



Water Management Plan

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Table of Contents

1	Commitment and Policy	4
1.1	Background	4
1.2	Scope	4
1.3	Objectives of the Water Management Plan.....	7
1.4	Requirements of the Water Management Plan	7
1.4.1	Statutory Requirements.....	7
1.4.1.1	Development Consents.....	7
1.4.1.2	Environment Protection Licences	7
1.4.1.3	Surface Water and Groundwater Licences	21
1.4.2	GCAA Requirements.....	24
1.5	Consultation.....	24
1.5.1	Consultation with Internal (Mt Owen Glendell) Stakeholders	24
1.5.2	Consultation with External Stakeholders	24
2	Planning.....	26
2.1	Catchment Context	26
2.2	Water Management Strategy.....	26
2.2.1	Clean Water Management.....	28
2.2.2	Dirty Water Management.....	28
2.2.3	Mine Water Management	28
3	Implementation	29
3.1	Water Management System	29
3.2	Water Management Infrastructure	42
3.3	Regional Water Impacts Management Protocol	42
3.3.1	Cumulative Impacts.....	42
3.3.2	Water Sharing	42
3.3.3	Coordination of water quality monitoring.....	42
3.3.4	Joint investigations	43
3.4	Site Water Balance	43
3.4.1	Water Sources	43
3.4.1.1	Runoff from Mining Disturbance (Mine Water).....	43
3.4.1.2	Sedimentation Dams (Dirty Water).....	44
3.4.1.3	Imported water via the GRAWTS (Mine Water)	46
3.4.1.4	Water Extracted from Glennies Creek (Clean Water)	46
3.4.1.5	Groundwater Inflows (Mine Water)	46
3.4.2	Water Use and Management.....	46
3.4.2.1	CHPP	46
3.4.2.2	Tailings Water.....	46
3.4.2.3	Dust Suppression.....	47
3.4.2.4	Potable Water Usage	47
3.4.2.5	Wastewater Effluent Disposal	47
3.4.3	Discharges	47
3.4.4	Off Site Water Transfers.....	47
3.4.5	Water Balance Predictions	48

3.4.6	Security of Supply	49
3.4.7	Net Harvestable rights	50
3.4.8	Decommissioning and Final Landform	50
3.5	Site Salt Balance	50
3.5.1	Saline Material	51
3.5.2	Saline Water	51
3.5.3	Salt Balance Predictions	52
3.6	Training and Communication	54
4	Measurement and Evaluation	55
4.1	Monitoring and Maintenance Requirements	55
4.1.1	Water and Salt Balance	55
4.1.2	Groundwater Inflows to Mining Pits	55
4.1.3	Water Structure Inspections	55
4.1.4	Water Monitoring	55
4.1.5	Complaints	55
5	Review and Improvement	57
5.1	Reporting	57
5.1.1	Annual Review	57
5.1.2	Incidents	57
5.2	Plan Review	58
5.3	Validation of Predictions	58
6	Commitments	59
7	Accountabilities	61
8	Definitions	62
9	Document Information	63
9.1	Relevant Legislation	63
9.2	Related Documents	63
9.3	Reference Information	64
9.4	Change Information	65
Appendix A - Water Management Plan Consultation		66
Appendix B - Water Management Plan Approval		68
Appendix C - Conceptual Final Landform Water Management System		69

1 Commitment and Policy

1.1 Background

Mt Owen Glendell Operations (MGO) is located in the Hunter Valley of NSW. Current and approved operations within MGO consist of Mt Owen Mine (including the North Pit Continuation and Bayswater North Pit (BNP)) and Glendell Mine. Mining operations at MGO include the integrated use of the Mt Owen coal handling and preparation plant (CHPP), coal stockpiles and rail load-out facility.

MGO comprises land within the catchments of Swamp Creek, Yorks Creek, Bowmans Creek, Main Creek and Bettys Creek. Both Swamp Creek and Bettys Creek flow in a southerly direction into Bowmans Creek which discharges into the Hunter River. The upper reaches of Swamp Creek have been diverted into Yorks Creek to the west of MGO as part of the mine development. The upper reaches of Bettys creek have been diverted into Main Creek to the east of MGO under existing licences from the Department of Primary Industries – Water (DPI – Water; refer to **Figure 1-2**)

Three modifications have been approved to SSD-5850. Modification 1 (MOD 1) facilitated the construction of a water pipeline to convey mine water from Integra Underground Mine to MGO and was granted on 15 September 2017. Modification 2 (MOD 2) approved an extension to the mining area at North Pit to enable access to an additional approximately 35 Mt of ROM coal. MOD 2 also approved an extension of the Mount Owen Mine life by an additional 6 years to 2037 and was granted on 6 September 2019. Modification 3 (MOD 3) was approved on 30 January 2020 and was an administrative Mod to include a land parcel within the Schedule of Lands. A modification of DA 80/952 (GLD MOD 4) was approved by the Department of Planning Industry and Environment (DPIE) on 4 March 2020 for Glendell Mine. The modification allows for a minor extension to the approved pit shell in order to access an additional 1.97 million tonnes run of mine (Mt ROM) coal from the Barrett Pit and access via a western haul roadunder the current approval which expires 30 June 2024.

MGO manage water through an integrated Water Management Plan (WMP). In addition to this, MGO is an integral part of the Greater Ravensworth Area Water and Tailings System (GRAWTS) with the adjacent Glencore mining operations, including Ravensworth Complex, Liddell Coal Operations and Integra Underground Mine. The GRAWTS allows greater flexibility in mine water management by the MGO.

1.2 Scope

This WMP provides a framework for the management of water on-site at MGO. The WMP is one of a series of Environmental Management Plans that together form the Environmental Management System for MGO (refer to **Figure 1-1**).

The WMP outlines:

- the water management strategy;
- detailed performance criteria;
- the MGO water balance; and
- the MGO salt balance.

The WMP should also be read in conjunction with the following plans:

- Erosion and Sediment Control Plan;
- Surface Water Management and Monitoring Plan;

- Groundwater Management and Monitoring Plan;
- Surface and Groundwater Response Plan; and
- Creek Diversions Plan.

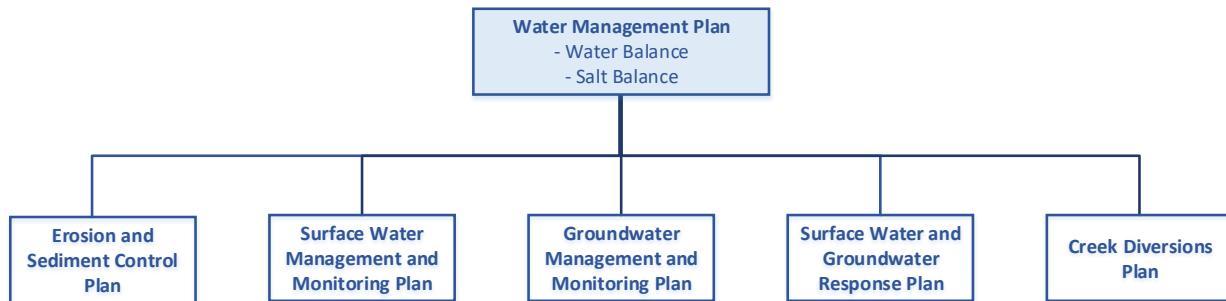


Figure 1-1 – MGO Water Management Plan Structure

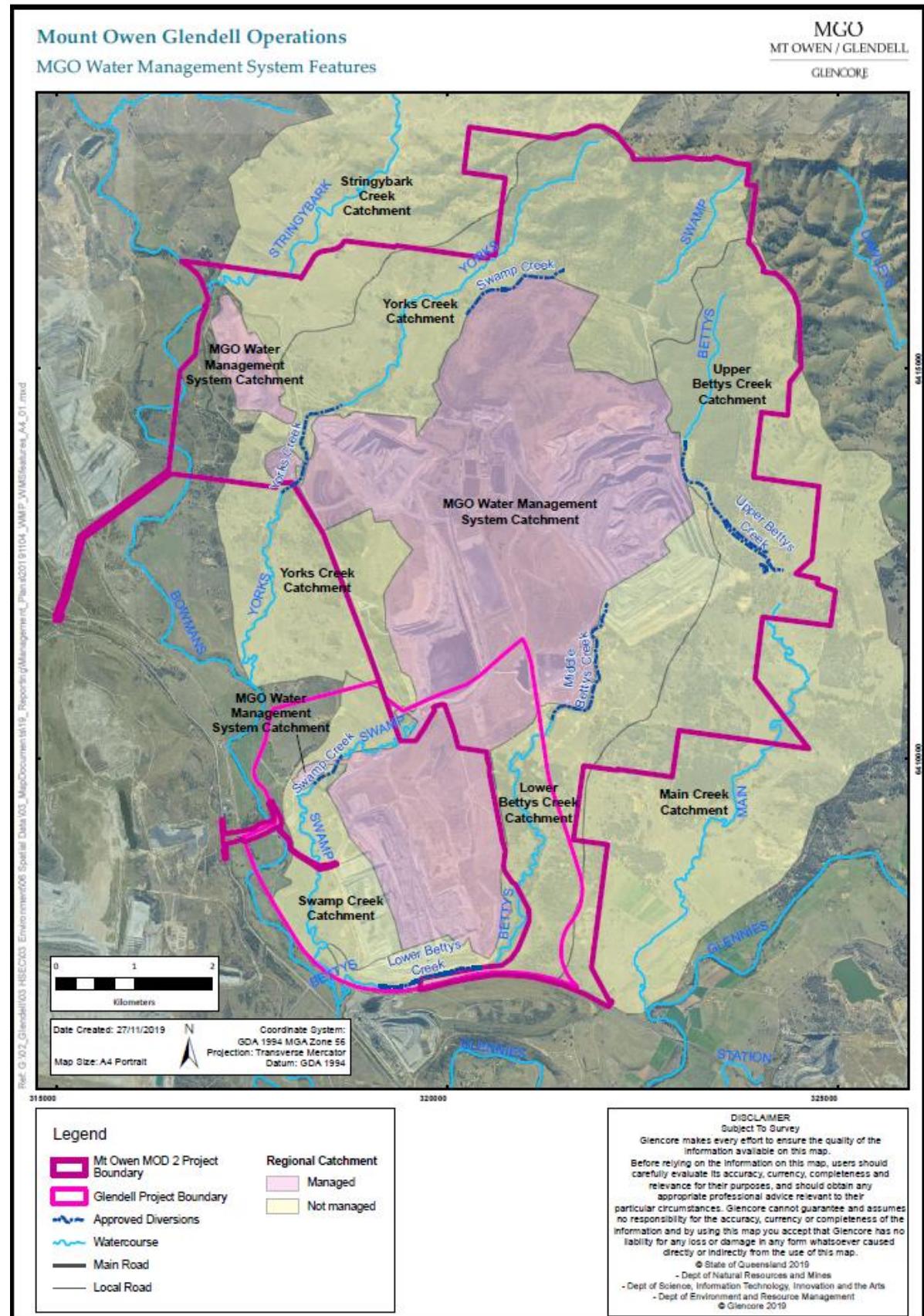


Figure 1-2 – MGO Water Management System Features

1.3 Objectives of the Water Management Plan

MGO has an extensive water management system (WMS), which includes mine dewatering systems, creek diversions, water storages, sediment dams, tailings ponds, pumps and pipeline infrastructure, drains and earthen bunding around stockpiles, hardstand areas, haul roads and refuelling areas.

The objectives of the MGO WMP and functions of the WMS are to:

- satisfy regulatory requirements, including meeting required performance criteria;
- divert clean water around mining operations to minimise capture of upslope runoff and separate clean water runoff from mining activities;
- 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 WMS and within the GRAWTS to reduce reliance on raw/clean water (that is, extraction from Glennies Creek); and
- minimise adverse effects on downstream waterways (including hydraulic and water quality impacts).

1.4 Requirements of the Water Management Plan

1.4.1 Statutory Requirements

1.4.1.1 Development Consents

Both the Mt Owen Mine (SSD-5850) and Glendell Mine (DA 80/952) development approvals stipulate requirements related to this WMP (refer to **Table 1-1**). Water management performance measures are specified by Mt Owen Mine SSD-5850 Schedule 3, Condition 25, which are listed in **Table 1-2**. Approval conditions associated with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2013/6978) are listed in **Table 1-3**. The Statements of Commitments for the Mt Owen Mine and Glendell Mine development approvals are provided in **Table 1-4** and **Table 1-5** respectively.

1.4.1.2 Environment Protection Licences

Condition L1.1 of Environment Protection Licence (EPL) 4460 (Mt Owen Mine and Ravensworth East) and EPL 12840 (Glendell Mine) requires compliance with Section 120 of the *Protection of the Environment Operations Act 1997* (POEO Act), which prohibits pollution of waters. The implementation of the management measures outlined in **Section 3** of this Plan facilitates achievement of this.

Table 1-1 – Relevant Development Consent Conditions

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
21	–	<p>The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of operations on site to match its available water supply.</p> <p><i>Note:</i></p> <ul style="list-style-type: none"> • <i>Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain all necessary water licences for the development prior to water take occurring.</i> • <i>The Applicant should consult with DPIE Water regarding the licensing requirements for the final landform and any associated impacts on the Bowmans Creek and Glennies Creek catchments.</i> 	<p>Section 1.4.1.3</p> <p>Section 3.4</p>
22	–	<p>The Applicant must provide a compensatory water supply to any landowner of privately-owned land whose rightful water supply is adversely and directly impacted (other than a negligible impact) as a result of the development, in consultation with DPIE Water, and to the satisfaction of the Secretary.</p> <p>The compensatory water supply measures must provide an alternative long term supply of water that is equivalent, in quality and volume, to the loss attributable to the development.</p> <p>Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner.</p> <p>If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.</p> <p>If the Applicant is unable to provide an alternative long term supply of water, then the Applicant must provide compensation to the satisfaction of the Secretary.</p> <p><i>Note: The Water Management Plan (see condition 26) is required to include trigger levels for investigating potentially adverse impacts on water supplies.</i></p>	<p>Surface and Groundwater Response Plan</p>
23	–	<p>Unless an EPL or the EPA authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.</p> <p><i>Notes:</i></p> <ul style="list-style-type: none"> • <i>The Applicant is required to obtain any necessary approvals or licences under the EP&A Act, POEO Act and/or Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002 prior to discharging water or tailings off-site via the GRAWTS.</i> • <i>The Applicant is required to comply with the relevant provisions of the POEO Act in relation to any unauthorised discharges.</i> 	<p>Section 1.4.1.2</p>

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
24	–	The Applicant must construct, maintain and rehabilitate any approved creek diversions associated with the development, including the diversions of Bettys Creek around the Eastern Rail Pit and into Main Creek, to the satisfaction of the Secretary.	Creek Diversion Plan
25	–	The Applicant must comply with the performance measures in Table 8.	Table 1-2
26	–	The Applicant must prepare a Water Management Plan for the development. This plan must:	Entire document
26 (a)	–	be prepared in consultation with DPIE Water and EPA, and submitted to the Secretary for approval prior to the commencement of development under this consent, unless the Secretary agrees otherwise;	Section 1.5.2
26 (b)	–	include detailed performance criteria and describe measures to ensure that the Applicant complies with the water management performance measures (see Table 8);	Table 1-2
26 (c) (i)	–	include a <u>Water Balance</u> that:	Section 3.4
26 (c) (i)	–	<ul style="list-style-type: none"> • includes details of: <ul style="list-style-type: none"> - sources and security of water supply, including contingency planning for future reporting periods; 	Section 3.4.1 Section 3.4.6
26 (c) (i)	–	<ul style="list-style-type: none"> - water use and management on site; 	Section 3.4.2
26 (c) (i)	–	<ul style="list-style-type: none"> - any off-site water transfers; and 	Section 3.4.3
26 (c) (i)	–	<ul style="list-style-type: none"> - reporting procedures, including the preparation of a site water balance for each calendar year; and 	Section 3.4 Section 5.1.1
26 (c) (i)	–	<ul style="list-style-type: none"> • describes the measures that would be implemented to minimise clean water use by the development; 	Section 3.4.2
26 (c) (ii)	–	include a <u>Salt Balance</u> that:	Section 3.5
26 (c) (ii)	–	<ul style="list-style-type: none"> • includes details of: <ul style="list-style-type: none"> - sources of saline material on the site; 	Section 3.5.1
26 (c) (ii)	–	<ul style="list-style-type: none"> - saline material and saline water management on site; and 	Section 3.4.3 Section 3.4.4 Section 3.5.1 Section 3.5.2

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
26 (c) (ii)	–	<ul style="list-style-type: none"> - reporting procedures, including the preparation of a salt balance for each calendar year; 	Section 3.5
26 (c) (iii)	–	<p>include an <u>Erosion and Sediment Control Plan</u>, that:</p> <ul style="list-style-type: none"> • is consistent with the requirements of <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries</i>, or its latest version; • identifies activities that could cause soil erosion, generate sediment or affect flooding; • describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; • describes the location, function, and capacity of erosion and sediment control structures and flood management structures; and • describes what measures would be implemented to maintain the structures over time; 	Erosion and Sediment Control Plan
26 (c) (iv)	–	<p>include a <u>Surface Water Management Plan</u>, that includes:</p> <ul style="list-style-type: none"> • relevant baseline data on channel stability, water flows and water quality in the sections and parts of creeks, rivers and waterbodies that are likely to experience a greater than negligible impact as a result of the development; • a detailed description of the water management system on site; • a description of measures used to manage, monitor and report on the transfer of water and/or tailings under the GRAWTS; • an appropriately detailed description of the flood warning signage and flood conveyance measures to be installed along Hebden Road; • appropriately detailed plans, design objectives and performance criteria for: <ul style="list-style-type: none"> - the Hebden Road realignment and upgrade works (including the construction of a new bridge over Bowmans Creek); - construction of an additional rail line and rail bridge crossing over Bettys Creek; - any approved creek diversions associated with the development; - any restoration works to be undertaken on creeks impacted by the development; - sediment and mine water dams; 	Surface Water Management and Monitoring Plan Surface and Groundwater Response Plan Creek Diversion Plan

