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MOUNT PLEASANT OPERATION

SURFACE WATER MANAGEMENT PLAN

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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 Surface Water Management Plan (SWMP) 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.

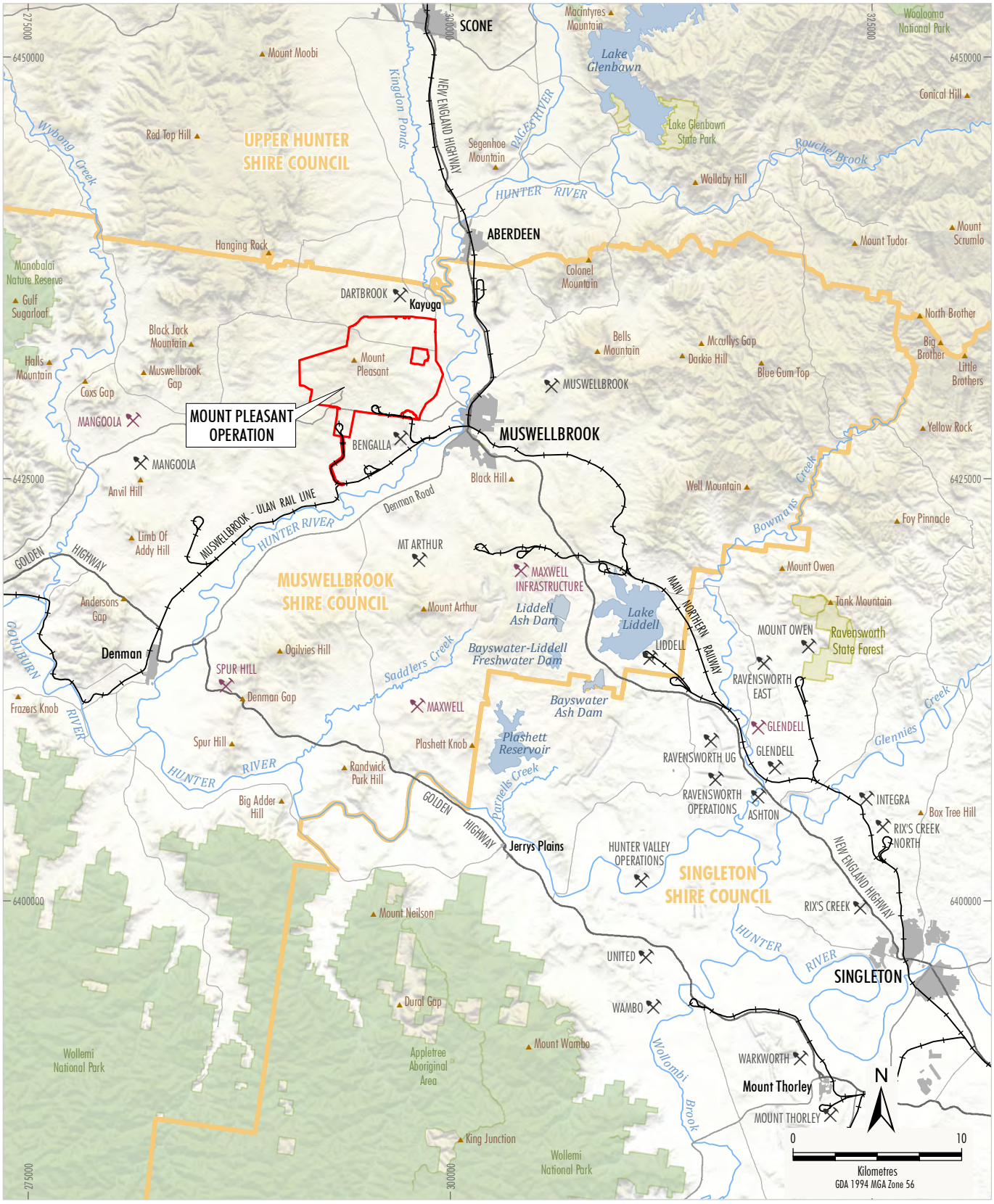
The Mount Pleasant Project Modification (MOD 1) was submitted on 19 May 2010 with a supporting Environmental Assessment (EA) prepared by EMGA Mitchell McLennan (EMGA Mitchell McLennan, 2010). MOD 1 included the provision of an infrastructure envelope for siting the mine infrastructure, the provision 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.

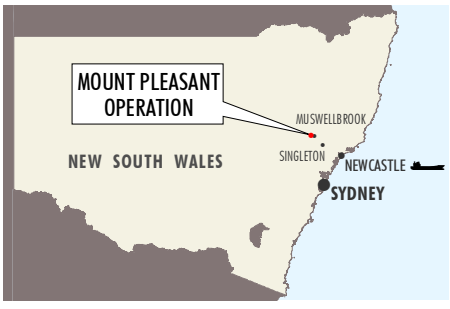
The MPO South Pit Haul Road Modification (MOD 2) was submitted on 30 January 2017 with a supporting EA prepared by MACH Energy (MACH Energy, 2017a). MOD 2 proposed to realign an internal haul road to enable more efficient access to the South Pit open cut, with no other material changes to the approved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

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 (DPE) (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 SWMP has been prepared by MACH Energy to satisfy the requirements under Development Consent DA 92/97 (as modified) and specifically Condition 28(c), Schedule 3.

The SWMP applies to all employees and contractors at the MPO and covers all areas within the MPO boundary. The SMP 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 SWMP 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 NSW Department of Planning, Industry, and Environment [DPIE], or the Division of Mining, Exploration and Geoscience [MEG] within the Department of Regional NSW) have been carried out satisfactorily.

This SWMP has been prepared to manage surface water related impacts 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.

1.2 STRUCTURE OF THE SWMP

This SWMP is a component of the Water Management Plan (WMP) for the MPO.

The remainder of the SWMP is structured as follows:

- Section 2: Outlines the statutory obligations relevant to this SWMP.
- Section 3: Describes the existing environment including regional and local drainage network.
- Section 4: Provides a description of the baseline data available for the MPO which relates to this SWMP.
- Section 5: Describes the surface water management measures implemented at the MPO.
- Section 6: Outlines the surface water impact trigger levels proposed for the MPO.
- Section 7: Describes the surface water monitoring program proposed for the MPO.
- Section 8: Describes the review process for MPO documentation, including in particular for this SWMP.
- Section 9: Outlines the reporting procedures proposed for the MPO.
- Section 10: Provides a list of 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 SWMP 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 SWMP are described below. A comprehensive list of all conditions in Development Consent DA 92/97 relevant to the water is provided in the WMP.

2.1.1 SWMP Requirements

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

Table 1
SWMP Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97 Schedule 3	Section where addressed in this SWMP 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:* *...* *(c) a Surface Water Management Plan, which must include:*	
• *detailed baseline data on surface water flows and quality in creeks and other waterbodies that could potentially be affected by the development;*	Section 4
• *surface water and stream health impact assessment criteria including trigger levels for investigating any potentially adverse surface water impacts;*	Section 6
• *a program to monitor and maintain the bridge openings and culverts associated with the MOD 4 rail infrastructure and ensure that they remain clear of blockages;*	Section 7.6
• *a program to monitor surface water flows and quality in the watercourses that could be affected by the project; and*	Section 7
• *reporting procedures for the results of the monitoring program;*	Sections 8 and 9

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 the SWMP.

Table 2 presents these requirements and indicates where each is addressed within this SWMP.

Table 2
General Development Consent DA 92/97 Conditions

MPO Development Consent DA 92/97 Schedule 5	Section where addressed in this SWMP 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 4
(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;*	Section 6
• *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;*	Section 6
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 5
(d) a program to monitor and report on the: • *impacts and environmental performance of the development;* • *effectiveness of any management measures (see c above);*	Sections 7 and 8
(e) a contingency plan to manage any unpredicted impacts and their consequences;	Surface and Ground Water Response Plan (SGWRP)
(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 8
(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 9
(h) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	Section 8

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*.
- 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.
- Environment Protection Licence (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 MEG.

2.3 OTHER LEGISLATION / GUIDELINES / POLICY / PLANS

Other NSW Acts, Regulations and policies that may be applicable to the SWMP for the MPO are summarised in the following sub-sections.

2.3.1 Water Management Act, 2000

The *Water Management Act, 2000* aims to provide sustainable and integrated management of the water sources of NSW for the benefit of both present and future generations.

The MPO is located in the Hunter Catchment, and is regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* and the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

The water sharing plans contain various rules applying to surface water sources in the MPO, such as access licence dealing rules, water supply works approval rules, water allocation account rules and access rules for rivers and creeks.

2.3.2 ANZECC/ARMCANZ (2000) Guidelines

The Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000) provide a national benchmark for assessing water quality in systems throughout Australia and New Zealand. The ANZECC & ARMCANZ (2000) guidelines provide guidance for developing local guidelines or strategies such as catchment water quality and river flow objectives (Section 2.3.3).

The ANZECC & ARMCANZ (2000) guidelines have been superseded by the Australian New Zealand Guidelines 2018 (ANZG 2018). However, site specific and default trigger levels or guideline values remain unchanged for the Southeast Coast water drainage division (in which the MPO is located)[1].

[1] As of 28 July 2022

2.3.3 NSW Water Quality and River Flow Objectives

The NSW Water Quality and River Flow Objectives (NSW Office of Environment and Heritage [OEH], 2006) have been developed to guide plans and actions to achieve healthy waterways in NSW. Each objective is based on providing the right water quality for the environment and the different beneficial uses of the water. They are based on measurable environmental values, which are those values or uses of water that the community believes are important for a healthy ecosystem for public benefit, welfare, safety or health. The target concentrations for each water quality objective are based on ANZG (2018) / ANZECC & ARMCANZ (2000).

2.3.4 Hunter River Salinity Trading Scheme

The HRSTS was originally established by the then Department of Land and Water Conservation and Hunter River Trust in 1995 as a pilot trial to manage salinity discharges to the Hunter River, such that salt concentrations would be held below irrigation and environmental standards.

The scheme is now managed by the NSW EPA under a statutory regulation attached to the *Protection of Environmental Operations Act, 1997*. The regulation came into effect on 1 December 2002. The stated objectives of the HRSTS are:

a) *to minimise the impact of discharges of saline water on irrigation, other water uses and on aquatic ecosystems in the Hunter River catchment:*
    i. *at the lowest overall cost to the community, and*
    ii. *in a way that provides ongoing financial incentives to reduce pollution, and*
b) *to facilitate sustainable water management by industry in the Hunter River catchment.*

The HRSTS achieves these objectives by prohibiting the release of saline water during periods of low flow in the Hunter River and controlling releases of saline water during periods of high flow in the Hunter River such that specific salinity targets at various points in the river are not exceeded.

Participants in the HRSTS are issued with tradeable discharge credits. Each credit entitles the holder to a share of the available salt discharge capacity announced by WaterNSW during high flow periods.

Discharges at the MPO would be undertaken in accordance with the HRSTS and EPL 20850. MACH Energy currently holds 46 discharge credits.

2.3.5 Local Policy and Plans

Local land service plans and policies for the Hunter region have been considered in the development of this SWMP. The key plan is the *Hunter-Central Rivers Catchment Action Plan 2013 – 2023* (Hunter Central Rivers Catchment Management Authority, 2013). This plan provides a direction for all government, industry and community actions in the region to maintain the health of natural systems in the region. The goals, targets and outcomes of the *Hunter-Central Rivers Catchment Action Plan 2013 – 2023* have been considered where relevant in the preparation of this SWMP.

3 EXISTING ENVIRONMENT

3.1 REGIONAL DRAINAGE NETWORK

The MPO is located within the Hunter Catchment. The Hunter Catchment has an overall size of 21,500 square kilometres (km^2), and includes the city of Newcastle and the major towns of Singleton and Muswellbrook. The Hunter River is the main drainage feature within the catchment, rising on the northern side of the Barrington Tops (Mount Royal Range) and flowing south and then east through Muswellbrook and Singleton, before draining to the Pacific Ocean at Newcastle.

