MACHEnergy

MOUNT PLEASANT OPERATION

SITE WATER BALANCE

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

1 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively (Figure 1). MACH Energy purchased the MPO from Coal & Allied Operations Pty Ltd (Coal & Allied) in 2016.

MACH Mount Pleasant Operations Pty Ltd is the manager of the MPO as agent for, and on behalf of, the unincorporated Mount Pleasant Joint Venture between MACH Energy Australia Pty Ltd (MACH Energy) (95 per cent [%] owner) and J.C.D. Australia Pty Ltd (5% owner). This Site Water Balance (SWB) is implemented at the MPO by MACH Energy.

The initial development application for the MPO was made in 1997. This was supported by an Environmental Impact Statement (EIS) prepared by Environmental Resources Management (ERM) Mitchell McCotter (ERM Mitchell McCotter, 1997). On 22 December 1999, the then Minister for Urban Affairs and Planning granted Development Consent DA 92/97 to Coal & Allied. This allowed for the "Construction and operation of an open cut coal mine, coal preparation plant, transport and rail loading facilities and associated facilities" at the MPO. The consent allowed for operations 24 hours per day seven days per week and the extraction of 197 million tonnes (Mt) of run-of-mine (ROM) coal over a 21 year period, at a rate of up to 10.5 Mt of ROM coal per year.

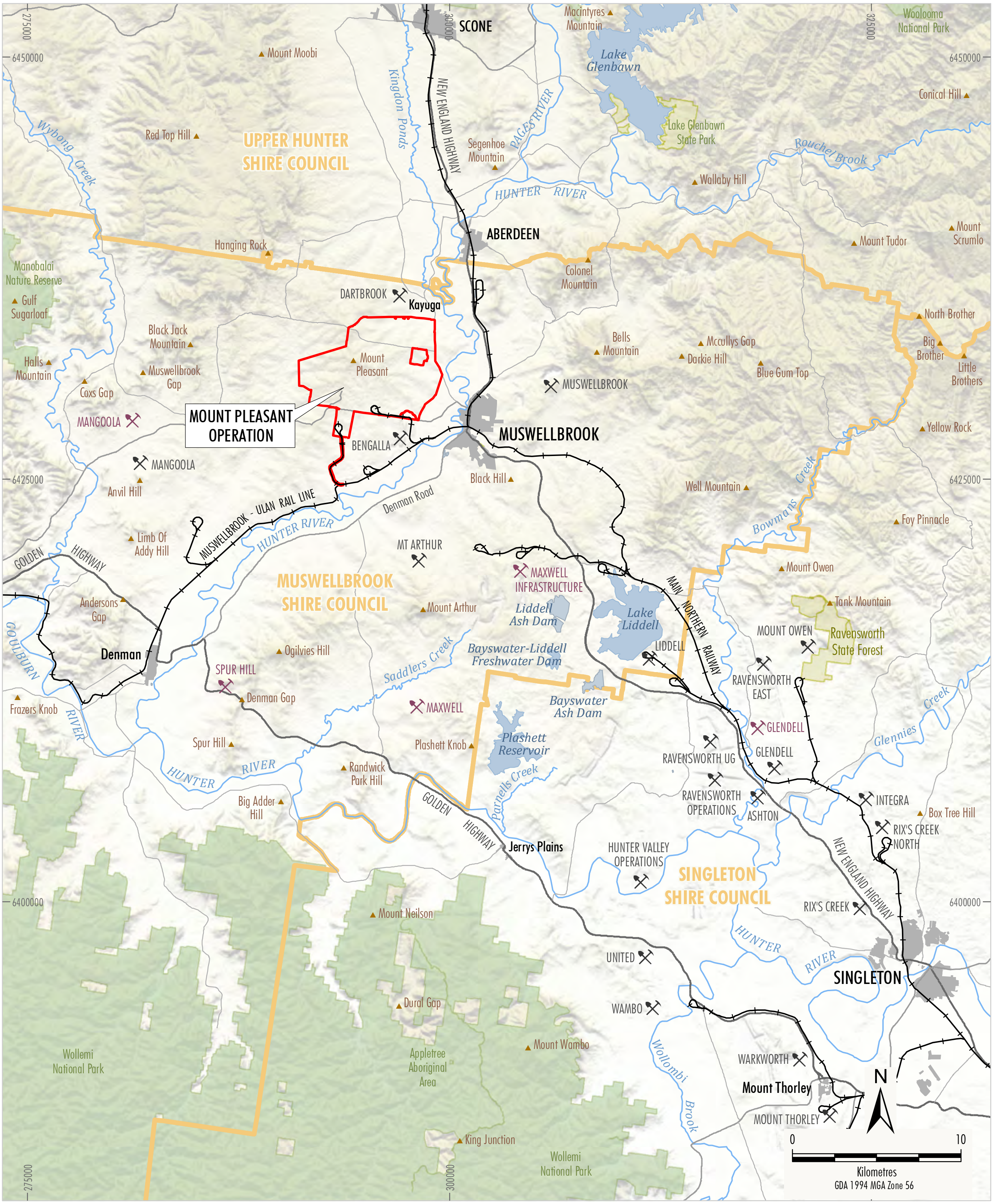
The Mount Pleasant Project Modification (MOD 1) was submitted on 19 May 2010 with a supporting Environmental Assessment (EA) prepared by EMGA Mitchell McLennan (EMGA Mitchell McLennan, 2010). MOD 1 included the provision of an infrastructure envelope for siting the mine infrastructure, the provision of an optional conveyor/service corridor linking the MPO facilities with the Muswellbrook-Ulan Rail Line and modification of the existing Development Consent DA 92/97 boundaries to accommodate the optional conveyor/service corridor and minor administrative changes. MOD 1 was approved on 19 September 2011.

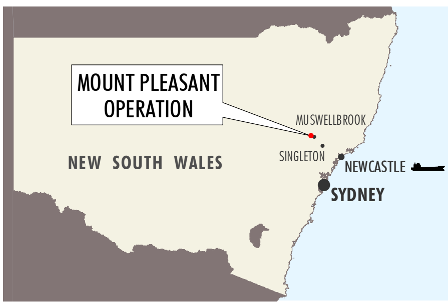
The MPO South Pit Haul Road Modification (MOD 2) was submitted on 30 January 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017a). MOD 2 proposed to realign an internal haul road to enable more efficient access to the South Pit open cut, with no other material changes to the approved MPO. MOD 2 was approved on 29 March 2017.

The MPO Mine Optimisation Modification (MOD 3) was submitted on 31 May 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017b). MOD 3 comprised an extension to the time limit on mining operations (to 22 December 2026) and extensions to the South Pit Eastern Out of Pit Emplacement to facilitate development of an improved final landform. MOD 3 was approved on 24 August 2018.

The MPO Rail Modification (MOD 4) was submitted on 18 December 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017c). MOD 4 proposed the following changes:

- duplication of the approved rail spur, rail loop, conveyor and rail load-out facility and associated services;
- duplication of the Hunter River water supply pump station, water pipeline and associated electricity supply that followed the original rail spur alignment; and
- demolition and removal of the redundant approved infrastructure within the extent of the Bengalla Mine, once the new rail, product loading and water supply infrastructure has been commissioned and is fully operational.





LEGEND

- Mining Operation
- Proposed Mining Operations (Application Lodged)
- Railway
- Local Government Boundary
- State Forest/Reserve
- National Parks and Wildlife Estate
- Mining Lease Boundary (Mount Pleasant Operation)

Source: NSW Spatial Services (2020)

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Project Location

Figure 1

MAC-18-03 MP2020_Figure 1_Rev B

MOD 4 was approved on 16 November 2018 by the Secretary of the Department of Planning and Environment (under Delegation). Appendix 2 of the modified Development Consent DA 92/97 illustrates the Conceptual Project Layout Plan of the approved MPO at 2021 and 2025, Approved Surface Disturbance Plan and Conceptual Final Landform (Attachment 1) incorporating the MOD 4 infrastructure relocations.

1.1 PURPOSE AND SCOPE

This Site Water Balance (SWB) has been prepared by MACH Energy to satisfy the requirements under Development Consent DA 92/97 (as modified) and specifically Condition 28(a), Schedule 3.

This SWB has been prepared to predict the water demand/supply associated with construction and operation of the MPO, including for example, initial establishment and development works, open cut mining, operation of the coal handling and preparation plant (CHPP), rail spur/loop and Fines Emplacement Area, and the supply of water to the MPO.

The SWB applies to all employees and contractors at the MPO and covers all areas within the MPO boundary. The SWB applies to the life of the MPO, including (but not limited to) the period of mining operations specified in Development Consent DA 92/97, which currently permits mining until 22 December 2026. As required by Condition 5, Schedule 2 of Development Consent DA 92/97, the SWB will continue to apply (excluding mining operations) beyond 22 December 2026, as required, until the rehabilitation and any additional undertakings (required by the Secretary of the Department of Planning, Industry and the Environment [DPIE], or the Division of Mining, Exploration and Geoscience [MEG] within the Department of Regional NSW) have been carried out satisfactorily.