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
		<ul style="list-style-type: none"> - the small height flood levee and proposed modifications to Dams 5 and 6 described in SEE (Mod 2); - the remediation of the dirty-water dam near Hebden Road, prior to its use as an offline flow detention area for Yorks Creek; - emplacement of tailings, acid forming and potentially acid forming materials, and saline and sodic materials; - re-establishment of free draining second and third order creeks, and their associated catchments, in the final post-mining landform; and - any final voids for the development (see the Rehabilitation Objectives in Table 10); • surface water performance criteria, including trigger levels for investigating any potentially adverse impacts, for the following: <ul style="list-style-type: none"> - the water management system, including mine water storages and sediment dams; - surface water user supplies; - downstream surface water quality; - downstream flooding impacts; and - stream and riparian vegetation health; • a program to monitor and report on: <ul style="list-style-type: none"> - the effectiveness of the water management system; - impacts on downstream water users (that are not negligible); - surface water flows and quality, as well as stream and riparian vegetation health in the watercourses that are likely to experience a greater than negligible impact as a result of the development; <ul style="list-style-type: none"> - acid forming and potential acid forming materials, incorporating the recommendations in Appendix 11 of SEE (Mod 2); and - downstream flooding impacts; and • a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the development; 	
26 (c) (v)	-	<ul style="list-style-type: none"> include a <u>Groundwater Management Plan</u>, that includes: <ul style="list-style-type: none"> • relevant baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that are likely to experience a greater than negligible impact as a result of the development; 	Groundwater Management and Monitoring Plan

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
		<ul style="list-style-type: none"> • a detailed description of the groundwater management system on site; • appropriately detailed plans, design objectives and performance criteria, for: <ul style="list-style-type: none"> - emplacement of tailings, acid forming and potentially acid forming materials, and saline and sodic materials; - any final voids for the development (see the Rehabilitation Objectives in Table 10); • groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts, for the following: <ul style="list-style-type: none"> - Main Creek, Glennies Creek, Bettys Creek, York Creek, Swamp Creek and Bowmans Creek alluvial aquifers and the Permian hard rock aquifer; - groundwater user bores; - groundwater inflows to the mining operations; - seepage/leachate from water storages, emplacements, backfilled voids and final voids; and - groundwater dependent ecosystems; • a program to monitor and report on: <ul style="list-style-type: none"> - groundwater inflows to the mining pits; - seepage/leachate from water storages, emplacements, backfilled voids and final voids; - background changes in groundwater yield/quality against mine-induced changes; - impacts of the development on: <ul style="list-style-type: none"> - regional and local (including alluvial) aquifers; - groundwater supply of potentially affected landowners; - groundwater dependent ecosystems and riparian vegetation; • a Trigger Action Response Plan to respond to any exceedances of the groundwater assessment criteria, and mitigate any adverse groundwater impacts of the development (including a protocol to install a low permeability barrier in the event that the Main Creek alluvial aquifer is intercepted or a significant decline in alluvial water levels is detected which may be attributable to mining operations); and • consideration of the cumulative groundwater interactions of the development and other nearby mines, including the Glendell Mine and Integra Underground Mine; 	<p>Surface and Groundwater Response Plan</p>

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
26 (c) (vi)	–	a program to periodically validate the water balance, salt balance, surface water take and groundwater model for the development, and compare monitoring results with modelled predictions, unless otherwise agreed by the Secretary;	Section 3.5
26 (c) (vii)	–	a protocol to report on the measures, monitoring results and performance criteria identified above, in the annual review referred to in condition 5 of Schedule 5; and	Section 5.1.1
26 (c) (viii)	–	<p>a protocol that has been prepared, using all reasonable endeavours, in consultation with the owners of any nearby mines (including the Glendell, Liddell, Ravensworth Operations, Integra Underground and Rix's Creek North Mines) to:</p> <ul style="list-style-type: none"> minimise cumulative water quantity and quality impacts; review opportunities for water sharing between the mines; co-ordinate water quality monitoring programs where practicable; and undertake joint investigations/studies in relation to complaints/exceedances of trigger levels where cumulative impacts are considered likely. 	Section 3.3
–	25	The Applicant must only discharge mine water from the site in accordance with the provisions of an EPL or the <i>Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002</i> .	Section 3.4.3
–	29	The Applicant must prepare a Site Water Management Plan for the development to the satisfaction of the Secretary. This plan must:	Entire document
–	29 (a)	be prepared in consultation with EPA and DPIE Water by suitably qualified expert/s whose appointment/s have been approved by the Secretary;	Section 1.5.2
–	29 (b)	be submitted to the Secretary for approval by the end of April 2008; and	Section 1.5.2
–	29 (c)	<p>include:</p> <ul style="list-style-type: none"> a Bettys Creek and Swamp Creek Diversion Plan/s; 	Creek Diversion Plan
–	29 (c)	<ul style="list-style-type: none"> a Site Water Balance; 	Section 3.4
–	29 (c)	<ul style="list-style-type: none"> an Erosion and Sediment Control Plan; 	Erosion and Sediment Control Plan
–	29 (c)	<ul style="list-style-type: none"> a Surface Water Management and Monitoring Plan; 	Surface Water Management

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
			<i>and Monitoring Plan</i>
–	29 (c)	<ul style="list-style-type: none"> • a Ground Water Monitoring Program; and 	<i>Groundwater Management and Monitoring Plan</i>
–	29 (c)	<ul style="list-style-type: none"> • a Surface and Ground Water Response Plan. 	<i>Surface and Groundwater Response Plan</i>
–	30	<p>The Bettys Creek and Swamp Creek Diversion Plan/s must include:</p> <ul style="list-style-type: none"> (a) a vision statement for the creek relocation; (b) an assessment of the water quality, ecological, hydrological and geomorphic baseline conditions in the creek; (c) the detailed design specifications for the creek relocation; (d) a construction program for the creek relocation, describing how the work would be staged, and integrated with mining operations; (e) a revegetation program for the relocated creek using a range of suitable native species; (f) water quality, ecological, hydrological and geomorphic performance and completion criteria for the creek relocation based on the assessment of baseline conditions; and (g) a program to monitor and maintain the water quality, ecological, hydrological and geomorphic integrity of the creek relocation. 	<i>Creek Diversion Plan</i>
–	31	The Site Water Balance must:	Section 3.4
–	31 (a)	<p>include details of:</p> <ul style="list-style-type: none"> • sources and security of water supply; 	Section 3.4.1 Section 3.4.6
–	31 (a)	<ul style="list-style-type: none"> • water use on site; 	Section 3.4.2
–	31 (a)	<ul style="list-style-type: none"> • water management on site; 	Section 3.4.2 Section 3.4.3
–	31 (a)	<ul style="list-style-type: none"> • off-site water transfers; and 	Section 3.4.4
–	31 (b)	investigate and describe measures to minimise water use by the development.	Section 3.4.2

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
–	32	<p>The Erosion and Sediment Control Plan must:</p> <ul style="list-style-type: none"> (a) be consistent with the requirements of <i>Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries</i>, or its latest version; (b) identify activities that could cause soil erosion and generate sediment, including activities on waterfront land (within 40 metres of a watercourse); (c) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters; (d) describe the location, function and capacity of erosion and sediment control structures; and (e) describe what measures would be implemented to maintain these structures over time. 	<p>Erosion and Sediment Control Plan</p>
–	33	<p>The Surface Water Management and Monitoring Plan must include:</p> <ul style="list-style-type: none"> (a) detailed baseline data on surface water flows and quality in creeks and other waterbodies that could potentially be affected by the development; (b) surface water and stream health impact assessment criteria; (c) a program to monitor surface water flows, quality and impacts on water users (upstream and downstream of the development in Bettys Creek, Swamp Creek and Bowmans Creek); (d) a program to assess stream health conditions in Bettys Creek, Swamp Creek and Bowmans Creek; (e) a program to monitor channel stability in Bettys Creek, Swamp Creek and Bowmans Creek; and (f) reporting procedures for the results of the monitoring program. 	<p>Surface Water Management and Monitoring Plan</p>
–	34	<p>The Groundwater Monitoring Program must include:</p> <ul style="list-style-type: none"> (a) detailed baseline data, based on sound statistical analysis, to benchmark the pre-mining natural variation in groundwater levels, yield and quality (including privately-owned groundwater bores within the predicted drawdown impact zone); (b) groundwater impact assessment criteria (including for monitoring bores); (c) a program for accurately delineating the boundary of the Bettys Creek and Swamp Creek alluvial aquifers in any areas intersected by mining; (d) a program to monitor: 	<p>Groundwater Management and Monitoring Plan</p>

Mt Owen Continued Operations (SSD-5850, Schedule 3)	Glendell Mine (DA 80/952, Schedule 3)	Condition	Relevant Section of Plan
		<ul style="list-style-type: none"> impacts on the groundwater supply of potentially affected landowners; impacts on the Bettys Creek and Swamp Creek alluvial aquifers; connectivity and groundwater leakage to/from Bettys Creek and Swamp Creek following diversion; impacts on groundwater dependent ecosystems and riparian vegetation; the volume of groundwater levels and quality in the alluvial, coal seam, ad overburden/interburden aquifers; and the groundwater pressure response in the surrounding coal measures; <p>(e) procedures for the verification of the groundwater model; and</p> <p>(f) reporting procedures for the results of the monitoring program and model verification.</p>	
–	35	<p>The Surface and Ground Water Response Plan must include:</p> <p>(a) a protocol for the investigation, notification and mitigation of any exceedances of the surface water, stream health and groundwater impact assessment criteria;</p> <p>(b) measures to mitigate and/or compensate potentially affected landowners for the loss of surface water flows in Bettys Creek, Swamp Creek and Bowmans Creek downstream of the development;</p> <p>(c) measures to minimise, prevent or offset groundwater leakage from the Bettys Creek and Swamp Creek alluvial aquifers;</p> <p>(d) measures to mitigate any direct hydraulic connection between the backfilled open cuts and the Bettys Creek and Swamp Creek alluvium if the potential for adverse impacts is detected; and</p> <p>(e) the procedures that would be followed if any unforeseen impacts are detected during the development.</p>	<p>Surface and Groundwater Response Plan</p>

Table 1-2 – Water Management Performance Measures

Feature	Performance Measure	Relevant Section of Plan
Water management – General	<ul style="list-style-type: none"> Minimise the use of clean water on site Minimise the need for make-up water from external supplies (other than the Greater Ravensworth Water Sharing Scheme) 	<p>Section 2.2</p> <p>Section 3.4.2</p>

Feature	Performance Measure	Relevant Section of Plan
Main, Glennies and Bowmans Creek alluvial aquifers	<ul style="list-style-type: none"> Negligible environmental consequences to the alluvial aquifer as a result of the development, including: <ul style="list-style-type: none"> - negligible change in groundwater levels; - negligible change in groundwater quality; and - negligible impact to other groundwater users, <p>beyond those predicted in the documents listed in condition 2(a) of Schedule 2</p>	Groundwater Management and Monitoring Plan
Construction and operation of infrastructure	<ul style="list-style-type: none"> Design, install and maintain erosion and sediment controls generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1</i>, <i>Volume 2A – Installation of Services</i>, <i>Volume 2C – Unsealed Roads</i>, <i>Volume 2D – Main Road Construction</i> and <i>Volume 2E Mines and Quarries</i> Design, install and maintain any infrastructure within 40 metres of watercourses generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land (2007)</i>, or its latest version Design, install and maintain any creek crossings generally in accordance with the <i>Policy and Guidelines for Fish Friendly Waterway Crossings (NSW Fisheries 2003)</i> and <i>Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003)</i>, or their latest versions 	Section 2.2.2 & 2.2.3 Erosion and Sediment Control Plan Surface Water Management and Monitoring Plan
Clean water diversion and storage infrastructure	<ul style="list-style-type: none"> Design, install and maintain the clean water system to convey the 100 year, 24 hour average recurrence interval (ARI) event Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site 	Surface Water Management and Monitoring Plan
Sediment dams	<ul style="list-style-type: none"> Design, install and maintain the dams generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries</i> 	Surface Water Management and Monitoring Plan
Mine water storages	<ul style="list-style-type: none"> Design, install and maintain mine water storage infrastructure to ensure no discharge of mine water to the off-site environment On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and maintained (including to minimise permeability) Ensure adequate freeboards within all pit voids at all times to minimise the risk of discharge to surface waters 	Section 2.2.3 Section 3.1 Surface Water Management and Monitoring Plan
Tailings storages	<ul style="list-style-type: none"> Design and maintain tailings storage areas to encapsulate and prevent the movement of tailings seepage/leachate offsite 	Section 2.2.3
Overburden emplacements	<ul style="list-style-type: none"> Design, install and maintain emplacements to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material Design, install and maintain out-of-pit emplacements to prevent and/or manage long term saline groundwater seepage 	Section 2.2.3

Feature	Performance Measure	Relevant Section of Plan
Chemical and hydrocarbon storage	<ul style="list-style-type: none"> Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards 	Section 2.2.3
Creek realignment and restoration works	<ul style="list-style-type: none"> 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 	Creek Diversion Plan
Aquatic and riparian ecosystems	<ul style="list-style-type: none"> Develop site-specific in-stream water quality objectives in accordance with ANZECC (2000) and <i>Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures</i> (2006), or its latest version 	Surface Water Management and Monitoring Plan

Table 1-3 – EPBC Act 1999 Approval Conditions

Condition	Description	Relevant Section of Plan
1c	Implement environmental performance conditions 21, 23-26, 28, 31, and 43-45 of schedule 3 of the state development consent, where the conditions relate to avoiding, mitigating, managing, offsetting, monitoring or recording, or reporting on impacts to protected matters	Entire document
1d	Notify the Department in writing of any proposed change to the conditions of the state development consent referred to in Conditions 1a – 1c, within 14 days of formally proposing a change or becoming aware of any other proposed change.	Section 5.2
1e	Notify the Department in writing of any change to conditions of the state development consent referred to in Conditions 1a – 1c, within 14 days of a change to conditions being finalised.	Section 5.2
4	Unless otherwise agreed to in writing by the Minister, the person taking the action must publish all management plans and strategies required by conditions 26, 31, 43 and 45 of the state development consent on their website. Each management plan and strategy must be published on the website within 1 month of being approved by the Secretary.	Section 1.5.2
5	The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans and strategies required by conditions 26, 31, 43 and 45 of the state development consent, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval.	Section 4.1 Surface Water Management and Monitoring Plan Groundwater Management and Monitoring Plan
6	Within three months of every 12 month anniversary of the commencement of the action, the person taking the action must	Section 5.1.1

Condition	Description	Relevant Section of Plan
	publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans and strategies required by conditions 26, 31, 43 and 45 of the state development consent. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the Department at the same time as the compliance report is published. The person taking the action must continue to publish the report until such time as agreed in writing by the Minister.	
7	Any potential or actual contravention of the conditions of this approval, including contravention of a commitment made in a management plan or strategy required by conditions 26, 27, 31, 43 and 45 of the state development consent must be reported to the Department within 7 days of the person taking the action becoming aware of the actual or potential contravention.	Section 5.1.2

Table 1-4 – Statement of Commitments for Mt Owen Continued Operations

Commitment	Relevant Section of Plan
Mount Owen will continue to manage operations in accordance with the WMP, the EPL and the Hunter River Salinity Trading Scheme (HRSTS).	Entire document Surface Water Management and Monitoring Plan
•	
Erosion and sediment controls will be monitored during construction and operation in accordance with the Blue Book (Landcom 2004 and DECC 2008).	Erosion and Sediment Control Plan
As part of the water balance monitoring for the Mount Owen water management system, water imported to the site, water used on site and water discharged from site will be monitored in accordance with Water Reporting Requirements for Mines (NOW undated).	Section 4
Within 12 months of approval, the Surface Water Monitoring Plan will be revised to include a trigger for analysis of metal/metalloid concentration in sediment dam water should a significant change in pH be noted as part of the routine monitoring program.	Surface Water Management and Monitoring Plan
Monitoring and remediation of erosion within watercourses outside of the active mining and emplacement areas will continue to be managed as set out in the MGO Landscape Management Plan.	Erosion and Sediment Control Plan
Mount Owen will install a new monitoring point on Main Creek (MC3). Monitoring at MC3 will commence upon Project Approval. In addition, Mount Owen will continue to monitor water quality during HRSTS discharge events as set out in the EPL.	Surface Water Management and Monitoring Plan

Commitment	Relevant Section of Plan
Within 12 months of Project Approval, Trigger Action Response Plans (TARPs) will be developed (or where already present, revised) to deal with the unlikely eventuality that the Project impacts on water quality in all downstream creek systems (which have existing monitoring points located on it).	Surface Water and Groundwater Response Plan
Should a discharge point be required at the MGO, a variation to the EPL will be sought, subject to gaining relevant approvals at that time.	Discharge point not required
Mount Owen will operate the Project in accordance with the <i>Hunter Regulated River Water Sharing Plan 2004</i> for extractions from Glennies Creek.	Surface Water Management and Monitoring Plan
Mount Owen will continue to provide a summary of the surface water monitoring results as part of the Annual Review.	Section 5.1.1 Surface Water Management and Monitoring Plan
Mount Owen proposes to, within three years of Project Approval, review the MGO water balance and interactions with GRAWTS.	Section 3.4
Mount Owen will continue to undertake groundwater monitoring in accordance with the MGO Groundwater Monitoring Program. The MGO Groundwater Monitoring Program and Surface Water and Groundwater Response Plan will be updated within 12 months of Project Approval to include the additional management and monitoring requirements identified in the EIS and Section 2.5 of the Response to Submissions Report B including: monitoring requirements for both alluvial groundwater levels and ecological condition of vegetation communities potentially impacted by changes in alluvial groundwater levels (i.e. Bettys and Main Creeks). Monitoring will include both hard rock and alluvial aquifers and include the installation of additional piezometers in area of maximum predicted drawdown in Main Creek and Bettys Creek and the identification of triggers that may indicate greater than predicted impacts.	Groundwater Management and Monitoring Plan Surface Water and Groundwater Response Plan
TARPs will be developed for any unexpected impacts on groundwater systems as well as impacts on riparian vegetation.	Surface Water and Groundwater Response Plan
Mount Owen will continue to extract groundwater from hard rock aquifers that flow into the Mount Owen and Ravensworth East Mines under the existing Part 5 licences under the <i>Water Act 1912</i> .	Groundwater Management and Monitoring Plan
The results of groundwater monitoring will be subject to an annual review and reported in the MGO Annual Review. The groundwater model will be periodically updated and refined as additional data and monitoring results become available.	Section 5.1.1

