Annual Review

Canyon Coal Mine

Name of operation	Canyon Coal Mine
Name of operator	Whitehaven Coal Mining Ltd
Development consent/project approval number	DA 8-1-2005
Name of holder of development consent/project approval	Whitehaven Coal Mining Ltd
Mining lease number	ML 1464, ML 1471
Name of holder of mining lease	Whitehaven Coal Mining Ltd
Water licence number	WAL 29458
Name of holder of water licence	Whitehaven Coal Mining Ltd
MOP start date	7 September 2015
MOP end date	6 September 2022
Annual review start date	1 January 2018
Annual review end date	31 December 2018

I, Jamie Frankcombe, certify that this audit report is a true and accurate record of the compliance status of Canyon Coal Mine for the period 1st January 2018 until 31st December 2018, and that I am authorised to make this statement on behalf of Whitehaven Coal Mining Pty Ltd.

Note. a) The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	Jamie Frankcombe
Title of authorised reporting officer	Director- Whitehaven Coal Mining Ltd
Signature of authorised reporting officer	
Date	26/02/2019.

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1. STATEMENT OF COMPLIANCE

The compliance status of the Canyon Coal Mine (CCM) as at the 31st December 2018 is summarised in Table 1. Table 2 notes non-compliances that occurred during the reporting period.

Table 1 - Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
DA 8-1-2005	No
ML 1471	Yes
ML 1464	Yes
WAL 29458	Yes

Table 2 - Non-Compliances

Relevant Approval	Condition, Schedule & Number	Condition Description (Summary)	Compliance Status	Comment	Where Addressed in Annual Review
DA 8-1-2005	Schedule 2(2)	The Proponent shall carry out the development: (a) generally in accordance with the EIS; and (b) in accordance with the conditions of this consent	NC	Non-compliance with the Development Consent are identified below.	10.2
DA 8-1-2005	Schedule 3(21)	Applicant to implement a range of erosion and sediment controls at the site in general accordance with the requirements of the Department of Housings *Managing Urban Stormwater: Soils and Construction* manual, to minimise erosion and the discharge of sediment from the site.	NC	Erosion of final void continues to occur.	10.2

Compliance status key for Table 2

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2. INTRODUCTION

This is the 18th Annual Review (AR), formally Annual Environmental Management Report (AEMR), produced for the CCM. It has been prepared in accordance with Condition 3 of Mining Leases (MLs) 1464 and 1471 (Mining Act 1992) and Schedule 5, Condition 5 of DA 8-1-2005, as modified. The AR follows the format required by the NSW Government Annual Review Guideline (October, 2015). The AR covers the period from the 1st January 2018 until the 31st December 2018.

CCM is located within the Narrabri Shire, approximately 30km north-west of Gunnedah, 16km east-south-east of Boggabri and immediately north of the former Vickery Coal Mine (see Figure 1 & 2).

Mining at CCM ceased in July 2009, and the mine is now in closure, with a small area leased to Hitachi as a maintenance compound.

2.1 Mine Contacts

The management personnel responsible for the CCM and their relevant contact details are as follows:

- Mr Jacques du Toit, General Manager, Open Cut Operations – oversees Open Cut Operations for the Whitehaven Group. Contact: (02) 6741 9309
- Mr Andrew Raal, Environmental Officer – oversees day to day environmental and rehabilitation performance across the site. Contact 0436 685 548