1.2 STRUCTURE OF THE SWB

Consistent with the requirements of Condition 28(a), Schedule 3 of Development Consent DA 92/97, the remainder of the SWB is structured as follows:

- Section 2: Outlines the statutory obligations relevant to this SWB.
- Section 3: Outlines the available data used in the modelling of the SWB.
- Section 4: Describes the water management system implemented at the MPO.
- Section 5: Outlines the predicted water demands present at the site.
- Section 6: Describes the controlled water releases proposed.
- Section 7: Outlines the site water sources.
- Section 8: Describes the water balance modelling undertaken as part of this SWB.
- Section 9: Outlines the review process for MPO documentation and in particular for this SWB.
- Section 10: Describes the reporting procedures relevant for this SWB.
- Section 11: Lists the references cited in this report.

2 STATUTORY OBLIGATIONS

MACH Energy's statutory obligations are contained in:

- the conditions of Development Consent DA 92/97 (as modified);
- the condition of the Commonwealth Approval EPBC 2011/5795;
- relevant licences (including Environment Protection Licence [EPL] 20850), permits and mining leases (mining leases 1645, 1708, 1709,1713, 1750 and 1808); and
- other relevant legislation.

Obligations relevant to this SWB are described below.

2.1 DEVELOPMENT CONSENT DA 92/97

The conditions of Development Consent DA 92/97 relevant to the content and structure of this SWB are described below. A comprehensive list of all conditions in Development Consent DA 92/97 relevant to water is provided in the Water Management Plan (WMP).

2.1.1 SWB Requirements

Condition 28(a), Schedule 3 of Development Consent DA 92/97 requires the preparation of a SWB, as part of the WMP for the MPO (refer Table 1).

Table 1
SWB Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97 Schedule 3	Section where addressed in this SWB document
28. The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Secretary. This plan must be prepared in consultation with DoI Water and EPA, and be submitted to the Secretary for approval by 30 June 2019, unless otherwise agreed by the Secretary. *The plan must include:* *(a) a Site Water Balance, which must:* • *include details of:*	
– *sources and security of water supply;*	Sections 4.3, 4.4, 7, 8.3 and 8.6
– *water use on site;*	Section 5
– *water management on site;*	Section 4
– *any off-site water transfers; and*	Section 6
• *investigate and implement all reasonable and feasible measures to minimise water use by the development;*	Section 4.3

2.1.2 Management Plan (General) Requirements

Condition 2, Schedule 5 of Development Consent DA 92/97 outlines the general management plan requirements that are applicable to the preparation of this SWB.

Table 2 presents these requirements and indicates where each is addressed within this SWB, or within the overarching WMP for the MPO.

Table 2
General Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97 Schedule 5	Section where addressed in this SWB document
2. The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	
(a) detailed baseline data;	Section 3
(b) a description of: • *the relevant statutory requirements (including any relevant consent, licence or lease conditions);*	Section 2
• *any relevant limits or performance measures/criteria;*	Surface Water Management Plan (SWMP) and Groundwater Management Plan (GWMP)
• *the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;*	SWMP and GWMP
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	SWMP and GWMP
(d) a program to monitor and report on the: • *impacts and environmental performance of the development;* • *effectiveness of any management measures (see c above);*	Section 9
(e) a contingency plan to manage any unpredicted impacts and their consequences;	Refer to Surface and Groundwater Response Plan (SGWRP)
(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 9 and Section 10
(g) a protocol for managing and reporting any: • *incidents;* • *complaints;* • *non-compliances with statutory requirements; and* • *exceedances of the impact assessment criteria and/or performance criteria; and*	Section 10
(h) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they are unnecessary for particular management plans.*	Section 9

2.2 LICENCES, PERMITS AND LEASES

Water management at the MPO is conducted in accordance with a number of licences, permits and leases. Key licences, permits and leases relating to water at the MPO include:

- Water Access Licences (WALs) issued under the *Water Management Act, 2000* (Table 3).
- Discharge credits (46) held under the NSW *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation, 2002* (HRSTS).
- Mining leases 1645, 1708, 1709, 1713, 1750 and 1808 issued under Part 5 of the NSW *Mining Act, 1992* and approved by the Minister for Mineral Resources.
- EPL 20850 issued under Part 3 of the NSW *Protection of the Environment Operations Act, 1997* by the NSW Environment Protection Authority (EPA).
- The Mining Operations Plan, as required by mining lease conditions issued under the *Mining Act, 1992* and approved by the DRG.

2.3 OTHER LEGISLATION

A description of other legislation relevant to water resources at the MPO is provided in the WMP, SWMP and GWMP.

Table 3
Surface Water Access Licences Held for the Mount Pleasant Operation

Water Access Licence	Water Source	Type	Share (units)
879	Hunter Regulated River Water Source	Regulated River (High Security)	243
880	Hunter Regulated River Water Source	Regulated River (High Security)	124
1113	Hunter Regulated River Water Source	Regulated River (High Security)	366
973	Hunter Regulated River Water Source	Regulated River (High Security)	3
638	Hunter Regulated River Water Source	Regulated River (High Security)	225
		High Security Subtotal	**961**
639	Hunter Regulated River Water Source	Regulated River (General Security)	134
974	Hunter Regulated River Water Source	Regulated River (General Security)	210
988	Hunter Regulated River Water Source	Regulated River (General Security)	156
1229	Hunter Regulated River Water Source	Regulated River (General Security)	480
1227	Hunter Regulated River Water Source	Regulated River (General Security)	99
992	Hunter Regulated River Water Source	Regulated River (General Security)	75
7808	Hunter Regulated River Water Source	Regulated River (General Security)	36
702	Hunter Regulated River Water Source	Regulated River (General Security)	267
993	Hunter Regulated River Water Source	Regulated River (General Security)	265
604	Hunter Regulated River Water Source	Regulated River (General Security)	183
662	Hunter Regulated River Water Source	Regulated River (General Security)	9
10775	Hunter Regulated River Water Source	Regulated River (General Security)	243
41438	Hunter Regulated River Water Source	Regulated River (General Security)	455
1074	Hunter Regulated River Water Source	Regulated River (General Security)	5
8406	Hunter Regulated River Water Source	Regulated River (General Security)	168
10531	Hunter Regulated River Water Source	Regulated River (General Security)	120
8598	Hunter Regulated River Water Source	Regulated River (General Security)	3
		General Security Subtotal	**2,908**
975	Hunter Regulated River Water Source	Domestic and Stock	8
989	Hunter Regulated River Water Source	Domestic and Stock	8
1230	Hunter Regulated River Water Source	Domestic and Stock	8
605	Hunter Regulated River Water Source	Domestic and Stock	8
677	Hunter Regulated River Water Source	Domestic and Stock	24
663	Hunter Regulated River Water Source	Domestic and Stock	16
13785	Hunter Regulated River Water Source	Domestic and Stock	1
1259	Hunter Regulated River Water Source	Supplementary Water	33.2
1258	Hunter Regulated River Water Source	Supplementary Water	5
1307	Hunter Regulated River Water Source	Supplementary Water	37.5
1260	Hunter Regulated River Water Source	Supplementary Water	5
1308	Hunter Regulated River Water Source	Supplementary Water	15.1
1338	Hunter Regulated River Water Source	Supplementary Water	17.5
8445	Hunter Regulated River Water Source	Supplementary Water	12.6
		Other Subtotal	**198.9**

3 AVAILABLE DATA

The SWB model has been developed using historical climate data representative of the MPO area, as described below.

3.1 CLIMATE DATA

Climate data for the SWB model was sourced from the Queensland Government's Data Drill service (Queensland Government, 2017). This service provides synthetic data sets for a specified point by interpolation between surrounding point records held by the Bureau of Meteorology. Daily evaporation and rainfall data from 1892 to 2012 was obtained for the mine site and used in the SWB model (Section 8).

3.2 HUNTER RIVER FLOW DATA

To calculate periods where licensed discharge could be simulated for the SWB, a relationship between the Hunter River flow rate and river registers for declared 'high' flow events was developed. This relationship was formulated using historical river registers sourced from Department of Industry – Water records, correlated against recorded Hunter River daily flows. This correlation extended to 'flood' flow events in the Hunter River (during which no daily discharge restriction applies). Hunter River flow rates at Muswellbrook were simulated by the Integrated Quantity and Quality Model for the same period of historical climate data as used in the water balance model and these flows used with the above correlation relationship to simulate river registers.

4 WATER MANAGEMENT SYSTEM

The MPO water management system is comprised of a number of dams, the open cut and the Fines Emplacement Area, together with a system of pumped transfers and drains. The Water Management System is shown in Schematic form in Figure 2 and described in detail below. General arrangement of the water management system at the MPO is shown on Figure 3.

Conceptual Project Layout Plans for the MPO, showing the proposed location of key water management system infrastructure, are shown in Attachment 1.

4.1 WATER MANAGEMENT SCHEME

4.1.1 Storage Dams

The Mine Water Dam (MWD) is the main water storage on-site and will supply makeup water to the CHPP. Fine rejects slurry produced by the CHPP will be pumped to the Fines Emplacement Area and water recovered from the Fines Emplacement Area is pumped back to the MWD. Any seepage from the Fines Emplacement Area is captured in a subsurface seepage collection system located at the toe of the Fines Emplacement Area embankment and pumped back to the storage area.

Environmental Dam 2 (ED2) is located downstream of the Fines Emplacement Area and will serve as a sediment dam for the construction of the Fines Emplacement Area.