Table 1-5 – Statement of Commitments for Glendell Mine

Commitment		Relevant Section of Plan
1.10.1	Design surface water controls to ensure that clean runoff is separated from runoff within disturbed mining and infrastructure areas. Design sediment and erosion controls to ensure any runoff from disturbed areas is appropriately treated.	Erosion and Sediment Control Plan
1.10.2	The proposed diversions of Swamp and Bettys Creeks will be designed and constructed in accordance with the conceptual designs developed in the water resources assessment.	Creek Diversion Plan
1.10.3	The Applicant will install cut off embankments along Bettys Creek to restrict alluvium inflows into the proposed pit area in accordance with the conceptual design developed in the water resources assessment.	Groundwater Management and Monitoring Plan
1.10.4	The Applicant will prepare a Groundwater Management Plan to detail the monitoring and management commitments relating to the Swamp Creek alluvial system, prior to mining occurring within this alluvial area.	Groundwater Management and Monitoring Plan
1.10.5	The Applicant will continue the groundwater monitoring at the existing groundwater monitoring locations within the alluvium of Swamp and Bettys Creek, aside from monitoring location NPz14 which will be impacted by the proposed Glendell operations.	Groundwater Management and Monitoring Plan
1.10.6	If groundwater monitoring indicates it is required, a barrier cut off wall within the alluvium associated with Swamp Creek will be constructed to limit groundwater seepage into the mine.	Groundwater Management and Monitoring Plan
1.10.7	The Applicant will extend its existing surface water monitoring program to include surface water monitoring to be undertaken at Glendell, as follows: <ul style="list-style-type: none"> two additional surface water monitoring locations on Bowmans Creek upstream and downstream of the confluence with Swamp and Bettys Creeks; two additional sites on Swamp Creek upstream and downstream of the proposed open cut pit; and two additional sites on Bettys Creek upstream and downstream of the open cut pit. 	Surface Water Management and Monitoring Plan

1.4.1.3 Surface Water and Groundwater Licences

MGO holds licences under the *Water Act 1912* for the operation of extraction and monitoring bores, which are summarised in **Table 1-6**. MGO also holds water access licences (WALs), water supply works and water use approvals under the *Water Management Act 2000* for extraction of water from Glennies Creek (Glennies Creek management zone, under the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*), and the diversions of Bettys and Swamp Creeks, which are summarised in **Table 1-7**. Specific details and requirements of these licences are presented in the **Surface Water and Groundwater Management and Monitoring Plans**.

Table 1-6 – Water Licences held by MGO under Water Act 1912

Licence Number	Licensed Activity
20BL169337	Groundwater extraction for dewatering of North Pit up to 140 ML/year
20BL170294	Groundwater extraction for dewatering purposes of Eastern Rail Pit up to 220 ML/year
20BL170295	Groundwater extraction for dewatering purposes of Ravensworth East pits up to 800 ML/year
20BL168209	Saline water extraction bore (Liddell Water Supply Bore)
20BL169544	Saline water extraction bore (Liddell Water Supply Bore)
20BL168116	Monitoring bore
20BL169332	Monitoring bore
20BL169333	Monitoring bore
20BL169334	Monitoring bore
20BL169335	Monitoring bore
20BL169336	Monitoring bore
20BL171534	Monitoring bore
20BL171535	Monitoring bore
20BL171536	Monitoring bore
20BL171537	Monitoring bore
20BL171538	Monitoring bore
20BL171539	Monitoring bore
20BL171540	Monitoring bore
20BL171541	Monitoring bore
20BL171542	Monitoring bore
20BL171543	Monitoring bore
20BL171544	Monitoring bore
20BL171545	Monitoring bore
20BL171546	Monitoring bore
20BL171547	Monitoring bore
20BL168116	Monitoring bore
20BL169332	Monitoring bore

Licence Number	Licensed Activity
20BL169333	Monitoring bore
20BL169334	Monitoring bore
20BL169335	Monitoring bore
20BL169336	Monitoring bore

Table 1-7 – Water Licences held by MGO under Water Management Act 2000

Licence Number	Approval Number	Licensed/Approved Activity
High Security Water Access Licences (Glennies Creek Management Zone)		
WAL7814 ¹	20WA200723	Licence to pump 1000 units
WAL704	20CA200608	Licence to pump 3 units
WAL1118	20CA201623	Licence to pump 3 units
WAL9521	20WA201228	Licence to pump 50 units
General Security Water Access Licences (Glennies Creek Management Zone)		
WAL612	20CA200382	Licence to pump 147 units
WAL613	20CA200390	Licence to pump 192 units
WAL637	20CA200445	Licence to pump 384 units
WAL705	20CA200608	Licence to pump 27 units
WAL1119	20CA201623	Licence to pump 60 units
WAL1215	20CA201862	Licence to pump 48 units
Supplementary Water Access Licences (Glennies Creek Management Zone)		
WAL1364	20CA201623	Licence to pump 2.2 units
WAL1420	20CA200382	Licence to pump 29 units
Domestic and Stock Licences (Glennies Creek Management Zone)		
WAL706	20CA200608	Licence to pump 8 units
WAL1218	20WA201868	Licence to pump 3 units
WAL7823	20WA201677	Licence to pump 9 units
WAL754	20WA200727	Licence to pump 16 units and middle diversion of Bettys Creek
WAL7817	20CA200779	Licence to pump 3 units

Licence Number	Approval Number	Licensed/Approved Activity
Unregulated River Licences (Jerrys Water Source)		
WAL18310	20WA210993	Licence to pump 200 units and upper diversion of Swamp Creek
Additional Water Supply Works Approvals (Jerrys Water Source)		
N/A	20WA211429	Diversion dam on Yorks Creek
N/A	20WA211425	Middle diversion of Swamp Creek
N/A	20WA211430	Lower diversion of Swamp Creek
N/A	20WA212187	Upper and middle diversion of Bettys Creek
N/A	20WA212660	Lower diversion of Bettys Creek

Note 1: WAL 7814 is a high security licence to pump 1,000 ML from Glennies Creek. MGO and Integra Underground (both owned by Glencore) will share the access rights under this licence in accordance with the requirements of DPI – Water.

1.4.2 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 which is critical to supporting operations. Water management planning assists in managing a number of aspects, such that:

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

1.5 Consultation

1.5.1 Consultation with Internal (Mt Owen Glendell) Stakeholders

This WMP has been reviewed by members of the Mt Owen Glendell Operations EMS Committee and endorsed at the meeting of 28 November 2016. Details of Training and Communication arrangements are outlined in **Section 3.6**.

1.5.2 Consultation with External Stakeholders

This document represents a revision of the originally approved MGO WMP, which was submitted to the then Department of Environment and Climate Change (DECC) and the then Department of Water and Energy in 2008.

The December 2016 revision of the WMP was prepared following approval of the Mt Owen Continued Operations SSD-5850 in consultation with DPE and DPI – Water. A copy of the consultation records is provided in **Appendix A**.

The Greater Ravensworth Area Water Sharing Scheme (GRAWSS), that includes the protocol described in **Section 3.3**, was prepared in consultation with the General Manager Northern Region Glencore and the Operations Managers of Ravensworth Operations, Liddell Coal Operations and Integra Underground. No formal consultation with neighbouring operations has been undertaken during the development of this WMP, however water supply agreements are currently in place with Rixs Creek North Mine and Ashton Coal Mine.

The final draft of the current revision of the WMP was submitted to Department of Planning and Environment (DP&E) in January 2017.

The WMP was updated following approval of MOCO MOD 2 and submitted to DPIE on 4 December 2019, following consultation with the EPA and DPIE – Water.

The approval of the plan by DPIE, however was put on hold in anticipation of impending approvals to Glendell MOD 4 and MOCO MOD3. Following the receipt of these approvals, the WMP has been reviewed and updated to incorporate these modifications. This has resulted in administrative changes only and therefore further consultation with external stakeholders is not considered necessary.

The revised WMP was submitted and approved by DPIE in September 2020. A copy of the most recent SWMMP approval is presented in **Appendix A** -

Version and revision history of this document is provided in **Section 9**

From November 2019, consultation records can be found on the DPIE major projects website.

2 Planning

2.1 Catchment Context

MGO is located within the catchments of Bowmans Creek and Glennies Creek. Both Bowmans Creek and Glennies Creek flow into the Hunter River to the south of the site. The Bowmans Creek catchment includes the sub-catchments of Stringybark Creek, Yorks Creek, Swamp Creek and Bettys Creek. The Glennies Creek catchment includes the sub-catchment of Main Creek. Bettys Creek has been the subject of three approved diversions known as the Upper, Middle and Lower Bettys Creek diversions. Both Yorks Creek and Swamp Creek have also been the subject of approved diversions (refer to **Creek Diversions Management Plan**).

2.2 Water Management Strategy

MGO categorises water into three types to effectively manage water across the complex and to mitigate any potential for environmental harm to occur. Each type of water requires different management measures to minimise the risk of contamination of downstream drainage systems. A description of the water quality and potential sources for the three categories of water are summarised in **Table 2-1**. Detailed performance criteria and associated TARPs are included in the Surface Water Management and Monitoring Plan and the Surface Water and Groundwater Response Plan respectively.

Table 2-1 – Water Categories and Design Criteria

Water Category	Description	Target Design Criteria
Clean Water	Runoff from undisturbed or rehabilitated areas where vegetation is fully established and where the water quality is suitable for release/discharge; and raw water imported under licence.	Release, where practicable, to downstream environment.
Dirty Water	Runoff from disturbed areas, such as active overburden emplacement areas or overburden emplacement areas where vegetation is not fully established. These areas have the potential for elevated suspended solids.	Managed in line with the Blue Book (Managing Urban Stormwater: Soils and Construction Volume 1 and Volume 2E).
Mine Water	Water exposed to coal or used in coal processing and runoff within Mining Infrastructure Areas. Mine water includes water associated with groundwater inflows into open cut pits. This water may be highly saline and/or contain pollutants such as hydrocarbons.	Contained for events up to and including the 1% AEP, 24 hour storm event (equivalent to the 100 year ARI, 24 hour storm event).

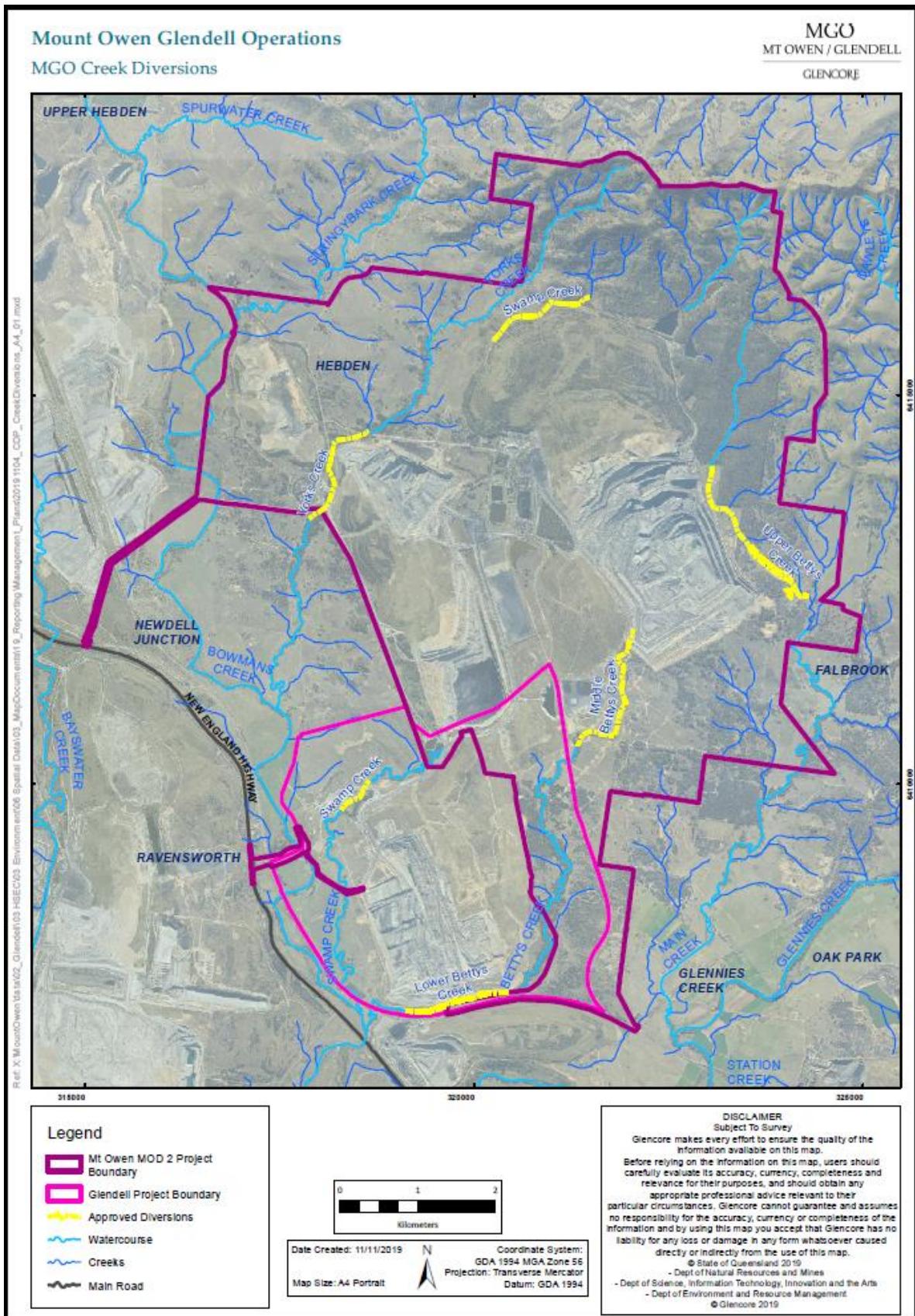


Figure 2-1 – MGO Creek Diversions

2.2.1 Clean Water Management

The clean WMS includes a series of diversion and catch drains and clean water dams around the perimeter of the operation in order to capture and maximise diversion of upstream catchment runoff away from active mining areas. Diversion drains will be sized to convey the 1% AEP, 24 hour storm event (equivalent to the 100 year ARI, 24 hour storm event) and will be constructed to enable design flow velocities to be non-scouring. Rock protection will be used where necessary to prevent erosion.

2.2.2 Dirty Water Management

Dirty water will be managed using a series of catch drains and sediment basins located to capture and manage runoff from disturbed areas. The dirty WMS is designed in general accordance with *Managing Urban Stormwater: Soils and Construction* including *Volume 1*, *Volume 2A – Installation of Services*, *Volume 2C – Unsealed Roads*, *Volume 2D – Main Road Construction* and *Volume 2E Mines and Quarries*; to manage runoff from the 5 day, 95th percentile rainfall event.

Further information on the management of dirty water is contained within the **MGO Erosion and Sediment Control Plan** and **Surface Water Management and Monitoring Plan**.

2.2.3 Mine Water Management

Mine water will be contained within the WMS in storages (including pit voids) suitably designed, installed and maintained to convey and contain runoff from the 1% AEP, 24 hour storm event (equivalent to the 100 year, 24 hour ARI storm event). The mine WMS is designed to minimise the risk of discharges of mine water to downstream watercourses.

Tailing storage areas will be suitably designed, installed and maintained to encapsulate and prevent the migrating of tailings seepage offsite. Overburden will be monitored for saline seepage as per the Surface Water Monitoring and Management Plan.

Water exposed to hydrocarbons within the pit-top facilities (mine infrastructure area) is treated by an oil-water separator. Any chemical and hydrocarbon products are stored in bunded areas in accordance with the relevant Australian Standards.

In conjunction with the approval of MOD 1, MGO is permitted to accept mine water from Integra Underground via pipeline. The construction of the pipeline will be in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2007) and ESC will be installed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004). Further information is found within the approved Mount Owen Complex Erosion and Sediment Control Management Plan.

3 Implementation

3.1 Water Management System

The key components of the MGO WMS are presented in **Figure 3.1** and are outlined in **Table 3-1** below. These include mine water storages, sediment dams and tailings storage facilities. The main changes to the WMS features planned are the progressive rehabilitation of the decommissioned tailings dams (Stage 2 Tailings Dam, TP1, ERP and RW Pit), the commissioning of BNP as void water storage following the completion of mining around 2023 and the progressive construction of various sediment dams as mining and rehabilitation progress. Decommissioned tailings dams will be managed for captured rainfall and catchment runoff.

