



Centennial Coal



Angus Place Colliery

Temporary Water Treatment Plant Water Monitoring Program

September 2018

DOCUMENT CONTROL

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APPROVAL DETAILS	Revision No.	Trigger	Details of change
	1	EPL 467 condition U1.2	
	2	Review of operational requirements following Project approval and varied EPL	Administrative changes to achieve consistency with varied EPL Additional text and figures around changes to LDP001 location

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1 Introduction

Centennial Angus Place Pty Limited (Centennial Angus Place) operates Angus Place Colliery (Angus Place) under Project approval PA 06_0021. On 11 May 2018, the Environment Protection Authority (EPA) issued Centennial Angus Place a variation to the Angus Place Colliery Environment Protection Licence (EPL 467).

The EPL variation imposed a Pollution Reduction Program (PRP) requiring the treatment of water discharged via the Angus Place Colliery Licenced Discharge Point LDP001 and authorised:

- The establishment and operation of a temporary water treatment plant, utilising reverse osmosis techniques, and ancillary infrastructure comprising water transfer pipelines and a 1 ML Mine Water Tank; and
- The management of waste stream from the water treatment plant through emplacement within the underground workings at Angus Place.

2 Pollution Reduction Program

In accordance with the new Condition U1.1 on EPL 467, Centennial Angus Place is required to install, by 31 August 2018, a reverse osmosis water treatment system that will treat all mine water discharged at LDP1 to an electrical conductivity of 350 $\mu\text{S}/\text{cm}$.

Condition U1.2 of the EPL requires Centennial Angus Place to prepare a monitoring program, in consultation with the EPA, to monitor the EC levels in District 800 and in the Wolgan River prior to commissioning of the reverse osmosis system.

3 Scope

This monitoring program has been prepared to satisfy the requirements of EPL 467 Condition U1.2 and to identify changes to water quality as a result of the emplacement of the waste stream from the water treatment plant within the underground workings at Angus Place.

4 Proposed monitoring program

4.1 Surface water

Monitoring is proposed to be undertaken at two locations on the Wolgan River, located upstream and downstream (refer to **Figure 1**) of any possible area of seepage via the outcropping Lithgow Seam. The following surface water monitoring program provided in **Table 1** is proposed.

Table 1 - Monitoring program for upstream and downstream sampling on Wolgan River

Parameter	Frequency*
<i>Physicochemical</i>	Monthly
pH, EC, TSS, Flow, total alkalinity, bicarbonate alkalinity (as CaCO_3), turbidity, oil and grease, temperature	

Parameter	Frequency*
Metals (dissolved and total)	
Aluminium, arsenic **, barium, boron, copper, iron, manganese, nickel and zinc	
Major ions	
Sodium, calcium, magnesium, potassium, sulfate, chloride, biocarbonate ion	
Other	
Surfactants	

* Current assessment predictions indicate the time frame for seepage to occur is likely to be in excess of the life of the Project and hence the risk is low. Therefore it is unlikely that the monitoring will identify any issues and hence the monthly frequency is proposed.

** Arsenic total concentration to consider III and V.

Monitoring of the LDP001 discharge point as a result of the Project will move from the existing v-notch weir concrete pit structure, to the recommissioned diffuser system, as is indicated in **Figure 4**. As part of the varied EPL the monitoring at LDP001 is to remain at a sampling frequency of monthly (minimum of 1 samples per 4 weeks). Similarly, the existing monitoring parameters sampled at LDP001 will be unchanged as is summarised in **Table 2**.

Table 2 - Monitoring program for LDP001

Parameter	Frequency*
Physicochemical	Monthly
pH, EC, TSS, total alkalinity, bicarbonate alkalinity (as CaCO ₃), turbidity, oil and grease, temperature, dissolved oxygen, TDS	
Metals (dissolved and total)	
Aluminium, arsenic, barium, boron, copper, iron, manganese, nickel, zinc, lead, cadmium [^] , uranium [^] , lithium [^] , molybdenum [^] , rubidium [^] , strontium [^] , and antimony [^]	
Nutrients	
Nitrate, nitrite, total nitrogen, nitrite+nitrate, TKN, total phosphorus, ammonia as N, total fluoride.	

Parameter	Frequency*
Major ions	
Sodium, calcium, magnesium, potassium, sulfate, chloride, biocarbonate ion, total hardness	
Other	
Surfactants, chlorine free and total, silica, silicon, total phenolics, TOC, Total cyanide	

^ sampling only dissolved concentrations of metals

4.2 Groundwater

One groundwater monitoring bore will be installed down-dip (north east) from the workings to allow for early detection of any potential seepage migration (refer to **Figure 2**). Underground quality sampling will also be undertaken to monitor changes in the chemistry of the stored water (refer to **Figure 3**). Potential migration/seepage from underground stored water will be detected based on a change in water level or chemistry at the groundwater bore.