Other site water storages include:

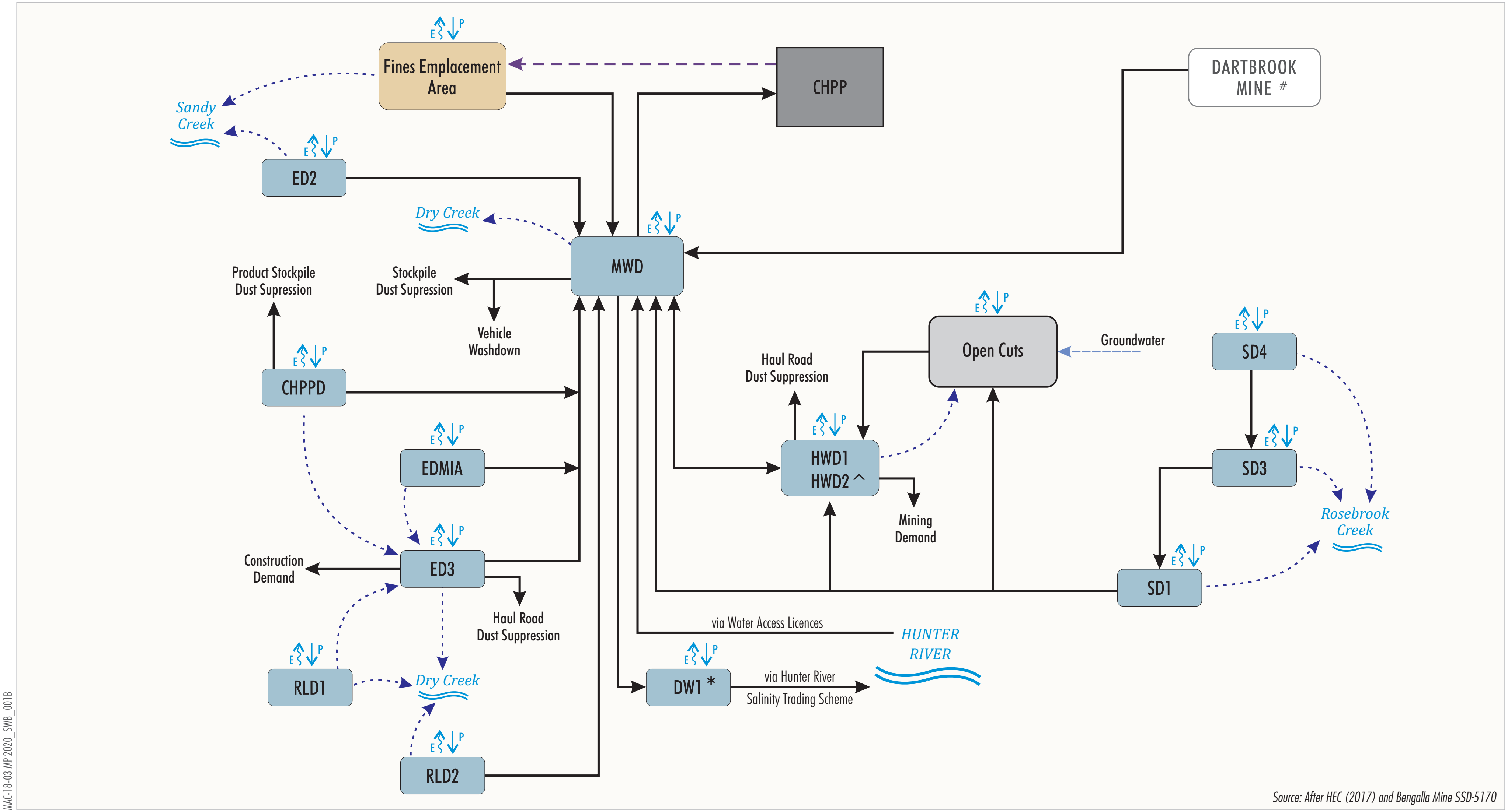
- Environment Dam Mine Infrastructure Area (EDMIA);
- Environmental Dam 3 (ED3);
- Environmental Farm Dam (EFD6)[1];
- Sediment Dam 1 (SD1);
- Sediment Dam 3 (SD3);
- Sediment Dam 4 (SD4);
- High Wall Dam 1 (HWD1);
- High Wall Dam 2 (HWD2);
- Rail Loop Dam 1 (RLD1);
- Rail Loop Dam 2 (RLD2); and
- CHPP Dam (CHPPD).

Other small farm dams are used periodically as available and required.

Each of these storages are pumped back to the water management system.

The MWD is able to receive water from the Hunter River via WALs. A discharge dam (DW1) and associated pipeline will also be constructed in the south-southwest of the MPO to receive excess water from the MWD (Attachment 1). DW1 and its associated pipeline were originally approved for construction under the development consent for the Bengalla Continuation Project (SSD-5170) with the intention that the MPO would seek any necessary secondary approvals required to facilitate its use.

[1] EFD6 is a small farm dam with a small external catchment area, and as such, has been included in the catchment of ED3.



LEGEND

- Water Storage
- Fine Rejects Storage
- Pumped Flow
- Overflow Due to Rainfall in Excess of Design Criteria
- Seepage Flow
- Fine Reject Slurry Flow
- Precipitation
- Evaporation

NOTE

* Mount Pleasant Discharge Dam authorised under Bengalla Mine SSD-5170.

\# Indicative alignment of water supply pipeline from Dartbrook Mine to MPO.

^ Not yet constructed.

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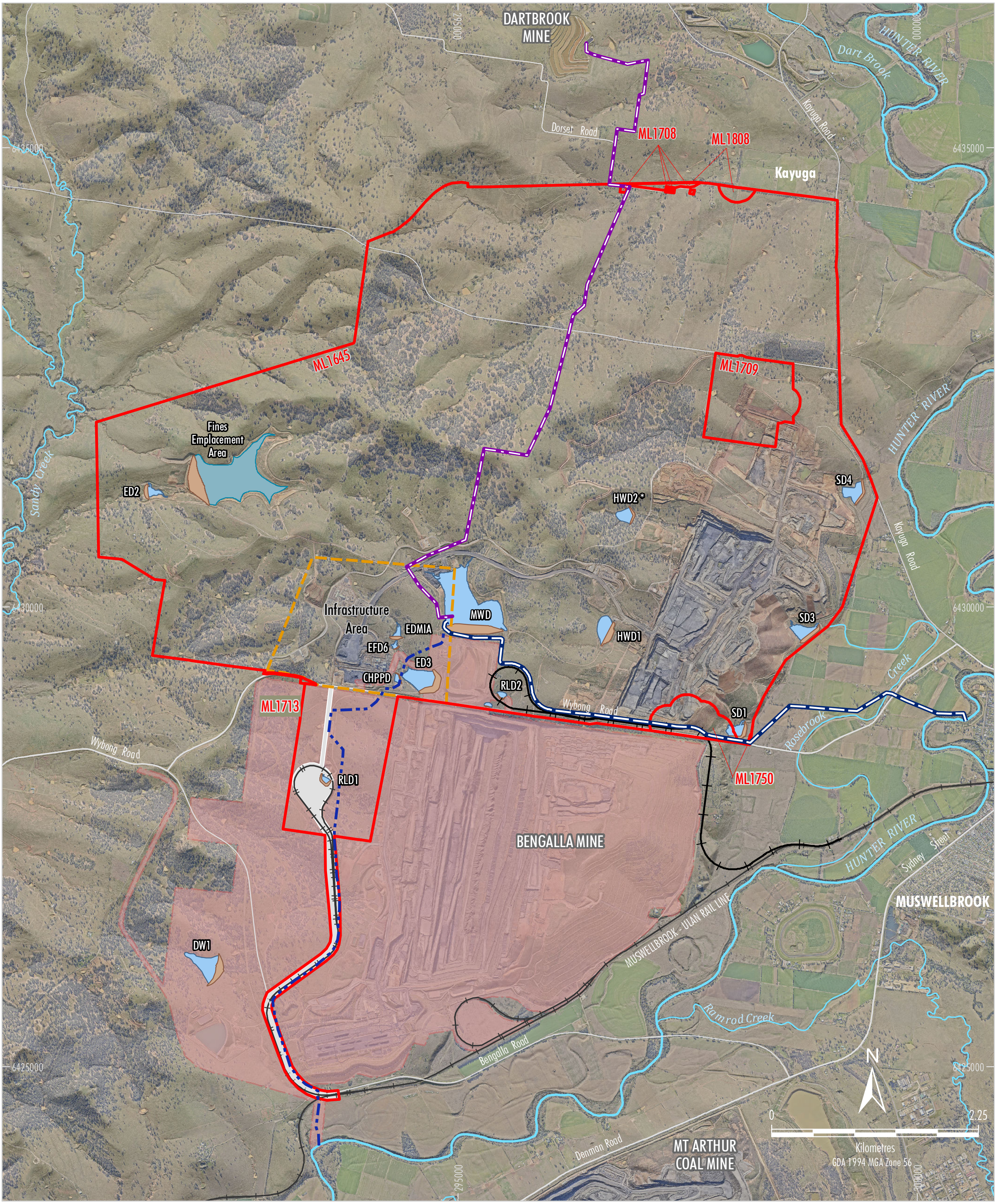
Water Management System Schematic

Figure 2



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LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Infrastructure Area Envelope
- Indicative Existing Coal Transport Infrastructure
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)
- Approved MOD4 Rail Spur and Loop
- MPO Hunter River Supply Pipeline
- MOD4 Hunter River Supply Pipeline Indicative Alignment
- Indicative Dartbrook Water Sharing Pipeline Alignment
- Water Dam
- Fines Emplacement Area

NOTE

* Construction to commence in 2021.