Table 3-1 – MGO Water Management System Features

Dam Name	Status	Water Category	Capacity (ML)	Maximum Surface Area (ha)
Raw Water Dam (RWD)	Active	Mining	96	2.6
Environmental Control Dam (ECD)	Active	Mining	294	5.8
Rail Loop Dam (RLD)	Active	Mining	100	4.8
Fresh Water Dam (FWD)	Active	Clean	8	0.5
Western Rail Dam (WRD)	Active	Mining	449	4.8
Dam 22	Active	Mining	50	1.2
Dam 5	Active	Mining	14	2.0
Bayswater North Pit (BNP)	Commissioned as void storage in 2023 following completion of mining	Mining	Approximately 35,000 [^]	Approximately 60
West Pit	Active tailings void	Mining	Reduces as tailings are deposited	12.8
Stage 2 Tailings Dam	Decommissioned tailings dam	Mining	–	12.4
RW Pit	Decommissioned tailings dam	Mining	–	5.6
ERP	Decommissioned tailings dam	Mining	–	16.8
TP1	Decommissioned tailings dam	Mining	–	45.5
Industrial Dam	Active	Mining	10	0.3
Pollution Control Dam (PCD)	Active	Mining	1	0.1
Transfer Dam (TD)	Active	Mining	1	0.1
Dam 23	Active	Mining	4	0.5
Dam 24	Active	Mining	2	0.2
Sediment dams	Various	Dirty	Various	Various

[^] Estimated maximum storage capacity (i.e. volume of spill crest) of BNP.

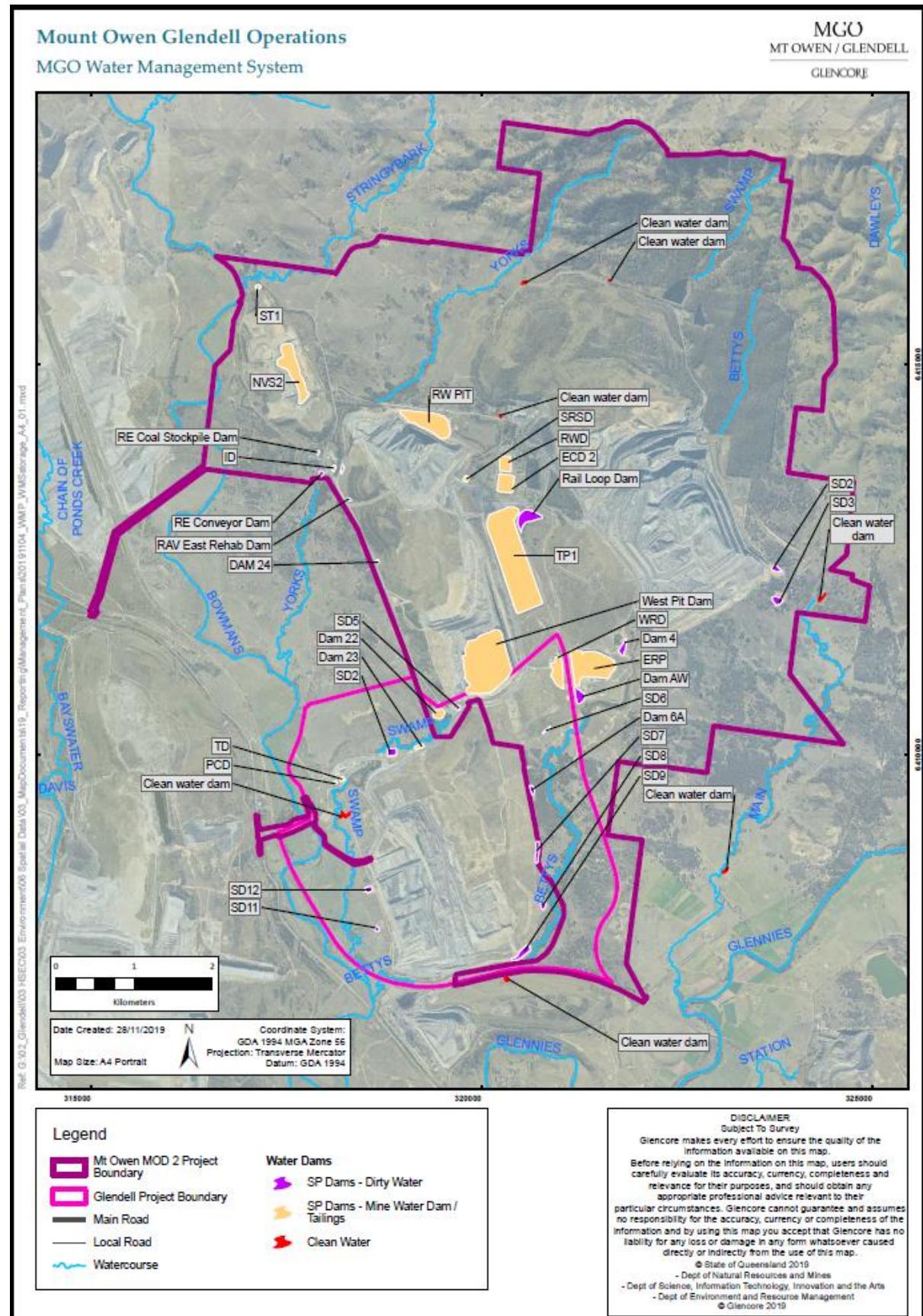
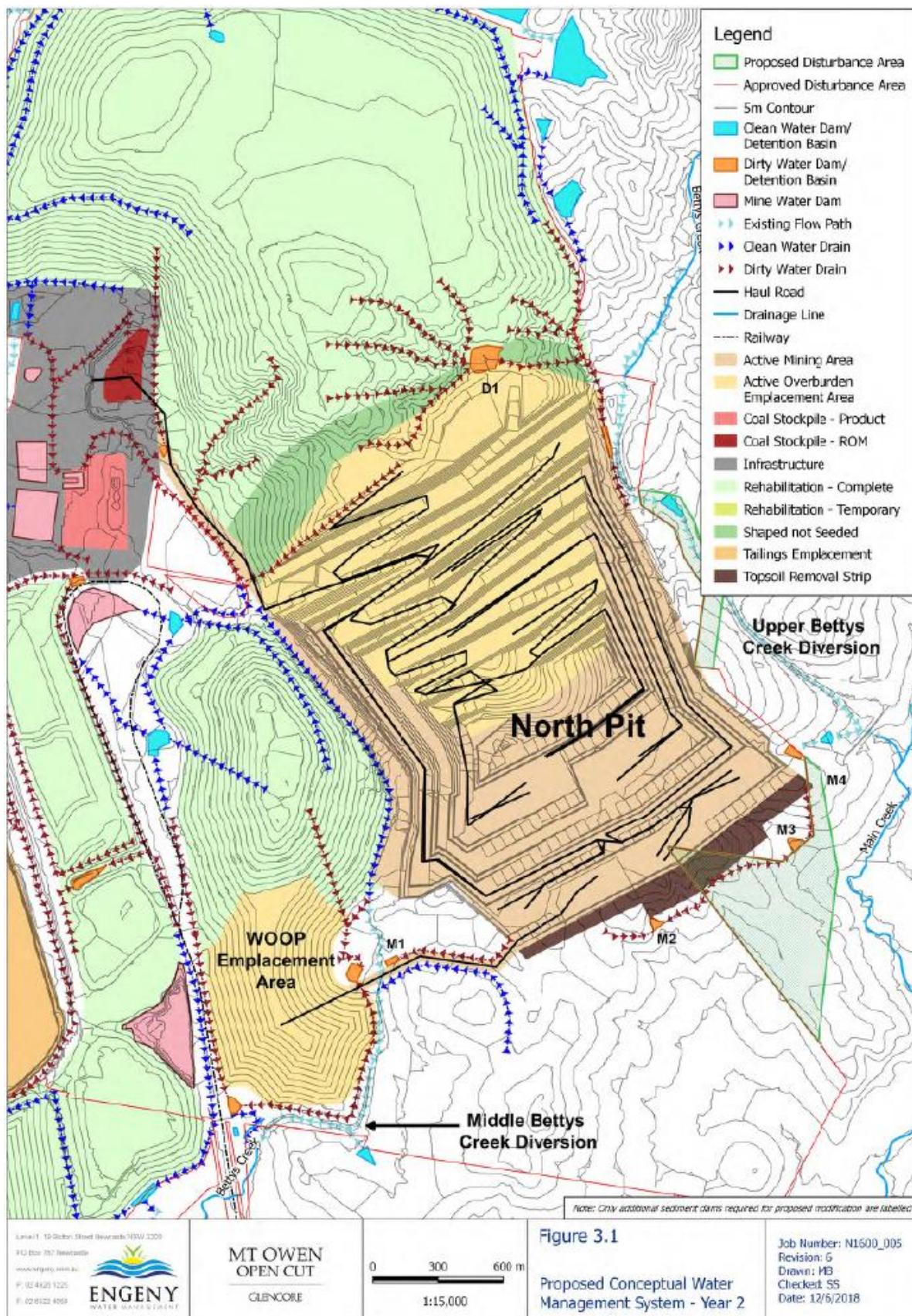


Figure 3-1 – MGO Water Management System

Conceptual water management system layouts were prepared to support the EIS/Approval Processes for the Mount Owen Continued Operations Project and the Glendell Mine Approval (refer to **Figures 3-2 to 3-4** and **3-5 to 3-7** respectively). These layouts provide a strategic overview of water management on site, actual water management may vary from what is proposed in these layouts.



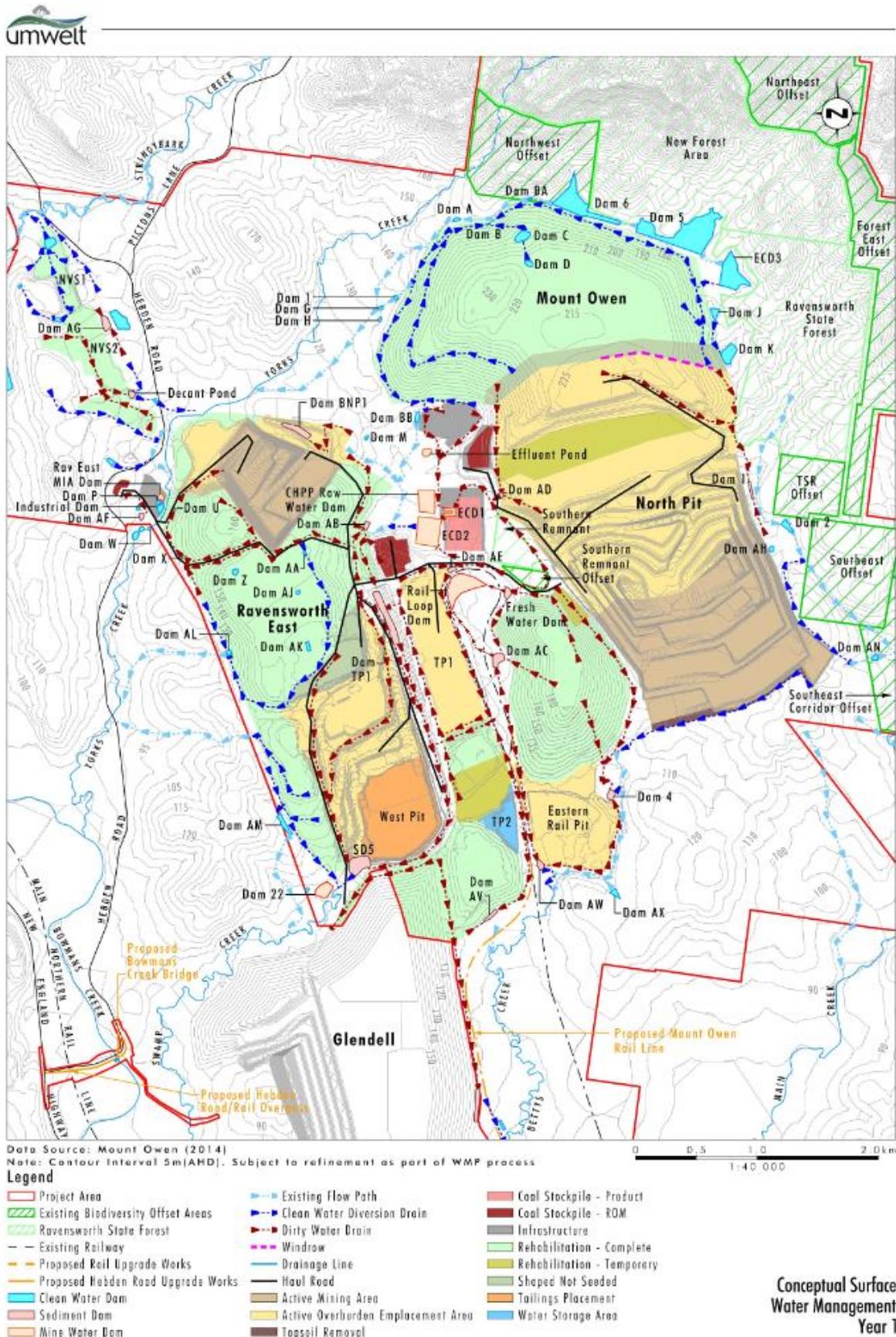


Figure 3-2 – Conceptual WMS – MGOO Project – Year 2 (2022)

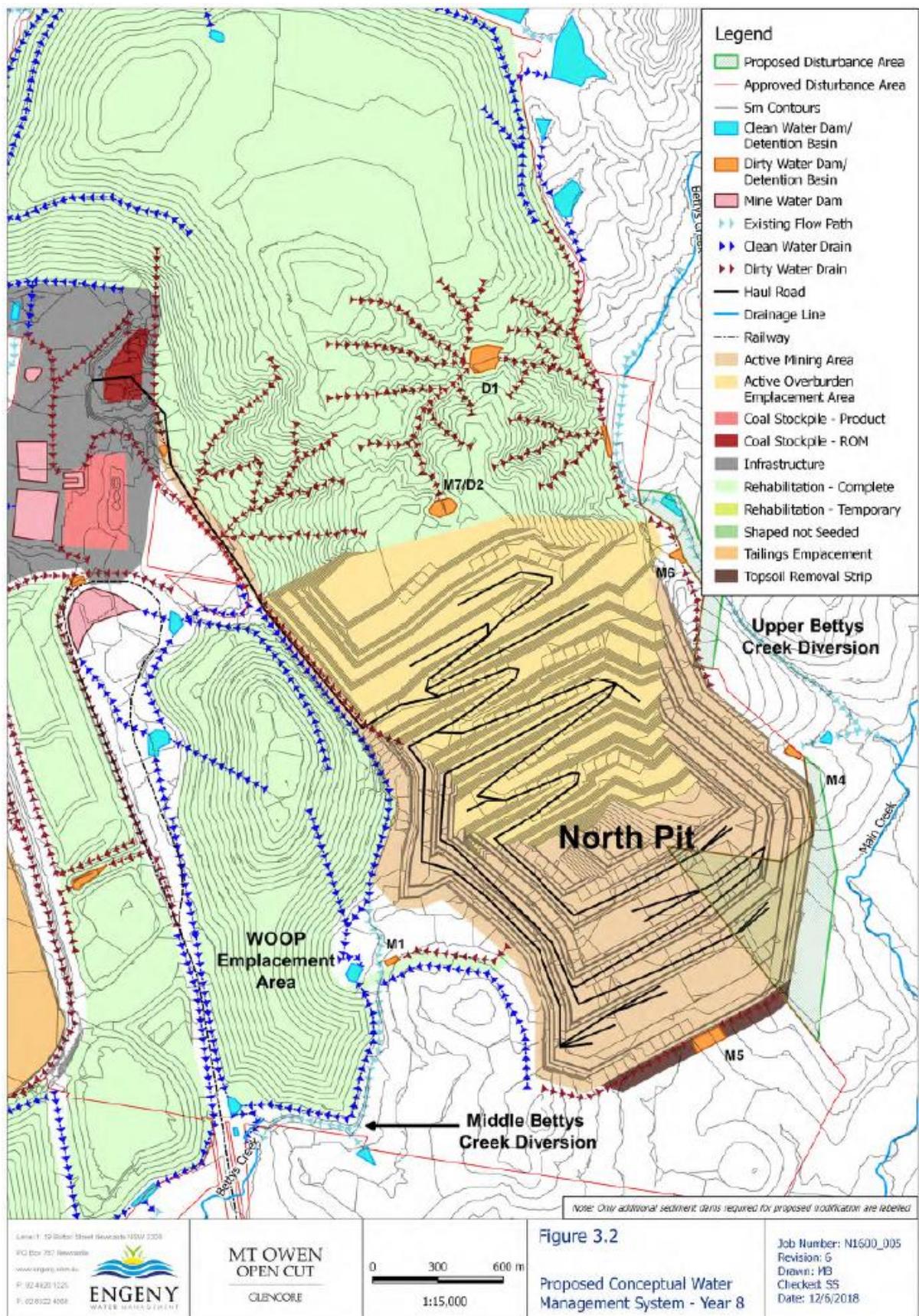
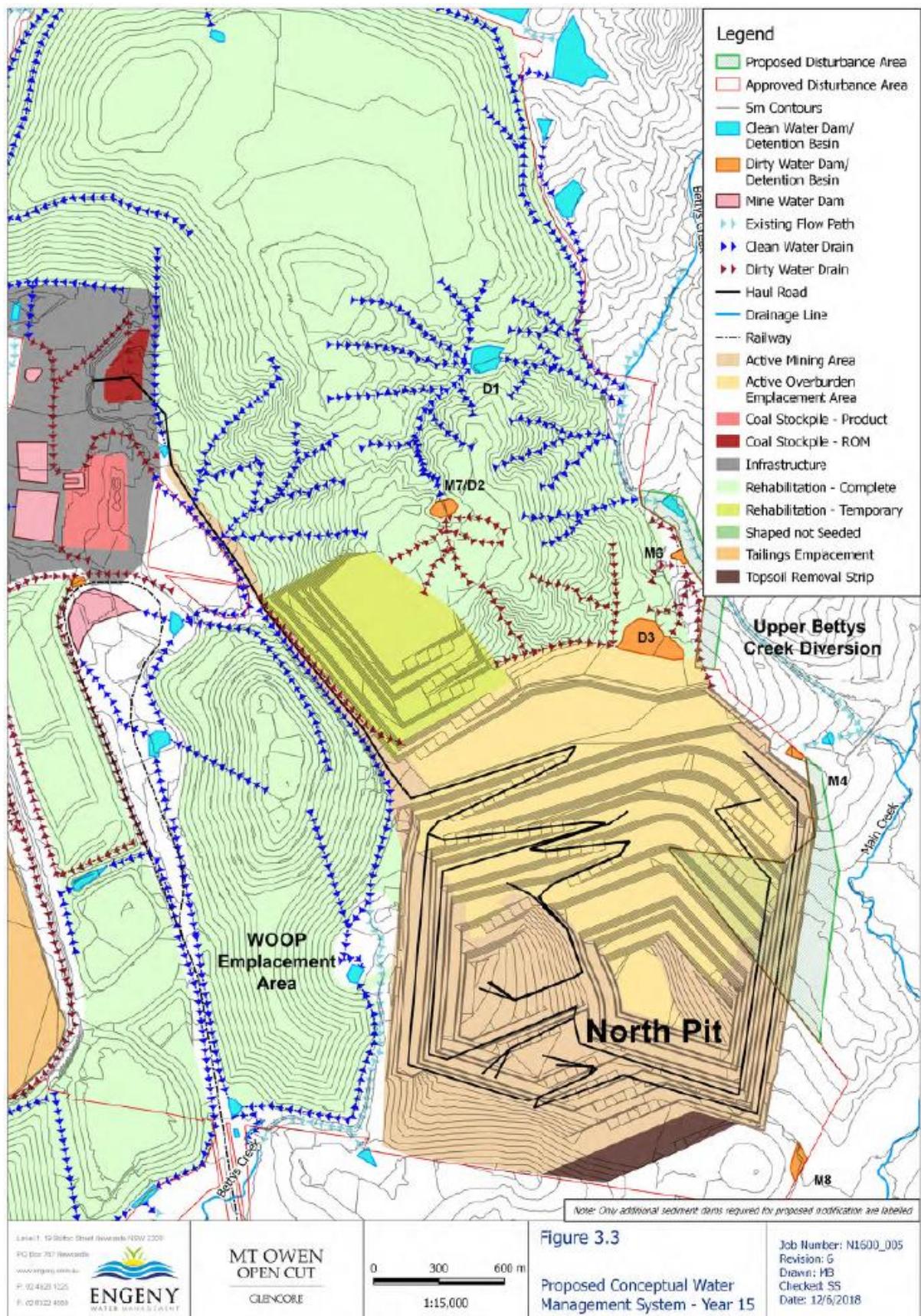


