WHITEHAVEN CHPP

WATER MANAGEMENT PLAN

Edition	Rev.	Comments	Author	Authorised By	Date
1	0	2012 CHPP Ponds Upgrade	URS	D Young	July 2012
2	0	Modification 3 review	T Dwyer	J Johnson	July 2016

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ACRONYMS USED THROUGHOUT THIS DOCUMENT

CHPP	-	Coal Handling and Preparation Plant
DP&E	-	Department of Planning and Environment
DPI Water	-	Department of Primary Industries - Water
EIS	-	Environmental Impact Statement
EPA	-	Environment Protection Authority
EPL	-	Environment Protection Licence
ML	-	Megalitre
Mtpa	-	Million tonnes per annum
NZS	-	New Zealand Standards
RLF	-	Rail Load-Out Facility
RP	-	Reject Pond
SP	-	Settlement Pond
TARP	-	Trigger Action Response Plan

1 INTRODUCTION

1.1 Background

The Whitehaven Coal Handing Preparation Plant (CHPP), incorporating the Rail Load-Out Facility (RLF), is owned and operated by Whitehaven Coal Limited (Whitehaven) and was originally approved by Gunnedah Shire Council on 7th September 2002 under Project Approval 0079.2002. The CHPP is located approximately 6km North West of Gunnedah between Quia Road and the Kamilaroi Highway and its regional setting is shown on Figure 1. Surface operations are located adjacent and accessed by the Kamilaroi Highway across Lot 678 DP705086, Lot 111, 112, 120, 471-475 and 498 DP755503, Lot 1 DP723509, Lot 1 DP810271, Lot 1 DP239575 and Lot 12 DP542047.

On 23rd December 2011, a proposal to construct additional reject ponds at the CHPP was approved by the then Department of Planning and Infrastructure (DoPI), now Department of Planning and Environment (DP&E), which provided for the construction of 3 additional reject ponds and 2 settlement ponds to the immediate east of the existing pond footprint.

On 24th August 2015 an administrative modification to DA 0079.2002 was approved.

A Water Management Plan (WMP) was prepared in 2012 in accordance with Schedule 3, Condition 3 and Condition 14 of Project Approval 0079.2002 to support the construction of the additional ponds and outline water management requirements for the site. This WMP has been revised in accordance with Schedule 3 Condition 19 of DA 0079.2002.

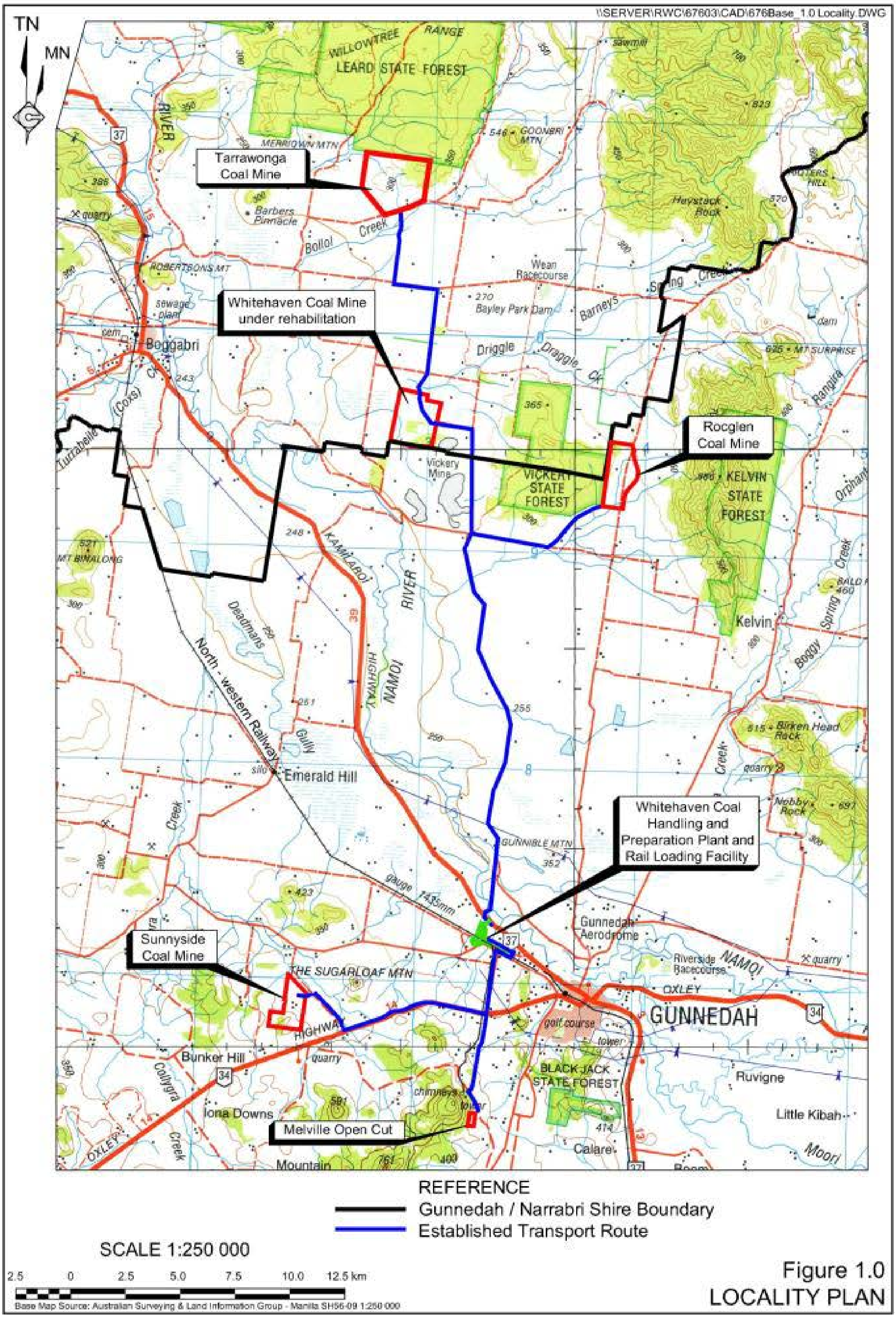

Figure 1 - Locality Plan

1.2 Conditional Requirements

Table 1 shows where the requirements of DA 0079.2002 have been addressed in the WMP.