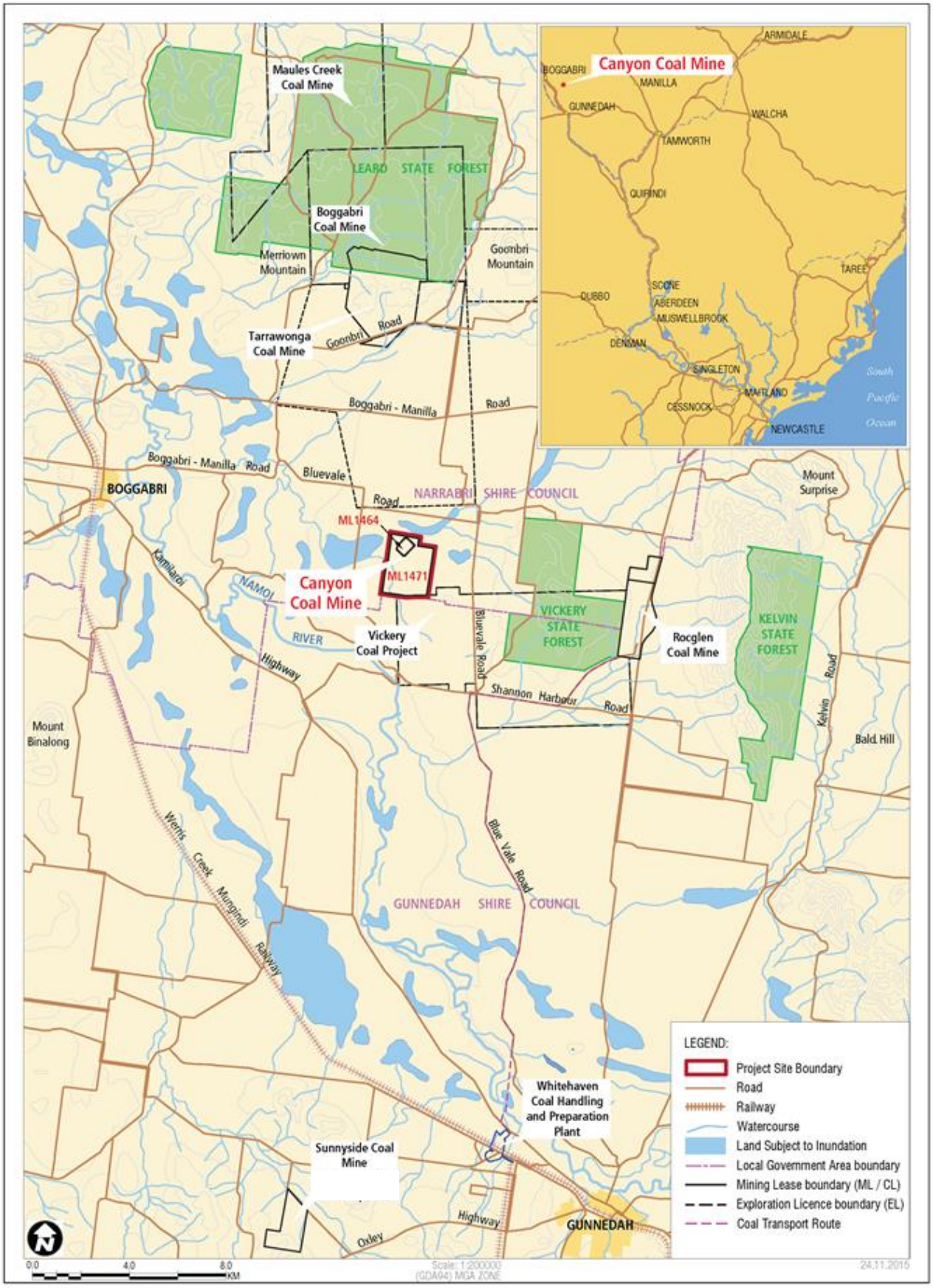

Figure 1 - Project Locality

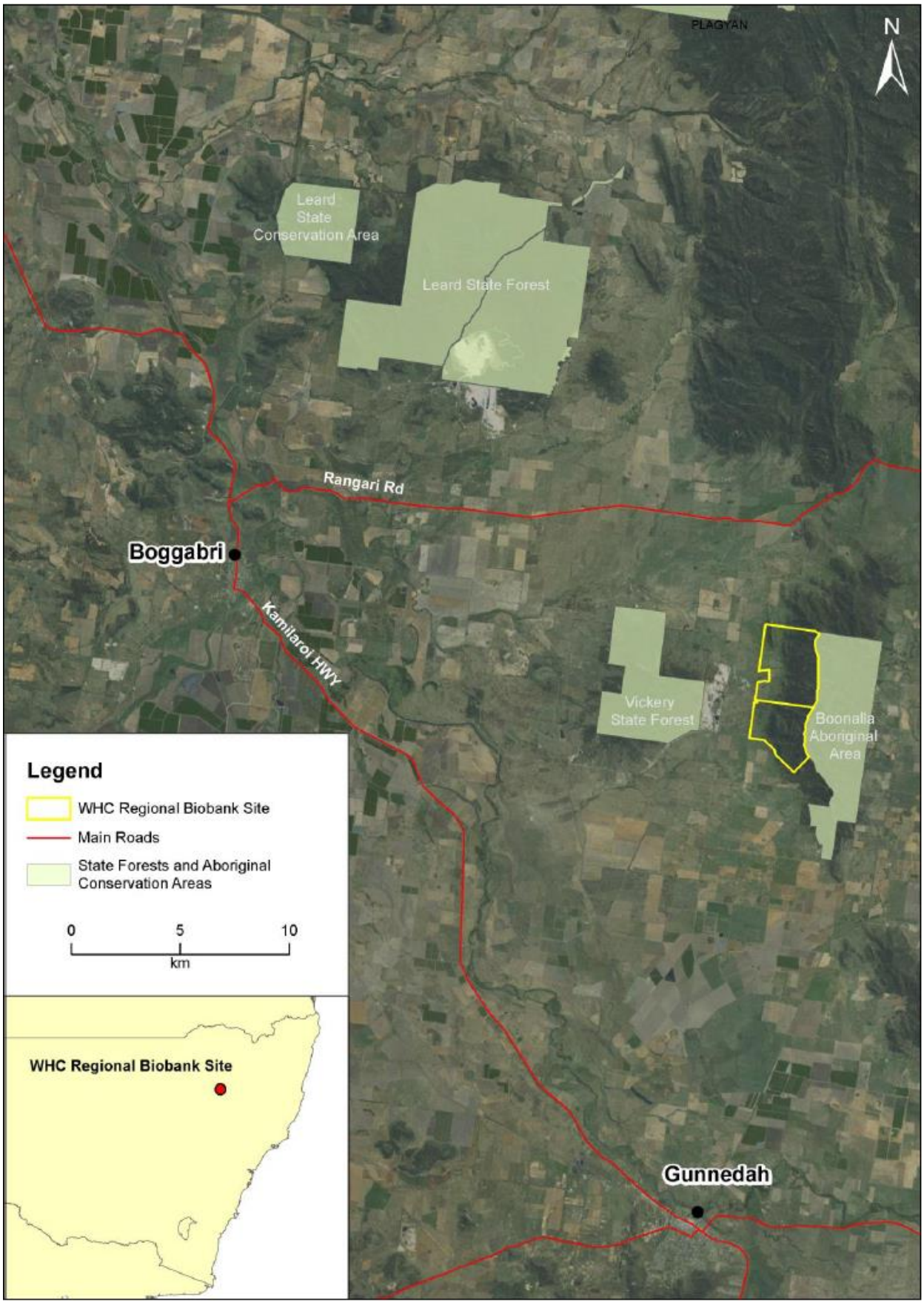

Figure 2 - Location of Biobank Site

3. APPROVALS

3.1 Tenements, Licences and Approvals

Table 3 identifies the approvals in place for the CCM at the end of the reporting period, the issuing/responsible Authority, dates of issue, expiry date and relevant comments.

Table 3 - Tenements, Licences and Approvals

Issuing/Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Department of Planning and Environment (DP&E)	Development Consent: DA 8-1-2005, Mod. 3	3rd September 2015	N/A	-
DP&E – Division of Resources and Geoscience (DRG)	ML 1471	7th September 2000	7th September 2021	-
DP&E – Division of Resources and Geoscience (DRG)	ML 1464	21st August 2006	21st August 2027	-
Department of Primary Industry - Water	WAL 29458 (90WA822498)	12th September 2012	In perpetuity	-

4. OPERATIONS SUMMARY

4.1 Mining Operations

No mining operations have occurred at the CCM during the reporting period.

Table 4 - Production Summary

Material	Approval Limit	Previous Reporting Period (actual)	This Reporting Period (actual)	Next Reporting Period (forecast)
Waste Rock/Overburden	N/A	0	0	0
ROM Coal/Ore	N/A	0	0	0
Coarse Reject	N/A	0	0	0
Fine Reject (Tailings)	N/A	0	0	0
Saleable Product	N/A	0	0	0

4.2 Next Reporting Period

Operations forecast for the next reporting period are expected to be limited to environmental monitoring and maintenance earthworks, if and as required.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Following review of the 2017 Annual Review, DP&E did not request that any further actions be required/undertaken.

6. ENVIRONMENTAL PERFORMANCE

The following sub-sections document the implementation and effectiveness of the various control strategies adopted at the CCM.

6.1 Air Quality

6.1.1 Criteria

The air quality criteria applicable to CCM are specified in DA 8-1-2005 and summarised below.

