourses relative to the previous inspection. Response: Implement Criteria Exceedance Protocol (<i>Section 10.4</i>). Where possible, stabilise the instabilities, which may require advice from a geomorphic specialist. Investigate cause for instabilities and whether recent construction works or mining-related activities have created the instability.	Trigger: Channel stability monitoring indicates one or more areas of decreased stability in watercourses, causing sediment loads to migrate and/or impact to riparian vegetation, relative to the previous inspection Response: Implement Criteria Exceedance Protocol (<i>Section 10.4</i>). Where possible, stabilise the instabilities, which may require advice from a geomorphic specialist. Investigate cause for instabilities and whether recent construction works or mining-related activities have created the instability.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify external agencies in accordance with PIRMP requirements.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Downstream water users	No complaints from downstream water users regarding loss of surface water or degradation of water quality.	Trigger: Complaint from downstream water user regarding loss of water availability (quality and/or quantity). Response: Implement Complaints Management Protocol (<i>Section 10.8</i>). Review of relevant historical monitoring results (water quality and/or flow). Identification of any potential contributing factors. Investigate whether the change in water availability is due to mining-related activity. Provide feedback to complainant.	Trigger: Investigation into Trigger 1 identifies that change in downstream water availability is due to mining-related activity. Response: Implement Response Protocols for Unforeseen Impacts and Complaints Management (<i>Sections 10.7 and 10.8</i>). Implement appropriate mitigation and management measures, which may include advice from independent water resource specialists. Undertake additional monitoring of mitigation and management measures. Provide compensatory water supply to any landowner whose water supply has been adversely and directly impacted.	Trigger 1: Notify E&C Coordinator/Manager. Provide a response to complainant. Trigger 2: Notify DPIE Water and DPIE.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Flooding	No forecast severe weather event. Surface water system managed appropriately, with sufficient freeboard in all surface water storages.	Trigger: Forecast severe storm event Surface water system managed appropriately, with sufficient freeboard in all surface water storages. Response: Inspection of flood management structures to ensure integrity and absence of flow obstructions. Utilise portable pumps to dewater flooded areas into site water storages. Evacuate site if danger exists.	Trigger: Forecast severe storm event. Insufficient freeboard in surface water storages. Severe damage to flood management structures identified. Response: Undertake dewatering of relevant storages to areas where water storage capacity exists. Inspection of flood management structures to ensure integrity and absence of flow obstructions. Protect equipment and infrastructure. Utilise portable pumps to dewater flooded areas into sediment basins. Evacuate site if danger exists.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify emergency services as required.

Aspect	Normal State	Trigger 1	Trigger 2	Actions
Riparian vegetation	Watercourse monitoring indicates no significant change in riparian vegetation quality or extent when compared with historical results and/or references sites.	Trigger: Monitoring indicates significant change in riparian vegetation quality or extent. Response: Identify any potential contributing factors. Investigate the source for the change in riparian vegetation and whether it was caused by mining-related activities.	Trigger: Investigation into Trigger 1 identifies that change in riparian vegetation is due to mining-related activity. Response: Implement appropriate mitigation and management measures, which may include advice from independent specialists. Undertake additional monitoring of mitigation and management measures.	Trigger 1: Notify E&C Coordinator/Manager. Trigger 2: Notify external agencies.

Appendix C - Stakeholder Consultation



**Planning,
Industry &
Environment**

Planning and Assessment
Resource Assessments
Contact: Melanie Hollis
Phone: 6271 2042
Email: melanie.hollis@planning.nsw.gov.au

Aislinn Farnon
Approvals Manager
United Wambo Joint Venture Project
134 Jerrys Plains Road
WARRIMOO NSW

Dear Ms Farnon

**United Wambo Open Cut Coal Mine (SSD 7142)
Water Management Plan**

I refer to your letter dated 10 December 2019, requesting the Planning Secretary's endorsement of suitably qualified and experienced persons to prepare the Water Management Plan (WMP) in accordance with condition B52(a) of SSD 7142.

The Department has reviewed the credentials of Ms Susan Shield and Ms Liz Webb and considers that they are suitably qualified and experienced to prepare the WMP.

The Planning Secretary therefore endorses the following personnel to prepare the WMP:

- Ms Liz Webb (EMM Consulting) - Groundwater Management Plan component; and
- Ms Susan Shield (Engeny Water Management) -- Water Management Plan including Site Water Balance, Salt Balance, Surface Water Management Plan and Erosion and Sediment Control Plan

Should you have any enquiries in relation to this matter, please contact Melanie Hollis.

Yours sincerely,

11/12/2019

Matthew Spratt
Director
Resource Assessments
as nominee of the Secretary