Figure excludes some incidental Project components such as water management infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, signalling, other ancillary works and construction disturbance. Refer Figure 2 of the Mount Pleasant Operation Water Management Plan for the Mount Pleasant Operation Indicative Surface Disturbance Plan as at 2021.

Source: MACH (2020); NSW Spatial Services (2020); Department of Planning and Environment (2016); Royal Haskoning DHV (2018)
Orthophoto: MACH Energy (July 2020)

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Water Management System
General Arrangement

Figure 3

MACH Energy will seek approval for a licensed discharge point at the outflow from DW1 to the Hunter River, in accordance with the HRSTS as a variation of EPL 20850.

A Clean Water Diversion Drain has been constructed to direct rainfall runoff from upslope undisturbed areas off-site. Groundwater inflow to the open cut is dewatered to HWD1.

RLD1 has been located adjacent to the approved rail loop south of the CHPP, to capture potentially mine affected runoff from this area which would be pumped back to ED3. RLD2 will be commissioned to the east of the CHPP to capture runoff from the approved MOD 4 rail loop.

Temporary sediment dams will also be commissioned to the south of Wybong Road for the construction of the approved MOD 4 rail infrastructure.

The existing storage dams at the MPO are shown on Figure 3.

4.1.2 Drains

A number of drains have been developed and/or are planned as part of the water management system, these include:

- a series of downslope (toe) drains at the perimeter of the Eastern Out of Pit Emplacement, directing runoff to SD1, SD3 and SD4;
- a drain downslope of the CHPP area directing runoff to ED3;
- a short clean water diversion drain upslope of the RLD;
- clean water diversion drains around the perimeter of the Fines Emplacement Area and ED2;
- drains around the out of pit emplacement areas to the north and west of the open cut areas; and
- additional clean water diversion drains upslope of the MWD.

4.2 DAM AND DRAIN DESIGN

The storage dams and their associated design capacities are outlined in Table 4 below.

Actual water storage and sediment dam design capacities may vary from those described in Table 4 based on progressive water balance modelling reviews.

The open cut was excluded from Table 4 because its capacity was not based on design criteria. For modelling purposes, the open cut storage was assumed to comprise a rectangular sump throughout the MPO life and the volume of water stored was tracked within the model and reported to assess potential risk of disruption to mining.

The Fines Emplacement Area was also excluded from Table 4 because its capacity varies with time. The storage was assumed to comprise a sloping fine rejects beach and the water storage level-volume-area relationships were derived for the period where fine rejects are present and estimated from existing topographic contours for the initial storage (at commissioning). A minimum capacity of 400 ML was simulated in early 2023 (just before a planned dam wall raise). The Fines Emplacement Area reclaim pumping rate was set so that no spills were simulated.

The catchment area of sediment dams SD1, SD3 and SD4 was assumed to be the maximum from the Conceptual Project Layout Plans (i.e. as at 2025 [Attachment 1]). The maximum catchment area reporting to ED2 was assumed to be from 2023 onwards from stage plans and Fines Emplacement Area embankment designs.

Table 4
Water Storage and Sediment Dam Design Capacities

Name of Dam	Type of Dam	Design Criterion	Capacity (ML)
ED2	Sediment Dam	Landcom (2004) & DECC (2008)	25.5#
ED3^	Sediment Dam	1% AEP spill risk*	331.7#
RLD1	Sediment Dam	1% AEP spill risk	16.3#
RLD2	Sediment Dam	1% AEP spill risk	9.5
EDMIA	Sediment Dam	Nominal size – spills allowed internally to ED3	17.1#
CHPPD	Mine Water Dam	Nominal size – spills allowed internally to ED3	8.2#
HWD1	Mine Water Dam	Spills (to open cut) once a year on average	117.3#
HWD2	Mine Water Dam	Spills (to open cut) once every two years on average	30.9
CWD1	Clean Water Dam	Spills (to open cut) once every five years on average	6.7
CWD2	Clean Water Dam	Spills (to open cut) once every five years on average	35.2
MWD	Mine Water Dam	Allow for buffer to supply site demands	2,077#
SD1	Sediment Dam	Landcom (2004) & DECC (2008)	51.6#
SD3	Sediment Dam	Landcom (2004) & DECC (2008)	40.2#
SD4	Sediment Dam	Landcom (2004) & DECC (2008)	36.6
DW1	Discharge/Storage Dam	1% AEP spill risk	363

Note:

ML = Megalitres, AEP = Annual Exceedance Probability and DECC = NSW Department of Environment and Climate Change.

* MACH Energy has installed a pump and pipeline system at ED3 to dewater the storage to MWD to reduce the potential for overtopping. This would provide additional capacity above the design criterion listed above and further reduce spill risks.

Based on as-built survey.

^ Includes EFD6.

MACH Energy notes the EPA's advice to Department of Planning and Environment on the Hunter Valley Operations South MOD 5 proposal, which provided guidance regarding sediment dam design in the context of the HRSTS (EPA letter dated 17 March 2017). In accordance with the EPA's recommendations, MACH Energy is monitoring the quality of water in sediment dams in order to regularly evaluate whether the salinity of controlled discharges/managed overflows from the sediment basins complied with the provisions of the HRSTS.

Longer term (2000 to 2020) monitoring results indicate an average EC at all site monitoring points are typically less than the limit for 'saline water' of 400 µS/cm described in the HRSTS Regulation.

Recent (2020) data for SD1 and SD3 have indicated EC values greater than 400 µS/cm, however this data has been collected during a dry period at the MPO and a correspondingly low water levels in SD1 and SD3 (i.e. due to evapoconcentration of salts). MACH Energy therefore considers that these results would not be indicative of a managed overflow event at SD1 (e.g. in the event of rainfall in excess of design criteria).

MACH Energy will continue to monitor the MPO sediment dams to ensure any controlled discharges are in accordance with the HRSTS.

To date, there have been no licensed discharges from the MPO sediment dams.

Notwithstanding, in the event that monitoring of the water quality in sediment dams after a significant rainfall event indicates that water would not meet the HRSTS maximum for non-regulated discharge, MACH Energy would identify and implement additional management measures in consultation with EPA. These may include:

- Licensing of sediment dams in an EPL and acquisition of additional salinity credits under the HRSTS.
- Increasing the capacity of relevant sediment dams.
- Implementing additional pumping arrangements to return water from the sediment dams to the mine water management system.

The capacities and storage operating levels of the MPO storages were developed based on as-built surveys or iterative simulations to achieve specific design criteria (as summarised in Table 4). For the MWD, ED3 and the RLD1 and 2, which spill externally, a spill risk assessment identified an AEP for each dam and iterative simulations were carried out to identify the required capacity for a given AEP. As noted in Table 4, MACH Energy has installed a pump and pipeline system at ED3 to dewater the storage to MWD. This would provide additional capacity above the design criterion and further reduce spill risks.

Drains are sized in accordance with Landcom (2004) and NSW DECC (2008) guidelines and would either be grassed or rip-rap lined or similar to control erosion.

4.3 MINIMISATION OF WATER USE

MACH Energy's water management strategy includes preferential use of on-site derived mine water, thereby reducing the need to import raw water from external sources for operational purposes. As described in Section 4.1.1, the water management system has been designed to recycle runoff, fine rejects bleed water and groundwater inflow wherever practicable. This water is reused for haul road and stockpile dust suppression, vehicle wash down, and in the CHPP.

Notwithstanding, general water management measures undertaken include, but are not limited to:

- finalising construction of proposed water storages as early as possible to increase site yield;
- limiting the extent of disturbance to reduce dust suppression requirements;
- all surface and groundwater will be taken in accordance with WALs; and
- regularly reviewing water use to identify areas for reduction and identify best practice technologies. This will be reviewed every year as part of the Annual Review process (Section 9.1).

During construction activities, water may be sourced externally, e.g. taken from commercial water fill points in the light industrial area.

MACH Energy would also seek opportunities to source excess mine water from the adjoining mines (i.e. Dartbrook and Bengalla Mines) should it be available, to minimise extraction from the Hunter River. The frequency, quality and quantity of water to be sourced from the Dartbrook or Bengalla Mines would depend on:

- Availability of surplus water on the other mine sites coinciding with a water deficit at the MPO.
- Suitability of Dartbrook/Bengalla water quality for the intended use at the MPO.
- MACH Energy and the other mining operator obtaining all necessary approvals.

MACH Energy would also consider the feasibility of other potential alternative water supply sources over the life of the mine in consultation with DPIE and EPA.

MACH Energy has obtained in-principle agreement with Australian Pacific Coal for Dartbrook Mine to supply some excess mine water to the MPO for its beneficial reuse (Figure 2).

4.4 POTABLE WATER

Treated potable water for all facilities is trucked to site and stored in on-site storage tanks with sufficient capacity to store a 7 day supply. All potable water supplied on-site will meet the requirements of the *Australian Drinking Water Guidelines* (National Health and Medical Research Council, 2011).