Table 5 - Air Quality Monitoring Criteria

Air Quality Type	Criteria
Maximum Increase in Deposited Dust	2 g/m^2/month
Maximum Mean Total Deposited Dust Level (Insoluble Solids)	4 g/m^2/month
Mean Annual Total Suspended Particulate (TSP) Matter (All Sources) Concentration	90 $\mu g/m^3$
Mean Annual PM10 Particulate Level	30 $\mu g/m^3$
24 Hour Average PM10 Particulate Level	50 $\mu g/m^3$

6.1.2 Dust Monitoring

Monitoring of deposited dust is undertaken on a monthly basis, with results presented below in Table 6.

Table 6 - Depositional Dust

Site	Property Name	Annual Mean Total Insoluble Solids (g/m^2/month)	Annual Mean Ash (g/m^2/month)
D1	Whitehaven	2.1	1.0
D2	Merton	2.3	1.4
D12	Whitehaven	6.9	5.7
D13b	Womboola	5.8	4.0

Two of the four depositional dust gauges for CCM returned results that exceeded the Annual Mean Total Insoluble Solids Criteria of 4 g/m^2/month. Given that the mine is no longer operational and extensively revegetated, these exceedances are deemed to be non-mine related. Grazing activity at D12 and D13b were noted on several occasions throughout the reporting period, as were the dry and dusty conditions in the region with a number of regional dust events having occurred during the reporting period.

6.1.3 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.1.4 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.2 Biodiversity

6.2.1 Flora

Biodiversity management of the Biobank Offset Site for CCM was ongoing during the reporting period, with the latest Annual Biobank survey conducted late in 2018. Report is still outstanding and will be forwarded when received, and included in the 2019 annual review.

6.2.2 Fauna

A series of investigations into the occurrence of Threatened fauna within the DA area, were undertaken by Countrywide Ecological Service as part of the Stage 2 EIS preparation phase, with two vulnerable microbat species and a koala recorded within open woodland areas within the 'Woomboola' property. No targeted fauna monitoring was completed during the reporting period.

6.2.3 Weeds

During December, a contractor was engaged to undertake site-wide spraying of weeds on the CCM, with a particular focus on African Boxthorn and Prickly Pear. Weed spraying was also undertaken by Whitehaven's own qualified personnel during April targeting weeds on the firebreaks as well as Africa Boxthorn and Prickly Pear.

6.2.4 Feral Animal Control

During November of the reporting period, two motion-sensor cameras were installed on the CCM site for the purpose of monitoring feral animal activity onsite. Though feral animals are not considered a significant land management issues on CCM's landholding, the cameras will allow personnel to better monitor and quantify feral animal number on site, and implement appropriate management/control programmes if and when necessary.

Feral pig trapping was undertaken on several occasions throughout the reporting period, with 23 pigs trapped and euthanized during the period.

6.2.5 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.2.6 Proposed Improvements to Environmental Management

Ongoing campaign weed spraying will continue to be undertaken if and when necessary on site. It is hoped that the addition of the two monitoring cameras will assist in improved control and management of feral animals on site in reporting periods to come.

6.3 Blasting

6.3.1 Criteria

Blasting criteria for CCM are noted in DA 8-1-2005 however, they are not relevant for this reporting period as no blasting was undertaken onsite.

6.3.2 Key Environmental Performance/Management Issues

No blasting was undertaken during the reporting period.

6.3.3 Proposed Improvement to Environmental Management

No blasting is proposed within the next reporting period.

6.4 Operational Noise

DA 8-1-2005 details the noise criteria for site operations and coal haulage, however there was no requirement for noise monitoring during the reporting period as CCM is no longer operational.

6.4.1 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.4.2 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.5 Transport

6.5.1 Criteria

Schedule 3, Condition 36 of DA 8-1-2005 details the monitoring requirements for gravel and coal haulage. There was no transport of either gravel or coal during the reporting period.

6.5.2 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.5.3 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.6 Greenhouse Gas

6.6.1 Criteria

Schedule 3, Condition 39 of DA 8-1-2005 details the monitoring, management and reporting requirements for greenhouse gas emissions, however no operations were undertaken on site during the reporting period.

Canyon is included in Whitehaven Coal's annual National Greenhouse and Energy Reporting.