Table 1 - Conditional Requirements

Requirement	Refer to Section
s3 Condition 3. *The Applicant shall ensure that any surface water discharges from the site comply with the discharge limits (both volume and quality) set for the development in any EPL.*	Section 5.3
s3 Condition 14.*The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This plan must be prepared in consultation with DPI Water and the EPA and be submitted to the Secretary for approval prior to construction of the additional reject and settlement ponds. The plan must include:*	
(a) *An Erosion and Sediment Control Plan, prepared in accordance with Managing Urban Stormwater: Soils and Construction (the Blue Book), 4th Edition or its latest version;*	Section 3
(b) *A Surface Water Management Plan, including:*	
• *a program to monitor surface water flows and quality in the watercourses that could be affected by the proposal, including trigger levels for investigating adverse impacts; and:*	Section 5
• *an updated Site Water Balance*	Section 4
(c) *A Groundwater Management and Response Plan, which must include:*	
• *baseline data of groundwater levels, yield and quality in the Project area;*	Refer Environmental Assessment
• *groundwater impact assessment criteria, including trigger levels for investigating any adverse groundwater impact :*	Section 6.2
• *a program to monitor groundwater in the area of the additional reject and settlement ponds;*	Section 6.4
• *a response protocol for any exceedances of assessment criteria; and*	Section 7.3
• *measures to mitigate and/or offset any adverse impacts on groundwater.*	Section 7.2.1

2 SURFACE WATER MANAGEMENT

2.1 Site Location and Layout

The site is located within the Namoi River basin, with elevations in the region ranging from 761m AHD at King Jack Mountain (approximately 12km south south-west from the site) to 886m AHD in the Kelvin Range (approximately 25km north from the site). To the immediate north of the site, along the Namoi River, elevation is approximately 260m AHD. The general site layout, including water management structures, is shown on Figure 2.

2.2 Principles

For the purposes of water management at the CHPP, surface water is considered in terms of three separate surface flows based on the source of runoff and the potential contaminants the runoff may contain:

- Clean Water Catchment – Catchment areas which are relatively undisturbed by CHPP activities;
- Dirty Water Catchment – Disturbed catchments such as the infrastructure areas, including processing water, and any other areas subject to disturbance.
- Contaminated Water Catchment – Catchments which may result in runoff becoming contaminated. Runoff from these catchments is to be contained, as far as practicable, to avoid discharge of potentially contaminated water into the natural water courses.

2.3 Clean Water Management

Clean water which enters the site from the catchment to the south of the RLF is conveyed to the Main Storage Dam via a clean water conveyance channel. The stored water is utilised to fulfil the water requirements of the CHPP. Clean water runoff from the surrounding areas is diverted around the site, as much as practicable, towards the Namoi River. This is achieved using purpose built diversion bunds and drainage channels to ensure separation from dirty or contaminated water.

The Whitehaven CHPP has several water bores on, or adjacent to, the site as per Water Access Licences 12715, 12645, 12724 and 12701, with an available allocation of 175ML. These supply clean water to the main pumping ring for usage in CHPP processes. In addition, river water is available in accordance with Water Access Licences 14936 and 16034, which provide 1054ML general security and 50ML in High Security allocation. When water is required from the Namoi River it is stored in the Main Storage Dam before being transferred to the ring main for use in the CHPP.

2.3.1 Main Storage Dam Design

The Main Storage Dam at the CHPP was constructed by the previous occupiers of the site (Rio Tinto) as a containment structure associated with the operation of the RLF for the Vickery

Coal Project. This Main Storage Dam has a maximum capacity of 20ML (12ML operating volume and 8ML storm capacity). Additional capacity (7ML) is held in the Fresh Water Dam located within the Rail Loop which directs flows via a culvert beneath the railway line and through the drainage system to the Main Storage Dam. As stated earlier, this is not a formal dam structure and is not currently used as a source of water.

2.3.2 Main Storage Dam Management

Clean water flows into the Main Storage Dam via a clean water conveyance channel. As the Main Storage Dam also provides direct feed to the CHPP, the storage volume is constantly changing based on plant feed requirements and subsequent inflows to maintain supply.

In terms of ongoing management of the Main Storage Dam:

- The Main Storage Dam will be cleaned out (de-silted) at the first available opportunity (on the basis of storage level) and re-surveyed to confirm storage capacity.
- The Main Storage Dam will continue to be subject to consistent drawdown as a consequence of water being recirculated through the CHPP for coal washing purposes. This will reduce the potential for discharge from this storage to occur.

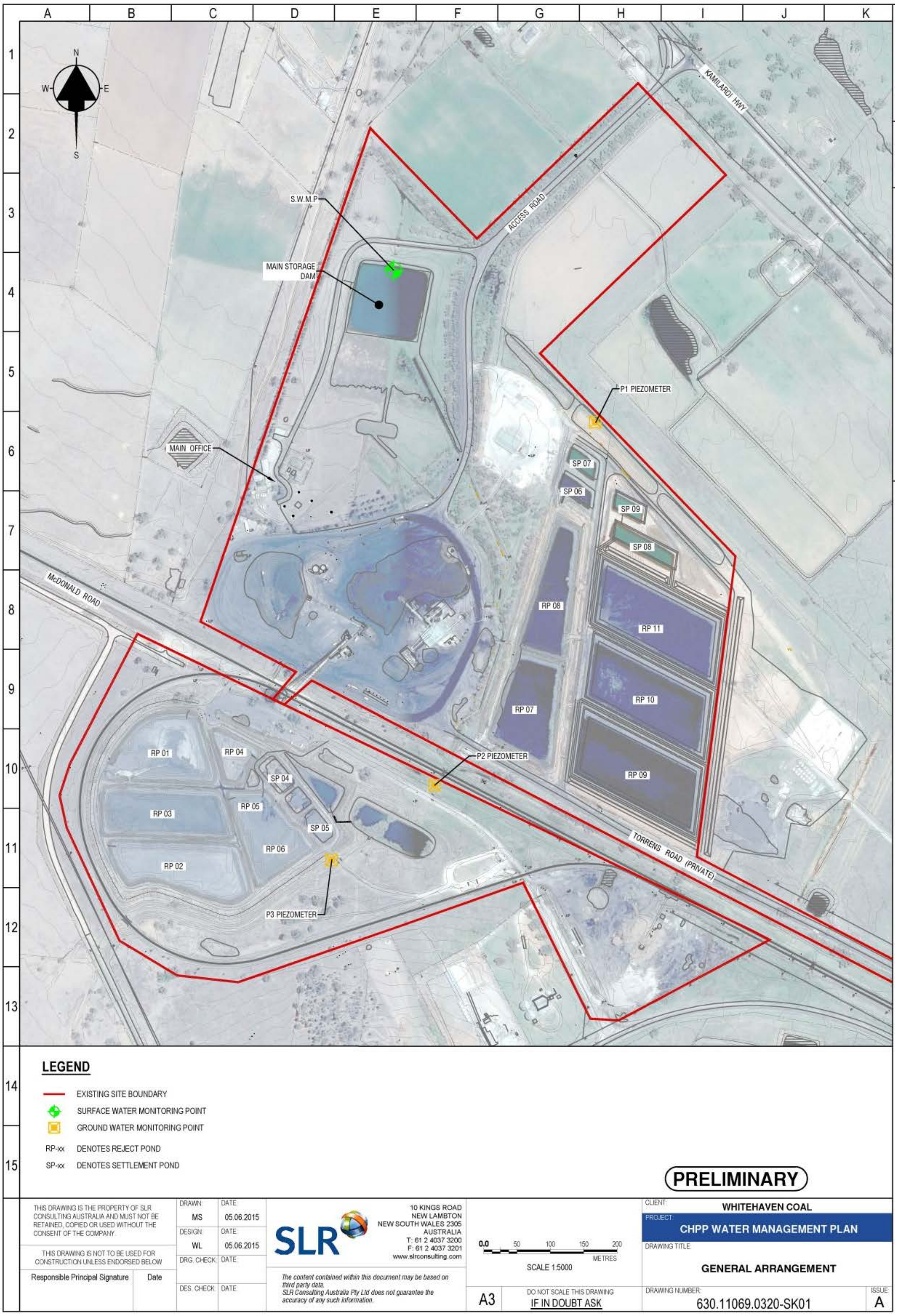

Figure 2 - General Arrangement

2.4 Dirty Water Management

2.4.1 Dirty Water Drainage System

The dirty water management system is based around a series of dirty water drains that convey surface flows. The system also contains a series of settlement and finishing ponds that make up the individual reject pond systems.