The Hunter River contains a number of significant tributaries upstream of Muswellbrook, including the Pages and Isis Rivers, as well as the Middle, Dart, Stewarts, Moonan and Rouchel Brooks. Alluvial floodplains ranging in width from 1.5 to 2 km border the river over the majority of its length. The eastern extent of the MPO mining lease boundary is located directly adjacent to these floodplains.

The Hunter River is regulated by two major storages, the Glenbawn and the Glennies Creek Dams. The Glenbawn Dam is located approximately 16 km north-east of the MPO mining lease boundary. The dam mainly serves as a flood mitigation measure for the surrounding area, as well as for supplying water to surrounding agriculture and industries. The dam has a current capacity of 750,000 megalitres (ML), with potential for an additional 120,000 ML during flood events (WaterNSW, 2018a). Glennies Creek Dam is approximately 37 km south-east of the MPO mining lease boundary and has a capacity of 283,000 ML (WaterNSW, 2018b).

3.2 LOCAL DRAINAGE NETWORK

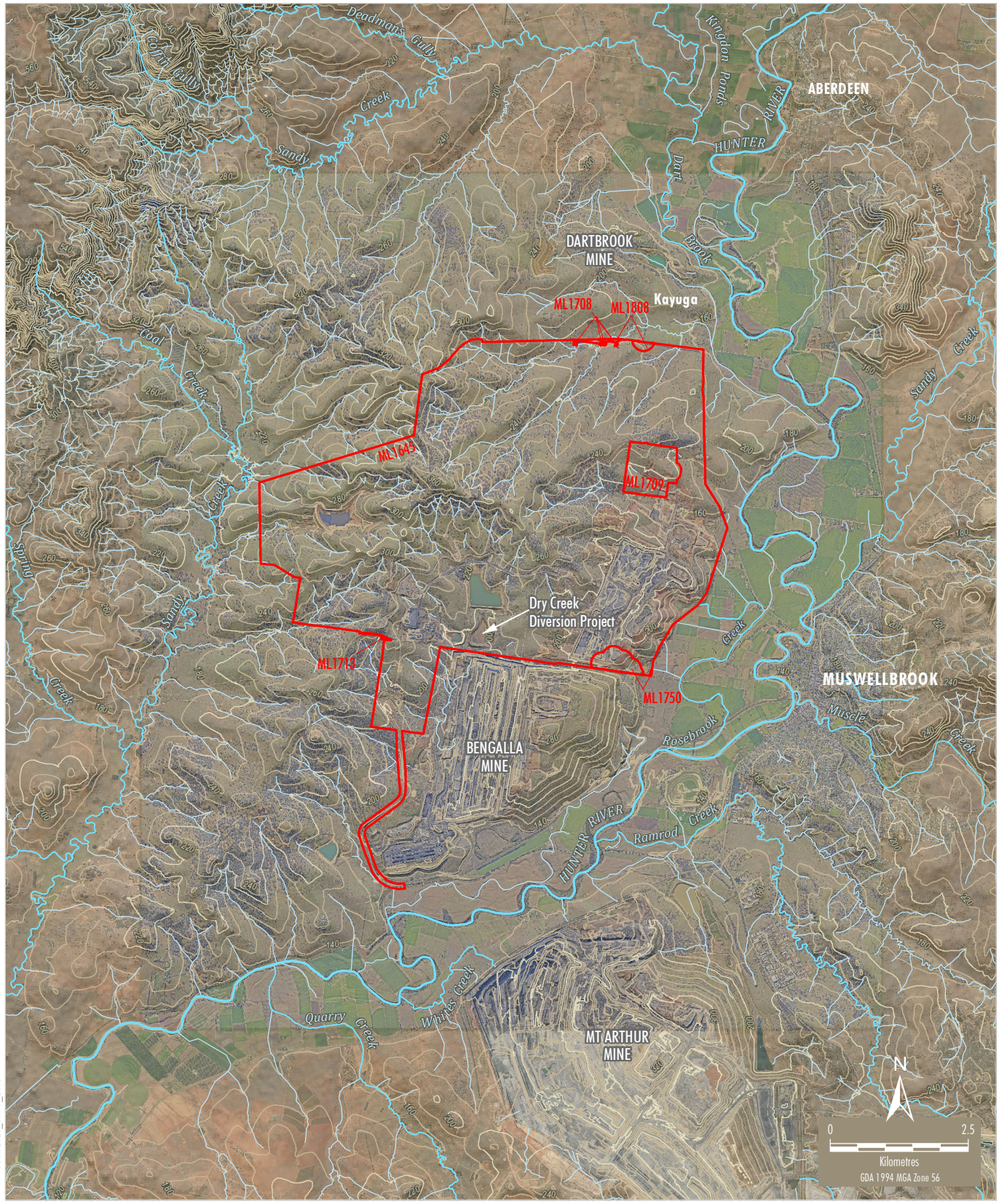
The local drainage network in the vicinity of the MPO is shown on Figure 2.

The drainage network is generally characterised by steep gullies which drain from the surrounding hills into the flat alluvial plains adjacent the Hunter River.

The main drainage feature within the vicinity of the MPO is the Hunter River which flows in a southerly direction approximately 1 km to the east of the MPO mining lease boundary. There are a number of ephemeral drainage lines which traverse the MPO area and drain into the Hunter River. The eastern portion of the MPO area drains via Rosebrook Creek, as well as other unnamed drainages. Areas in the south and west of the MPO area drain via an unnamed drainage line (sometimes referred to as Dry Creek) and Sandy Creek respectively, both of which are tributaries of the Hunter River. All other areas drain into unnamed drainage lines, which also flow to the Hunter River.

The Bengalla Mine's Dry Creek Diversion Project diverts the unnamed drainage line that drains the south of the MPO area (Figure 2). The Dry Creek Diversion Project includes a clean water dam north of Wybong Road, a pump station and pipeline used to direct water around the Bengalla Mine and a protective contour levee to release water from the pipeline into an unnamed tributary of the Hunter River. The Bengalla Mining Company (BMC) monitors a number of unnamed drainage lines and the Hunter River, downstream of the MPO. Relevant monitoring information from the Bengalla Mine has been considered in this SWMP.

Part of Mangoola Coal is located within the Sandy Creek catchment. Accordingly, Mangoola Coal Operations Pty Limited (MCO) undertake surface water and stream health monitoring in Sandy Creek. Relevant monitoring information has been considered in this SWMP.



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LEGEND

Mining Lease Boundary (Mount Pleasant Operation)

Contour (20 m Interval)

Source: MACH (2020); NSW Spatial Services (2020)
Orthophoto: MACH Energy (July 2020)

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Local Drainage Network and Topography

Figure 2

4 BASELINE DATA

Surface water monitoring was undertaken from January 1993 to December 1995 to inform the EIS Water Management Study. The results of this monitoring are presented in PPK Environment & Infrastructure (1997) and included creeks and other waterbodies in the vicinity of the MPO.

The collection of surface water monitoring data at the MPO resumed in 2000 at ten monitoring locations. For the purposes of this plan, baseline monitoring is taken as the period up to and including July 2016. Construction at the MPO commenced in November 2016. Surface water monitoring at sites W12 and W15 commenced in October 2017, and baseline monitoring at these sites was undertaken between October 2017 and May 2020. Sampling locations used to establish baseline data in the MPO surface water monitoring network are summarised in Table 3 and shown on Figure 3.

Table 3
Baseline Surface Water Monitoring Locations

Site	Watercourse	Baseline Period of Record
W1	Hunter River	July 2000 – October 2011
W2	Hunter River	July 2000 – July 2016
W3	Hunter River	July 2000 – July 2016*
W4	Muscle Creek	July 2000 – July 2016
W5	Unnamed Drainage Line	July 2000 – July 2016
W6#	Hunter River	July 2000 – April 2015
W7	Unnamed Drainage Line	July 2000 – July 2016
W8^	Unnamed Drainage Line	July 2000 – July 2016
W9	Unnamed Drainage Line	July 2000 – July 2016
W10^	Unnamed Drainage Line (Dry Creek)	July 2000 – July 2016
W12	Sandy Creek	October 2017 – May 2020
W15	Hunter River	October 2017 – May 2020

* Located adjacent to Department of Primary Industry – Water (DPI – Water) gauging station. Only monitored intermittently for laboratory analysis.

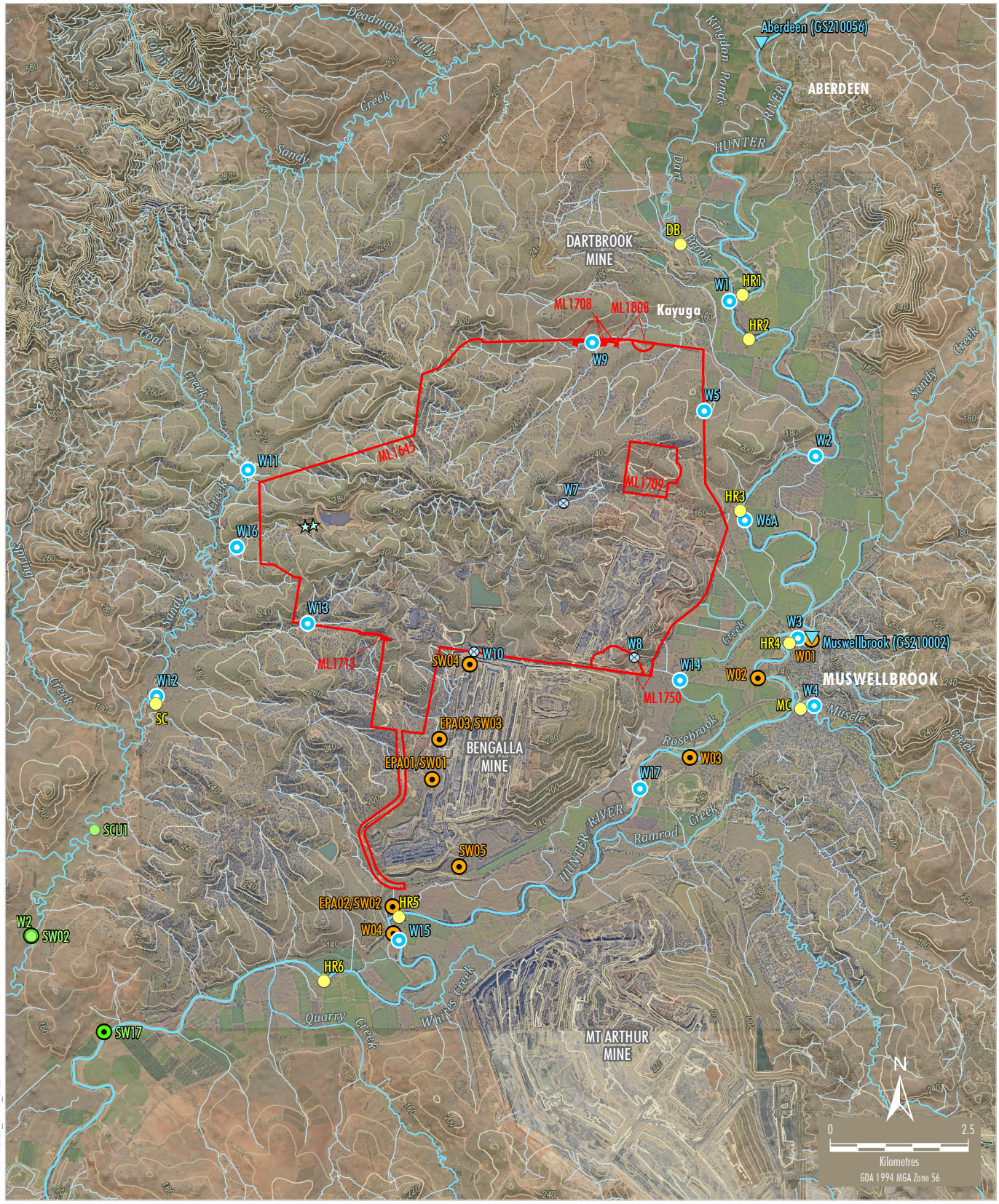
^ Note these monitoring locations have since been disturbed by mining activities and are therefore no longer monitored (Figure 3).

Note this monitoring site has been replaced by Site W6A, as outlined in Section 7.3.