6.6.2 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.6.3 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.7 Aboriginal Heritage Management

6.7.1 Environmental Management Measures

Four Aboriginal heritage sites have been discovered since 1999, during investigations for the CCM. Two of these sites, Whitehaven 3 and Whitehaven 4, were located within the Mining Lease area. Whitehaven 3, a scar tree located adjacent to the southern mine lease boundary, has been protected by fencing to minimise the potential for adverse impacts. Whitehaven 4 was located within the extraction area, and artefacts at this site were salvaged by representatives of the Red Chief LALC in accordance with a Section 90 Permit (No. 2051) prior to disturbance. The remaining two heritage sites, Whitehaven 1 and Whitehaven 2, although not located within the Mine Lease boundary, have also been fenced and demarcated to avoid disturbance.

6.7.2 Consultation

No soil stripping has been undertaken for the CCM. No additional Aboriginal cultural heritage items have been discovered during the reporting period, and no consultation with Aboriginal stakeholders was conducted.

6.7.3 Environmental Management Measures

Given the status of the site, the environmental management measures for Aboriginal Heritage are limited to ensuring that any identified heritage sites remain undisturbed.

6.7.4 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.7.5 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.8 Natural Heritage

There are no features of natural heritage within the Project Approval area and hence no specific management procedures are required.

6.9 Bushfire Management

6.9.1 Environmental Management Measures

CCM is located within an area of cleared agricultural land, and Whitehaven Coal personnel liaise with the local Rural Fire Service, as required. All firebreaks were graded during November of the reporting period. No bushfire incidents occurred on, or adjacent to, the mine site during the calendar year.

6.9.2 Key Environmental Performance/Management Issues

No key environmental performance/management issues were identified during the reporting period.

6.9.3 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.10 Waste

No waste was produced by Whitehaven Coal Mining (WHC) at the Canyon mine site during the reporting period. The small compound currently leased by Hitachi is managed by the tenants, who maintain responsibility of their own waste treatment and removal.

6.10.1 Key Environmental Performance/Management Issues

Though no waste was produced by WHC during the reporting period, there was some remnant waste that was discovered on site. This waste was collected, removed and disposed of appropriately by a waste contractor and included: two IBC's, several batteries, gallon drums (x2) and timber. During the year, the wash-down bay onsite was found to have a build-up of oily water/sediment. To avoid any discharge of the contaminated water, another qualified waste removal company was engaged to pump out and dispose of this at an appropriate waste management facility.

6.10.2 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.11 Environmental Performance Summary

An environmental performance summary for CCM is presented in Table 7 below.

Table 7 - Environmental Performance

Aspect	Approval Criteria/EIS Prediction	Performance during the Reporting Period	Trend/Key Management Implications	Implemented/Proposed Management Actions
Air Quality	Refer Schedule 3(1)	Two exceedances of the annual average depositional dust criteria.	No operational activities on CCM – exceedances not deemed to be mine related.	Nil
Blasting	Schedule 3(12&13)	N/A. No blasting on site.	No blasting on site.	No blasting on site.
Erosion	Not Applicable	Continued erosion issues within the final void.	Nil. Void is a closed system.	Action pending determination of Vickery extension project. Monthly Inspections to continue.
Noise	Schedule 3(6)	N/A. No operational activity on site.	N/A	N/A
Water	Schedule 3(19)	Upward trending EC of Groundwater & Surface Water continues.	Final void acts as a groundwater sink and as such changes in water quality are not expected to extend off site.	Further investigation into Surface Water trends undertaken. See Section 7.1.
Rehabilitation	Not Applicable	Rehabilitation progresses	Recommendation by Eco Logical Australia that monitoring no longer needs to be annual (biannual sufficient).	Continuation of rehabilitation monitoring.

7. WATER MANAGEMENT

7.1 Surface Water Management & Performance

Surface water management on site is limited to the void, and wet weather monitoring as required. The complete surface water monitoring results are presented in Appendix 1.

2018 sampling results show that there continues to be an upward trend in Electrical Conductivity (EC) and pH within the lower void. Following their review of groundwater trends, SLR Australia was re-engaged in 2018 to determine the reason behind the void water's increasing EC and pH. Results indicated that changes in pH and EC were potentially separate mechanisms, with evaporation seeming to be the primary mechanism behind the increase in EC. A study on the increasing pH and EC in the voids is currently being finalised at time of writing the annual return. Main conclusion is that salts are being concentrated due to evaporation which creates an increasing conductivity. Change in acidity is likely due to water percolating through the alkaline spoils and entering the void.

7.1.1 Discharges

No wet weather discharges occurred during the reporting period.