5 WATER DEMANDS

5.1 OVERVIEW

Key water demands on-site include the following:

- water used in the CHPP, including water retained in coal products and rejects;
- haul road dust suppression; and
- miscellaneous water usage such as vehicle wash down and stockpile water usage.

A description of these water demands and the assumptions adopted in development of the SWB model is provided in the sections below.

5.2 CHPP

The CHPP accounts for the largest use of water at the MPO. Water lost from the coal handling and preparation process is either entrained within product coal or reject materials. CHPP demand was calculated by simulating the moisture balance[2] across the CHPP. The resulting forecast CHPP make-up demand rate equates to approximately 270 ML/Mt.

The CHPP water demand was assumed to increase over time, corresponding with the increase of ROM coal production over the mine life. CHPP demand is initially predicted to be at its lowest at the start of production at 2.73 ML/day (ML/d). At maximum production, the MPO is licensed to mine up to 10.5 million tonnes per annum, which yields an assumed water requirement of up to 8 ML/d.

5.3 DUST SUPPRESSION

MPO haul road dust suppression demand was calculated based on haul road lengths derived using mine stage plans. Calculated haul road dust suppression demand averaged approximately 1.2ML/d.

5.4 MISCELLANEOUS (VEHICLE WASHDOWN AND STOCKPILE USAGE)

Vehicle wash down demand was assumed to be 37 ML/year (ML/yr) while dust suppression of stockpiles was assumed to be 115 ML/yr for all modelled years.

5.5 OTHER LOSSES

For the purposes of calculating evaporation losses, storage volume surface areas were derived using storage level-volume-area relationships. Where storage specific information was unavailable, contour data was used to derive storage information.

Evaporation losses were calculated using the following pan factors over the various water storages at the site:

- the Fines Emplacement Area = 1.1 – due to the darker fine rejects surface;
- the open cut = 0.8 – due to shading effects and lower wind speed at depth; and
- all other storages – monthly values varying from 0.84 to 0.95 on the basis of values in McMahon *et al.* (2013) for Scone.

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[2] The amount of external water required to process coal through the CHPP (i.e. the difference between the moisture content in the ROM coal [input] and the moisture content in the product coal, coarse rejects and tailings [output]).

6 CONTROLLED WATER RELEASE

6.1 TREATED EFFLUENT DISPOSAL

Wastewater from offices, workshop and bath houses is collected and treated in on-site effluent treatment systems located within the Mine Infrastructure Area and the CHPP. Effluent is treated to meet the *Australian Guidelines for Water Recycling* (Environment Protection and Heritage Council, 2006), as well as NSW Health Department and local council requirements. Any additional effluent sites installed for expanded operations will be appropriately licensed. Effluent is removed from site by a suitably qualified contractor. Additionally, on-site treated effluent may be pumped to the MWD to supplement CHPP usage, vehicle wash down and stockpile dust suppression.

Any treated effluent released from the MWD to the Hunter River via the HRSTS will comply with the discharge conditions specified in EPL 20850.

6.2 LICENSED DISCHARGE

Licensed discharge will occur between MWD and the Hunter River via DW1 when appropriate secondary approvals are obtained. At the appropriate time, MACH Energy will seek these approvals in accordance with the HRSTS as a variation of EPL 20850 (Section 4.1.1).

The HRSTS regulates the amount and salinity of water which can be discharged into the Hunter River.

7 WATER SOURCES

Sources of water supply to the MPO are summarised below:

- groundwater inflows to the open cut;
- runoff captured from the footprint of the mining disturbance area by the water management system;
- fine rejects bleed water captured from the Fines Emplacement Area; and
- water pumped from the Hunter River and/or groundwater supply bores.

Operational water supply is reviewed regularly, collating all groundwater extractions, in-pit rainfall accumulation and runoff, as well as imported water to inform on-site water management.

MACH Energy will manage the available water sources and, if necessary, adjust the scale of operations to match the available water supply (in accordance with Condition 25, Schedule 3 of Development Consent DA 92/97).

MACH Energy would also seek opportunities to source excess mine water from the adjoining mines (i.e. Dartbrook and Bengalla Mines) should it be available (Section 4.3). However, potential access to excess water from other mining operations has not been currently assumed for this SWB model.

7.1 GROUNDWATER INFLOWS

Groundwater inflows were assumed to progressively increase over time, corresponding to the size of the open cut increasing over the mine life. The assumed pit inflow rate was lowest in 2018 at 0.11 ML/d, and peaking in 2026 at 0.69 ML/d. These inflow rates were reduced before use in the SWB model, to allow for evaporation from the exposed coal seams. Evaporation rates were calculated based upon coal seam thickness and strike length, using a pan factor of 0.8.

The median net inflow rate (incorporating evaporation) increased progressively, peaking yearly in the winter months. The inflow rate increased from a negligible daily rate, to approximately 0.2 ML/d for the final year of the initial five year operating period (during winter 2024).

7.2 CATCHMENT RUNOFF

As far as practical, clean water runoff from up catchment areas is diverted around active mining and other disturbance areas. Diversion design will consider catchment extent, required disturbance and safety. Water that accumulates within mining pits is pumped to surface storages for reuse in the mining operations and CHPP, as described in Section 4.1.

Catchment areas were derived using mine stage plans and converting mine areas into different sub-catchment types based upon their function and expected runoff behaviour. This is described in detail in Section 8.2.

7.3 FINE REJECTS BLEED WATER

As described in Section 4.1.1, fine rejects slurry will be pumped from the CHPP to the Fines Emplacement Area. Fine rejects bleed water is water liberated from fine rejects slurry as it settles. This water ponds at the fine rejects surface and is available for reclamation. Fine rejects bleed water recovered from the Fines Emplacement Area is pumped to the MWD.

The fine rejects bleed rate was assumed to increase progressively over the mine life due to the increased rate of ROM coal being handled in the CHPP (See Section 5.2). The bleed rate was assumed to be negligible in the first year of operations, approximately 2.5 ML/d during 2019 and approximately 5.5 ML/d for the rest of the simulation (2020 to end 2024).

7.4 PUMPING FROM THE HUNTER RIVER/GROUNDWATER SUPPLY BORES

714 ML/yr of Hunter River High Security Entitlment WALs and 829 ML/yr of MACH Energy's Hunter River General Security WALs are assumed to be available for the MPO currenlty. Up to 842 ML/yr of Hunter River High Security Entitlment WALs and 2,785 ML/yr of River General Security WALs could be made available in future if required.

The Integrated Quantity and Quality Model (IQQM) is the model used by the Department of Planning, Industry and Environment – Water (DPIE – Water) to set licence allocation levels in the Hunter Valley, in accordance and in conjunction with the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

IQQM simulations have previously been undertaken using climatic data from 1892 to 2012 (the same period of data as used in the water balance model) to generate predictions of General Security WALs available water determinations, periods of off-allocation flow and volume of water stored in Glenbawn Dam and Glennies Creek Dam (the two Hunter River major regulating storages), used to estimate available water determinations for WALs.

MACH Energy may also obtain make-up water from groundwater supply bores. Any water taken from groundwater bores would be in accordance with WALs issued under the relevant water sharing plan (i.e. depending on the relevant groundwater source).

8 WATER BALANCE MODELLING

8.1 OVERVIEW

The water balance model for the life of mine (ten year period) has been developed for the MPO, beginning on 1 March 2017 and simulating until the end of 2026 (HEC, 2018).

A short-term operational water balance model has also been developed for the initial operating period, beginning on 1 August 2019 and simulating until the end of 2024 (HEC, 2020). The initial five year operating period model has been informed by as-built survey of the water management system and mine plans for the first five years of operations (including surface disturbance/rehabilitation plans and a production schedule).

Both models have been developed using the GoldSim simulation package. The model simulates the behaviour of water held in and pumped between all simulated water storages shown in Figure 2. For each storage, the model simulates:

Change in Storage = Inflow – Outflow
Where:

- *Inflow* includes rainfall runoff, groundwater inflow (to the open cut), fine rejects bleed water, water pumped from the Hunter River and all pumped inflows from other storages.
- *Outflow* includes evaporation, spill, licensed discharge to the Hunter River via the HRSTS and all pumped outflows to other storages or to a demand sink (e.g. the CHPP).

The models operate on an 8-hourly time step. The models simulate 121 'realisations', derived using ten and five year time steps of the historical daily climatic record from 1892 to 2012, respectively[3]. The results from all realisations were used to generate estimates of supply reliability, spill and open cut water inventory. This method effectively includes all recorded historical climatic events in the water balance model, including high, low and median rainfall periods.

The sections below present the information derived from the initial five year water balance model (HEC, 2020) with the exception of Sections 8.3 and 8.4, which present the results derived from the life of mine water balance model (HEC, 2018).

8.2 SIMULATION OF CATCHMENT RUNOFF

Rainfall runoff in the water balance model was simulated using the Australian Water Balance Model (AWBM) (Boughton, 2004). The AWBM is a nationally-recognised catchment-scale water balance model that estimates catchment yield (flow) from rainfall and evaporation.

[3] Realisation 1 for the life of mine model (ten year simulation period) uses climate data from 1892 to 1902, realisation 2 uses data from 1893 to 1903 etc. Realisation 1 for the five year water balance model uses climate data from 1892 to 1897, realisation 2 uses data from 1893 to 1998 etc.