Figure 3-3 – Conceptual WMS – MGOO Project – Year 8 (2028)



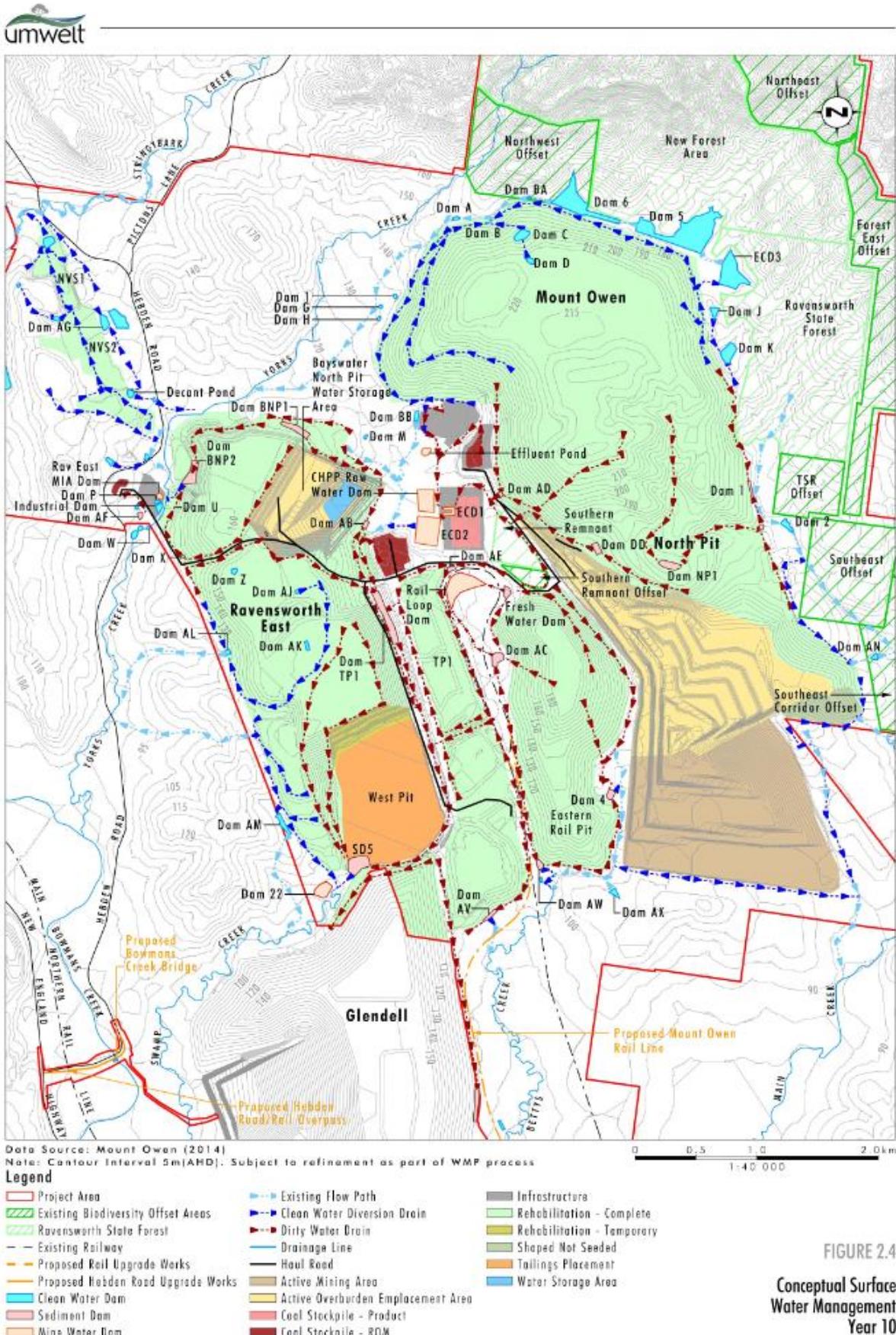
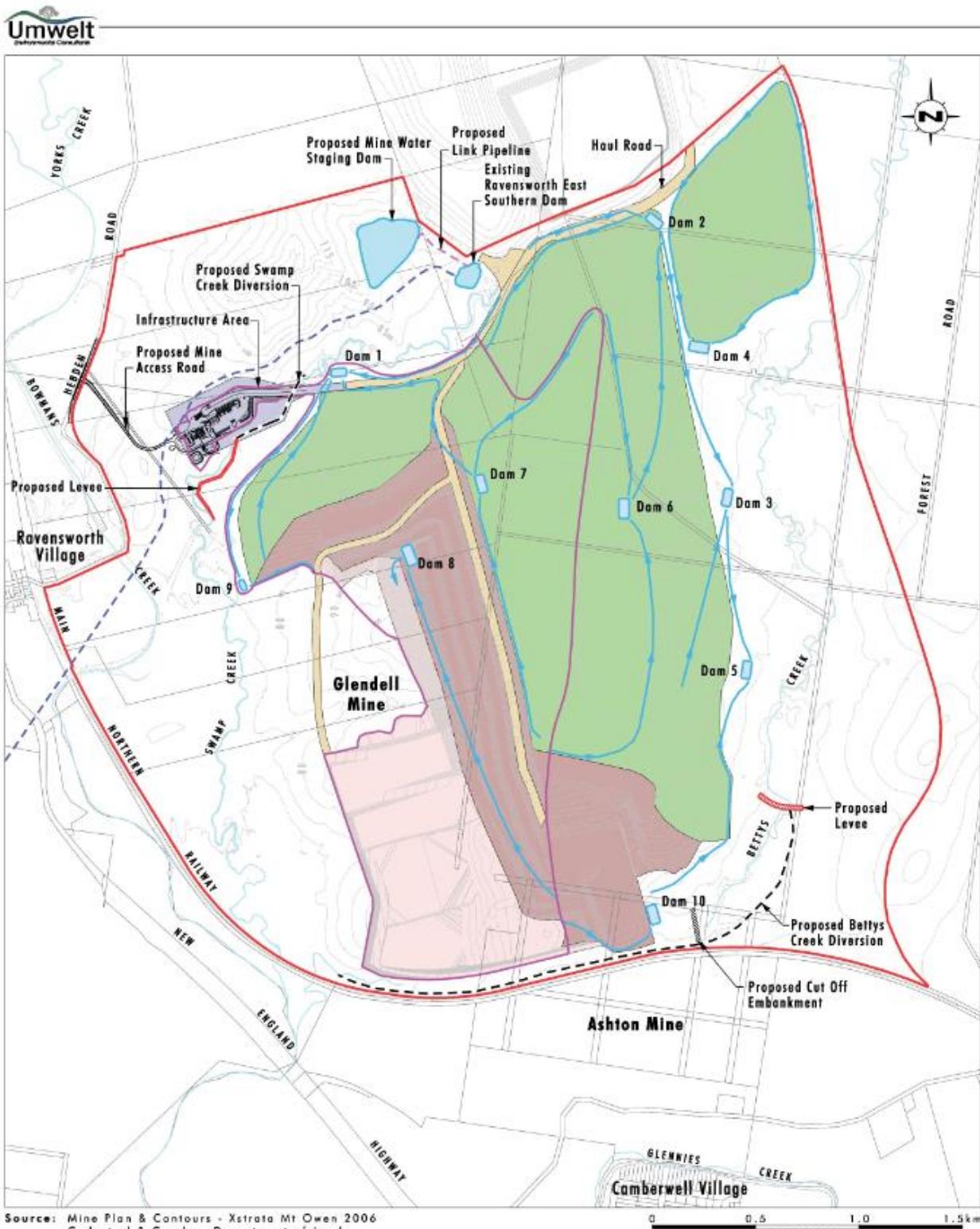


FIGURE 2.4 Conceptual Surface Water Management Year 10

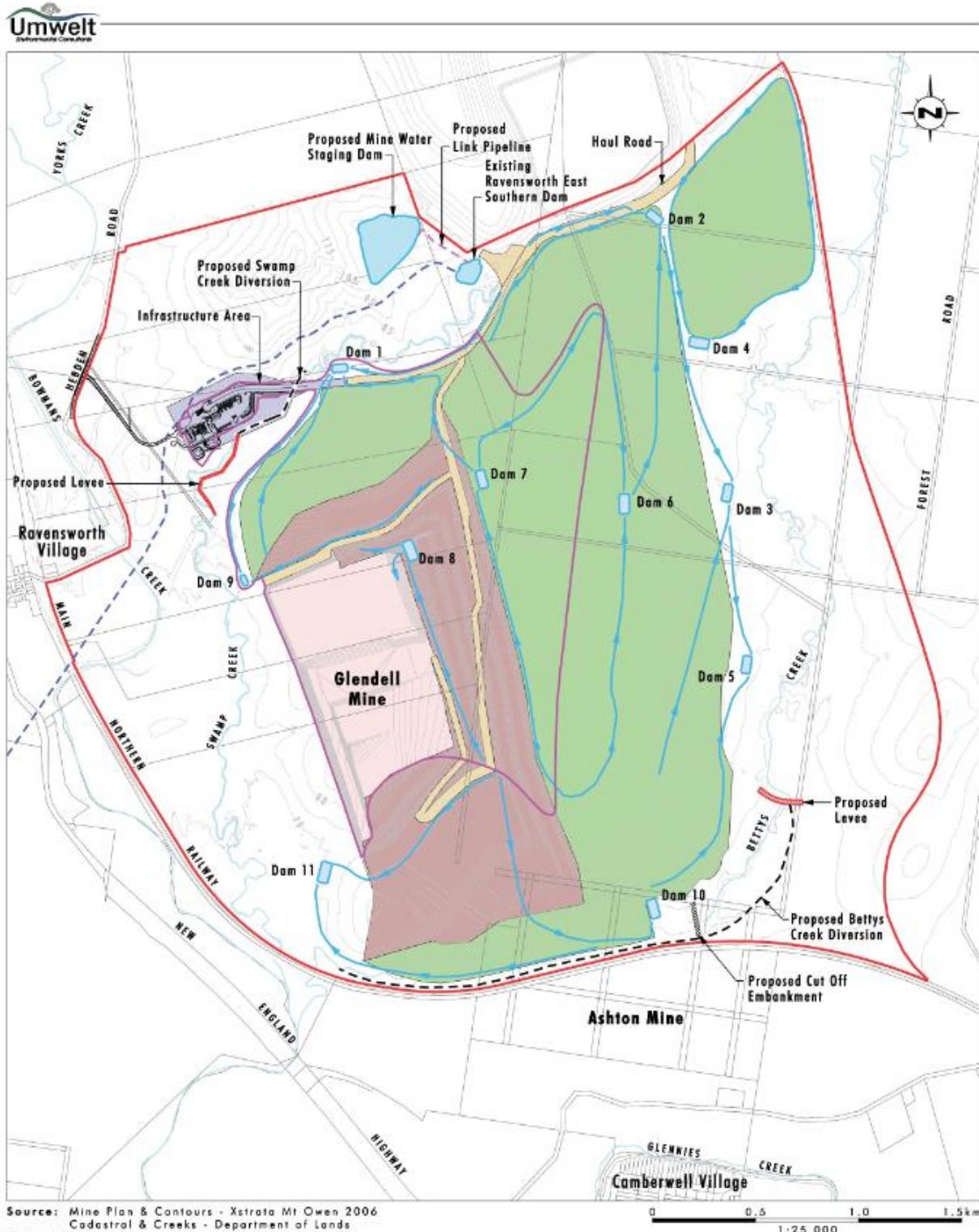
Figure 3-4 – Conceptual WMS – MGOO Project – Year 15 (2035)



Legend

- Glendell DA Boundary
- Active Mining Area
- Glenell Infrastructure Area
- Haul Road
- Unshaped Overburden Area
- Rehabilitation
- Dam
- Mine Water Management System Catchment
- Catch/Diversion Drains
- Norma Pipeline
- Link Pipeline
- Creek Diversion
- Creek

Figure 3-5 – Conceptual WMS – Glendell Mine – Year 9 (2017)



Concept for Proposed Water
Management Controls Year 12

Figure 3-6 – Conceptual WMS – Glendell Mine – Year 12 (2020)

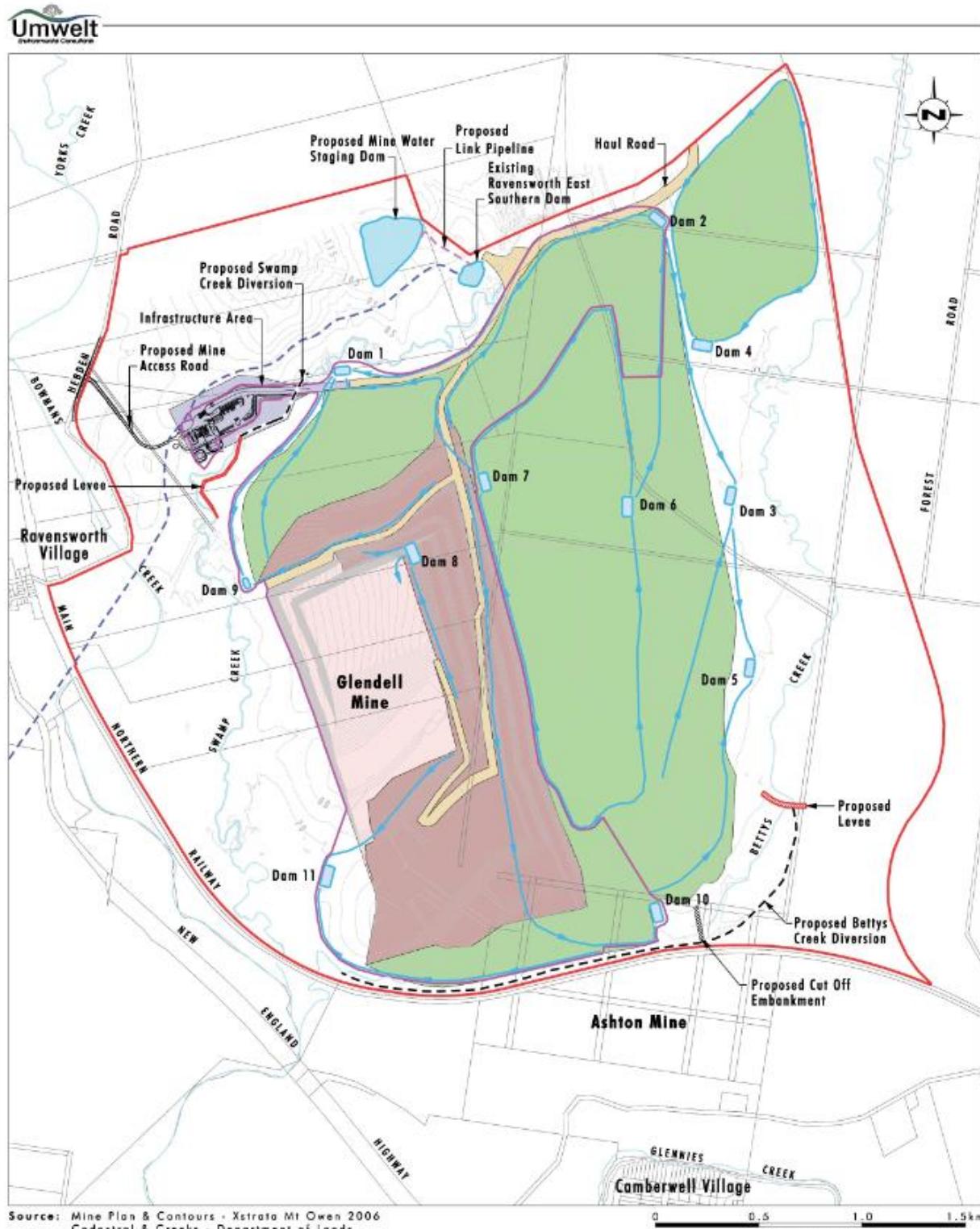


Figure 3-7 – Conceptual WMS – Glendell Mine – Year 15 (2023)

3.2 Water Management Infrastructure

Water is transferred around site using the MGO pump and pipeline infrastructure. Pipelines are inspected regularly as per the GCAA **Pipeline Protocol** (CAA HSEC PCL 0010 11.02 Pipeline Management). As approved under MOD 1, the Integra Underground water transfer pipeline will be managed and monitored in accordance with the **GCAA Pipeline Protocol**. Inspection frequency is risk based depending on water quality being transferred and the environment in which the pipeline is located. The pipeline network is quite dynamic and may change over time based on need and location of mining and in pit water.