7.1.2 Water Take

During December of the reporting period, water from the void at Canyon began being pumped and transported, via truck, to Rocglen Coal Mine (RCM). As a result of the dry weather, water stocks became depleted at RCM during the reporting period meaning there was a need to seek a supplementary source of water to use for dust suppression. Water take for the year is outlined in Table 8 below.

Table 8 - Surface Water Transported

Month	No. Loads	Water Transported (ML)
January	-	-
February	-	-
March	-	-
April	-	-
May	-	-
June	-	-
July	-	-
August	-	-
September	-	-
October	-	-
November	-	-
December	241	7.09*
TOTAL	**241**	**7.09***

*Water transported determined by flow meter reading. This reading was taken on the 7th Jan 2019. No. loads is for December only.

7.2 Groundwater Management & Performance

Current monitoring requirements include six (6) monthly monitoring as per Table 8 below.

Table 9 - Groundwater Monitoring Parameters

	Parameters					
GW Bore	**Standing Water Level**	**pH**	**Conductivity**	**Cl**	**Na**	**Oil & Grease**
GW-7	✓					
GW-8	✓					
GW-9	✓					
GW-11	✓	✓	✓	✓	✓	✓
P3	✓	✓	✓	✓	✓	✓

The complete groundwater monitoring results are presented in Appendix 2.

Results show the Standing Water Level (SWL) of GW-7, GW-9, GW-11 and P3 remain generally consistent. GW-8 shows regular fluctuations in SWL however, this bore is connected to a solar pump and as such, fluctuations are not believed to be mine related.

GW-11 continues to display an increasing Electrical Conductivity (EC) and decreasing pH. As discussed in the 2017 Annual Review, these trends are most likely as a result of water percolating through waste rock and entering into the groundwater system. The system is considered to be a closed groundwater system with the final void acting as a sink. Given this, any expected water quality changes are not anticipated to extend off site.

7.2.1 Water Take

During the reporting period, no water was taken from any bores on site.

7.3 Rehabilitation Performance during the Reporting Period

7.3.1 Status of Mining and Rehabilitation

Table 10 - Rehabilitation Status

Mine Area Type[1]	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	2017 (ha)	**2018 (ha)**	**2019 (ha)**
A. Total Mine Footprint	416.98	416.98	416.98
B. Total Active Disturbance	2.9	2.9	2.9
C. Land Being Prepared for Rehabilitation	0	0	0
D. Land Under Active Rehabilitation	249.8	249.8	249.8
E. Completed Rehabilitation	0	0	0

[1]Refer to Annual Review Guideline (p.11) for description of mine area types.

7.3.2 Annual Rehabilitation Monitoring

Provided below is a summary of both the 2017 and 2018 rehabilitation monitoring data gathered by Eco Logical Australia. Monitoring locations are shown in Figure 3 below. Previously, due to the timing of receipt of final reports, monitoring results for the year prior to the reporting period have been provided (i.e. 2016 results reported in 2017 AR). Alignment of the monitoring results with the relevant reporting period should, from here on in, occur.