The following groundwater monitoring program provided in **Table 3** is proposed.

Table 3 - Monitoring program for groundwater bore and underground sampling

Parameter	Frequency
Physicochemical	Monthly
pH, EC, TSS, water level (bore only), total alkalinity, bicarbonate alkalinity (as CaCO ₃), turbidity, oil and grease, temperature	
Metals (dissolved and total)	
Aluminium, arsenic **, barium, boron, copper, iron, manganese, nickel and zinc	
Major ions	
Sodium, calcium, magnesium, potassium, sulfate, chloride, biocarbonate ion	
Other	
Surfactants	

** Arsenic total concentration to consider III and V.

4.3 Monitoring duration

Monitoring is to occur from the commencement of injection activities. A period of monitoring following the completion of the Project will also be considered which will be a minimum period of 12 months or until stored underground water returns to pre-project conditions (storage level and quality).

Where monitoring locations are already established, and co-purposed for other operations, then these points will not be decommissioned but will return to the management of the site.

5 Monitoring program justification

Monitoring locations have been proposed based on accessibility and location to potential seepage locations. Where possible monitoring locations utilise existing locations where a good history of monitoring data exists.

Monitoring parameters recommended generally include those parameters that are going to be indicative of the source of water. The source of water will be a mixture of groundwater and treatment plant residuals. Typically treatment plants undergo pilot testing that can identify typical quality concentrations of treated and residual streams, however these are not available. We do however have typical information on an equivalent scenario through the works done for the Springvale Water Treatment Plant.

From existing groundwater testing we know that Angus Place has the following chemical signature to its extracted groundwater:

- Elevated dissolved metal fractions of: arsenic, barium, boron, and molybdenum.
- Elevated total metal fractions of: aluminium, arsenic, barium, boron, copper, and iron.
- Zinc, nickel, and manganese not elevated compared to Springvale Mine however monitoring is still required as they are common indicator parameters.

As there is minimal difference between the total and dissolved fractions of the parameters required, assessment of both fractions across all identified metals is proposed.



Date & Time: Fri Apr 27 13:08:32 AEST 2018
 Position: 56 S 232152 E 11628
 Altitude: 681m
 Datum: AUSTRALIAN GEODETIC 1994 (GDA94)
 Azimuth/Bearing: 112.7568E 199 mils (True)
 Elevation Angle: -03.7
 Horizon Angle: +00.9
 Zoom: 1X
 Wolgan River at Wolgah

Date & Time: Fri Apr 27 13:08:32 AEST 2018
 Position: 56 S 232152 E 11628
 Altitude: 681m
 Datum: AUSTRALIAN GEODETIC 1994 (GDA94)
 Azimuth/Bearing: 112.7568E 199 mils (True)
 Elevation Angle: -03.7
 Horizon Angle: +00.9
 Zoom: 1X
 Wolgan River US sample point



LEGEND	
	River/Creek
	Colliery Holding Boundary
	Newnes Plateau Shrub Swamp (DECC)

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DATE	30.04.2018
SEAM	LITHGOW
SCALE	DIAGRAM ONLY
DRAWN	Alan Mellor
CHECKED by	NA
REFERENCE	N:\SHARED\DWGS\WEST\SURFACE\Jobs for Devon Roberts\2018.04.30\2018.04.30.dwg

Angus Place Colliery
Water Treatment Plant Project
Wolgan River Monitoring Locations