The MPO site was split into six different sub-catchment types for AWBM simulation, these were:

- undisturbed (natural) areas;
- hardstand (for example, roads and infrastructure areas);
- open cut pit;
- active waste rock emplacements;
- rehabilitated waste rock emplacements; and
- fine rejects.

AWBM simulation of flow from each of the sub-catchment types was undertaken. Evaporation pan factors were set to 1 for fine rejects and hardstand areas and 0.85 for all other sub-catchment types. The fine rejects sub-catchment was split into two classifications: wet beach (20% of the area), and dry beach (80% of the area), to allow for the different runoff properties expected.

For water surface areas, rainfall was assumed to add directly to the storage volume with no losses.

Catchment areas for the above sub-catchment types changed progressively over the life of the mine, due to changes in surface topography and water storage size. Catchment sizes were calculated for years 2019, 2021, 2023 and 2025. These areas were derived using mine stage plans, which showed the variance of surface contours and mining areas over the initial operating period. Catchment areas for in-between years were calculated by linearly interpolating between the catchment values for these four years.

The total catchment area peaks at approximately 1580 ha at the start of the simulation period, with a reduction due to the construction of a clean water diversion upslope of the open cut pit and SD4.

8.3 OVERALL WATER BALANCE

Water balance results, averaged over all 121 model realisations during the life of mine simulation period are presented in Table 5 below. The results for this single realisation show inflows and outflows for a representative climate sequence.

It should be recognised that the following items are subject to climatic variability:

- rainfall runoff;
- evaporation; and
- licensed site releases (including licensed sediment dam spills).

The results presented in Table 5 are an average of all realisations, and will include wet and dry periods distributed throughout the mine life. Rainfall yield for each phase is affected by the variation in climatic conditions within the adopted climate sequence.

Table 5
Average Annual Water Balance

Water Inflows		
Inflow	**Volume (ML/Yr)**	**Approximate Percentage of Total Inflow (%)**
Runoff	1746	53
Groundwater	13	0
Fine Rejects Bleed Water	887	27
Hunter River Pumping (via WALs)	656	20
Water Outflows		
Outflow	**Volume (ML/Yr)**	**Approximate Percentage of Total Outflow (%)**
Evaporation	393	12
CHPP Demand	1876	58
Haul Road Demand	510	16
Stockpile Demand	112	3
Vehicle Wash Demand	36	1
Discharge to Hunter River (via HRSTS)	217	7
Non Sediment Dam Spillage	0.7	0
Sediment Dam Spillage	18	0.6
Off-site Clean Water Discharge	60	2

Rainfall runoff provides the greatest average modelled system inflow, accounting for 53% of total inflows, followed by water liberated from fine rejects bleed water (27%). Licensed extraction via WALs accounts for approximately 20% of inflows on average. Average outflows are dominated by supply to the CHPP (58%), followed by supply for haul road dust suppression (16%) and evaporation (12%).

8.4 SIMULATED HUNTER RIVER INTERACTION

As part of the water balance output, graphs of modelled outputs for the simulated extraction and release of water to/from the Hunter River were produced. These graphs showed the 5th, 10th, 90th and 95th percentile, as well as the median extraction/discharge values over the life of mine simulation period, and are presented in the sections below.

8.4.1 Hunter River Extraction

Figure 4 below presents the predicted extraction from the Hunter River simulated over the life of mine period.

8.4.2 Hunter River Discharge

Figure 5 below presents the predicted discharge to the Hunter River simulated over the life of mine period.

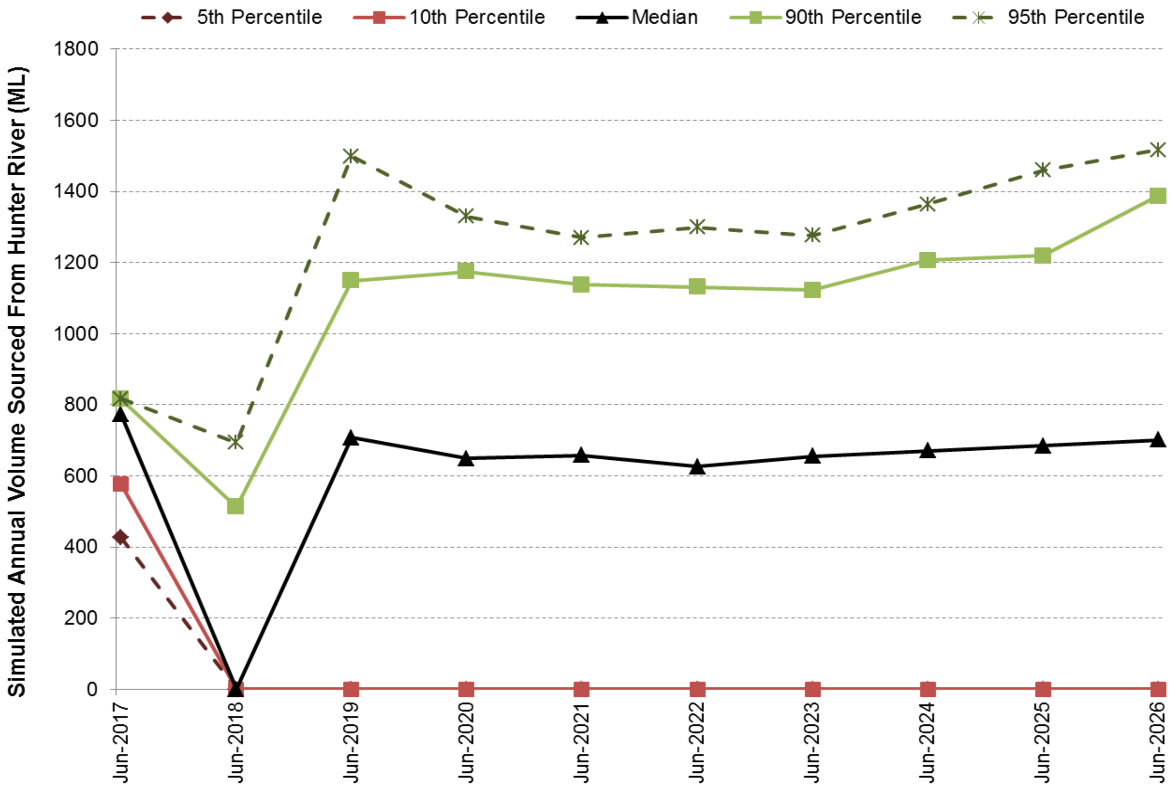

Figure 4: Simulated Hunter River Extraction

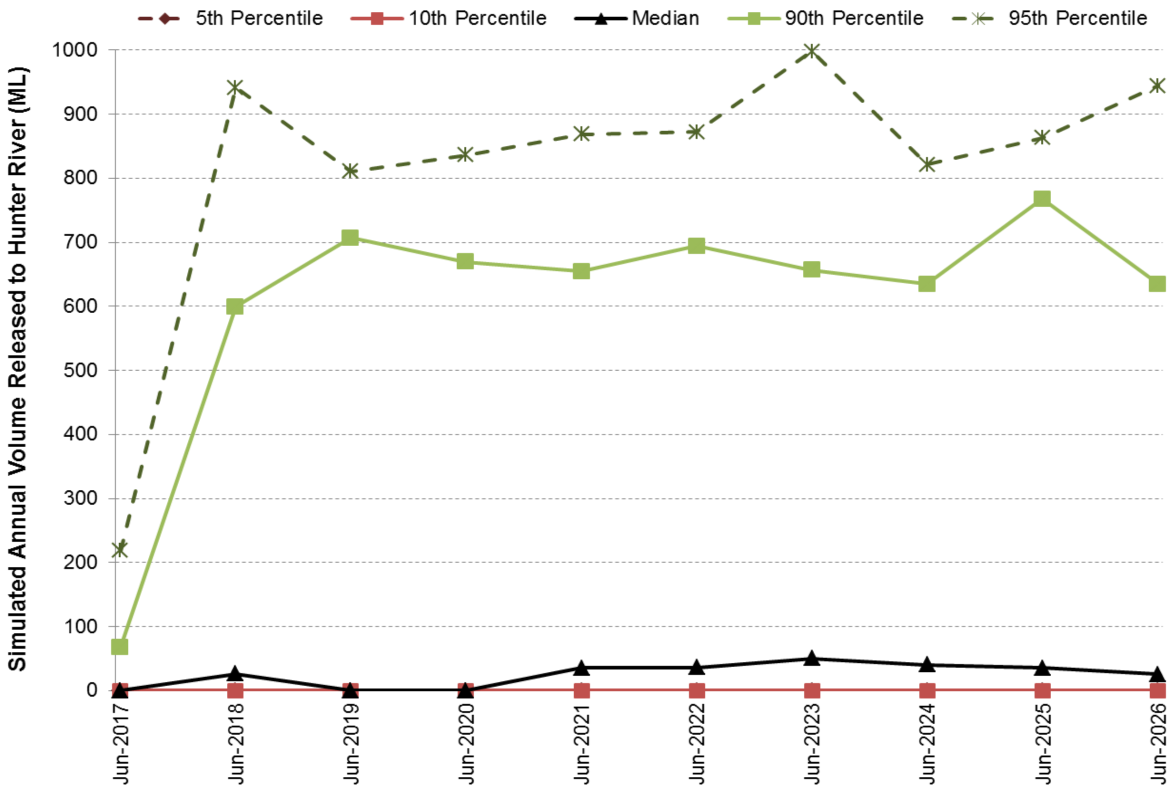

Figure 5: Simulated Hunter River Release

8.5 EXTERNAL OVERFLOWS

Sediment dams were designed to operate in accordance with the criteria listed in Table 4. The sediment dams overflowed when rainfall exceeded the design rainfall event. No overflows occurred from the MWD or Fines Emplacement Area.