The dirty water diversion channels constructed around the site convey dirty water in a controlled way to the respective dirty water dams prior to re-use and/or subsequent discharge. Diversion bunds are used to direct surface flows to the diversion channels.

All water collected and contained within the reject pond system at the CHPP will be either; retained in settlement ponds, pumped to the Main Storage Dam for storage, or pumped directly to the CHPP for use in the coal washing process.

2.4.2 Reject Ponds and Settlement Ponds

The CHPP currently has in place a series of reject and settlement ponds associated with the reject circuit from the processing plant. Reject is directed to the fine reject ponds on a cyclical basis depending upon available storage. The reject ponds have been constructed with compacted clay bases, and coarse reject walls to enable the water to filter through the walls and into the settlement ponds.

Clarified water captured from the reject ponds in the settlement ponds and the polishing and recovery ponds is reused through the CHPP circuit either through direct pumping through the plant or via storage in the Main Storage Dam.

2.5 Contaminated Water Management

The CHPP workshop has been constructed with concrete flooring which in conjunction with bunding, oil/water separation infrastructure and spill kits minimise the likelihood of contamination.

Routine sampling of the Main Storage Dam allows identification of any hydrocarbon contamination issues that may arise and management of the dam with sufficient freeboard minimises the likelihood of wet weather discharges.

3 EROSION AND SEDIMENT CONTROL

3.1 Sources of Erosion and Sedimentation

There are a number of activities which are undertaken at the CHPP which have the potential to cause soil erosion and generate sediment unless adequate control measures and practices are implemented. Erosion or sedimentation may potentially result from any of the following:

- Surface runoff from areas disturbed as a result of vegetation or topsoil removal;
- Surface runoff from topsoil or subsoil stockpiles prior to establishment of an adequate vegetative cover;
- Surface runoff from rehabilitation areas prior to the establishment of a suitable ground cover;
- Runoff from hardstand areas including roads and the main office area;
- Excessive surface water runoff velocity within drainage lines and on disturbed surfaces; and
- Surface runoff from coal stockpile areas.

3.2 On-going Erosion and Sediment Management Practices

The following practices will be implemented at the CHPP to minimise potential for erosion and sedimentation:

- Installation of all erosion and sediment controls and water management structures prior to any ground disturbance taking place;
- Land disturbance will be minimised by clearing the smallest practical area of land ahead of disturbance activities;
- Disturbance areas which will not be actively utilised will be revegetated as soon as practical following completion of works in that area;
- Where practical, disturbance areas will be shaped such as to provide a free draining surface to direct dirty water runoff into the dirty water drains for collection in the Main Storage Dam;
- Where localised flooding or ponding occurs, access will be restricted where practicable until such time as the ground is no longer waterlogged in order to reduce the potential for additional sediment mobilisation;
- If erosion is identified on a rehabilitating landform or in the operational area, it will be remediated as quickly as practical to reduce the potential for significant erosion to develop. Areas previously rehabilitated will be inspected regularly to ensure rehabilitation works are effective; and
- Where necessary, temporary erosion and sediment control measures will be utilised to prevent and/or reduce the potential for adverse erosion developing. Temporary erosion and sediment control structures and management practices

will be constructed in accordance with the construction principles presented in the Blue Book (Landcom) and may include sediment fences, check dams, surface protection and advanced revegetation methods such as hydromulching.

Temporary erosion and sediment control measures will be implemented for the construction of the proposed water management structures.

4 WATER BALANCE

A water balance model was developed in 2012 to satisfy the conditions of approval for the reject pond expansion. This section of the report summarises the assessment undertaken and its findings. The water balance model was constructed in excel and used daily time steps.

The CHPP site has a relatively simple water cycle system. The water balance model forecasts the following water movements within this water cycle:

- Demand of the CHPP process and facilities (refer Section 4.5.1);
- Export with the final coal product (refer Section 4.5.1 and Figure 5);
- Import from bores and the Namoi River (refer Section 4.5.1);
- Controlled release (refer section 4.4.2), and
- Uncontrolled discharge from the site (refer Section 4.5.3).

4.1 Management Principles

A water balance must make a number of assumptions to represent the operations on site. These vary for each site and can also vary across a single site. The following general management principles were adopted across all elements of the site:

- Limiting the extent of site disturbance;
- Using the minimum volume of water necessary in the process circuit;
- Optimising the volume of water discharged from the site (in accordance with EPL LDP criteria);
- Segregation of water by quality or source;
    - Reducing contaminant concentrations by suitable treatment methods;
    - Avoiding the accumulation of large volumes of contaminated water on-site;
    - Protecting groundwater resources from contamination.

It should be noted that the CHPP system is constantly losing water through evaporation and through export of the final coal product. Therefore, it is anticipated that the site will generally operate in water deficit, requiring volumes from the licenced bore and Namoi River allocation. The additional reject ponds that were constructed allow increased evaporation time for the fine reject. This gives the site the ability to operate under wetter conditions and acts as a safe guard against uncontrolled discharge from the site.

4.2 Climatic Inputs and Outputs

4.2.1 Evaporation

Evaporation is one of the primary losses of water from site and therefore it is a key element of the water balance model. Daily evaporation information was limited; therefore monthly evaporation figures obtained from the Australian Bureau of Meteorology were used in this assessment. The figures were taken from station number 055024 (Gunnedah Resource Centre) and basic station data is outlined in Table 2.

Table 2 - Climate Data Station

055024 GUNNEDAH RESOURCE CENTRE
Commenced: 1948
Last Record: 2016
Latitude: 31.03 Degrees South
Longitude: 150.27 Degrees East
Elevation: 307 m
State: NSW

The mean daily evaporation (mm) for years 1948 to 2016 and the adjusted values are shown in Table 3.

Table 3 - Average Monthly Point Potential Evapotranspiration Rates

	Pan Factor:	**0.75**
Month	**Pan Evaporation mm/day**	**Adjusted Evaporation mm/day**
January	7.7	5.78
February	6.8	5.10
March	6	4.50
April	4.3	3.23
May	2.7	2.03
June	1.9	1.43
July	1.9	1.43
August	2.8	2.10
September	4	3.00
October	5.4	4.05
November	6.7	5.03
December	7.8	5.85
Average	**4.8**	**3.63**

4.2.2 Rainfall

Daily rainfall records in millimetres were obtained from the Bureau of Meteorology from station number 055044, Boggabri (Retreat). This is not the closest gauge to the site, but inspection of the data showed a good correlation between the recorded rainfall events and the discharge events observed on site. Therefore this was considered the most representative gauge with the longest available record.