3.3 Regional Water Impacts Management Protocol

MGO forms part of the GRAWTS which involves transfer of water between MGO, Ravensworth Operations, Liddell Coal Operations and Integra Underground Mine. Water transfers are managed with operational triggers and the management of the scheme is reviewed on a monthly basis. Management of the GRAWTS is discussed at regular Greater Ravensworth management meetings in conjunction with the Greater Ravensworth Water and Tailings Manager.

GCAA also has an existing arrangement with Rixs Creek North Mine to review cumulative impacts and water sharing opportunities on a semi-regular basis. Currently, the GRAWTS has had opportunity for reuse of the excess water at Rixs Creek North Mine from groundwater make due to the drier than average climatic conditions.

3.3.1 Cumulative Impacts

The existing GRAWTS allows for water excesses and deficits at individual sites to be offset by transfers between sites as part of normal operations. This maximises the reuse of mine water in the system as a whole, which therefore minimises extractions from water sources and discharges to the environment.

GRAWTS participates in the HRSTS. This scheme shares and schedules the discharge of saline water at times of high river flows such that salinity targets are not exceeded. By participating in this scheme, MGO minimises cumulative impacts on downstream water quality in the Hunter River of MGO and nearby mines.

3.3.2 Water Sharing

The existing GRAWTS allows for water excesses and deficits at individual sites to be offset by transferring and storage of water between sites as part of normal operations. MOD 1 has further approved the transfer of mine water from Integra Underground to MGO for the purposes of storage within the GRAWTS.

Due to the drier than average climatic conditions there has been increased water share with Rix's Creek North Mine which has allowed the transfer of additional water into GRAWTS.

3.3.3 Coordination of water quality monitoring

In order to characterise the quality of water from nearby mines, in isolation of the operations at MGO, a record of the water quality in the storages at nearby mines from which water is directly transferred is included in the MGO water quality monitoring program.

3.3.4 Joint investigations

If the trigger levels described in any of the sub-plans listed in **Section 1.2** are exceeded and cumulative impacts are considered likely, MGO will liaise with the relevant nearby mines to undertake a joint investigation of the exceedance.

3.4 Site Water Balance

The development consent conditions for Mt Owen and Glendell Mines specify requirements for the preparation of a site water balance. The site water balance for MGO is used to assist in the management and reporting of water use at the site and in the assessment of water supply. The site water balance is reviewed on an annual basis and the results are reported in the Annual Review (refer **Section 5.1.1**).

An aerial map of all of the MGO water storage locations is provided in **Figure 3.1** while a schematic showing the interactions of the key mine WMS components is presented in **Figure 3.8**.

The sources, uses, disposal of water and the site water balance are outlined in **Section 3.4.1**, **Section 3.4.2**, **Section 3.4.3** and **Section 3.5** respectively.

3.4.1 Water Sources

The sources of water supply to MGO are:

- direct rainfall onto the surface of water storages (clean water);
- runoff captured from the footprint of the mining disturbance area by the WMS (mine water), including seepage from overburden emplacement areas (potentially saline);
- water captured via the Sedimentation Dams (dirty water);
- water imported from via the GRAWTS or a nearby mine (mine water);
- water extracted from Glennies Creek under licence (clean water); and
- groundwater inflows to the open cut mining pits (mine water).

3.4.1.1 Runoff from Mining Disturbance (Mine Water)

The respective catchment areas over the course of mining are influenced by the following assumptions:

- the West Pit void will be utilised as a tailings emplacement area for the Mt Owen CHPP and for the GRAWTS;
- mining will cease in the BNP in approximately 2022, with the pit to be utilised as a potential future water or tailings storage area with rehabilitation of the area completed in line with the Mining Operations Plan (MOP);
- North Pit catchment area is rehabilitated and runoff from established rehabilitation areas will be diverted off-site in accordance with the Mt Owen Continued Operations Project Environmental Impact Statement (EIS);
- Western Out of Pit (WOOP) Dump and associated Rail Loop Dam catchment areas will be fully rehabilitated and diverted off site in accordance with the Mt Owen Continued Operations Project EIS;
- Stages 1 and 2 catchment areas are fully rehabilitated, however continue to contribute to the MGO WMS catchment area;
- Eastern Rail Pit catchment area is fully rehabilitated and does not contribute to the MGO WMS catchment area;

- Glendell Mine catchment area and out of pit dump will be rehabilitated and diverted off site in accordance with the Environmental Assessment for Modification of Glendell Mine Operations.

Rainfall is recorded at the two weather stations located at the MGO, however, for long term rainfall records used in developing the water balance, the Jerrys Plains Bureau of Meteorology station is used which is located approximately 15 km from the MGO which has records that date back to 1898. The typical annual rainfall for the area is approximately 650 mm per annum.

3.4.1.2 Sedimentation Dams (Dirty Water)

Sedimentation dams will be managed in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom 2004) and *Volume 2E Mines and Quarries* (DECC 2008). Permanent sediment dams will be maintained with adequate capacity to contain the site specific 5 day, 95th percentile rainfall depth. Any water with less than adequate water quality (with total suspended solids concentration greater than 50 mg/L) will be pumped back to the mine WMS and reused on site. More detail on management of sedimentation dams is contained in the MGO ***Erosion and Sediment Control Plan***.

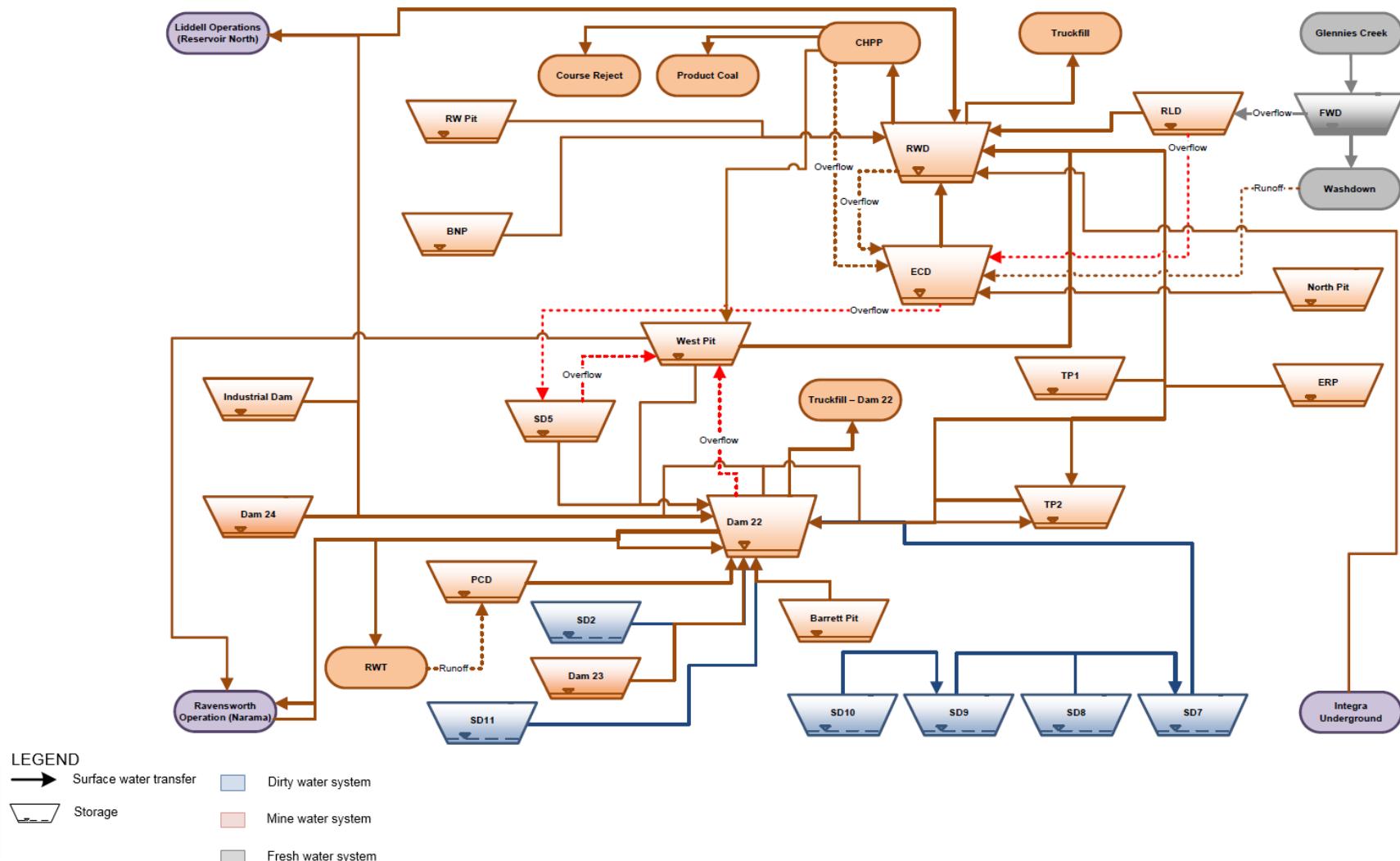


Figure 3-8 – MGO Water and Salt Balance Flow Paths

3.4.1.3 Imported water via the GRAWTS (Mine Water)

Where practical, MGO seeks to use surplus mine water from other operations in preference to fresh water from Glennies Creek or clean catchment runoff. Infrastructure is in place via the GRAWTS to transfer mine water between GCAA mining operations in the Greater Ravensworth Area (that is, Liddell Coal Operations, MGO, Ravensworth Operations and Integra Underground). MGO is continually seeking new opportunities to introduce mine water sharing schemes with other mines. Communication across operations as part of GRAWTS will be managed through the **Greater Ravenworth Water Operations Manual** which requires confirmation by all involved operations prior to transfer. Water is also imported to MGO within the tailings received as part of the GRAWTS. Bleed water from the tailings is recovered and reused in the CHPPs at Mt Owen and Ravensworth Operations.

3.4.1.4 Water Extracted from Glennies Creek (Clean Water)

MGO holds WALs to extract up to 1056 units of high security water and 858 units of general security water from Glennies Creek (refer **Table 1-7**). WAL 7814 is a high security licence to pump 1,000 ML from Glennies Creek MGO and Integra Underground (both owned by Glencore) will share the access rights under this licence in accordance with the requirements of DPI – Water and will report water take in the Annual Review.

Water extracted from Glennies Creek is generally used for potable water activities such as use in the administration offices, workshop, bath houses and for the fire-fighting system and washdown of plant and vehicles.

3.4.1.5 Groundwater Inflows (Mine Water)

Open cut mining within the MGO intercepts saline groundwater aquifers. Groundwater that accumulates within mining pits is pumped to surface storages for reuse within the mine WMS.

3.4.2 Water Use and Management

The water uses on site include:

- gross water requirements for the CHPP, which includes water lost to product, coarse rejects and tailings, washdown water and water for stockpile dust suppression;
- dust suppression of haul roads, stockpiles, etc.;
- exported water via the GRAWTS; and
- potable water.

The main water losses are attributable to evaporation from the surface of water storage dams/pits and tailings dams.

Managing water demand and maximising reuse of water on-site, so as to minimise the import/use of potable/clean water, is an important aspect of the water management at MGO.

3.4.2.1 CHPP

The Mt Owen CHPP is the major water user at the MGO. Water from the coal handling and preparation process either remains within the product (9.8% moisture) or coarse reject material (14 % moisture) or pumped as tailing slurry (pumped tailings solids 31.6% by weight) to tailings emplacement areas. Most of the water is salvaged from the tailings emplacement areas and recirculated into the mine WMS. However, some water remains bound in with the tailings and is not recoverable. The gross water requirement of the CHPP is approximately 400 L/tonne run of mine (ROM) coal. However, the net water loss, once recycling from the tailings is accounted for, is approximately 200 L/tonne ROM coal.

3.4.2.2 Tailings Water

Tailings emplacement areas can retain between 25% and 50% (by weight) water. The balance of the water is decanted from the tailings and reused in the mine WMS. Typically, the design of the tailings emplacement areas results in a 'beach' forming at one end of the emplacement area and a pond where the water is recovered at the other. It is estimated that the tailings retain at least 45% by weight water

because of the design of the tailings emplacement areas. Active and planned tailings dams at MGO are detailed in **Table 3-2**.

Table 3-2 – Tailings Emplacement Areas at MGO

Tailings Dam	Area (Ha)	Planned Decommissioning	Capping Completed	Rehabilitation Completed
NVS1	11	Complete	Complete	Complete
NVS2	34	Complete	2021	2021
TP1	42	Complete	2023	2024
RW Pit	10	Complete	2021	2023
ERP	19	Complete	2023	2027
West Pit	76	End of Mine Life	End of Mine Life	End of Mine Life

Note: All timeframes indicated in **Table 3-2** are indicative only. Factors that may influence this plan include drying rates of the tailings dams and approvals.

3.4.2.3 Dust Suppression

The volume of water required for dust suppression will vary according to prevailing climatic conditions, the extent of haul road development and the usage of the haul roads and is reported each year in the Annual Review.

3.4.2.4 Potable Water Usage

MGO holds WALs to extract water from Glennies Creek for use as potable water in the administration offices, workshop and bath house. Potable water is imported via trucks at Glendell and Ravensworth East for use in the administration, bath house and workshop areas.

3.4.2.5 Wastewater Effluent Disposal

Wastewater from the administration offices, workshop and bath houses is collected and treated on site in a number of aerated wastewater treatment plants. At the Mt Owen Mine administration offices and workshop complex the effluent is then used to irrigate a 3 ha tree-lot. At the Ravensworth East Mine workshop, the effluent is handled by the site waste contactor and treated at an offsite facility. At the Glendell infrastructure area the water treated then reused within the mine WMS.

3.4.3 Discharges

No saline water discharges are authorised to the surrounding creek systems under the EPLs for the MGO.

MGO will share water with other Glencore operations within the Greater Ravensworth Water Sharing Scheme (GRWSS) (refer to Section 3.4.4 for management of off site water transfers). Where the GRWSS is in surplus to requirements for all operations, discharges from the GRWSS may be required. These discharges will occur via the licensed discharge points at either Ravensworth Operations or Liddell Coal Operations which are also part of the GRWSS. Discharges from the Ravensworth Operations and Liddell Coal Operations will be managed by these operations and undertaken in accordance with the relevant conditions of their respective EPLs. There is no current intention to discharge from the Mount Owen Complex based on the operation of the GRWSS.

3.4.4 Off Site Water Transfers

Water can be imported to and exported from the MGO WMS to neighbouring GCAA-owned operations including Ravensworth Operations, Liddell Coal Operations and Integra Underground Mine.

Water is imported and exported between the operations on an as needs basis. The maximum transfer rates are provided in **Table 3-3**; however, transfer rates are typically lower and are managed with operational triggers.

Table 3-3 – Potential Water Import and Export Rates

Operation	Maximum Rates from MGO		Maximum Rates to MGO	
	Daily Rate	Annual Rate	Daily Rate	Annual Rate
Liddell Coal Operations	8.5 ML/day	3,103 ML/year	18.9 ML/day	6,899 ML/year
Ravensworth Operations	9 ML/day	3,154 ML/year	8.6 ML/day	3,139 ML/year
Integra Underground Mine	N/A	N/A	4.93 ML/day	1,798 ML/year

3.4.5 Water Balance Predictions

A site water balance model has been developed to simulate the proposed mining and coal handling characteristics. This model considers existing and future operations and is used to predict water surplus and requirements into the future. The model allows detailed analysis and calibration of the MGO water balance and considers:

- direct rainfall onto dam/water storage surfaces;
- water loss due to evaporation from water storages and pits;
- runoff from natural, rehabilitated and disturbed catchment areas;
- groundwater inflow to open cut pits;
- water lost to product coal through the CHPP and ROM coal through the crusher;
- water used for on-site dust suppression (haul roads and stockpiles);
- transfers to and from other sites via the GRAWTS; and
- extraction from Glennis Creek.

This model forms part of a water and salt balance model for the Greater Ravensworth Area. The WMS is simulated using a historical time series of daily rainfall data to represent a wide range of possible rainfall conditions.

A summary of the average inputs and outputs for the WMS is provided in **Table 3-4**.

Table 3-4 – Summary of Average Water Balance Results

Water Management Element	2017 (ML/year)	2020 (ML/year)	2025 (ML/year)
INPUTS			
Direct rainfall and catchment runoff	2,085	2,225	2,275
Groundwater inflows into open cut pits	704	1,154	494
Imports from GRAWTS	2,504	3,292	3,276
Extractions from Glennis Creek	161	175	146
Bleed water recovered from tailings	4,753	6,102	1,057
Total inputs	10,206	12,949	7,248
OUTPUTS			

Water Management Element	2017 (ML/year)	2020 (ML/year)	2025 (ML/year)
Evaporation from storages	486	528	629
CHPP usage	5,568	5,829	2,872
Dust suppression usage	1,099	1,071	647
Exports to GRAWTS	1,597	5,064	2,782
Release from Sediment Dams	77	71	80
Total Outputs	8,826	12,563	7,010
CHANGE IN STORAGE	1,380	385	238
BALANCE	0	0	0

Figure 3.9 presents the total stored water volume at MGO predicted by the site water balance model. Note that the total capacity for water storage steadily declines between 2017 and 2020 due to the filling of West Pit with tailings and increases in 2023 due to the completion of mining in BNP, which then becomes available for the storage of water.