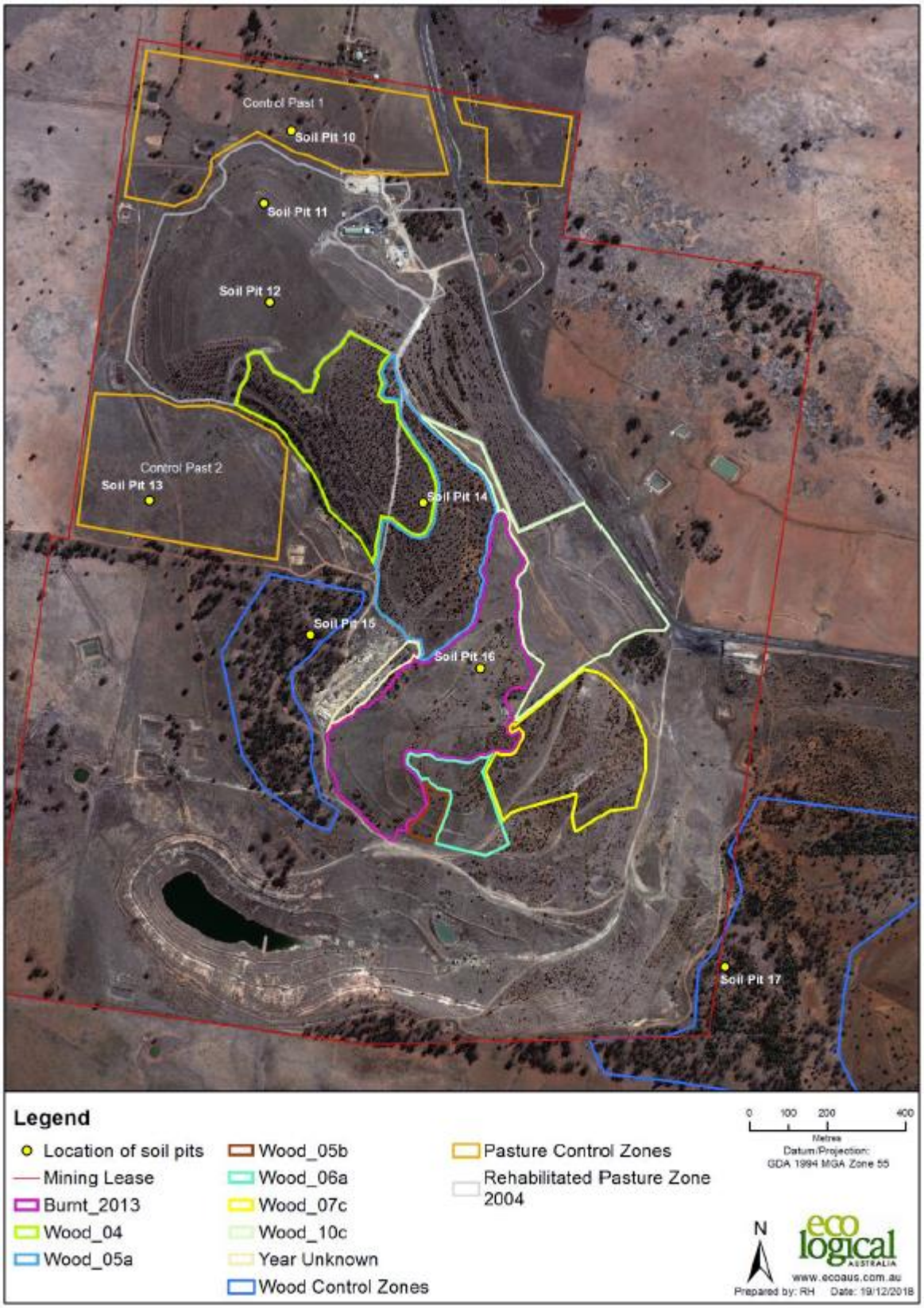

Figure 3 - Rehabilitation Monitoring Zones (ELA 2018)

FLORA

Remote Sensing Monitoring

- **2017**
  Minimal changes in terms of Photosynthetically Active Biomass (PAB) were identified in most rehabilitated zones. There were significant decreases noted in pasture zone 2004, however similar decreases were also seen in the southern end of the mining lease and in the adjoining land to the west. These decreases were deemed to be as a result of drier conditions causing loss of groundcover. Eco Logical noted that this groundcover reduction was expected due to the year prior having had above average rainfall resulting in increased ground coverage (particularly exotics). Cloud cover in the 2017 imagery also resulted in some of the significant decrease in PAB.
- **2018**
  Similar to 2017, minimal change to PAB were noted, with changes comparable to the control zones.

Woodland Vegetation Monitoring

Structural Complexity

- **2017**
  Wood_04 and Wood_05 showed a continued increase in structural complexity resulting in more suitable fauna habitat, reflected in an increase of animals using the site. Though other rehabilitation plots also displayed an increase, they are establishing at a much slower rate. Note that though the rehabilitation sites are displaying increases in structural complexity and diversity, it is still low in comparison to the control sites.
- **2018**
  Increase in structural complexity slowly continuing despite the dry conditions experienced in 2018. Again, complexity remains low compared with the control zones.

Canopy Layers

- **2017**
  Canopy layer not yet developed in woodland rehabilitation zones, showing no True Projected Foliage Cover (TPFC) within control zones. Wood_04 did however show an increase from 0.1 in 2016 to 0.2 in 2017. Juvenile tree species within rehabilitation zones are expected to form canopy layers as monitoring progresses.
  All monitoring zones (except Wood_10c and Wood_06a) showed continued mid-storey stratum development though at a decreased rate to 2016. Mid-storey stratum levels remain low (TPFC <1%) but have increased since 2016. Control zones display an abundance of mature canopy and mid-storey species.
  Multivariate analysis of both over-story and mid-storey species indicated the species composition in the control zones are generally different to that in the rehabilitation zones.