Other baseline monitoring data and assessments undertaken for creeks and other waterbodies by surrounding mining operations have also been utilised where available including (Figure 3):

- downstream water quality monitoring undertaken by the BMC;
- water quality monitoring on Sandy Creek undertaken by MCO; and
- stream health monitoring on Sandy Creek undertaken by MCO.

In addition to the above, Department of Planning, Industry and Environment – Water (DPIE – Water) streamflow and electrical conductivity (EC) gauging stations are located on the Hunter River at Aberdeen (GS210056), Muswellbrook (GS210002) and Denman (GS210055) (Figure 3).



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LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- DPI Water Gauging Station

Mt Pleasant Monitoring

- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2020); NSW Spatial Services (2020); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH Energy (July 2020)

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Surface Water and Stream Health Monitoring Sites

Figure 3

4.1 STREAMFLOW

4.1.1 Hunter River

DPIE – Water monitor flow in the Hunter River at three gauging stations in the vicinity of the MPO (Figure 3). Data from these gauging stations is summarised in Table 4. All three gauging stations monitor flow continuously.

Table 4
Hunter River Streamflow

Monitoring Site	Monitoring Commenced	Percentage of Days with Data*	Catchment Area (km^2)	Daily Flow (ML/day)*		
				Minimum	Median	Maximum
Aberdeen (GS210056)	1959	65.3%	3,090	13.7	372	91,556
Muswellbrook (GS210002)	1906	67.6%	4,220	0.0	348.5	167,292
Denman (GS210055)	1908	80.9%	4,530	0.0	346.1	108,560

Note: ML/day = Megalitres per day.

* Data Source: http://realtimedata.water.nsw.gov.au/water.stm?ppbm=SURFACE_WATER&rs&3&rskm_url; accessed 15 Dec 2016

Under current catchment conditions (since the construction of Glenbawn Dam was completed in 1958), the Hunter River is perennial, with a minimum flow rate at Aberdeen of approximately 14 ML/day (Table 4). Flow duration curves since 1988 for each gauge are shown on Figure 4. These flow duration curves indicate that flow in the Hunter River is fairly consistent immediately upstream and downstream of the MPO, with some variation primarily due to missing data.

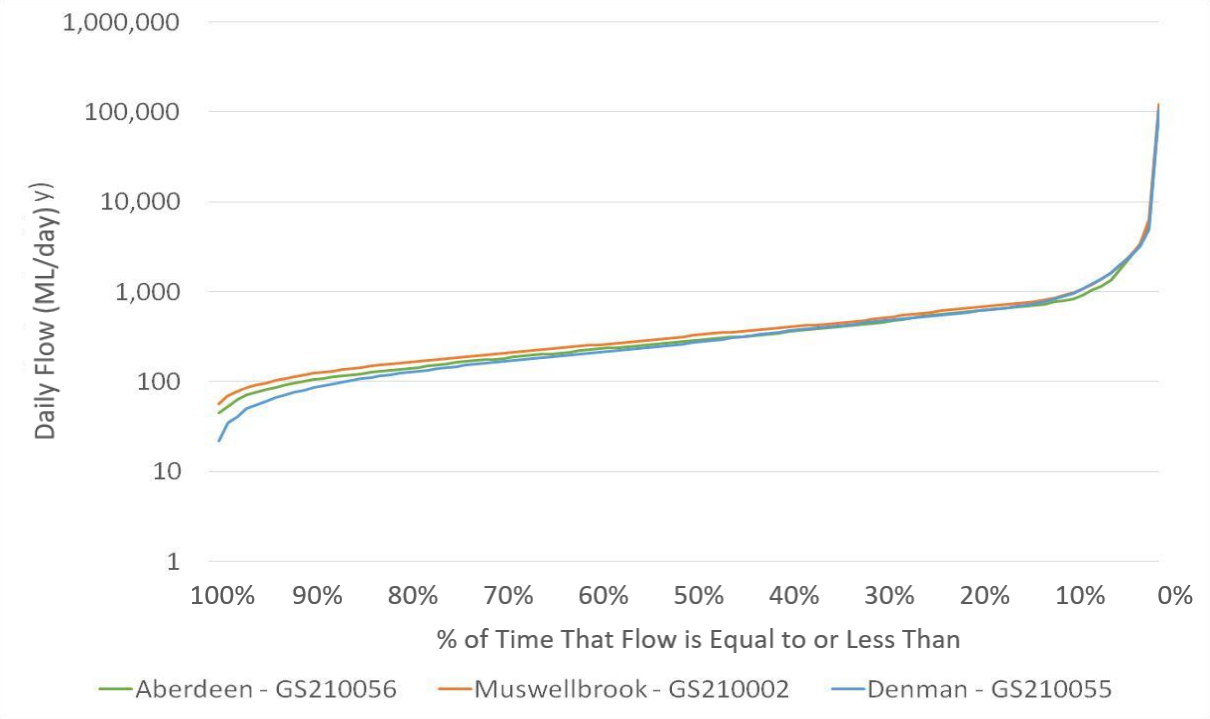

Figure 4: Flow Duration Curves

4.1.2 Sandy Creek

MCO monitor Sandy Creek at SW01 (downstream of Mangoola Coal) and SW02 (upstream of Mangoola Coal). Both monitoring sites are located downstream of the MPO, where Sandy Creek has a larger catchment than adjacent to the MPO.

The Mangoola Coal Water Management Plan (MCO, 2014) includes monitoring data for SW01 and SW02 from 2002 to 2014 (reproduced in Attachment 3). During this period, both monitoring sites were frequently dry with SW01 reporting dry/no flow approximately 50% of the time and SW02 reporting dry/no flow approximately 42% of the time.

4.1.3 Other Local Drainages

A summary of samples collected from local drainages in the MPO area is provided in Table 5. This indicates that the drainages are highly ephemeral, with dry samples representing more than 85% of the total samples obtained at each site.

Table 5
Flow Frequency of Local Drainages

Site	Number of Samples	Number of Dry Samples	Flow Frequency
W5	186	183	1.6%
W7	188	186	1.1%
W8	188	161	14.4%
W9	188	178	5.3%
W10	187	186	0.5%

BMC has historically monitored the unnamed drainage line that drains the south of the MPO area (referred to as Dry Creek in the Bengalla Mine Water Management Plan). From 2008 to 2013, there were only 14 occasions that the unnamed drainage line had sufficient flow (not including controlled discharges from Bengalla Mine's Staged Discharge Dam in accordance with the HRSTS) for water quality sampling to be undertaken (BMC, 2015). As described in Section 3.2, Bengalla Mine's Dry Creek Diversion Project involves the diversion of flow in this unnamed drainage line.

4.2 SURFACE WATER QUALITY

Baseline surface water quality data is presented in Attachment 2 and a summary is provided in Tables 6 and 7 below.

Median pH values at creek sites show that surface water in the vicinity of the site is relatively neutral. Sites located along the Hunter River (i.e. W1, W2 and W6), have a median pH value and overall pH range which is slightly alkaline.

Median electrical conductivity (EC) values for the surface water sites were generally below 400 µS/cm. Given the frequency in which the unnamed drainage lines were dry, the monitoring results for these drainage lines likely reflect flows occurring during or immediately after rainfall events, which is why the local median EC is lower than the Hunter River. This is with the exception of sites W4 and W12, located at Muscle Creek and Sandy Creek, which had a median EC value of 2,030 µS/cm and 4,970 µS/cm, respectively.

Table 6
Surface Water Quality Summary – pH and Electrical Conductivity

Site	Number of Samples with Flow	Median pH	Median Electrical Conductivity (µS/cm)
W1	131	8.00	400
W2	184	8.10	410
W3*	-	-	-
W4	186	7.60	2,030
W5	3	6.30	120
W6	123	8.10	400
W7	2	7.30	228
W8	27	7.30	238
W9	10	7.05	255
W10	1	6.20	30
W12**	36	8.00	4,970
W15**	36	7.90	414

Note: µS/cm = micro Siemens per centimetre,

* Located adjacent to DPI - Water gauging station. Only monitored intermittently for laboratory analysis.

** Monitoring at sites W12 and W15 commenced in October 2017, and baseline monitoring at these sites was undertaken between October 2017 and May 2020.

Table 7
Surface Water Quality Summary – Total Suspended Solids and Total Dissolved Solids

Site	Number of TSS Samples	Median TSS (mg/L)	Number of TDS Samples	Median TDS (mg/L)
W1	129	8	1	<5
W2	182	8	5	251
W3*	-	-	-	-
W4	185	6	4	1,620
W5	3	15	0	-
W6	119	8	0	-
W7	2	46	0	-
W8	26	292	1	1,560
W9	10	159	0	-
W10	1	139	0	-
W12**	36	8.5	36	2,905
W15**	36	16	36	263

Note: TSS = Total Suspended Solids, TDS = Total Dissolved Solids.

* Located adjacent to DPI Water gauging station. Only monitored intermittently for laboratory analysis.

** Monitoring at sites W12 and W15 commenced in October 2017 and baseline monitoring at these sites was undertaken between October 2017 and May 2020.

4.3 STREAM HEALTH

Stream health surveying at a number of surface water sites in the Hunter Catchment was undertaken from 1994 – 1999 and included as part of the EPA's *River Health in the New South Wales Lower North Coast, Hunter and Central Coast Catchments* report (Hose and Turak, 2004). This report identified a number of parameters using the Australian River Assessment System (AusRivAS), averaged over two monitoring periods (Autumn and Spring) during a single year. AusRivAS is a rapid river health assessment system which uses the presence or absence of macro invertebrate taxa to assess the biological health of Australian rivers. Observed (O) numbers of macro invertebrates at the site are compared with the Expected (E) number of macro invertebrates which could be found at the site, if the site was in a natural state (i.e. had not been disturbed). This informs an overall 'band of impairment' score ranging from X (more biologically diverse than expected) to D (extremely impaired).

The measured average parameters and the resulting 'band of impairment' score for four sites in the vicinity of the MPO are outlined in Table 8 below.

Table 8
Historical Stream Health in the Vicinity of the MPO

Historical Site ID	Updated Site ID	Site Location	Edge			Riffle		
			O/E Taxa	Band	O/E Signal	O/E Taxa	Band	O/E Signal
Hunt 585	DB	Dart Brook at MacIntyre Bridge	0.79	B	0.88	0.75	B	0.93
Hunt 506	MC	Muscle Creek at Muswellbrook	0.77	B	0.83	-	-	-
Hunt 571	HR4	Hunter River at Muswellbrook	0.56	B	0.88	0.73	B	1.06
Hunt 854	HR3	Hunter River downstream of Aberdeen	1.02	A	1	-	-	-

Source: Hose and Turak, 2004.

As shown, three of the four monitoring sites fell within band 'B'. This indicates that ecological condition of macro invertebrates at the sites has been 'significantly impaired', meaning that a potential impact on water quality and/or habitat quality has resulted in a loss of taxa. The monitoring location on the Hunter River downstream of Aberdeen however, fell within band 'A'. This indicates that impacts on water and habitat condition at the site have not resulted in a loss of macro invertebrate diversity.

Stream health monitoring has been undertaken at three points along Sandy Creek by Glencore for Mangoola Coal. This monitoring has involved assessing macro invertebrate community structures, water quality, and overall riparian health using AusRivAS, SIGNAL2 sampling, HABSCORE assessments, and physicochemical water quality testing. Stream health results published as part of the 2015 *Mangoola Annual Review* indicates that Sandy Creek has remained in a poor but stable condition since monitoring began in 2009 (SLR Consulting Australia Pty Ltd, 2015).

Extensive historical surveying of river health in the Hunter River has been undertaken due to its regional ecological and agricultural significance. This surveying has indicated that the river has been historically degraded due to agricultural and industrial use, however surveys in recent years suggest river health has improved.

The 2002 Healthy Rivers Commission investigation of the Hunter River determined that the river was not ecologically sustainable in its current capacity (Healthy Rivers Commission, 2002). The commission found that the overall water quality of the river was variable, and that nearly two thirds of streams were considered to be in a degraded condition. Approximately 30% of native fish species were estimated to have been lost from the Hunter River, and between 40 and 70% of sampled macro invertebrate sites were found to be in poor condition.