Station 055044 had a long record of reliable data stretching back to the 1800s. This analysis used the data from the 1/1/1900 and is summarised in Table 4.

Table 4 - Rainfall Station Data and Statistics

Data	
Station Number	055044
Station Name	Boggabri (Retreat)
Years of Data	116
Start Date	1/1/1900
End Date	30/4/2016
Statistics - Annual Rainfall	**Rainfall (mm)**
Mean	581.3
Lowest	231.5
5th %ile	366
10th %ile	394.8
Median	580.3
90th %ile	762.8
95th %ile	812.8
Highest	1037.6

4.3 Namoi River Sub-Catchments

The CHPP site is located in the lower reaches of a sub-catchment of the Namoi River, referred to here as Catchment B. The catchments are shown in Figure 3. The site crosses the entire width of Catchment B and encroaches marginally into the two adjacent sub-catchments (Catchment A and Catchment C). Flows from the adjacent Catchments A and C are directed around the site and are not affected by it. Flows from Catchment B enter the site via the railway loop where it enters a Fresh Water Dam before flowing through the site in a man-made channel and reporting to the Main Storage Dam.

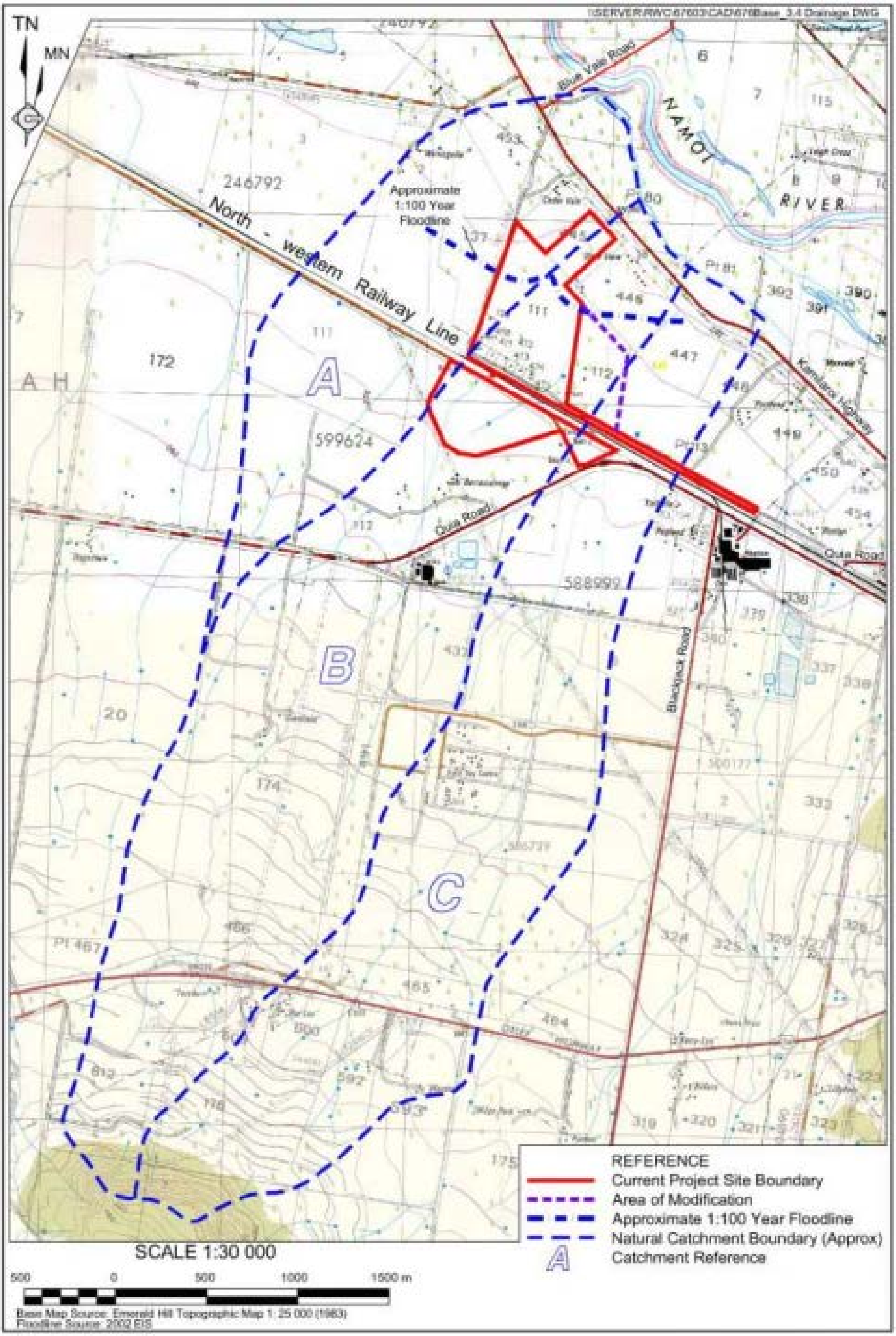

Figure 3 - Local Catchment Plan

4.4 System

In order to build the water balance model, the processes within the CHPP site were grouped into common elements, including: Water Sources, Water Uses, Water Storage, Water Treatment and Water Losses/ Discharges.

Water generally moves through the main processing plant and is then pumped to the reject ponds as slurry, containing the fine reject. Water evaporates from these ponds and the excess seeps through the pond walls and is collected in settlement ponds. From here, the water is recycled into the processing plant with additional water supplied first from the Main Storage Dam and then from the licenced sources. Some water is also lost to the product coal which exits the CHPP in a mix with approximately 8% water.

Water is moved around the site using a main pumping ring (Ring Main). The main water movements are from the settlement ponds to the CHPP, or to the Main Storage Dam before then moving to the CHPP. Within the reject pond systems, water is able to freely drain to the settlement ponds.

Ponds SP-7 and SP-9 have the potential to overflow directly to the unnamed tributary that drains Catchment B. The tributary is not a licenced discharge point (LDP) and therefore this poses a potential risk to the environment. To manage this risk, priority is given to drawing down these ponds first, pumping the water to the Main Storage Dam. This process provides sufficient freeboard in the settlement ponds to avoid overflow except in extreme rainfall events. This is possible due to the relatively small catchments within each reject pond system (max of 5.5ha) that reports to these settlement ponds.

Settlement ponds SP-1 and SP-2 have been excluded from the water balance model because of their small size.

4.4.1 Reject Ponds

The reject ponds are set up in three distinct systems, spread across the CHPP site. Each system consists of a number of reject ponds, all of which are connected to a smaller number of settlement ponds. The reject ponds have therefore been modelled as three elements, each representing a reject pond system with a single volume. The combined volumes and surface areas of the reject ponds are shown in Table 5, Table 6 and Table 7.