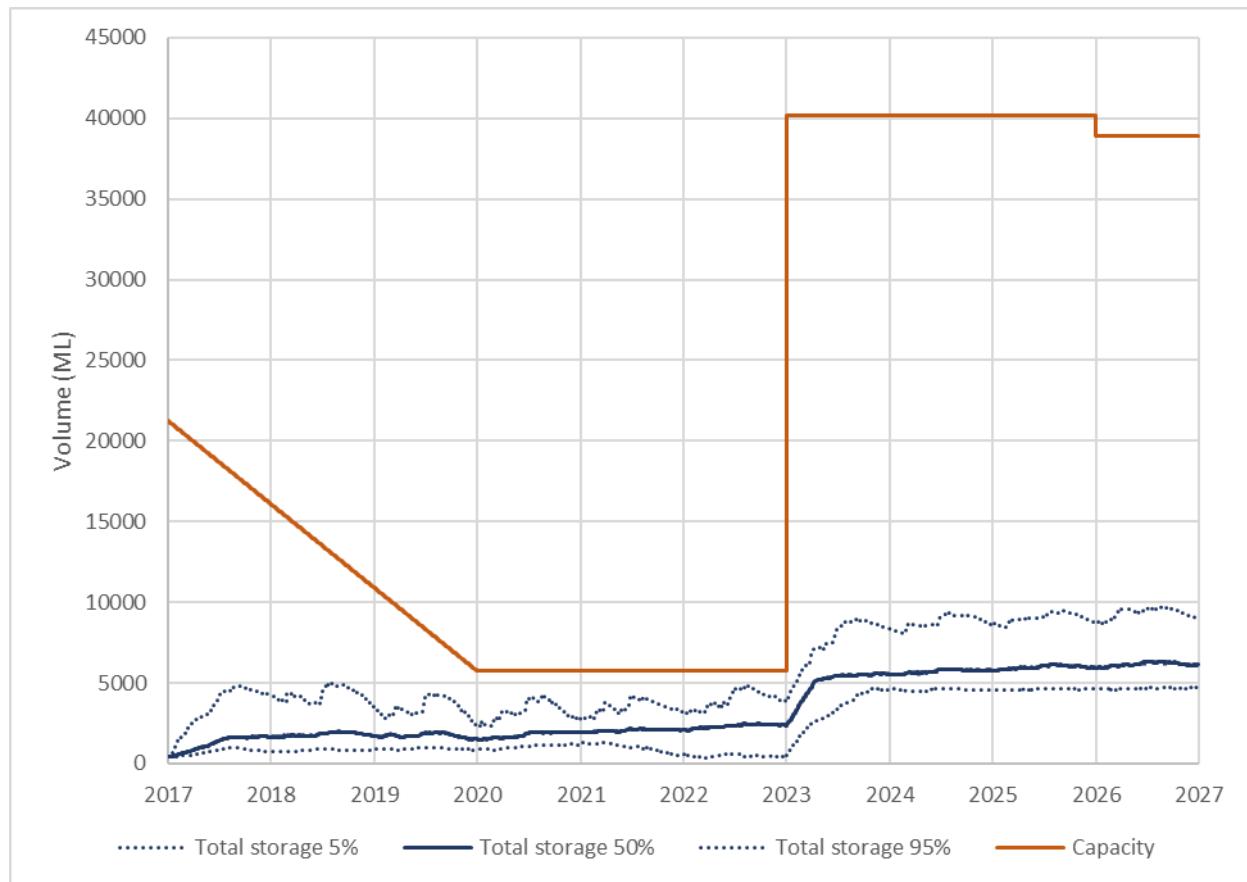


Figure 3-9 – Predicted Stored Water Volume

3.4.6 Security of Supply

As discussed in **Section 3.4.1**, water is supplied to MGO from rainfall and catchment runoff captured in surface storages, imported from the GRAWTS and extracted from Glennies Creek under licence. The site water balance model results predict that MGO will have a water surplus which is stored on site in

surface water storages or exported to the GRAWTS. The risk of a shortfall of water to meet the daily operational requirements at MGO is low.

In the event that extended dry periods or drought lead to a water shortage, MGO will either reduce production to a level to suit water availability or additional water will be sourced from external sources, including additional water allocations or from other mining operations. Any additional water sources would be obtained in accordance with any relevant approvals and licences.

3.4.7 Net Harvestable rights

The total contiguous landholdings at the MGO are currently approximately 8560 ha. Based on the maximum harvestable rights calculator (DNR 2019), this entitles MGO to capture up to 10% of the annual average runoff from the property by means of dams sited on first or second order streams with a total volume of no more than 599ML. Existing water storages on the contiguous landholdings outside of the water management system at MGO have a total catchment area of about 20.6ha, with an estimated volume of 165ML, based on typical average depth of 2 m. This total volume is well within the maximum harvestable rights of MGO, based on the current contiguous landholdings, affording an estimated net harvestable rights entitlement of 434 ML (GHD, 2019).

3.4.8 Decommissioning and Final Landform

Sedimentation dams will be retained until all other rehabilitation measures have been completed and the final landform is stable. Sedimentation dams will be infilled, reshaped and rehabilitated with suitable vegetation covering consistent with the surrounding final landform. Local erosion and sediment control measures will be implemented during this process. Prior to construction activities, Construction Management Plans detailing the specific inspection maintenance and revegetation will be implemented. An overview is included in the MGO **Surface Water Management and Monitoring Plan** with the details of these works being defined further within the Mining Operations Plan (MOP) and Mine Closure Plans associated with the relevant areas.

Final design of water management structures in the final landform will ensure that water captured is within the licensable allocation that exists at the completion of rehabilitation. As required, this would be achieved through rationalisation of the conceptual final landform WMS as identified in **Appendix C**. This conceptual framework includes:

- consideration of available water allocation calculated in accordance with the harvestable rights provisions and the applicable WAL availability over the life of MGO;
- consideration of the relevant applicability criteria and exemptions that occur for water management structures under these regulatory regimes;
- accurate delineation of water allocation based on volume (harvestable rights) and water take (WAL) to correctly design water management structures within this framework; and
- conceptual licence and accounting framework which includes consideration of final void water licensing requirements to ensure that all relevant water management structures and features in the final landform are captured in an integrated manner.

3.5 Site Salt Balance

A site salt balance has been developed as an extension of the site water balance for the Greater Ravensworth Area (refer **Section 3.4**). The salt balance model allows the salt load and salinity of water exported from MGO as part of the GRAWTS to be predicted, which is an important consideration for the management of discharges from Ravensworth Operations under the HRSTS.

Salt transfers were simulated within the site water balance model in parallel with the water transfers. The site salt balance provides the expected salt loads and concentration of salt associated with each water transfer within the model. The site salt balance is reviewed on an annual basis, in association with the review of the site water balance, and the results are reported in the Annual Review (refer **Section 5.1.1**).

3.5.1 Saline Material

Saline material is any material moved on site that has the potential to generate saline water. Salt is chemically released by weathering and then has the potential to be transported by water. The sources of saline material at MGO are:

- overburden and interburden;
- ROM coal;
- product coal;
- coarse coal rejects; and
- tailings.

Saline material has the potential to generate saline water while it is exposed to the surface. Saline material will be managed through storage and emplacement such that the saline water that is generated is contained in the WMS. The details of the management of the different source of saline material are summarised in *Table 3-5*.

Table 3-5 – Management of Saline Material

Source	Management
Overburden and interburden	Emplaced in dumps that are constructed such that runoff is contained in the water management system before being capped and revegetated
ROM coal	Stored in stockpiles that are constructed such that runoff is contained in the water management system before being processed in the CHPP
Product coal	Stored in stockpiles that are constructed such that runoff is contained in the water management system before being exported off site
Coarse coal rejects	Emplaced in dumps that are constructed such that runoff is contained in the water management system capped and revegetated
Tailings	Emplaced in tailings dams that are constructed such that runoff is contained in the water management system capped and revegetated

3.5.2 Saline Water

The sources of saline water at MGO are:

- runoff – in addition to the salt released by weathering of the saline material, salt also accumulates by deposition from rainfall in soil. The salt on the surface of the soil or material is dissolved by rainfall and enters the WMS dissolved in runoff;
- groundwater inflows into open cut pits;
- water imported from the GRAWTS;
- water imported from Glennies Creek; and
- direct rainfall onto water storages.

As salt lost via evaporation is negligible, salt concentrates in the water stored and used at MGO. Once dissolved, the salt remains in solution as it is transferred through the MGO WMS, unless the water is discharged via the Ravensworth Complex discharge point (as part of the GRAWTS), in which case the salt is returned to the environment.

Salt passes through the CHPP in solution and either remains with the product or coarse reject material or is pumped as tailings slurry in proportion to the water volumes. Salt dissolved in the tailings slurry is either retained in the tailings or transferred in solution with decant water in proportion to the water volumes. Salt dissolved in water used for dust suppression accumulates on the haul roads as the water evaporates. The salt is redissolved when runoff occurs and re-enters the WMS. Salt dissolved in wastewater effluent accumulates on the surface of the irrigation area before being dissolved in runoff.

The sources of saline water at MGO are shown in **Table 3-6**, along with representative salinity values. Runoff parameters were calibrated to observed water quality monitoring. Imported water from the GRAWTS, Integra Underground Mine, Glennies Creek and groundwater inflows were derived from monitoring data.

Table 3-6 – Typical Salinity of Saline Water at MGO

Source	Typical Salinity
Direct rainfall	20 mg/L
Runoff from natural surfaces	250 mg/L
Runoff from rehabilitated surfaces	1,000 mg/L
Runoff from hardstand surfaces	1,500 mg/L
Runoff from tailings	1,500 mg/L
Runoff from open cut pits	2,000 mg/L
Runoff from spoil	2,000 mg/L
Imports from the GRAWTS	3,300 mg/L
Imports from Integra Underground Mine	5,360 mg/L
Imports from Glennies Creek	350 mg/L
Groundwater inflows to North Pit	6,400 mg/L
Groundwater inflows to West Pit	5,120 mg/L
Groundwater inflows to BNP	6,400 mg/L
Groundwater inflows to Barrett Pit	5,120 mg/L

3.5.3 Salt Balance Predictions

The summary of the predicted salt balance for MGO is shown in **Table 3-7**.

Table 3-7 – Summary of Average Salt Balance Results

Water Management Element	2017 (tonne/year)	2020 (tonne/year)	2025 (tonne/year)
INPUTS			
Direct rainfall and catchment runoff	2,626	2,728	2,385
Groundwater inflows into open cut pits	3,898	2,483	2,528
Imports from GRAWTS	10,356	18,495	16,906

Water Management Element	2017 (tonne/year)	2020 (tonne/year)	2025 (tonne/year)
Extractions from Glennies Creek	60	45	41
Bleed water recovered from tailings	22,627	12,097	4,013
Total inputs	39,567	35,847	25,873
OUTPUTS			
CHPP usage	23,644	21,015	10,736
Dust suppression usage	4,074	2,403	2,636
Exports from GRAWTS	11,261	12,792	12,312
Release from Sediment Dams	60	58	69
Total Outputs	39,039	36,248	25,752
CHANGE IN STORAGE	529	-401	120
BALANCE	0	0	0

The predicted mean salinity of all water stored on site is shown in **Figure 3.10**.

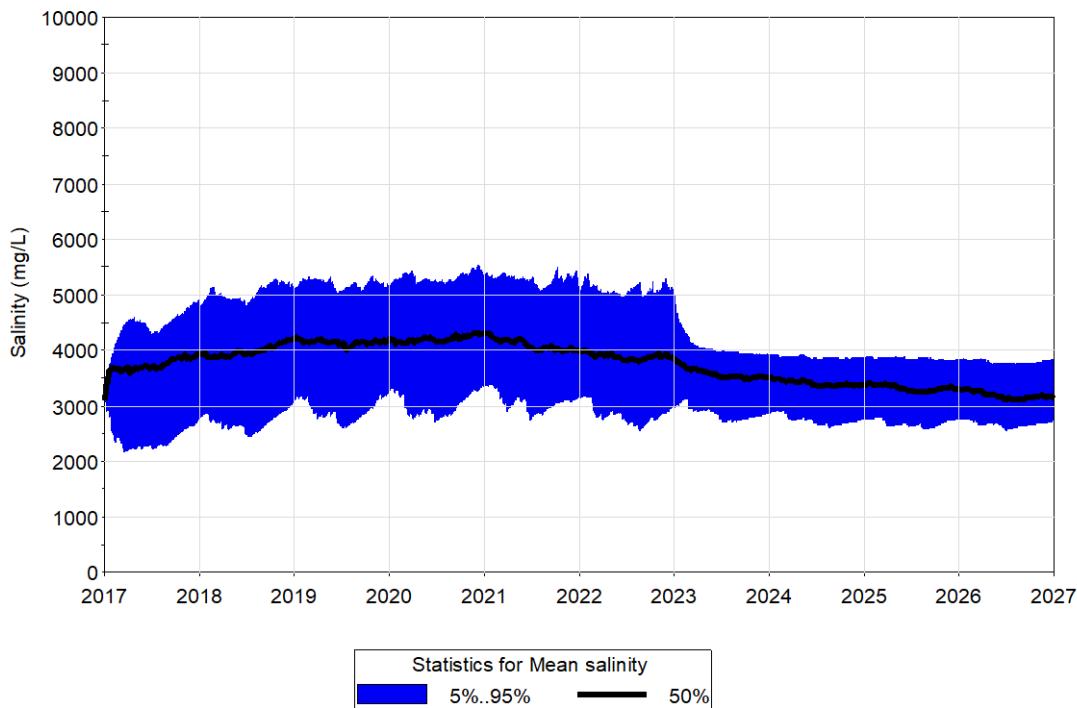


Figure 3-10 – Predicted Mean Salinity of Stored Water

The salinity is generally in the range of 3,000 $\mu\text{S}/\text{cm}$ to 5,000 $\mu\text{S}/\text{cm}$, and increases gradually due to salt load imported in the tailings emplaced in West Pit, before gradually decreasing. The variability of mean salinity is constrained after 2023 due to increased volume of water present in BNP, which buffers climatic and operational variability. Mean salinity is expected to reduce gradually over time as more catchment area is rehabilitated.

3.6 Training and Communication

Generic training on the aspects of the WMP is provided to all employees and contractors through the GCAA **Generic Surface Induction** and 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 MGO 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.

4 Measurement and Evaluation

4.1 Monitoring and Maintenance Requirements

4.1.1 Water and Salt Balance

As part of the WMS, MGO monitor rainfall, water usage, fresh water imported to site, mine water transferred to or from site, the transfers of water around site and the volume and salinity (or electrical conductivity) of water stored in designated storages on the site.

The monitoring data is used to update the site water and salt balance annually and track water inventory. The results from the site water and salt balance are reported in the Annual Review.

4.1.2 Groundwater Inflows to Mining Pits

As part of the ongoing water balance monitoring the groundwater inflows to the mining pits will be reviewed quarterly. This will be undertaken by review of available data (including flow metering data or pump hours); site daily rainfall data; and site survey data) to estimate groundwater inflows to each pit at MGO.

Groundwater inflows will be compared to predicted inflows as outlined in the MGO **Groundwater Management and Monitoring Plan**.

4.1.3 Water Structure Inspections

Routine inspections of water structures, including dams, drop structures, diversion drains and erosion and sediment control structures, as well as inspections following significant rainfall events (greater than 25 mm in 24 hours), will be conducted by MGO personnel. Water structures are inspected to assess the capacity, structural integrity and effectiveness and advise on any maintenance requirements. Monitoring of creek diversions will be undertaken in accordance with approved plans. Further detail can be found in the MGO **Erosion and Sediment Control Plan**.

4.1.4 Water Monitoring

Water sampling and monitoring is undertaken on a monthly basis on key water storages, catchments and creek lines around MGO. Refer to MGO **Surface Water Management and Monitoring Plan** for further detail.

Water sampling and monitoring is undertaken on a quarterly basis for groundwater levels and quality as part of the groundwater monitoring program. Refer to MGO **Groundwater Management and Monitoring Plan** for further detail.

Monitoring results are reported in the Annual Review (refer **Section 5.1.1**) and made available on the MGO website.

4.1.5 Complaints

The MGO operates a dedicated complaints hotline. The details of this hotline are advertised in local newspapers, via a six monthly newsletter and on the MGO website. A procedure for handling complaints has been implemented as part of the MGO Environmental Management System (EMS) to ensure a consistent approach to handling any complaint. All legitimate complaints will be thoroughly investigated by the MGO Environment and Community (E&C) Manager.

In accordance with the condition M4 of EPL 4460 and EPL 12840, MGO keep a record of any complaints made to MGO or any employee or agent of MGO in relation to pollution arising from any site activities. The record of complaint is kept for at least four years and includes the following details:

- the date and time of the complaint;
- the method by which the complaint was made;
- any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- the nature of the complaint;
- the action taken by MGO in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by MGO, the reasons why no action was taken.

5 Review and Improvement

5.1 Reporting

5.1.1 Annual Review

The MGO E&C Manager will be responsible for reporting any significant findings regarding the implementation of this Plan in the Annual Review, including:

- any amendments to licensing or statutory approvals;
- a summary of any complaints or incidents relating to the performance of the WMS over the reporting period;
- a summary of monitoring results collected over the reporting period and assessment against the relevant performance measures and criteria;
- a summary of water extracted from Glennies Creek during the relevant water reporting period/s;
- an evaluation of any trends in monitoring results over the life of the operation;
- any non-compliance recorded during the reporting period and the actions taken to ensure compliance;
- identification of any discrepancies between the predicted and actual impacts of MGO and an analysis of the potential cause of any significant discrepancies; and
- a summary of the management actions to be implemented over the next year to improve the environmental performance of the site.

The Annual Review will be provided to DP&E and other relevant agencies and will be made available on the MGO website.