A suite of more contemporary surveys undertaken between 2004 – 2006 have shown the overall health of the Hunter River has been improving (Cumberland Ecology, 2013). These surveys showed suitable habitat for a variety of macro invertebrates and amphibians, with the presence of a diverse variety of macro invertebrate species.

A 2010 *State of the Catchment Report* (NSW Government) determined that although the health of the overall Hunter Catchment was poor, the health of the Hunter River was considered 'moderate'.

Macro invertebrate condition (a measure of the remaining proportion of macro invertebrate assemblages which have been retained in the river system) of the Hunter River and surface water drainages in the vicinity of the MPO, was found to be 'moderate'. This means that less than half, but more than a quarter, of macro invertebrate were estimated to have been lost in the river system.

Although overall fish condition for the Hunter Catchment was determined to be very poor, fish condition along the Hunter River in the vicinity of the MPO was rated as 'moderate'. Fish condition scores are based upon both the proportion of fish species which are native to the region, as well as the proportion of fish species that have been retained relative to pre-disturbance conditions (NSW Government, 2010).

Historical surveys of the Hunter River have not indicated the presence of any threatened species and the overall habitat of the Hunter River Catchment has been considered unsuitable for threatened species and communities listed under both the *Fisheries Management Act, 1994* and the *Environmental Protection and Biodiversity Conservation Act, 1999* (Cumberland Ecology, 2013).

A contemporary stream health monitoring program commenced at the MPO in Spring 2017 (November 2017) in accordance with the SWMP. The Spring 2017 monitoring round is the only contemporary survey undertaken at the stream health monitoring sites prior to commencement of operations at the MPO. The Spring 2017 monitoring round results are outlined in Table 9 below and were reported in the MPO 2017 Annual Review (MACH Energy, 2018).

Table 9
Spring 2017 Stream Health Monitoring Round Results

Historical Site ID	Updated Site ID	Number of Taxa	SIGNAL 2*	Baseline Band of Impairment Score	O/E Taxa
W1	HR1	8	3.31	C	0.41
W1	HR2	11	3.38	B	0.59
Hunt 854	HR3	13	3.19	B	0.64
Hunt 571	HR4	12	2.88	C	0.51
W15	HR5	10	3.04	B	0.61
SW17	HR6	13	3.38	B	0.73
Sandy 1	SC	11	3.28	B	0.61
Hunt 585	DB	18	3.41	B	0.66
Hunt 506	MC	13	3.24	B	0.55

Source: BIO-ANALYSIS Pty Ltd (2018).

* The SIGNAL score for a macroinvertebrate sample is calculated by averaging the pollution sensitivity grade numbers of the families present, which may range from 10 (most sensitive) to 1 (most tolerant).

The Spring 2017 monitoring results indicated that the band of impairment score measured at sites HR3 and HR4 were lower than the previously assigned stream health performance criteria, which were determined by combining edge and riffle habitat scores of the samples collected in mid-1990s as discussed above. Contributions from agriculture, mining, urban run-off, drought and flow regulation, among others, since the mid-1990s are likely to have had a considerable influence on aquatic biota within the area. Accordingly, the contemporary data collected in 2017 is considered to provide a more appropriate representation of the baseline conditions of the Hunter River prior to commencement of operations at the MPO.

Further discussion regarding the stream health trigger levels is presented in Section 6.2.

5 SURFACE WATER MANAGEMENT MEASURES

5.1 MINIMISATION OF WATER USE

MACH Energy's water management strategy includes preferential use of on-site derived mine-affected water (i.e. water that has come into contact with mining or processing operations), thereby reducing the need to import raw water from external sources for operational purposes. As described in the Site Water Balance (SWB), the water management system involves recycling site runoff, fine rejects reclaim water and groundwater inflow wherever practicable, for reuse in the CHPP and/or for dust suppression.

General water management measures proposed at the site 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.
- 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 8.1).

During construction and/or prior to commissioning of the Hunter River water supply pipeline, water may be sourced externally (e.g. taken from commercial water fill points in the light industrial area).

In addition, in order to reduce make-up water demand from the Hunter River over the life of the MPO, MACH Energy may also source excess mine water from the adjoining mines (i.e. Dartbrook and Bengalla Mines) for use on-site. Should this water sharing be undertaken, it would be subject to MACH Energy and the other mining operator obtaining all necessary approvals.

5.2 INFRASTRUCTURE DESIGN

Sediment dams will be designed with consideration given to topsoil and overburden characteristics and the contributing area of disturbance. The sediment dams will be sized in accordance with current recommended design standards in the following guidelines:

- *Managing Urban Stormwater, Volume 1 – Soils and Construction* (Landcom, 2004).
- *Managing Urban Stormwater, Soils and Construction, Volume 2E - Mines and Quarries* (DECC, 2008).

Discussion on the design of specific sediment and mine water dams is provided in the SWB.

5.3 MANAGEMENT OF POTENTIALLY ACID FORMING MATERIALS

Geochemical testing of overburden material undertaken at the site has revealed that the only acid forming leachate occurs in the Wynn Seam (Mountford and Wall, 1995). Material balance calculations undertaken for the 1997 EIS indicated that dilution and neutralisation will negate any acid forming potential that may occur in this leachate.

Due to the predicted small proportion of potentially acid forming material, it is expected that operational blending during ROM dumping will produce a non-acid forming material within the overburden emplacement and back-filled open cut. The management strategy for the MPO will provide that no zones of poorly blended, potentially acid forming material are exposed in the final surface of the overburden emplacement and back-filled open cut. This will be achieved by excluding the material identified as potentially being acid forming (i.e. non-economic coal and identified coal seam roof and floor rock from the Wynn Seam) from the final face of the overburden emplacement.

Using this strategy, it is anticipated that no surface water will come into contact with potentially acid forming materials at the site.

5.4 CHEMICAL AND HYDROCARBON STORAGE

Chemicals and hydrocarbons will be managed through the MPO procedures for site contamination prevention and control. These procedures will minimise the potential for land and water contamination from the handling, storage and disposal of these substances.

Chemicals and hydrocarbons will be transported and stored on-site in accordance with the NSW *Work Health and Safety Act 2011* and *Work Health and Safety (Mines and Petroleum Sites) Act 2013*. Additionally, MACH Energy will register all chemicals used on site within a central database. The central database will contain all information in the Safety Data Sheets (SDS) and an inventory of chemicals held on-site. The information will be accessible at any computer terminal within the MPO and provide guidance on storage, use and disposal.

On-site controls will include storage within properly sealed containers and controlled areas, bunded for medium to long-term storage requirements. These storage and waste receival areas will be isolated from clean water catchments to minimise the risk of land or water pollution should an unplanned spill occur.

The response to any accidental spills or ground contamination will be assessed on a case-by-case basis and remediated using biodegradable spill absorbent. Emergency response procedures will also be enacted as required in accordance with the relevant environmental procedures. Hydrocarbon or chemical spills will be reported in the mine site incident reporting and management system with corrective and preventative measures undertaken as appropriate.

6 SURFACE WATER IMPACT TRIGGER LEVELS

6.1 SURFACE WATER QUALITY

Surface water quality triggers have been developed using the ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines in conjunction with baseline data collected at the site.

The ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines recommend that wherever possible, site-specific data is used to define trigger values for physical and chemical factors which can adversely impact the environment. Trigger values are not regarded as assessment criteria; rather they are used as an indicator of potential impacts and to initiate investigations into the surface water quality as reported by the monitoring program.

The ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines have been superseded by the Australian New Zealand Guidelines 2018 (ANZG 2018). However, site specific and default trigger levels or guideline values remain unchanged for the Southeast Coast water drainage division (in which the MPO is located)[2]

The approach recommended by ANZG (2018) / ANZECC & ARMCANZ (2000) for developing site-specific trigger values for slightly to moderately disturbed ecosystems, is to formulate trigger values based on the 20th and 80th percentile of the site-specific monitoring data. These values should be calculated from a minimum of 2 years of monthly data (i.e. 24 data points). The objective of this approach is to develop conservative, site-specific trigger values for use as a means to improve water quality in highly disturbed ecosystems.

Trigger levels have not been established for sites upstream of the MPO (i.e. W1, W4 and W11) because these cannot be affected by the MPO. Site specific trigger levels have been developed for sites W2 and W6 as indicator sites. Site W6 contains sufficient data to develop trigger levels although there was insufficient data to develop TDS trigger levels for this site. Sites W5, W9, W13 and W16 are located on ephemeral drainage lines which are frequently dry and do not have sufficient data to develop site-specific trigger levels. There was insufficient data to develop trigger levels for site W14 due to dry conditions. ANZG (2018) / ANZECC & ARMCANZ (2000) default trigger levels for these sites have been adopted, until such time as sufficient data is available to develop site-specific triggers.

Preliminary trigger values from the *Bengalla Water Management Plan* (BMC, 2017) have been assigned for site W17. MACH Energy has established preliminary triggers at this site as it is the only site downstream of MPO's footprint on the Hunter River which is not also downstream of the Bengalla Mine footprint. MACH Energy therefore considers this site particularly important for assessing surface water impacts prior to site specific triggers becoming available to establish.

MCO has established triggers on Sandy Creek, downstream of the MPO. A description of these triggers and how they were derived is contained in the *Mangoola Coal Surface Water Monitoring Plan* (MCO, 2018).

Proposed water quality trigger levels for the surface water sites and the corresponding ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines are presented in Table 10 below. Where the 80th percentile value for EC is lower than the ANZG (2018) / ANZECC & ARMCANZ (2000) guidelines, the guidelines have been adopted as the trigger value for that specific parameter.

[2] As of 28 July 2022

An investigation is triggered when:

- a water quality indicator at a downstream receiving water monitoring location is above (or outside the range) of trigger investigation level for three consecutive sampling events; and
- a water quality indicator at a downstream water monitoring location is above (or below in event of a trigger of the lower pH limit) the corresponding upstream monitoring location (where such a monitoring location exists) sampled on the same day.

Table 10
Surface Water Quality Trigger Levels

Site	pH	EC (µS/cm)	TSS (mg/L)
	20th – 80th Percentile Trigger Values	80th Percentile Trigger Value	80th Percentile Trigger Value
Site Specific Trigger Levels			
W2	6.5 – 8.3**	539	18
W6*	6.5 – 8.4**	496	19
W12	6.5 – 8.1**	6420	30
W15	6.5 – 8**	460	23
Default Trigger Levels^			
W5	6.5 – 7.5	350	-
W9	6.5 – 7.5	350	-
W13	6.5 – 7.5	350	
W14	6.5 – 7.5	350	
W16	6.5 – 7.5	350	
Bengalla Mine Trigger Levels#			
W17	6.5 – 8.1	650	40

* Due to safe access no longer being available at site W6, triggers developed for this site will now be used at the new monitoring location W6A approximately 500 metres (m) downstream of W6, as described in Section 7.3.

** Where the 20th – 80th percentile trigger values were within the default trigger levels, the default trigger levels were adopted.

^ Default triggers are based on ANZECC & ARMCANZ (2000) guideline values for upland rivers in south-east Australia. ANZECC & ARMCANZ (2000) does not provide guideline values for TSS.

Preliminary trigger values have been sourced from the *Bengalla Water Management Plan* (BMC, 2017), which have been established from baseline data for monitoring sites adjacent to W17 (e.g. Bengalla sites W01, W02 and W03 [Figure 3]), as well as the ANZECC & ARMCANZ (2000) guideline.

6.2 STREAM HEALTH

Baseline data for the stream health of surface water in the vicinity of the MPO has been collected using the AusRivAS system, which is described in Section 4.3. Using the AusRivAS system, observed (O) numbers of macro invertebrate taxa were compared with the expected (E) numbers of macro invertebrate taxa found at each site. Using this information, an O/E proportion was calculated, and this informed an overall 'band of impairment' score for each site.

Band of impairment scores are based upon where the O/E values fall within a specified range, as shown in Table 11 below.

Contributions from agriculture, mining, urban run-off, drought and flow regulation, among others, since the mid-1990s are likely to have had a considerable influence on aquatic biota within the area and the previously assigned baseline band of impairment scores, which were determined by combining edge and riffle habitat scores of the samples collected in mid-1990s.