Table 5 - Reject Pond System 1 – Reject Ponds RP1 to RP6

Pond #	Operating Volume (m3)	Freeboard Volume (m3)	Total Volume to Crest (m3)	Top Surface Area (m2)
RP-1	15,038	7,262	22,300	12,103
RP-2	15,612	7,018	22,630	11,697
RP-3	15,133	7,327	22,460	12,212
RP-4	2,379	2,411	4,790	4,019
RP-5	2,728	2,552	5,280	4,254
RP-6	4,689	2,471	7,160	4,119
Sum	**55,578**	**29,042**	**84,620**	**48,404**

Table 6 - Reject Pond System 2 - Reject Ponds RP-7 to RP-8

Pond #	Operating Volume (m^3)	Freeboard Volume (m^3)	Total* Volume to Crest (m^3)	Top Surface Area (m^2) (Measured from Survey)
RP-7	20,050	6,035	26,085	10,650
RP-8	17,160	5,648	22,808	9,345
Sum	**37210**	**11,683**	**48893**	**19,995**

* Allowance has been made for reduction of volume due to the Coarse Reject Blanket.

Table 7 - Reject Pond System 3 - Reject Ponds RP-9 to RP-11

Reject Pond	OWL Volume	Volume to Crest	Operating Volume (m^3)	Freeboard Volume (m^3)	Total Volume to Crest (m^3)	Top Surface Area (m^2)
	Including Coarse Reject Blanket Volume					
RP-9	36,703	46,592	32,410	9,890	42,300	16,731
RP-10	37,143	46,884	32,933	9,741	42,674	16,480
RP-11	44,233	53,533	40,390	9,300	49,690	15,740
Sum			**105,733**	**289,301**	**134,664**	**48,950**

4.4.1.1 Freeboard and Drawdown

The model has assumed that the settlement ponds will maintain a freeboard of 0.6m and the volume this creates has been estimated in the tables above. In the event of rainfall elevating the water levels of these ponds above the freeboard level, water will be pumped back to the Main Storage Dam. The pumping rate to the Main Storage Dam adopted for the model was 12l/s pumping 10 hours per day. Water within the settlement ponds below the freeboard level is assumed to be pumped into the ring main for use in the CHPP or for dust suppression. This pumping will stop when the basin reaches 1m from invert to avoid agitation of the settled sediments.

Table 8 - Settlement Ponds Volumes, Surface Area and Pumping Rates

Parameter	SP4 and SP5 Recovery (SP-3) and Polishing	SP-6 and SP-7	SP-8 to SP-9
Max Volume (m^3) =	10500	4000	8662*
Pumping Start Volume (m^3) =	7053.815	3154	7132*
Pumping Stops Volume (m^3) =	5514	2256	1814*
Surface Area (m^2) =	6892	2820	4111*
Initial Volume (m^3) =	0	0	0
Infiltration Seepage Rate =	0%	0%	0%
Pumping Rate to Storage (12L/s x 10 hours per day (m^3/day) =	432.0	432.0	432.0

4.4.2 Main Storage Dam

The operating plan for the Main Storage Dam, found in the approved EIS, states that the storage volume will be maintained at 12ML. Maintaining this permanent storage volume allows sufficient capacity to contain stormwater during the:

- 1:20 year AEP event below the release valve (20ML total); and
- Greater than a 1:100 AEP storm event below the spillway level.

The model assumes that any storm water detained above the permanent storage volume will be released or used within 5 days of the rainfall event. This is modelled with a draw down rate of 1600m^3/day when storage is above the draw down volume.

Table 9 - Storage Data Used in Water Balance Model

Parameter	Value	Comment
Max Volume (m^3) =	20000	
Draw Down Volume (Storage) (m^3) =	12000	
Pumping Stops Volume (m^3) =	2250	
Surface Area (m^2) =	1800	Used for evaporation loss
Initial Volume (m^3) =	0	
Infiltration Seepage Rate =	0.2%	Ground water loss
Drawdown Rate (m^3/day) =	1600	Release rate required to draw down 6ML within 5 days.

4.4.3 Clean Water Diversion Weir

The diversion weir allows harvesting of water from Catchment B. The weir currently diverts low flow to the Main Storage Dam and allows high flows to continue on the high flow diversion drain and exit the site. The model has assumed the conservative case that all flows from

Catchment B reach the Main Storage Dam. This will have the effect of increasing the volume in the Main Storage Dam, making discharge more likely.

4.5 Modelling Results

The water balance modelling considered a CHPP throughput of 3Mtpa and a direct bypass of high quality coal to the load point of 1.5Mtpa.

4.5.1 Annual Water Demand

The water demand for the site is dependent on climatic influence. Estimates of variation in demand are modelled using historic recorded rainfall and evaporation records. Confidence and probability limits have been applied to this rainfall data and included in the water balance model results.

From the 112 years of Station 055044 historic records analysed the average annual water demand for the CHPP process was estimated at 826.9ML of which the average demand from the bore and river licences was 282.7ML.

The average yearly inflow into the model was estimated as 695ML. The breakdown of the inflow sources are shown in Figure 4. The breakdown of the outflow and losses of this water out of the system are shown in Figure 5.