The Minerals Council of Australia (MCA) has developed the Water Accounting Framework (WAF) to report on the water use in a consistent manner across the mining industry. GCAA has adopted the WAF as the water reporting tool for all operations and has committed to the MCA to provide water reporting data using this tool. The WAF is consistent with Global Reporting Initiative and broadly consistent with the water reporting component of Glencore Corporate Practice (GCP). MGO collects and reports data required in accordance with the GCAA requirements outlined in the **GCAA Water Accounting Framework Procedure** (CAA HSEC PRO 0015 11.03 Water Accounting Framework).

5.1.2 Incidents

Any incident which occurs within the site boundary or is associated with MGO operations will be immediately reported by the employee or contractor who has been associated with or witnessed the incident. The method for reporting incidents is outlined in the **Pollution Incident Response Management Plan** (GLD SD PLN 0037 Mt Owen Complex Pollution Incident Response Management Plan) and MGO **Environmental Management Strategy (Framework)**. MGO will immediately notify DPIE and any other relevant agencies of any incident that has or has the potential to cause environmental harm. A detailed report on the incident will be provided to DPIE and any other relevant agencies within seven days as well as any other further reports that may be requested.

In accordance with condition R2 of EPL 4460 and EPL 12840 and the **MGO Pollution Incident Response Management Plan** MGO will notify the EPA of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident. Notifications will be made by telephoning the Environment Line service on 131 555. MGO will also provide written details about the notification to the EPA within seven days of the incident.

5.2 Plan Review

This WMP and associated documents will be reviewed in accordance with the MGO **Environmental Management Strategy (Framework)** and SSD-5850 Schedule 5, Condition 6. This will occur within three months of:

- the submission of an Annual Review (refer **Section 5.1.1**);
- the submission of an incident report (refer **Section 5.1.2**);
- the submission of an independent environmental audit; or
- any modification to the conditions of development consent for Mt Owen Continued Operations (SSD-5850) or Glendell Mine (DA 80/952).

Glencore will review and if necessary, revise this WMP every year or earlier if required. The WMP will reflect any changes in environmental requirements, technology and operational procedures.

5.3 Validation of Predictions

As part of the Annual Review process (refer **Section 5.1.1**), the site water balance, site salt balance, surface water take and groundwater model will be validated by comparing predicted results to monitoring results collected over the life of the development. Models and predicted impacts will be revised as necessary following the results of the validation.

6 Commitments

All commitments outlined within this WMP are detailed in **Table 6-1** below. Management commitments requiring actioning will be entered into the MGO Compliance Management System (CMO) and actioned. Records of documentation associated with the management commitments will also be maintained within the CMO.

Table 6-1 – Water Management Plan Commitments

Number	Commitment	Relevant Section of Plan
1	New components of the water management system will be designed to meet requirements of Section 2.2 and the Ground Disturbance Permit process.	Section 2.2
2	Tailings storage areas will be designed and maintained to encapsulate and prevent the migrating of tailings seepage offsite.	Section 2.2.3
3	Overburden will be monitored for saline seepage as per Surface Water Monitoring and Management Plan.	Section 2.2.3
4	Any water exposed to hydrocarbons within pit-top facilities (e.g. mine infrastructure area) will be treated by an oil-water separator.	Section 2.2.3
5	Any chemical and hydrocarbons products will be stored in bunded areas in accordance with the relevant Australian Standards.	Section 2.2.3
6	Decommissioned tailings dams will be managed for captured rainfall and catchment runoff.	Section 3.1
7	MGO pump and pipeline infrastructure will be inspected as per the GCAA Pipeline Protocol (CAA HSEC PCL 0010 11.02 Pipeline Management).	Section 3.2
8	Management of the GRAWTS will be reviewed in conjunction with the Greater Ravensworth Water and Tailings Manager	Section 3.3
9	If any trigger levels are exceeded and cumulative impacts are considered likely by a groundwater or surface water expert, MGO will engage with relevant nearby mines to undertake a joint investigation of the exceedance.	Section 3.3.4
10	The site water balance will be reviewed on an annual basis with the results reported in the Annual Review.	Section 3.4
11	Dirty and mine water will preferentially be reused within the WMS and GRAWTS over clean water from Glennis creek and catchment runoff.	Section 3.4.1
12	Sedimentation dams will be managed in accordance with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom 2004) and Volume 2E Mines and Quarries (DECC 2008).	Section 3.4.1.2
13	The site salt balance will be reviewed on an annual basis with the results reported in the Annual Review.	Section 3.5
14	Generic training on the aspects of the WMP will be provided to all employees and contractors through the GCAA Generic Surface Induction and the Site Familiarisation process. Selected site personnel whose duties directly involve the management of water at the MGO 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.	Section 3.6
15	Rainfall, water usage, fresh water imported to site, mine water transferred to or from site, the transfers of water around site and the volume and salinity (or electrical conductivity) of water stored in designated storages on the site will be monitored.	Section 4.1.1

	MGO will report on the following aspects of this plan in the annual review <ul style="list-style-type: none"> • any amendments to licensing or statutory approvals; • a summary of any complaints or incidents relating to the performance of the WMS over the reporting period; • a summary of monitoring results collected over the reporting period and assessment against the relevant performance measures and criteria; • a summary of water extracted from Glennies Creek during the relevant water reporting period/s; • an evaluation of any trends in monitoring results over the life of the operation; • any non-compliance recorded during the reporting period and the actions taken to ensure compliance; • identification of any discrepancies between the predicted and actual impacts of MGO and an analysis of the potential cause of any significant discrepancies; and • a summary of the management actions to be implemented over the next year to improve the environmental performance of the site. 	Section 5.1.1
16	The WAF will be used to report on water use on site. Data will be collected and reported in accordance with the GCAA requirements outlined in the GCAA Water Accounting Framework Procedure (CAA HSEC PRO 0015 11.03 Water Accounting Framework).	Section 5.1.1

7 Accountabilities

Table 7-1 outlines the accountabilities associated with this WMP.

Table 7-1 – Accountabilities

Role	Accountabilities for this document
Operations Manager	Provide adequate resources for the implementation of this Plan.
Environment and Community Manager	Implement the WMP. Responsible for ensuring that monitoring, periodic environmental inspections and visual assessments after high rainfall events are undertaken. Provide that the Training and Communication, Monitoring and Review and Improvement requirements of this Plan are met. Investigate and report all incidents involving the failure or damage to Water Management Structures.
Environment and Community Coordinator / Officer	Assist the E&C Manager as required in implementation of this Plan. Investigate and report all incidents involving the failure or damage to Water Management Structures.
Task Coordinators	Provide that the requirements of this Plan are met through compliance with GDP procedures. Report all incidents involving the failure or damage to Water Management Structures.
All contractors	Undertake works in accordance with the objectives and principles of this Plan and GDP (where relevant). Report all incidents involving the failure or damage to Water Management Structures.
All personnel	Undertake works in accordance with the objectives and principles of this Plan and GDP (where relevant). Report all incidents involving the failure or damage to Water Management Structures.

8 Definitions

Term	Definition
AEP	Annual exceedance probability
ARI	Average recurrence interval
BNP	Bayswater North Pit
CHPP	Coal handling and preparation plant
CMO	Compliance Management System
DA	Development application
DECC	Department of Environment and Climate Change
DPIE	Department of Planning, Industry and Environment
DPIE – Water	Department of Planning Industry and Environment – Water
E&C	Environment and Community
EIS	Environmental Impact Statement
EMS	Environment Management System
EPA	Environment Protection Authority
EPL	Environment Protection Licence
GCAA	Glencore Coal Assets Australia
GCP	Glencore Corporate Practice
GRAWTS	Greater Ravensworth Area Water and Tailings System
GRAWSS	Greater Ravensworth Area Water Sharing Scheme
Ha	Hectares, equivalent to 10,000 m ²
HRSTS	Hunter River Salinity Trading Scheme
MCA	Minerals Council of Australia
ML	Megalitres or millions of litres, e.g. 5 ML is the same as 5 million litres
MGO	Mt Owen Glendell Operations
MOP	Mining Operations Plan
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
RMS	NSW Roads and Maritime Service
ROM	Run of mine
SSD	State significant development
TARP	Trigger Action Response Plan
WAF	Water Accounting Framework
WAL	Water access licence
WMP	Water Management Plan
WMS	Water management system
WOOP	Western Out of Pit
µS/cm	Microsiemens per centimetre is the standard measure of electrical conductivity.

9 Document Information

9.1 Relevant Legislation

The following legislation is relevant to this Plan:

- *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 Sharing Plan for the Hunter Regulated River Water Source 2016*; and
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

9.2 Related Documents

Related documents, listed in Table 9-2 below, are internal documents directly related to or referenced from this document. Internal procedures have not been reviewed or endorsed by DPE and Glencore is responsible for verifying these procedures are in accordance with this management plan and generally in accordance with the Project Approval.

Table 9-2 – Related Documents

Reference	Title
GCAA	
11.01	Annual Environment and Community Risk Assessments
11.02	Pipeline Management
11.03	Water Management
11.03	Water Accounting Framework
11.05	Dams and Diversions
11.06	Erosion and Sediment Control
Mt Owen Glendell Operations	
Erosion and Sediment Control Plan	
Surface Water Management and Monitoring Plan	
Groundwater Management and Monitoring Plan	
Surface and Groundwater Response Plan	
Environmental Management Strategy	
Environmental Monitoring Program	
Creek Diversion Plan	
Other	
GHD, 2019	Glendell Continued Operations Project, EIS – Surface Water Assessment.
Umwelt (Australia) Pty Limited, 2016	Mount Owen Continued Operations Project Response to PAC Review Report.
Umwelt (Australia) Pty Limited, 2016	Mount Owen Continued Operations Project Clarification of Project and Assessment Findings Report.

Reference	Title
Hansen Bailey, 2015	Greater Ravensworth Area Tailings Pipeline Modification Environmental Assessment
Umwelt (Australia) Pty Limited, 2015	Environmental Impact Statement Mt Owen Continued Operations
Umwelt (Australia) Pty Limited, 2015	Mount Owen Continued Operations Project Response to Submission: Report A (including Addendum dated October 2015)
Umwelt (Australia) Pty Limited, 2015	Mount Owen Continued Operations Project Response to Submission: Report B
Umwelt (Australia) Pty Limited, 2015	Response to Queries Raised by Agencies Following Response to Submissions
Umwelt (Australia) Pty Limited, 2007	Environmental Assessment for Modification of Glendell Mine
Umwelt (Australia) Pty Limited, 2003	Environmental Impact Statement Mt Owen Operations

9.3 Reference Information

Reference information, listed in **Table 9-3** below, is information that is directly related to the development of this document or referenced from within this document.

Table 9-3 – Reference Information

Reference	Title
ANZECC, 2000	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ANZECC, 2006	ANZECC Guidelines and Water Quality Objectives in NSW procedures
DECC, 2008	The Blue Book, Managing Urban Stormwater: Volume 2A – Installation of Services
DECC, 2008	The Blue Book, Managing Urban Stormwater: Volume 2C – Unsealed Roads
DECC, 2008	The Blue Book, Managing Urban Stormwater: Volume 2D – Main Road Construction
DECC, 2008	The Blue Book, Managing Urban Stormwater: Volume 2E Mines and Quarries
DPI – Water, 2012	Guidelines for Controlled Activities on Waterfront Land
Landcom, 2004	The Blue Book, Managing Urban Stormwater: Soils and Construction – Volume 1
NSW EPA, 2002	Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation
NSW Fisheries, 2003	Policy and Guidelines for Fish Friendly Waterway Crossings
NSW Fisheries, 2003	Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings

9.4 Change Information

A summary of the document history is provided in **Table 9-4** below.

Table 9-4 – Change information

Version	Date	Review team (consultation)	Change Summary
1	November 2008	E&C Coordinator HSEC Manager	New Document
2	November 2011	MGO E&C Manager E&C Coordinator	Update with current practices and applicable standards
3	November 2012	MGO E&C Manager MGO Operations Manager Glendell Operations Manager	Update with current practices and applicable standards
4	September 2013	MGO E&C Manager	Update to remove Xstrata references and general review of document.
5	May 2014	MGO E&C Manager Glendell ECC Thiess Senior Environmental Advisor	Updated document to reflect Department of Planning and Infrastructure's comments on Sept version and updated to reflect current practice.
6	November 2014	MGO E&C Manager	Updated document to include removal of the Mt Owen licensed discharge point, updates to Table 1 and updates to Tailings Dam Capping timeframes.
7	October 2015	MGO E&C Manager Glendell E&C Coordinator	Updated the document in line with the GCAA Water Management protocol and put it into the GCAA template and included updates from comments from DP&E.
8	December 2016	MGO EMS Steering Committee	Updated to address the Mt Owen Continued Operations development consent (SSD-5850) conditions and revised development consent for Glendell Mine (DA 80/952 MOD 3).
9	October 2017	MGO E&C Manager MGO E&C Coordinator	Updated to address changes following MOD1 to SSD 5850.
9.1	March 2018	MGO E&C Manager	Updates to commitment register and associated plan text to streamline commitments.
New SharePoint			
1.0	November 2019	MGO E&C Coordinator	Updated to address changes following MOD2 to SSD-5850.
2.0	March 2020	MGO E&C Manager MGO E&C Officer	Updated to address changes following MOD4 to DA 80/952.

Appendix A - Water Management Plan Consultation



Department of
Primary Industries
Water

Contact: Hannah Grogan
Phone: 02 4904 2516
Email: hannah.grogan@dpi.nsw.gov.au
Our ref: V15/3875-2#18 & OUT17/20871

Mount Owen Complex

Email: vicki.mcbride@glencore.com.au

Attention: Vicki McBride

Dear Ms McBride,

Mount Owen Complex – Water Management Plan Suite

I refer to your email dated 17 January 2017 seeking the Department of Primary Industries – Water's (DPI Water) comments on the Water Management Plan Suite (WMP) for the Mt Owen Continued Operations Project (SSD 5850). DPI Water has reviewed the WMP and our comments are as follows. Detailed comments are outlined in **Attachment A**.

DPI Water considers that the groundwater assessment criteria require further development to ensure that objects and principles of the *Water Management Act 2000* are met. This is important to ensure that the beneficial use class of the alluvial aquifer is maintained and monitored.

In addition it is recommended that further consultation occurs regarding proposed diversion design to ensure long term geomorphic function.

Recommendations:

DPI Water recommends that:

1. Water dependent assets (including GDEs, groundwater users and the associated surface water systems) within and around the Mount Owen Complex (MOC) will have different impact risk including proximity to open cut pits, void structures and emplacement areas. The groundwater assessment criteria needs to be further developed in consultation with DPI Water. The criterion is to consider water quality and water level triggers for investigating any potentially adverse groundwater impacts. The proponent should address these different risks and set the trigger levels based on representative data for the appropriate area, noting a decline in salinity can be an equally important indicator for a change in hydrological connection between aquifers.
2. The WMP has used the term 'significant' or 'significantly' to define a level of impact change relating to mine inflows and alluvial seepage. These terms require a

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prescriptive definition that warrants an investigation so that there is no ambiguity between the proponent and regulator.

3. It is noted in the Groundwater Management and Monitoring Plan (GMMP) Table 2.1 'Mine Inflows' that there is a sharp increase in pit inflows at the Glendell Mine for year 2020. Clarification is requested as to the driver for the sharp increase in inflow in year 2020 and any additional licensing requirements that may arise subject to the source of increased inflows.
4. As the overall salinity in the alluvium is reported to be higher than the hardrock/coal aquifers, which is a peculiarity, a check of the bore log construction, history of data observations and mining should be undertaken to evaluate the representatives of a trigger site before selection. DPI Water recommends the provision of downhole salinity EC profiles and charge balance error assessments for major ions to assist in the alluvial aquifer resource conceptualisation and data validity. This will assist DPI Water in providing advice on the groundwater assessment criteria.
5. Further clarification is required within the GMMP to demonstrate how groundwater monitoring links with the Biodiversity Plan and how this will assist in the management and protection of GDEs.
6. Further detail is required to understand the extent of discrepancy required between water balance and evaporative losses that would lead to triggering an investigation of water losses from storages and tailings emplacements. Consideration should be given to linking this trigger to the bore water quality and level monitoring.
7. It is recommended that the proposed diversion be redeveloped in consultation with DPI Water. It is considered that the currently proposed hydraulically smooth channel, grass lined and over-steepened channel bed is not sufficient for promoting geomorphic processes and preventing erosion and scour. This review must include increased channel roughness elements such as large woody debris tied to rock bed level controls. This is important to protect revegetation of the channel bed and banks and to form elements to capture and incorporate sediment transported from upstream into channel geomorphic features and hydraulic elements including runs, glides and pools.
8. Revegetation of the diversion should be designed in accordance with DPI Water Guidelines for Controlled Activities on Waterfront Land (2012).
9. Commitment 19 should consider appropriate indicators of geomorphic change.

Please contact Hannah Grogan, Water Regulation Officer (Newcastle) on (02) 4904 2516 or Hannah.grogan@dpi.nsw.gov.au if you have further enquiries regarding this matter.

Yours sincerely,



Irene Zinger
Regional Manager - Metro
Water Regulatory Operations

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Appendix B - Water Management Plan Approval

To be inserted once approved by the Department.

Appendix C - Conceptual Final Landform Water Management System

Method for Calculating Water Licensing Requirements Final Landform	Harvestable Rights		Water Access Licences	
	Mount Owen Land	Forestry Corporation Land	Jerrys	Glennies
Water Allocation Volumes Available				
Harvestable Rights Provisions:				
	Insert here (as a +ve number)			
Water Access Licences				
Determine available water access licences (WAL) (Hunter Unregulated WSP – Jerrys and Glennies water sources)	Insert here (as a +ve number)			
Determine Licensable Water Take				
Dams				
	Insert here (as a -ve number)			
Final Voids				
Calculate Water Take (i.e. surface water captured in Void * regional runoff rate x catchment area)	Insert here (as a -ve number)			
Determine if under or over allocated (sum values in columns above)				