Revised baseline band of impairment scores have been determined based on the Spring 2017 monitoring round results, which is the only contemporary survey undertaken at the stream health monitoring sites (Table 8) prior to commencement of operations at the MPO. The band of impairment scores derived from the Spring 2017 monitoring round were generally lower than the previously assigned baseline band of impairment scores (likely due to the activities described above). Accordingly, the contemporary data collected in 2017 is considered to provide a more appropriate representation of the baseline conditions of the Hunter River prior to commencement of operations at the MPO.

Should a measured band of impairment score at a particular downstream monitoring site degrade below the baseline band level outlined in Table 12, and the band level at a corresponding upstream monitoring site remain the same for two successive monitoring rounds, the stream health investigation protocol (refer to the SGWRP) would be initiated[3].

The stream health triggers for each downstream site are presented in Table 12.

Table 11
Stream Health Band of Impairment Scores

Band Label	O/E Taxa Range	Band Name	Band Description
Band X	>1.12	More biologically diverse than reference sites.	More taxa found than expected. Potential biodiversity hot-spot. Possible mild organic enrichment.
Band A	0.85 – 1.15	Reference condition.	Most/all of the expected families found. Water quality and/or habitat condition roughly equivalent to reference sites. Impact on water quality and habitat condition does not result in a loss of macro invertebrate diversity.
Band B	0.55 – 0.84	Significantly impaired.	Fewer families than expected. Potential impact either on water quality or habitat quality or both resulting in loss of taxa.
Band C	0.25 – 0.54	Severely impaired.	Many fewer families than expected. Loss of macro invertebrate biodiversity due to substantial impacts on water and/or habitat quality.
Band D	0 – 0.24	Extremely impaired.	Few of the expected families remain. Extremely poor water and/or habitat quality. Highly degraded.

Source: Gray B. (2004); Hose, G. and Turak, E. (2004).

[3] There is no corresponding upstream site for site SC. The stream health investigation protocol would be initiated if the band of impairment score at site SC degrades below the baseline band level outlined in Table 12 for two successive monitoring rounds.

Table 12
Stream Health Trigger Values

Historical Site ID	Updated Site ID	Baseline Band of Impairment Score	O/E Taxa^
W1	HR1	C	0.41
W1	HR2	B*	0.59
Hunt 854	HR3	B	0.64
Hunt 571	HR4	C	0.51
W15	HR5	B	0.61
SW17	HR6	B	0.73
Sandy 1	SC	B	0.61
Hunt 585	DB	B	0.66
Hunt 506	MC	B	0.55

^ Derived from the Spring 2017 monitoring round (refer Table 9).

* Previously recorded as Band A, which is considered unrealistic due to the disturbances that the site is regularly exposed to (e.g. stream bank erosion, water regulation and agricultural activities).

MACH Energy commenced stream health monitoring at three additional downstream sites in Spring 2017, including one on Sandy Creek and two on the Hunter River. MCO has established stream health trigger levels for monitoring sites on Sandy Creek (Figure 3). In the event a deterioration in stream health is observed at these locations, MACH Energy would consult with MCO during the implementation of their response mechanisms.

6.3 LICENSED DISCHARGE

Licensed discharges from the MPO will be undertaken in accordance with the HRSTS and criteria described in EPL 20850.

7 SURFACE WATER MONITORING PROGRAM

7.1 STANDARDS

Surface water monitoring at the MPO will be undertaken in accordance with relevant Australian Standards, legislation and NSW Guidelines, including (but not limited to):

- *Approved Methods for the Sampling and Analysis of Water pollutants in NSW* (DEC, 2004);
- *AS/NZS 5667.1:1998 Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*; and
- *AS/NZS 5667.10:1998 Water Quality – Sampling – Guidance on Sampling of Waste Waters.*

7.2 STREAMFLOW

MACH Energy would continue to review data from DPI-Water's gauging stations in the vicinity of the MPO (e.g. to inform groundwater modelling reviews). All three of these gauges continuously monitor:

- level (m);
- discharge/flow (ML/day);
- EC (μS/cm); and
- water temperature (degrees Celsius).

A qualitative measure of flow would also be recorded at all surface water quality sites at the time of sampling (e.g. dry, stagnant pool, low flow or high flow).

7.3 SURFACE WATER QUALITY

Monthly water sampling is undertaken at the relevant monitoring locations listed in Table 3. This includes the seven new surface water monitoring sites that were added to the monitoring network following commencement of operations (W11 – W17). The surface water monitoring program is shown on Figure 3 and summarised in Table 13 below.

Since 2011, monitoring data has not been collected at the Hunter River site W6 due to the river bank being too steep at this location to allow safe access. As such, water monitoring at site W6 has been discontinued and monitoring is undertaken at the new monitoring site W6A. This site is located at the same point as stream health monitoring site HR3, approximately 500 m downstream of the historical W6 site (Figure 3). Given its close proximity to the original site, as well as the overall scale of the Hunter River, trigger values developed at site W6 (Table 10) are used for monitoring at site W6A.

Monitoring at sites W7 and W8 have been discontinued due to being disturbed by mining activities. Monitoring at site W10 has been discontinued as the site is located on Dry Creek directly downstream of the Bengalla Mine Dry Creek Diversion Project.

Two v-notch weirs have been installed to the west of the Fines Emplacement Area for internal monitoring purposes. The location of the installed v-notch weirs is shown on Figure 3. The established v-notch weirs may be relocated as part of any future works. Should the v-notch weirs be relocated, the revised location of the weirs will be shown in the revised SWMP. Further information regarding the SWMP revision in provided in Section 8.2 of this SWMP.

Table 13
Surface Water Monitoring Program

Feature	Location/Sites	Parameters	Frequency[1]
Hunter River[#]	Upstream (Aberdeen [GS210056])	Streamflow, EC	Continuous (DPIE-Water)
	Upstream (W1)	Water Quality (Suite 1)	Monthly & Event Based
	Upstream (W1)	Water Quality (Suite 2)	Special Frequency
	*Upstream / Downstream (Muswellbrook [210002])	Stream Flow	Continuous (DPIE-Water)
	*Upstream / Downstream (W2, W3 & W6A)	Water Quality (Suite 1)	Monthly (*Baseline*)
			Monthly & Event Based (*When development within sub-catchment*)
	*Upstream / Downstream (W2, W3 & W6A)	Water Quality (Suite 2)	Special Frequency
	*Upstream / Downstream (HR3 & HR4)	Stream Health[%]	Bi-Annual (Spring and Autumn)
	Downstream (W15 & W17)	Water Quality (Suite 1)	Monthly & Event Based
	Downstream (W15 & W17)	Water Quality (Suite 2)	Special Frequency
	Downstream (Denman [210055])	Stream Flow	Continuous (DPIE-Water)
Dart Brook	Upstream (DB)	Stream Health[%]	Bi-Annual (Spring and Autumn)
Muscle Creek	Upstream (W4)	Stream Quality	Event Based
	Upstream (MC)	Stream Health[%]	Bi-Annual (Spring and Autumn)
Unnamed Tributaries – Draining mining lease 1645 (North-east to Hunter River)	Downstream (W5 & W9)	Water Quality (Suite 1)	Event Based (*Baseline*)
			Monthly & Event Based (*When development within sub-catchment*)
	Downstream (W5 & W9)	Water Quality (Suite 2)	Special Frequency
Rosebrook Creek	Downstream (W14)	Water Quality (Suite 1)	Monthly & Event Based
	Downstream (W14)	Water Quality (Suite 2)	Special Frequency
Sandy Creek^	Upstream (W11)	Water Quality (Suite 1)	Monthly & Event Based
	Upstream (W11)	Water Quality (Suite 2)	Special Frequency
	Downstream (W12)	Water Quality (Suite 1)	Event Based (*Baseline*)
			Monthly & Event Based (*When development within sub-catchment*)
	Downstream (W12)	Water Quality (Suite 2)	Special Frequency
	Downstream (SC)	Stream Health[%]	Bi-Annual (Spring & Autumn)

Table 13 (Continued)
Surface Water Monitoring Program

Feature	Location/Sites	Parameters	Frequency[1]
Unnamed Tributaries – Draining mining lease 1645 (West to Sandy Creek)	Downstream (W13 & W16)	Water Quality (Suite 1)	Event Based (*Baseline*)
			Monthly & Event Based (*When development within sub-catchment*)
	Downstream (W13 & W16)	Water Quality (Suite 2)	Special Frequency

[1] Event based frequency would be no greater than once per month.

[#] Available water monitoring results from the Mangoola Coal water monitoring program at nearby sites on Hunter River (SW14, SW15 & SW17) would also be used for comparative purposes.

[*] Upstream / Downstream – reflects monitoring locations that would not be potentially affected by the development until later in the Project life.

[^] Available water monitoring results from the Mangoola Coal water monitoring program at nearby sites on Sandy Creek (SW1 & SW2) would also be used for comparative purposes.

[%] Stream health monitoring parameters are described in Section 7.4.

Suite 1 = pH, EC, TSS and TDS sampling.

Suite 2 = pH, EC, TSS, Cu, Pb, Zn, Ni, Fe, Mn, As, Se, Cd, Cr, Li, Ba, Sr, Turbidity, Dissolved Oxygen, Total P and Total N.

Special Frequency = Quarterly until the end of 2018 and annually thereafter.

Note: During the construction phase of the MOD 4 rail loop and associated infrastructure, a Construction Environmental Management Plan (CEMP) will be implemented. The CEMP includes project-specific surface water quality monitoring to monitor potential impacts to water quality from the construction activities.

7.4 STREAM HEALTH

The stream health monitoring program is based on the AusRivAS aquatic invertebrate monitoring protocol, as used for the baseline stream health study.

AusRivAS is a rapid biological assessment protocol with twice yearly (spring and autumn) aquatic macro invertebrate sampling. Monitoring would continue to be undertaken at the nine sites shown on Figure 3. Stream health monitoring is also undertaken by MCO on Sandy Creek, to the south of site SC, and to the south-west of the MPO (Figure 3) and published in the Mangoola Coal Annual Reviews.

In addition to the aquatic macro invertebrate sampling, monitoring at the MPO stream health sites will also include:

- fish observations;
- site water quality;
- stream condition; and
- aquatic and riparian edge plants.

Due to the highly ephemeral nature of drainage lines within the MPO boundary, it is unlikely that these drainage lines support significant ecosystems. Therefore, all stream health monitoring locations are located on significant watercourses outside the MPO boundary.

The outcomes of the annual stream health monitoring (i.e. two rounds of monitoring) will be described in the Annual Review.

7.5 ON-SITE (MINE) WATER MANAGEMENT

A description of the on-site water management system is provided in the SWB.

Regular on-site water management monitoring will be undertaken to minimise potential environmental harm, ensure relevant statutory requirements are being met and to improve the water management system implemented at the site.

Regular monitoring of water levels in all mine water management storage dams will be undertaken. The integrity of clean water diversion and runoff collection structures will be monitored after rainfall events causing flow and on scheduled inspections. Visual and olfactory checks will occur following any contamination incidents, to monitor for any remnant contamination (this may involve laboratory assessment). All mine water storages (including open cut pits and sediment dams) will be sampled for Suite 1 water quality parameters monthly. An automated system for water diversion is used on-site to reduce human error.

The Secretary of the DPIE and the Chief Executive Officer of the EPA will be notified as soon as practicable after monitoring has identified a discharge incident causing material environmental harm. A detailed report on the incident will be made available within seven calendar days after the incident was identified.

To further reduce the risk of a discharge incident causing material harm, MACH Energy has developed a Surface Water Management Procedure which provides a set of recommended work practices for use by MPO employees and contractors to manage construction dams within the MPO. The Surface Water Management Procedure is an internal MACH Energy document, which expands on the procedures outlined in this SWMP[4].

MACH Energy has also prepared the CEMP in accordance with Condition 44I, Schedule 3 of Development Consent DA 92/97, which provides measures to minimise potential environmental impacts from MOD 4 construction works, including surface water management. The CEMP was approved on 10 March 2020.