Centennial Coal
 Angus Place

Figure 1
A3



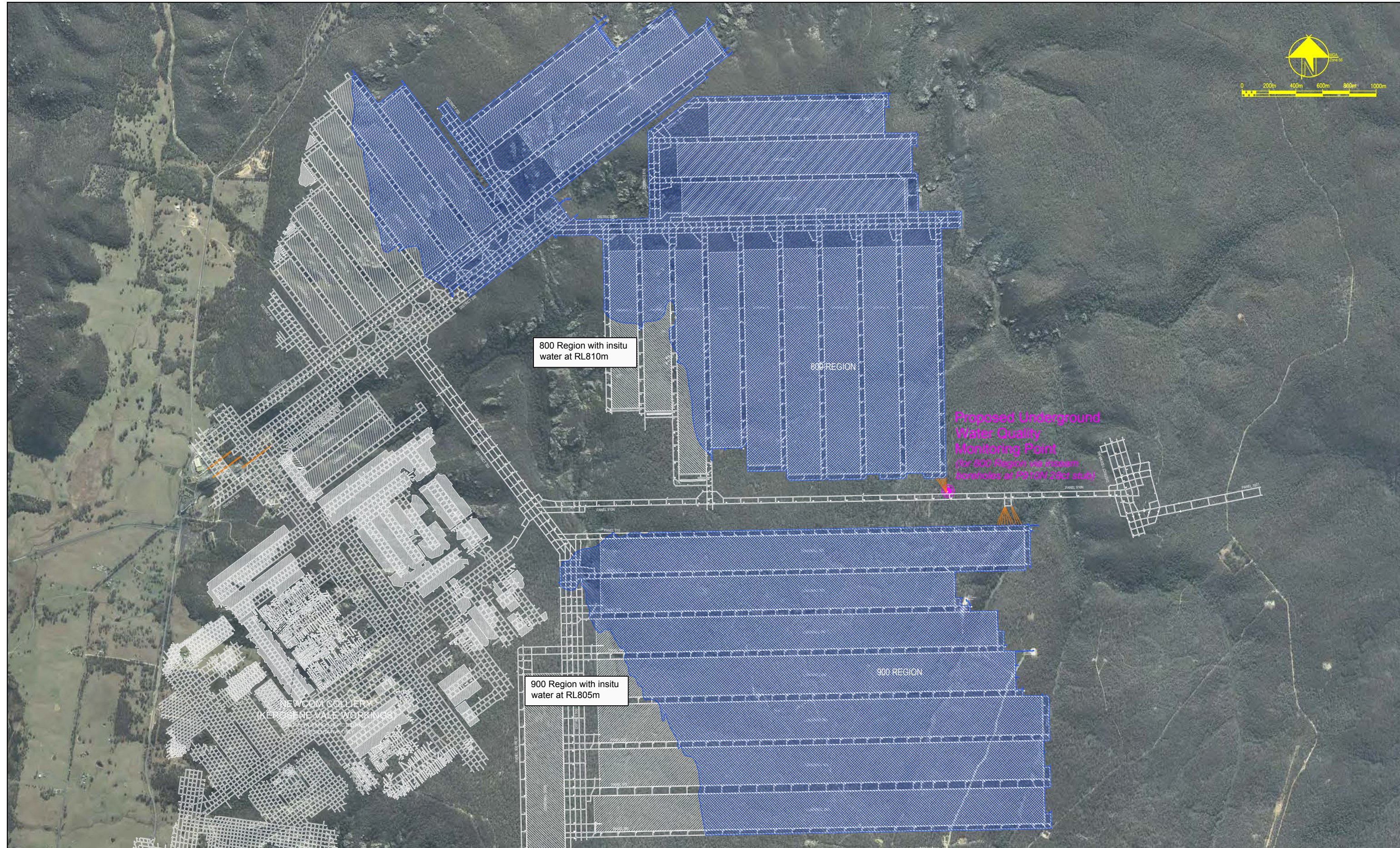
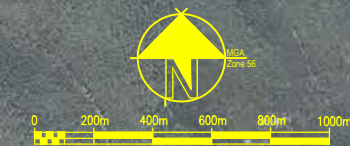
LEGEND	
	River/Creek
	Colliery Holding Boundary
	Tracks
	Newnes Plateau Shrub Swamp (DECC)


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DATE	4.06.2018
SEAM	LITHGOW
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CHECKED by	NA
REFERENCE	N:\SHARED\DWGS\WEST\SURFACE\Jobs for Devon Roberts\2018.05.03\APC_WTP_Wolgan River Borehole Location.dwg

Angus Place Colliery
Water Treatment Plant Project
Proposed Water Quality
Monitoring Borehole Location
 (Adjacent to Wolgan River)

 Centennial Coal Angus Place	A3
DRG. No. Figure 2	




LEGEND	
	In Situ Water

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DATE	8.06.2018
SEAM	LITHGOW
SCALE	DIAGRAM ONLY
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CHECKED by	NA

Angus Place Colliery
Water Treatment Plant Project
Proposed Underground Water Quality
Monitoring Point
 (for 800 Region via inseam boreholes at P910N 28ct stub)

 Centennial Coal Angus Place	DRG. No. Figure 3	A3
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REFERENCE N:\SHARED\DWGS\WEST\SURFACE\Jobs for Devon Roberts\2018.05.03\APC_WTP_Underground Monitoring Point.dwg



LEGEND	
	Licence Discharge Point
	Cadastré

LOCATION	Angus Place
SEAM	
DRAWN	C.P.T.
CHECKED	J.W.
APPROVED	P.C.D.
SCALE	Refer to scalebar

Angus Place Colliery Plan Showing Licenced Discharge Points



Centennial Coal

Fassifem

DATE 05-07-2018

PC6795