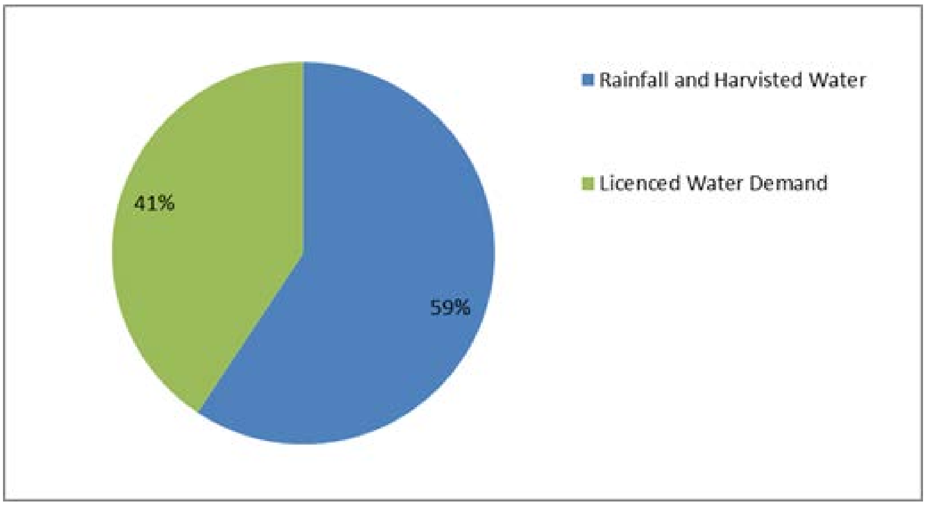

Figure 4 - Inflow Water Sources

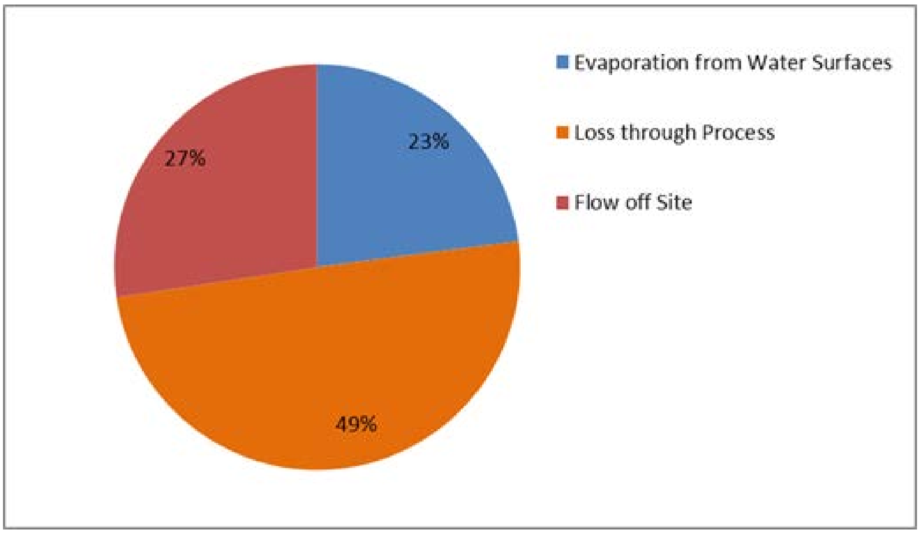

Figure 5 - Outflow and Losses in Model

The "Loss through Process" section of the outflow figures includes water exported in the final coal product, exported in the reject, and used in dust suppression. While dust suppression is ultimately lost to evaporation, it was considered more informative to include it as a process action.

Table 10 summarises the annual water demand.

Table 10 - Annual Site Water Demand

Water Source	Reject Ponds Seepage		From Site	External	Total
	Seepage Water (ML)	Recycled CHPP Water (ML)	Total Harvested and Reclaimed Water (ML)	Water Demand from Rivers and Bores (ML)	Total Site Water Demand (ML)
Lowest	356.1	-	424.5	156.4	809.2
10th %	392.4	-	480.4	224.3	817.9
Mean	405.8	-	550.2	276.1	827.7
90th %	425.9	8.1	598.7	351.7	834.4
Highest	448.7	36.9	653.0	417.5	841.9
Average	406.4	2.8	544.2	282.7	826.9

The amount of water used by the CHPP site varies greatly depending on the seepage rate adopted for flow leaving the reject ponds and entering the settlement ponds. This seepage rate also affects the amount of reject storage required to maintain production.

4.5.2 Seasonal Variation in Demand

Seasonal variation affects the availability of water from rainfall runoff and the water lost to evaporation. This creates seasonal variation in the use and demand of water. The variation in the seasonal water demand of the CHPP, as predicted by the model, is shown in Figure 6.

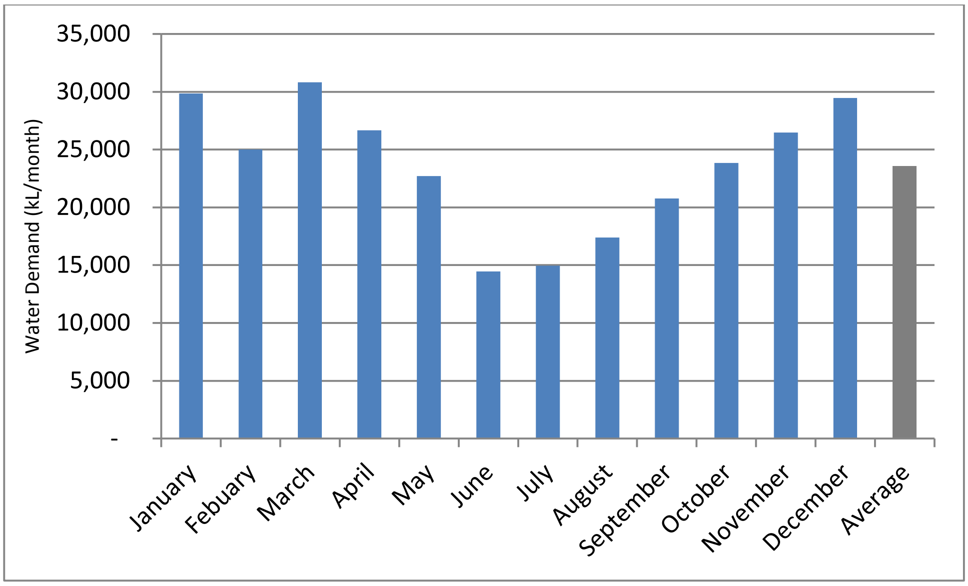

Figure 6 - Average Monthly Demand (kl/month)

The results of the water balance show an average seasonal peak demand in March of 30,808kL and the lowest demand of 14,466kL in June. The average monthly demand is estimated at 23,534kL/month. The maximum monthly demand of 57,089kL was observed in the water balance model in January 2001. These results are shown in Table 11.

Table 11 - Peak Water Demand in Each Calendar Month (kL/month)

Month	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Ave	29,859	25,009	30,808	26,669	22,710	14,466	14,953	17,383	20,769	23,844	26,486	29,452
Max	57,089	47,378	48,858	43,705	39,395	32,516	33,225	32,829	38,044	45,390	48,953	53,921
Min	0	0	7,021	0	0	0	0	0	0	0	0	0

4.5.3 Site Discharge

Discharge is permitted from the site as described in EPL 3637. The water balance model estimated an annual average release from the discharge point of 87.5 ML/year and an average annual flow off site of 98ML. The amount of water released from site is heavily dependent on runoff from Catchment B during large rainfall events.

Analysis of the topography suggests that there is significant additional storage available below the spill level of the Main Storage Dam. It is therefore estimated that discharge would not occur until the volume in the Main Storage Dam has approximately doubled to 40ML (that is, 20ML above the current operating volume of 12ML plus an 8ML allowance for storm inflows). The water balance analysed the 5 day volumes of release events with a significant discharge (above the 40ML total storage) during the operation of the site. It was found that the dates of modelled discharges over this period show a correlation with the observed events.

4.5.4 Water Balance Review

The assessment of the accuracy of the model was based on the prediction of site discharge due to the limited data recorded on the site. It was found that the model predicted discharges from site at approximately the same dates that they were observed. Therefore the model is considered to be a good broad level model which can be significantly improved as the inherent assumptions are reduced.

Information which would assist in the calibration of the water balance model includes:

- Seepage rates from the reject ponds;
- Material capacity of the reject ponds;
- Site rainfall records;
- Water pumped from the ponds;
- Harvested water quantities from Catchment B;
- Controlled and uncontrolled release volumes, and;
- Production water use.

Whitehaven will investigate practicable methods to improve this model, thereby assisting in the estimation of the site's future reject pond requirements and water management practices.

The water balance model will be reviewed, including consideration of the above dot points, within 12 months of approval of the Water Management Plan.

5 SURFACE WATER MONITORING PROGRAM

5.1 Existing Water Quality Monitoring

The CHPP is subject to a water monitoring program to verify the quality of water retained in the Main Storage Dam. Current water monitoring locations are shown in Figure 2. The water quality information collected between 2012 and 2015 from the Main Storage Dam is provided in Table 12.