7.6 BRIDGE OPENINGS AND CULVERTS

Condition 28(c), Schedule 3 of Development Consent DA 92/97 requires MACH Energy to implement a program to monitor and maintain the bridge openings and culverts associated with the MOD 4 rail infrastructure and ensure that they remain clear of blockages.

An assessment of the potential for blockages to occur in the proposed final design of bridge openings and culverts was undertaken by WRM Water and Environment (2020).

Assessment of the design blockage for the conceptual rail spur bridge openings was undertaken in accordance with Australian Rainfall and Runoff 2019, which included consideration of key design criteria including debris availability, mobility and transportability. The blockage assessment for the conceptual rail spur bridge openings indicated a low blockage potential and resulted in a 0% blockage for the most likely inlet blockage level (WRM Water and Environment, 2020).

MACH Energy has also designed the final MOD 4 rail infrastructure to meet specific flooding criteria in accordance with Conditions 44C and 44D, Schedule 3 of Development Consent DA 92/97 (WRM Water and Environment, 2020).

[4] Note that the Surface Water Management Procedure has not been reviewed or endorsed by the DPIE. MACH Energy takes responsibility for ensuring the procedures in the Surface Water Management Procedure are in accordance with provisions in this SWMP and provisions in Development Consent DA 92/97.

An independent review of the proposed final design of the MOD 4 rail infrastructure was undertaken by Royal HaskoningDHV (2020) in accordance with Condition 44D, Schedule 3 of Development Consent DA 92/97. The final design of the MOD 4 rail infrastructure meets the performance criteria specified in Condition 44C, Schedule 3 of Development Consent DA 92/97 (Royal HaskoningDHV, 2020) and was approved by the DPIE on 5 August 2020.

Notwithstanding the limited potential for blockages to occur, MACH Energy would undertake visual inspections annually and following flooding events[5] of the existing culvert crossings, culvert crossing extension and rail bridges to identify any blockages or potential blockage risks.

Any blockages that are identified would be removed by MACH Energy personnel and disposed of in accordance with the Waste Management Plan.

MACH Energy would also implement the management measures outlined in the CEMP to minimise the potential for blockage at culvert and bridge crossings during the construction of the approved MOD 4 rail infrastructure.

[5] Defined as a flood event equal to or exceeding the 'minor flooding' classification in the Muswellbrook Shire Local Flood Plan (NSW State Emergency Service, 2013).

8 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

8.1 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 of the DPIE.

In relation to water, the Annual Review will:

- include a review of the surface water monitoring data and site water balance 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 2.1.1);
  - 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 surface 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 surface water monitoring data over the life of the MPO;
- identify any discrepancies between the predicted and actual surface water impacts of the MPO, and analyse the potential cause of any significant discrepancies; and
- describe what surface 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.

8.2 SWMP REVISION

In accordance with Condition 4, Schedule 5 of Development Consent DA 92/97, this SWMP 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.

Within 4 weeks of conducting a review of this SWMP, MACH Energy will advise the Secretary of the DPIE of the outcomes of the review, and submit any revised documents for the approval of the Secretary.

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

If agreed with the Secretary of the DPIE, a revision to this SWMP 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.

The approved SWMP 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 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/).

10 REFERENCES

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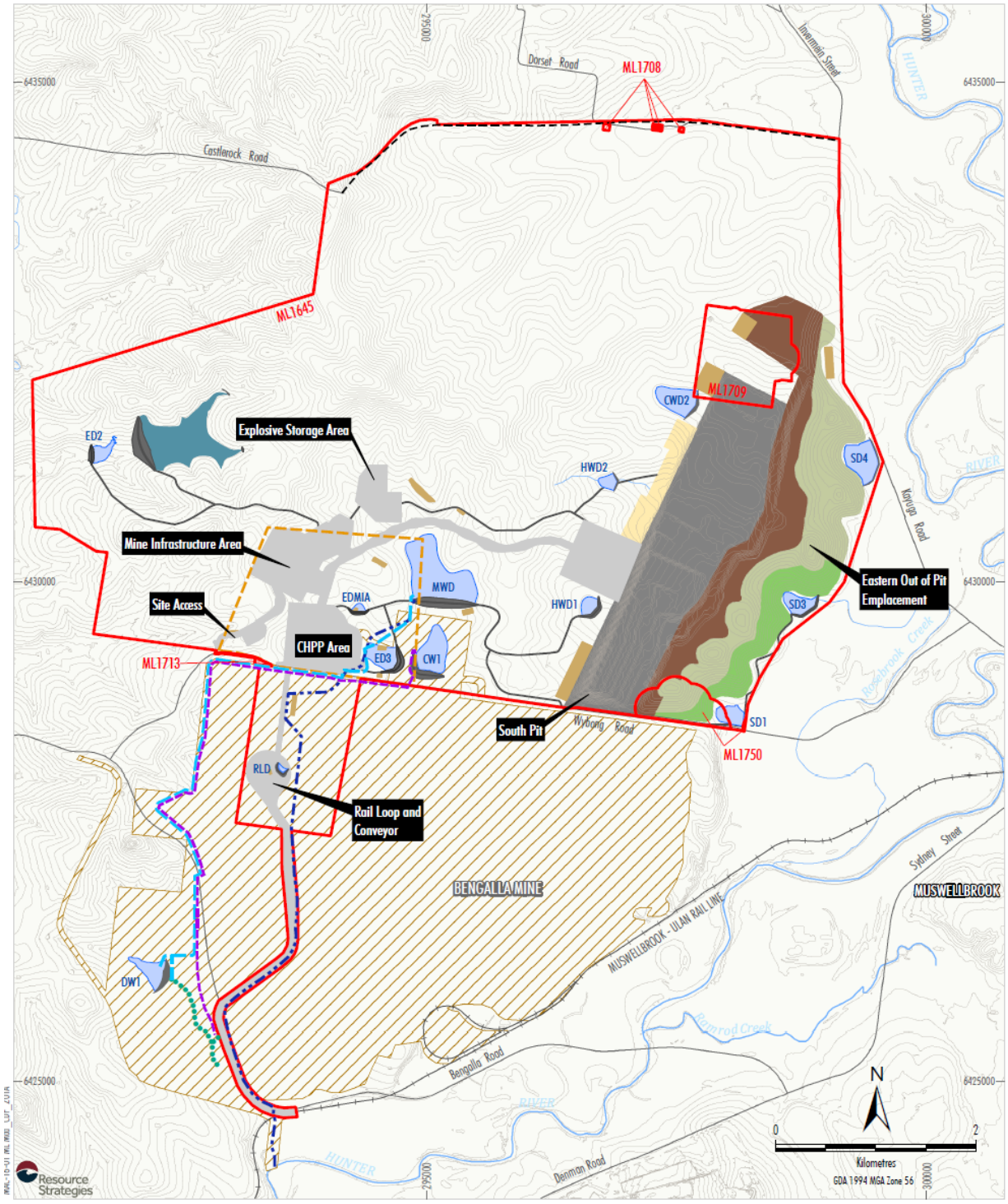
ATTACHMENT 1

APPENDIX 2 OF DEVELOPMENT CONSENT DA 92/97

APPENDIX 2
FIGURE 1 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2021



LEGEND

- Mining Lease Boundary
- Bengalla Mine Approved Disturbance Boundary (SSD-5170)
- Infrastructure Area Envelope
- Active Stripping Area
- Active Mining Area
- Active Overburden Emplacement Area
- Topsoil Stockpile
- Initial Rehabilitation
- Established Rehabilitation
- Infrastructure and Borrow/Stockpile Area
- Access Road
- Northern Link Road

Indicative Water Pipeline Alignment

- MPO Hunter River Supply Pipeline
- MPO DW1 Pipeline (Bi-directional)
- Bengalla Mine CW1 Pipeline
- Approximate Extent of Scour Protection
- Water Dam
- Fines Emplacement Area

Source: NSW Land & Property Information (2017); NSW Division of Resources & Energy (2017); MACH Energy (2017)

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FIGURE 2 - CONCEPTUAL PROJECT LAYOUT PLAN AT 2025

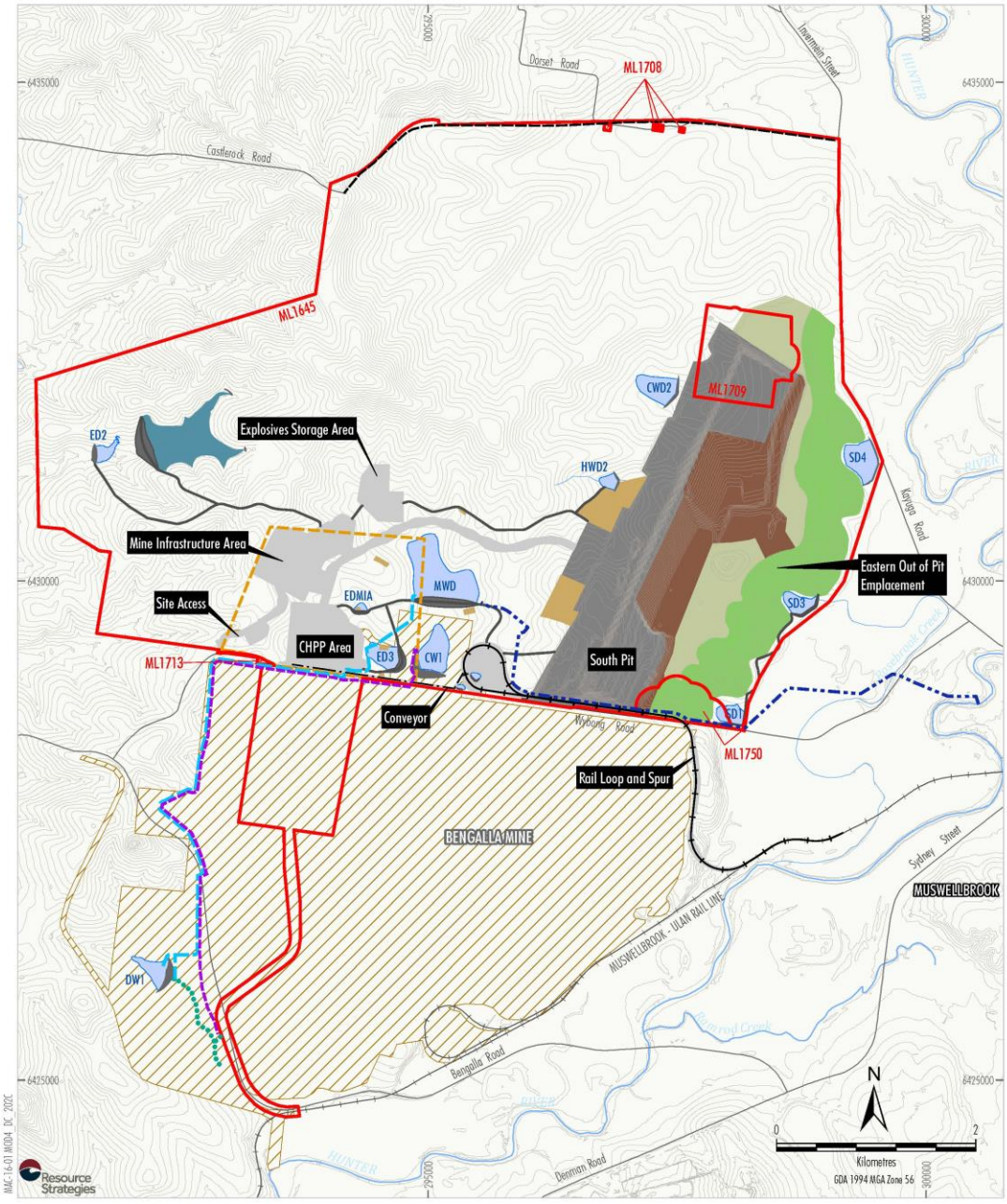
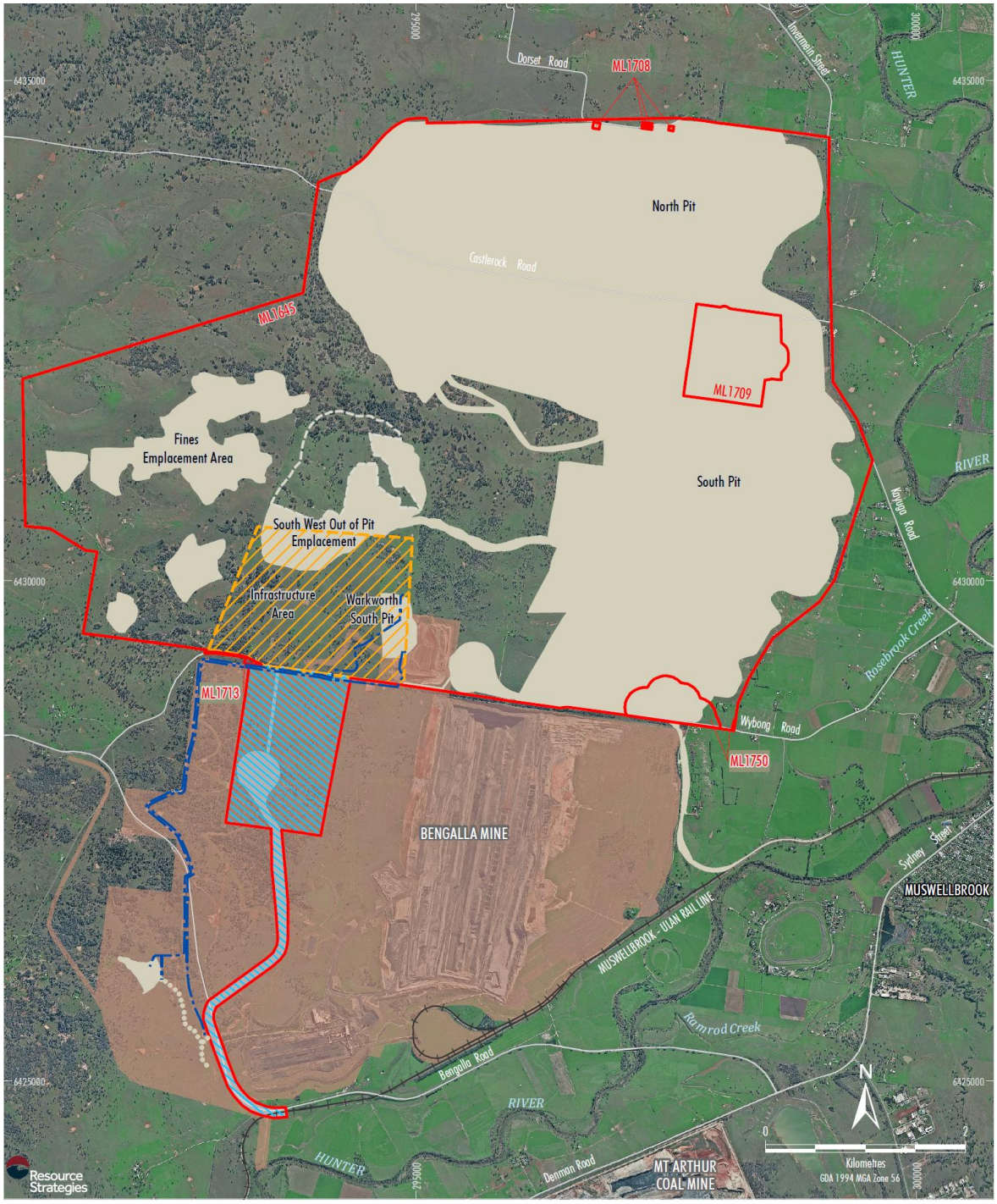