8.6 WATER SUPPLY RELIABILITY

Predicted average supply reliability is expressed as total water supplied divided by total demand (i.e. a volumetric reliability) over the simulation period. Average supply reliability for the initial operating period over all climatic realisations for CHPP supply, haul road dust suppression and stockpile dust suppression are summarised in Table 6.

Table 6
Summary of Average Modelled Water Supply Reliability

CHPP Supply	Haul Road Dust Suppression	Stockpile Dust Suppression
96.8%	81.1%	98.5%

An average 96.8% supply reliability is equivalent to 68 days lost operation over the initial operating simulation period.

The water balance modelling indicates that the average haul road dust suppression water supply reliability across the simulated climatic sequences would be 81.1%. During operations, MACH Energy would undertake periodic updates to the site water balance modelling. This would allow MACH Energy to maintain the continuity of water supply for dust suppression by identifying and implementing additional management measures as required.

These may include:

- acquiring additional WALs;
- adding or relocating pumps to provide additional supply to truckfill points and/or installing additional truckfill points on the MWD or other available water storages;
- increasing the available water storage capacity on-site (e.g. providing additional in pit storage capacity) to provide additional buffer capacity; and/or
- adjusting coal washing rates in the CHPP (and potentially producing additional bypass coal) as necessary in particularly dry periods to maintain continuity of dust suppression activities.

As discussed in Section 4.3, MACH Energy may also pursue opportunities to source water from adjoining mine operations (e.g. Dartbrook and Bengalla mines), should it be mutually advantageous and subject to obtaining any necessary approvals.

9 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

9.1 ANNUAL REVIEW

In accordance with Condition 3, Schedule 5 of Development Consent DA 92/97 MACH Energy will review and evaluate the environmental performance of the MPO by the end of March each year (for the preceding calendar year) (or other such timing as agreed by the Secretary).

In relation to water, the Annual Review will:

- include a review of the SWB relating to the MPO over the past year, which includes a comparison of these results to evaluate compliance against the:
  - relevant statutory requirements, limits or performance measures/criteria (refer Section 2.1);
  - monitoring results of the previous years; and
  - relevant predictions in the EIS and MOD 1, MOD 2, MOD 3 and MOD 4 EAs;
- identify any water-related non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the water monitoring data over the life of the MPO;
- identify any discrepancies between the predicted and actual water impacts of the MPO, and analyse the potential cause of any significant discrepancies; and
- describe what water-related measures will be implemented over the next year to improve the environmental performance of the MPO.

The Annual Review will be made publicly available on the MACH Energy website (https://machenergyaustralia.com.au/) in accordance with Condition 11, Schedule 5 of Development Consent DA 92/97.

9.2 SWB REVISION

In accordance with Condition 4, Schedule 5 of Development Consent DA 92/97, this SWB will be reviewed, and if necessary revised to the satisfaction of the Secretary of the DPIE, within three months of the submission of:

- an Annual Review (Condition 3, Schedule 5);
- an incident report (Condition 7, Schedule 5);
- an Independent Environmental Audit (Condition 9, Schedule 5); and
- any modification to the conditions of Development Consent DA 92/97[4].

Within 4 weeks of conducting any such review, the Secretary of the DPIE will be advised of the outcomes of the review and any revised documents submitted to the Secretary for approval.

In accordance with Condition 4A, Schedule 5 of Development Consent DA 92/97, MACH Energy may submit a revised SWB for the approval of the Secretary at any time, and may also submit any revision to this SWB required under Development Consent DA 92/97 on a staged basis.

[4] Note that in the event of an inconsistency between Condition 4(d), Schedule 5 of Development Consent DA 92/97 and any Condition in Schedule 3 of Development Consent DA 92/97, the latter prevails.

If agreed with the Secretary of the DPIE, a revision to this SWB required under Development Consent DA 92/97 may be prepared without undertaking consultation with all parties nominated under the relevant Condition of Development Consent DA 92/97.

This SWB will be made publicly available on the MACH Energy website (https://machenergyaustralia.com.au/), in accordance with Condition 11, Schedule 5 of Development Consent DA 92/97.

10 REPORTING PROCEDURES

In accordance with Condition 2, Schedule 5 of Development Consent DA 92/97, MACH Energy has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

These protocols are described in Section 5 of the WMP.

In accordance with Condition 8, Schedule 5 of Development Consent DA 92/97, MACH Energy will provide regular reporting on the environmental performance of the MPO on the MACH Energy website (https://machenergyaustralia.com.au/).

11 REFERENCES

Australian Government National Health and Medical Research Council (2011) *Australian Drinking Water Guidelines*.

Boughton, W.C. (2004) *The Australian Water Balance Model*. Environmental Modelling and Software, vol.19, pp. 943 – 956.

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HEC (2018) *Mt Pleasant Project Commissioning Phase Site Water Balance*. Prepared for MACH Energy Australia Pty Ltd, Revision F, December 2018.

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MACH Energy (2017b) *Mount Pleasant Operation – Mine Optimisation Modification Environmental Assessment.*

MACH Energy (2017c) *Mount Pleasant Operation – Rail Modification Environmental Assessment.*

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Queensland Government (2017). Data Drill website, Queensland Government Department of Science, Information Technology and Innovation. Accessed 16 December 2015, available at: https://www.longpaddock.qld.gov.au/silo/datadrill/.