Table 12 - Water Quality Data - Main Storage Dam

DATE	pH	EC (µS/cm)	Total Suspended Solids (mg/L)	Total Organic Carbon (mg/L)	Oil & Grease (mg/L)
06-02-2012	7.85	1090	28	11	<5
01-02-2012	7.7	1030	101	18	<5
01-05-2012	8.16	1420	31	5	<5
01-08-2012	8.28	1560	24	6	<5
13-11-2012	8.53	2230	16	4	<5
12-02-2013	8.07	1460	14	7	<5
01-05-2013	8.55	2120	27	7	<5
05-08-2013	8.41	1990	9		<5
04-11-2013	8.51	2720	9	6	<5
04-02-2014	8.42	2480	17	4	<5
01-05-2014	8.24	2110	17	<1	<5
05-08-2014	8.6	2490	10	4	<5
05-11-2014	8.36	3070	10	5	<5
12-02-2015	8.61	1430	21	6	<5
05-05-2015	8.47	2190	16	<1	<5

As a means of confirming whether releases from the site have a negative effect on water quality within the river, Whitehaven, in consultation with EPA, will investigate the need for additional monitoring locations on the Namoi River, upstream and downstream of the CHPP site. Whitehaven, in consultation with NOW, will also investigate the need for an additional monitoring location upslope of the CHPP site to observe the quality of run on flows entering the CHPP site from Catchment B (refer to Figure 3).

5.2 Water Quality Monitoring Schedule

Table 13 defines the parameters to be tested and the recommended sampling frequency for the water storages onsite. The current water quality monitoring program includes discharge event grab samples and quarterly grab samples for the Main Storage Dam to determine whether site runoff meets the adopted water quality compliance criteria.

On-site quarterly sampling from the Main Storage Dam allows for any potential problem areas with respect to pollutant generation on-site to be identified early, ensuring appropriate remedial action can be taken.

The event-based sampling should enable quantification of any pollutant loads from the site.

Monitoring is the responsibility of the Environmental Department and should be conducted by a suitably qualified professional in accordance with the relevant Australian Standards and Approved Method(s).

Table 13 - Water Quality Monitoring Schedule

Location	Parameters	Frequency
Main Storage Dam	EC Oil and grease pH TSS Total Organic Carbon	Quarterly During release events.

5.3 Surface Water Impact Assessment Criteria and Trigger Levels

5.3.1 Environment Protection Licence

Impact assessment criteria for surface water is only relevant to water actually discharged from the site. EPL 3637 contains a single LDP for discharge events, which is the Main Storage Dam. Currently, the EPL does not define concentration or volume limits for discharge waters; however Whitehaven will target the following concentration limits Table 14.

Table 14 - Target Concentration Limits for Discharge Point EPL ID 6

Pollutant	Unit of Measure	100^{th} percentile Concentration Limit
Oil and Grease	mg/L	10
pH	pH	6.5 – 8.5
Total Suspended Solids	mg/L	50

5.4 Reporting Procedures

The Environmental Department will retain an active database of monitoring results which will be updated on a regular basis. Any off-site discharge event will result in the triggering of a sampling event. All sampling results will be made available in the EPL 3637 Annual Return and in accordance with publishing of monitoring data under the terms of the POEO Act.

The ongoing monitoring program and collation of relevant data will provide the basis for continuing improvement in surface water management across the site. This will also contribute to the ongoing improvement of the Trigger Action Response Plan presented in Section 7.3.

5.4.1 Inspections and Maintenance

Regular inspections will be undertaken for all water management and erosion and sediment control structures throughout the operational life of the CHPP. Inspections are undertaken monthly or following a significant rainfall event of >25mm/hr.

Where water management structures or erosion and sediment control structures have lost capacity due to excessive sediment build up or scouring is identified, rectification works will be undertaken when possible to ensure the structures have sufficient capacity to handle any subsequent rainfall events.

6 GROUNDWATER MONITORING PROGRAM

6.1 Baseline Data

Water quality data for registered groundwater bores within 1.5km of the Project Site is presented in Table 3.1 of the EIS (2002).

True baseline data does not exist for current monitoring bores, however for Initial data records from the commencement of the current groundwater monitoring program (refer section 6.2) is presented in Table 15.

Table 15 - P1, P2 and P3 Monitoring Data

Site ID	Depth to Water (m)	pH - Field	Electrical Conductivity - Field (µs/cm)	Sulphate (SO4) – mg/L
P1	7.48	7.97	5320	378
P2	1.41	6.98	5060	201
P3	1.25	6.72	5240	408

6.2 Current Groundwater Monitoring

The groundwater monitoring network consists of 3 piezometers as identified on Figure 2 and listed in Table 16.

Table 16 - Piezometer Information

Site ID	Licence Number	Completion Date	Easting MGA-56	Northing MGA-56	Screen Top (mbgl)	Screen Base (mbgl)	Drilled Depth (mbgl)
P1	90BL254681	6/03/2009	232938.82	6572749.08	1	10	31.3
P2	90BL254680	7/03/2009	232694.13	6572201.91	1	10	30.0
P3	90BL254682	7/03/2009	232541.02	6572090.75	1	10	30.0

6.3 Monitoring Schedule

Data records to date suggest that Standing Water Levels have marginally decreased during the monitoring period of 2009 and 2015. Water quality has remained relatively consistent over the sampling period with no indications of any significant quality change. Current sampling frequency and parameters are included in Table 17.

Table 17 - Groundwater Monitoring Parameters and Frequency

Bore	Frequency	Parameters
P1-P3	Quarterly	Water Level, Temperature, pH, Electrical Conductivity (EC), Lead (mg/L), Calcium (mg/L), Magnesium (mg/L), Sodium (mg/L), Potassium (mg/L), Total Cations (meq/L), Chloride (mg/L), Sulphate (mg/L), Hydroxide Alkalinity (mg/L), Carbonate Alkalinity (mg/L), Bi-Carbonate Alkalinity (mg/L), Alkalinity (mg/L), Total Anions (meq/L), Ionic Balance, Nitrite, Nitrate, Ammonia.

All monitoring results will be reviewed annually and reported in each Annual Return.

6.4 Groundwater Sampling

Groundwater sampling will be undertaken in accordance with AS/NZS 5667.11:1998.

7 SURFACE AND GROUNDWATER RESPONSE PLAN

The surface and ground water response plan includes a protocol for managing and reporting any:

- Incidents;
- Complaints;
- Non-compliances with statutory requirements;
- Exceedances of the impact assessment criteria and or performance criteria; and
- A protocol for periodic review of the plan.

Records of any of these items along with the data collected as outlined in this section is maintained and available for review by the appropriate agency/authorities.

7.1 Surface Water

If an exceedance of the monitoring criteria for site discharge (listed in Section 5.3) is identified then Whitehaven will follow the procedure listed below:

- Exceedance in monitoring criteria identified;
- Record the timing, location, environmental conditions and any contributing factors to the exceedance;
- Advice issued to relevant agencies as soon as is practicable;
- Sampling point inspected to ascertain cause of exceedance;
- Operational practices reviewed to determine if any current operational practice contributed to the exceedance;
- Implementation of ameliorative measures on site to minimise the potential for future exceedance, which may include clean out, redesign or alteration to structures and/or operational practice;
- Written advice to relevant agencies identifying actions undertaken to reduce future risk of exceedance within 7 days;
- Where specific cause of exceedance cannot be identified, external advice may be sought; and
- Ongoing future monitoring to ensure ameliorative measures have been successful with concentration criteria being met.