FIGURE 3 - APPROVED SURFACE DISTURBANCE PLAN



LEGEND

- Mining Lease Boundary
- Approximate Extent of Approved Surface Development [1]
- Indicative Water Pipeline Alignment
- 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)

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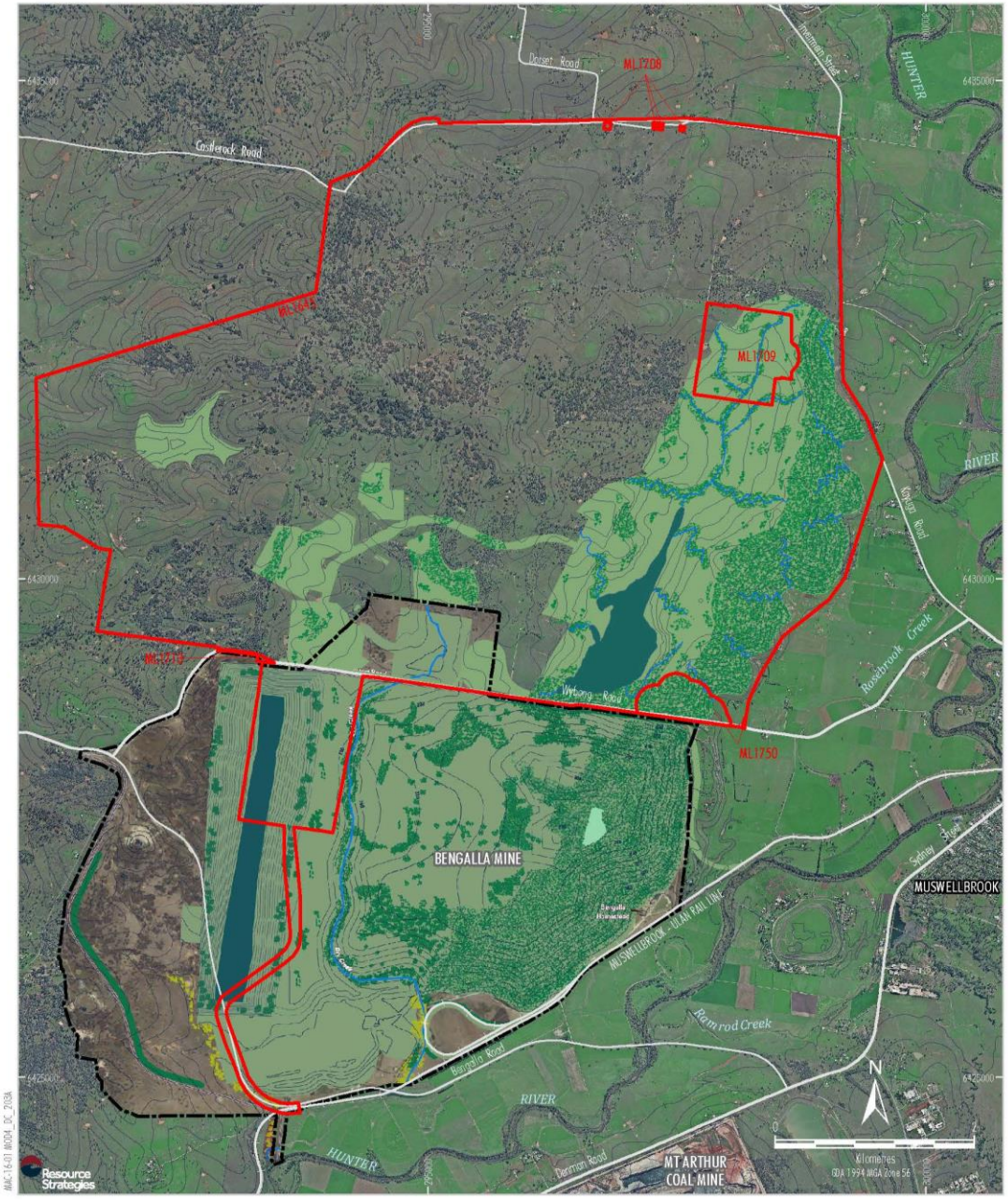
MOUNT PLEASANT OPERATION

Revised Approved Surface Disturbance Plan

FIGURE 4 - CONCEPTUAL FINAL LANDFORM



ATTACHMENT 2

MPO BASELINE SURFACE WATER QUALITY DATA

Table A2-1
MPO Baseline Surface Water pH and EC Water Quality Data Summary

Site	Number of Samples	Number of Dry Samples	First Record	Final Record	pH					EC				
					Min	20th %ile	Median	80th %ile	Max	Min	20th %ile	Median	80th %ile	Max
W1	131	0	20/07/2000	17/10/2011	6.14	7.60	8.00	8.20	8.60	231	355	400	529	880
W2	184	0	20/07/2000	12/07/2016	6.47	7.80	8.10	8.30	8.80	229	351	410	539	790
W3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W4	186	0	20/07/2000	12/07/2016	6.50	7.36	7.60	7.80	8.30	383	1,468	2,030	2,480	5,580
W5	186	183	20/07/2000	12/07/2016	6.10	6.18	6.30	6.72	7.00	80	96	120	983	1,558
W6	123	0	20/07/2000	17/04/2015	6.89	7.8	8.10	8.40	8.70	280	358	400	496	860
W7	188	186	20/07/2000	12/07/2016	6.80	7.00	7.30	7.60	7.80	145	178	228	277	310
W8	188	161	21/07/2000	12/07/2016	6.10	6.90	7.30	7.60	8.50	60	114	238	318	930
W9	188	178	21/07/2000	12/07/2016	6.40	6.68	7.05	7.30	7.40	50	128	255	365	537
W10	187	186	21/07/2000	12/07/2016	6.20	6.20	6.20	6.20	6.20	30	30	30	30	30
W12	36	-	23/10/2017	01/05/2020	7.50	7.70	8.00	8.10	8.40	897	4,270	4,970	6,420	7,890
W15	36	-	23/10/2017	01/05/2020	7.40	7.80	7.90	8.00	8.20	278	366	414	460	778

Table A2-2
MPO Baseline Surface Water TSS and TDS Water Quality Data Summary

Site	Number of Samples	Number of Dry Samples	First Record	Final Record	TSS (mg/L)					TDS (mg/L)				
					Min	20th %ile	Median	80th %ile	Max	Min	20th %ile	Median	80th %ile	Max
W1	131	0	20/07/2000	17/10/2011	1	3	8	20	194	-	-	-	-	-
W2	184	0	20/07/2000	12/07/2016	1	4	8	18	211	8	178	251	262	268
W3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W4	186	0	20/07/2000	12/07/2016	1	3	6	12	232	1530	1,566	1,620	1,758	1,850
W5	186	183	20/07/2000	12/07/2016	8	11	15	18	20	-	-	-	-	-
W6	123	0	20/07/2000	17/04/2015	1	4	8	19	219	-	-	-	-	-
W7	188	186	20/07/2000	12/07/2016	20	30	46	61	71	-	-	-	-	-
W8	188	161	21/07/2000	12/07/2016	7	100	292	672	2,060	1560	1,560	1,560	1,560	1,560
W9	188	178	21/07/2000	12/07/2016	28	36	159	678	784	-	-	-	-	-
W10	187	186	21/07/2000	12/07/2016	139	139	139	139	139	-	-	-	-	-
W12	36	-	23/10/2017	01/05/2020	1	4	8.5	30	172	448	2610	2,905	3,890	4,730
W15	36	-	23/10/2017	01/05/2020	4	11	16	23	3,550	189	226	263	306	483