ATTACHMENT 1

APPENDIX 2 OF DEVELOPMENT CONSENT DA 92/97

APPENDIX 2
FIGURE 1 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2021

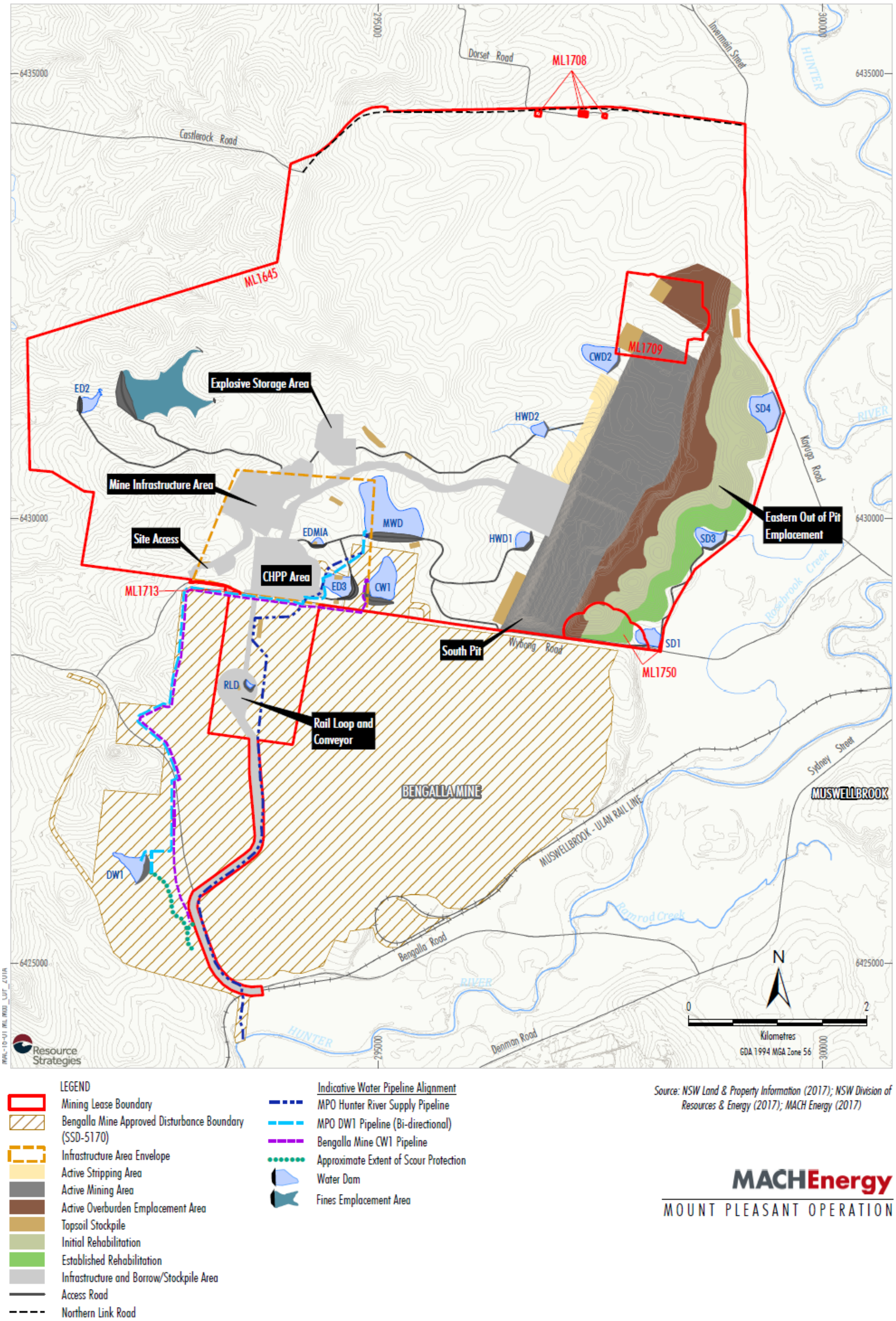


FIGURE 2 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2025

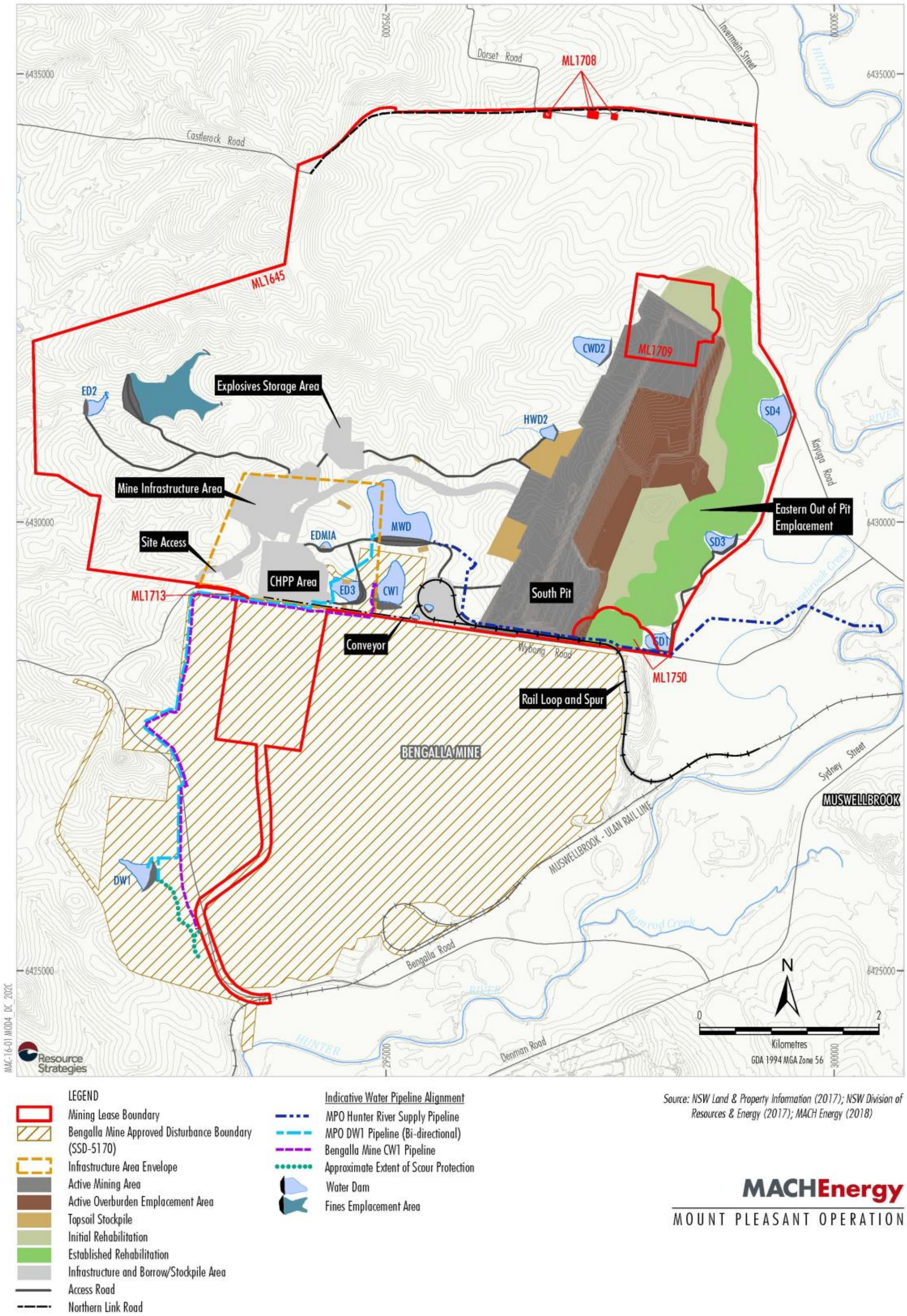
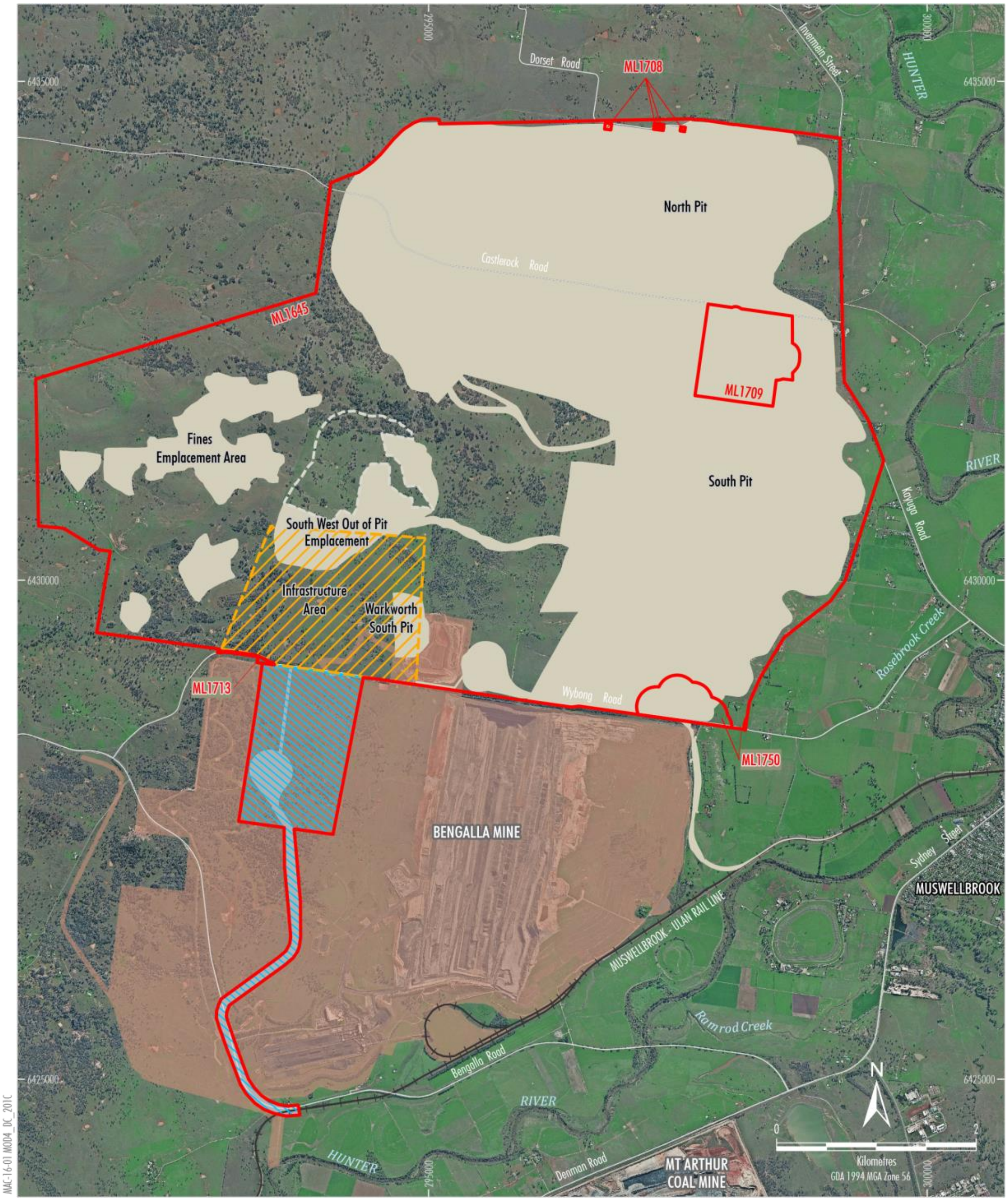


FIGURE 3 - APPROVED SURFACE DISTURBANCE PLAN



LEGEND
- Mining Lease Boundary
- Approximate Extent of Approved Surface Development [1]
- Area Relinquished for Overburden Emplacement and Major Infrastructure
- Infrastructure Area Envelope
- Infrastructure to be removed under the Terms of Condition 37, Schedule 3
- Indicative Existing Coal Transport Infrastructure
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)

NOTE
1. Excludes some project components such as water management infrastructure, infrastructure within the Infrastructure Area Envelope, offsite coal transport infrastructure, road diversions, access tracks, topsoil stockpiles, power supply, temporary offices, signalling, other ancillary works and construction disturbance.

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2018); Department of Planning and Environment (2016); MACH Energy (2017)
Orthophoto: MACH Energy (Aug 2016)

MACHEnergy
MOUNT PLEASANT OPERATION
Approved Surface Disturbance Plan

FIGURE 4 - CONCEPTUAL FINAL LANDFORM