All other surface water monitoring will be included in the Annual Return.

7.2 Groundwater

In the event that adverse impacts or water quality degradation is identified in groundwater resources, and these impacts are considered associated with the CHPP operation, Whitehaven will commission an assessment of the causes, develop a staged response program satisfactory to DPI Water, EPA and DP&E to mitigate the adverse impacts, and will establish and implement measures to manage further impact.

7.2.1 Contingency Measures

The identification process and response protocol to adverse outcomes are provided in the Trigger Action Response Plan (TARP, refer to Section 7.3). The responses proposed incorporate a staged assessment and development of management measures deemed appropriate for each individual event should it occur.

Specific trigger levels have been designed to alert Whitehaven to observed parameter responses which are outside of normal variation, or where observed parameter values do not follow anticipated trends.

The CHPP site is not anticipated to have a significant effect on groundwater quality and the extraction quantities are limited by licence. Therefore, if changes are identified, they will generally be investigated to identify the likely source. This will lead to an investigation into response measures.

The triggers for instigation of response actions would occur when observed changes to monitored parameters exceed specified levels. Such changes in observed parameters or conditions include:

- Significant change in observed water quality or groundwater levels between sampling rounds;
- Changes in trends over an extended period for groundwater levels and quality; and
- A significant increase or variation from predicted models.

7.3 Trigger Action Response Plan (TARP)

The TARP has been developed to focus upon appropriate trigger and response actions for mitigation of impacts to the natural environment as a result of operations at the CHPP.

Monitoring serves to advise of changes to surface and groundwater levels or quality that occur, or to raise alert that an abnormal condition relating to CHPP operation has developed.

Each monitoring program has established trigger levels of particular impacts at which a response is needed, and to help define an appropriate response. Management of impacts within predictions follows standard assessment review and response protocols.

The TARP has been designed to allow reference to risks of impact from the CHPP operation to the surrounding environment. These include both predicted and unpredicted impacts, and include:

- Groundwater level and quality;
- Surface water quality; and
- Discharges

The TARP should be updated to accommodate any future surface water and groundwater monitoring locations subject to the findings of the investigations proposed.

The TARP can be found in Table 18.

Table 18 - Trigger Action Response Plan

	Monitoring		Response		
	Methodology	**Purpose**	**Trigger**	**Action**	**Responsibility**
Surface Water					
Water quality (leaving site)	**Sites:** Discharge point (MSD). **Parameters:** EC, oil and grease, pH, TSS, TOC. **Analysis:** Comparison of results to water quality criteria in Table 14. Review of water quality trends over time. **Frequency:** During flow events (when possible)	To provide baseline water quality data. To identify potential surface water quality impacts as a result of CHPP activities (e.g. surface water discharge, erosion).	Exceedance of proposed target concentration limits (Refer to Table 14). Long-term upwards trend comparative to ANZECC quality guideline limits.	Repeat sampling to confirm results exceed trigger level. Hydrologist (or similar specialist) to review sampling and climate data and confirm likely impact or otherwise. If CHPP-related, undertake physical inspection of affected surface and creeks to identify potential source of water quality degradation. Implement appropriate management or contingency response.	Environmental Department.
Groundwater					
Groundwater Levels	**Sites:** All monitoring bores. **Parameters:** Water level. **Analysis:** Comparison of recorded water levels taking into account natural variations. **Frequency:** Manual monitoring of groundwater bores quarterly.	To identify water level impacts.	Sustained (3 sample events) drawdown greater than historic recorded water levels or that known to be caused by bore extraction.	Engage hydrogeologist to undertake investigation and report on any identified changes /likely causes and recommendations in accordance with Section 7.2.1. Notify agencies when exceedance becomes known, and provide updates throughout investigation above, and at conclusion of assessment. Implement contingency responses as agreed with government agencies and in	Environmental Department.

	Monitoring		Response		
	Methodology	**Purpose**	**Trigger**	**Action**	**Responsibility**
				accordance with hydrogeologist recommendations.	
Groundwater Quality	**Sites:** All monitoring sites. **Parameters:** Water quality – full laboratory analysis suite (See Table 17). **Analysis:** Comparison of recorded water quality results. **Frequency:** Quarterly.	To identify water quality impacts.	Sustained (3 sample events) exceedance of water quality (97.5th percentile of historic data).	Engage hydrogeologist to undertake investigation and report on any identified changes /likely causes and recommendations in accordance with Section 7.2.1. Notify agencies when exceedance becomes known, and provide updates throughout investigation above, and at conclusion of assessment. Implement contingency responses as agreed with government agencies and in accordance with hydrogeologist recommendations.	Environmental Department.

7.4 Unforeseen Impacts Protocol

Table 19 outlines the procedure to be followed (in general accordance with the criteria exceedance protocols detailed in Section 7.1 and Section 7.2) in the event that any unforeseen surface or groundwater impacts are detected.

Table 19 - Unforeseen Impact Procedure

Stage	Procedure
1	Review the unforeseen impact including consideration of: • Any relevant monitoring data; and • Current CHPP activities and land management practices in the relevant catchment
2	Commission an investigation by an appropriate specialist into the unforeseen impact, if considered appropriate by the Environmental Specialist.
3	Develop appropriate ameliorative measures based on the results of the above investigations, in consultation with the relevant authorities.
4	Implement additional monitoring where relevant to measure the effectiveness of the improvement measures.

7.4.1 Incidents

In accordance with the requirements of EPL 3637, Whitehaven will notify the EPA of any incidents threatening material harm to the environment immediately after the incident becomes known to site personnel in accordance with the site's Pollution Incident Response Management Plan. Details of any incidents will be communicated to the EPA via telephone with a written report provided within 7 days of the incident occurring. Where ameliorative actions may reduce the threat or harm to the environment, they will be implemented as soon as is practicable and described in the written report.

8 REFERENCES

ANZECC and ARMCANZ, 2000, '*Australian and New Zealand Guidelines for Fresh and Marine Water Quality'*, Australian and New Zealand Environment Control Council and Agricultural and Resource Management Council of Australia and New Zealand, Australia.

RW Corkery & CO, 2008, '*Statement of Environmental Effects for the Increase in Throughput at the Whitehaven Coal Handling and Preparation Plant and Rail Loading Facility'*, Report prepared by RW Corkery & CO for Whitehaven Coal Pty Ltd.

Whitehaven Coal Ltd, 2011, '*Environmental Assessment for the establishment of additional reject ponds at the Whitehaven CHPP'*, Report prepared by Whitehaven Coal Ltd.

Landcom, 2004 and DECCW, 2008, *'Managing Urban Stormwater: Soils and Construction Volume 1 and Volume 2E: Mines and Quarries'*.

NSW Environment Protection Authority, 2015, '*Environment Protection Licence – Whitehaven CHPP'*.