ATTACHMENT 3

MANGOOLA COAL BASELINE SURFACE WATER DATA – SANDY CREEK

	old site name	W1					W2				
	new site name	SW01					SW02				
	Eastings (MGA, z 56)	284041					286917				
	Northings (MGA, z 56)	6419087					6423773				
month	date sampled	Flow Condition	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Flow Condition	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
Feb-02	19/02/2002		6.81	304	29	328		7.48	839	119	704
Mar-02	19/03/2002		7.60	605	11	410		7.50	4060	21	2330
Apr-02	17/04/2002		8.25	568	10	360		7.86	5910	8	3650
May-02	14/05/2002		8.27	696	10	355		8.02	6840	0	3700
Jun-02	18/06/2002		8.40	548	38	330		8.10	4920	25	2810
Jul-02	24/07/2002		8.40	830	0	434		8.20	4940	25	3070
Aug-02	21/08/2002		8.26	1090	14	645		8.12	5640	6	3140
Sep-02	20/09/2002		8.00	1100	60	665		8.00	5850	2	3150
Oct-02	18/10/2002	Dry						7.93	6890	4	3920
Nov-02	19/11/2002	Dry					Dry				
Dec-02	11/12/2002		7.50	279	69	195		7.60	3390	21	1960
Jan-03	16/01/2003		8.26	520	9	398		7.39	4620	20	2670
Feb-03	19/02/2003		8.06	779	14	569		7.23	5430	116	2800
Mar-03	12/03/2003		8.29	518	27	363		7.26	5560	103	2960
Apr-03	15/04/2003		8.29	633	31	430		7.28	5310	58	3040
May-03	21/05/2003		8.60	735	18	577		7.33	5670	54	3310
Jun-03	18/06/2003		8.44	1010	444	706		7.28	5520	48	2970
Jul-03	17/07/2003		8.31	538	26	360		8.07	6990	3	3940
Aug-03	18/08/2003		7.98	419	6	264		7.86	4190	6	2260
Sep-03	15/09/2003		7.95	247	10	295		7.75	2950	10	1540
Oct-03	14/10/2003		7.90	304	9	243		7.95	5820	7	3230
Nov-03	17/11/2003		8.30	459	26	336	Dry				
Dec-03	24/11/2003		7.37	216	29	242		7.34	968	22	517
Jan-04	15/12/2003		7.63	233	21	261		7.52	1780	6	961
Feb-04	13/01/2004		8.23	440	26	344	Dry				
Mar-04	11/02/2004		7.77	283	30	243	Dry				
Apr-04	10/03/2004		8.62	286	18	202	Dry				
May-04	14/04/2004		8	347	31	233	Dry				
Jun-04	12/05/2004		8.24	505	44	316	Dry				
Jul-04	15/06/2004		8.5	423	41	270	Dry				
Aug-04	15/07/2004		8.3	527	48	342	Dry				
Sep-04	16/08/2004		8.3	599	123	384	Dry				
Oct-04	14/09/2004		7.9	372	843	262	Dry				
Nov-04	1/10/2004		7.74	373	141	270	Dry				
Dec-04	5/11/2004		8.31	314	130	350	Dry				
Jan-05	14/12/2004		8	620	5	380	Dry				
Feb-05	4/01/2005		8.2	470	103	300	Dry				
Mar-05	10/02/2005		7.3	240	97	230	Dry				
Apr-05	1/03/2005		7.9	370	68	250	Dry				
May-05	6/04/2005		7.5	503	58	518	Dry				
Jun-05	3/05/2005		7.4	634	25	414	Dry				
Jul-05	9/06/2005	Dry					Dry				
Aug-05	4/07/2005		7.22	116	65	245	Dry				
Sep-05	31/08/2005		7.3	331	80	256	Dry				
Oct-05	12/09/2005		7.2	360	129	282	Dry				
Nov-05	11/10/2005		7.6	479	63	320	Dry				
Dec-05	15/11/2005		8.2	437	99	216	Dry				
Jan-06	19/01/2006		7.1	561	49	466	Dry				
Feb-06	17/02/2006		7.3	831	101	564	Dry				
Mar-06	6/03/2006	Dry					Dry				
Apr-06	6/04/2006	Dry					Dry				
May-06	9/05/2006	Dry					Dry				
Jun-06	8/06/2006	Dry					Dry				
Jul-06	10/07/2006	Dry					Dry				
Aug-06	10/08/2006	Dry					Dry				
Sep-06	8/09/2006	Dry					Dry				
Oct-06	18/10/2006	Dry					Dry				
Nov-06	23/11/2006	Dry					Dry				
Dec-06	28/12/2006	Dry					Dry				
Jan-07	25/01/2007	Dry					Dry				
Feb-07	22/02/2007	Dry					Dry				
Mar-07	21/03/2007	Dry					Dry				
Apr-07	26/04/2007	Dry					Dry				
May-07	24/05/2007	Dry					Dry				
Jun-07	8/06/2007		5.63	62	456	420		5.77	16	120	20
Jul-07	20/07/2007		8.1	528	11	356		7.5	7050	22	3944
Aug-07	21/08/2007		7.1	567	68	343		7.6	3335	92	2334
Sep-07	12/09/2007		7.6	701	254	370		7.4	4930	13	2690
Oct-07	17/10/2007		8	1695	99	1061		7.2	5720	200	3795
Nov-07	19/11/2007		7.9	1382	44	870		6.9	7765	34	4420
Dec-07	14/12/2007		8.1	964	13	436		7.9	1915	7	1072
Jan-08	15/01/2008		7.9	950	31	542		8.3	3700	10	1890
Feb-08	14/02/2008		6.4	825	34	500		7.3	1792	12	1034
Mar-08	14/03/2008		7.8	840	54	556		8.3	5385	0	2760
Apr-08	16/04/2008		7.6	1899	57	1031		8.3	6440	11	10675
May-08	13/05/2008		9.8	1310	47	854		9.2	5920	14	3635
Jun-08	12/06/2008		7.6	1331	63	676		7.8	5220	8	3100
Jul-08	10/07/2008		8.4	1500	38	770		8.1	5620	3	3080
Aug-08	12/08/2008		8.3	1288	26	662		7.9	6120	6	2960
Sep-08	15/08/2008		8.6	730	86	376		8	3250	3	1570
Oct-08	10/10/2008		7.8	680	142	482		8	1940	21	1126
Nov-08	12/11/2008		8.3	952	139	590		8.4	4620	6	3215
Dec-08	8/12/2008		8.3	1160	185	700		8	4480	8	3110
Jan-09	20/01/2009	Dry					Dry				
Feb-09	12/02/2009	Dry						7.2	4800	20	3000
Mar-09	19/03/2009		7.9	790	30	530		8.2	5300	20	3300
Apr-09	16/04/2009		7.6	630	26	420		8	5220	4	3020
May-09	13/05/2009	Dry						8.3	5200	2	3400
Jun-09	11/06/2009	Dry						8	5000	3	2740
Jul-09	15/07/2009	Dry						8.2	4940	2	2805
Aug-09	10/08/2009	Dry						8.3	5065	1	2978
Sep-09	11/09/2009	Dry						8.1	4900	1	2600
Oct-09	15/10/2009	Dry						9	5600	4	3600
Nov-09	12/11/2009	Dry						8.1	4800	5	2800
Dec-09	29/12/2009	Dry						7.5	5600	8	3200
Jan-10	15/01/2009		7.6	510	7	350		7.8	3100	7	2500
Feb-10	12/02/2010		8.5	650	100	440	Dry				
Mar-10	17/03/2010	Dry					Dry				
Apr-10	12/04/2010		7.3	400	15	340	Dry				
May-10	12/05/2010	Dry					Dry				
Jun-10	11/06/2010	Dry						8	4310	27	1960

	old site name	W1					W2				
	new site name	SW01					SW02				
	Eastings (MGA, z 56)	284041					286917				
	Northings (MGA, z 56)	6419087					6423773				
month	date sampled	Flow Conditions	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)	Flow Conditions	pH	EC (uS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-10	9/07/2010	Dry					Flow	8.4	5495	6	2805
Aug-10	20/08/2010	No Flow	8.6	287	3	182	Flow	8.2	5330	11	2865
Sep-10	16/09/2010	No Flow	8.0	336	8	178	Flow	7.8	5465	14	2915
Oct-10	19/10/2010	Dry					No Flow	8.1	5630	232	3050
Nov-10	10/11/2010	No Flow	7.8	318	8	242	No Flow	7.7	4020	4	2570
Dec-10	2/12/2010	No Flow	7.7	334	15	282	No Flow	7.7	4310	26	2440
Jan-11	10/01/2011	No Flow	8.2	297	35	380	No Flow	8.2	5440	19	3080
Feb-11	14/02/2011	No Flow	7.5	859	249	580	No Flow	7.7	6470	23	4070
Mar-11	10/03/2011	No Flow	7.5	999	394	694	Dry				
Apr-11	14/04/2011	No Flow	7.4	678	725	514	Dry				
May-11	11/05/2011	Dry					Dry				
Jun-11	9/06/2011	No Flow	8.8	383	48	228	No Flow	8.0	3890	5	2220
Jul-11	25/07/2011	No Flow	7.6	487	17	282	Flow	8.0	5250	21	2870
Aug-11	18/08/2011	No Flow	8.0	529	11	327	Flow	8.0	5230	2	2960
Sep-11	29/09/2011	Flow	9.0	485	15	310	Flow	7.8	5220	<1	2900
Oct-11	20/10/2011	No Flow	7.3	269	5	358	Flow	8.0	3410	1	1880
Nov-11	17/11/2011	No Flow	7.4	283	43	209	Flow	7.8	5380	16	2920
Dec-11	28/12/2011	No Flow	9.0	1253	4	714	Flow	7.7	2730	1	1500
Jan-12	26/01/2012	No Flow	7.9	1461	23	924	Flow	7.6	4580	4	2660
Feb-12	24/02/2012	No Flow	8.8	825	5	475	Flow	7.7	2560	4	1380
Mar-12	3/03/2012	Flow	6.7	126	25	223	Flow	7.9	1993	293	1230
Apr-12	20/04/2012	No Flow	8.5	1736	4	976	Flow	8.0	3260	3	1970
May-12	22/05/2012	No Flow	8.4	1739	11	991	Flow	8.1	3850	2	2060
Jun-12	28/06/2012	No Flow	8.4	1660	10	892	Flow	8.1	3690	5	2060
Jul-12	26/07/2012	Flow	7.9	1463	8	773	Flow	8.2	3070	3	1650
Aug-12	27/08/2012	No Flow	8.3	1983	6	1090	Flow	8.2	3790	<1	2120
Sep-12	24/09/2012	No Flow	8.8	2820	24	1500	Flow	8.1	3940	2	2150
Oct-12	16/10/2012	No Flow	9.0	3080	13	1750	Flow	8.0	4080	1	2330
Nov-12	13/11/2012	No Flow	7.7	4460	215	2450	No Flow	7.9	4950	11	2760
Dec-12	21/12/2012	No Flow					Dry				
Jan-13	16/01/2013	Dry					No Flow	7.6	6200	11	3460
Feb-13	14/02/2013	No Flow	7.4	541	12	391	Flow	7.9	4040	69	2460
Mar-13	14/03/2013	Flow	7.5	1739	1	974	Flow	7.8	2030	3	1160
Apr-13	17/04/2013	No Flow	8.3	2270	2	1340	Flow	7.9	3550	<1	1920
May-13	16/05/2013	No Flow	8.4	2970	10	1560	Flow	8.1	3930	1	2190
Jun-13	6/06/2013	No Flow	8.3	2940	15	1460	Flow	8.2	4180	<5	2150
Jul-13	10/07/2013	No Flow	8.6	1615	7	934	Flow	8.2	3740	3	2150
Aug-13	19/08/2013	No Flow	9.2	3190	9	1740	Flow	8.6	3800	<1	2140
Sep-13	12/09/2013	No Flow	8.4	3820	29	2170	Flow	8.0	3850	<1	2240
Oct-13	10/10/2013	No Flow	8.3	4640	32	5310	Flow	8.0	4220	3	2400
Nov-13	20/11/2013	No Flow	7.8	1329	82	774	Flow	7.8	1984	19	1090
Dec-13	18/12/2013	No Flow	8.3	2020	25	1130	Flow	7.7	3800	4	2090
Jan-14	20/01/2014	No Flow	8.9	4150	51	2400	No Flow				
Feb-14	13/02/2014	No Flow					No Flow				
Mar-14	20/03/2014	No Flow	7.5	554	17	408	No Flow	7.6	5510	6	3260
Apr-14	9/04/2014	No Flow	7.4	371	24	327	Flow	7.7	3900	1	2220
May-14	7/05/2014	No Flow	7.7	485	95	926	Flow	7.9	3980	1	2310
Jun-14	19/06/2014	No Flow	8.2	672	10	388	Flow	8.1	4540	<5	2320
Jul-14	9/07/2014	No Flow	7.8	768	39	458	Flow	8.0	4340	<1	2430
All data	95th Percentile		8.8	3014	251	1632		8.3	6544	118	3924
July 2010 to July 2014 - Flow	95th Percentile		8.8	1698	24	944		8.3	5410	57	2917
July 2010 to July 2014 - No Flow	95th Percentile		9.0	4181	264	2405		8.2	6362	150	3826
All data	Maximum		9.8	4640	843	5310		9.2	7765	293	10675
All data	Minimum		5.6	62	0	178		5.8	16	0	20