- **2018**

  As above, no canopy layer has formed and no True Projected Foliage Cover (TPFC) was shown. Two plots within Wood_04 continue to show increase in TPFC.

  All rehabilitation zones showed a continuation in mid-storey stratum development. High variation in TPFC was observed between rehabilitation zones, ranging from 0.003 ± 0.007 at Wood_10c and 3.52 ± 2.39 at Wood_07c. Though the control zones did display an increase in TPFC, this was considered insignificant.

  Multivariate analysis of both over-story and mid-storey species indicated the species composition in the control zones are generally different to that in the rehabilitation zones.

Groundcover Species Richness

- **2017**

  Higher native species richness than any previous year was observed at all rehabilitation zones. Though the control zones still display a higher groundcover species richness than any rehabilitation zones, a slight decrease in native groundcover species (in comparison to 2016) was observed. This decrease is thought to be reflective of seasonal patterns (i.e. dry conditions experienced in spring 2017 prior to monitoring).

  Exotic groundcover species richness was variable with increases in Burnt_2013, Wood_10c, Wood_06a and Wood_07c, and decreases in Wood_04, Wood_05, Control Wood 1 and Control 2.

- **2018**

  All rehabilitation zones showed a decrease in native species richness since 2017 though the species richness was still higher than 2016 and any previous years. The overall average species richness had decreased since 2017 but was deemed to not be insignificant. A decrease was also seen at the control zones but again was not deemed to be significant. Decreases may be as a result of the prevailing dry conditions.

  Exotic species richness increased at all sites except for Wood_07c and Wood Control 1. An insignificant increase in mean exotic groundcover species richness since 2017 was identified, though mean exotic species richness in the control zones decreased when compared to the 2017 results.

Vegetation Cover

- **2017**

  Average cover of native species increased notably from 2016 in all rehabilitation and control zones. Wood_10c, Wood_07c and Burnt_2013 had the highest ever recorded coverage since monitoring began.

  Since 2016, exotic species cover decreased significantly throughout all rehabilitation and control zones, though in all rehabilitation zones the exotic species cover remained greater than native cover (except Wood_04). Native species cover in the control zones remained higher than exotic cover.

  Leaf litter and organic matter increased substantially, most likely due to the decay of previously widespread exotic forbs. Bare ground cover was variable, however generally an increase was seen at

all sites. Coarse woody debris (CWD) decreased in the control zones but increased in all rehabilitation zones except Wood_10c.

- **2018**

  2018 saw a decrease (though insignificant) in native ground cover within both control zones and Wood_10c, Wood_04 and Burnt_2013. Wood_07c, Wood_06a and Wood_05a rehabilitation zones saw a non-significant increase. Mean native groundcover was higher than mean exotic groundcover in all zones except Wood_10c and Burnt_2013).

  Average organic matter increased in all but two rehabilitation sites (Wood_07c and Wood_04). Due to the ongoing dry conditions preceding the 2018 average plant cover declined across all sites. A significant increase in bare ground was seen in Wood_06a and Burnt_2013.

FAUNA

Birds

- **2017**

  As expected, due to its more complex and dense vegetation cover, Control Wood 2 had the highest bird species richness of all sites across spring and winter. Rehabilitation zones showed higher or comparable bird species richness compared with Control Wood 1, which is a similar size to the rehabilitation zones.

  Grey-crowned babblers (*Pomatostomus temporalis temporalis*) were recorded for the third consecutive year and were seen in all seasons at Control Wood 1 and during winter in Control Wood 2. They were also spotted in Wood_04, Wood_05 and Wood_07. The turquoise parrot (*Neophema pulchella*) remained unrecorded however, the Speckled Warbler (*Chthonicola sagittata*), another vulnerable species, was recorded during winter at Control Wood 2.

- **2018**

  Bird species richness was again highest in Control Wood 2, for the same reasons as stated above. Interestingly, bird species richness in all rehabilitation zones except Wood_04, was higher than the control zones in autumn.

  The Turquoise Parrot (*Neophema pulchella*) remained unrecorded. Grey-crowned Babblers (*Pomatostomus temporalis temporalis*) were again recorded in several locations. The Little Eagle (*Hieraaetus morphnoides*) was recorded in Control Wood 1 during winter, and the vulnerable Speckled Warbler (*Chthonicola sagittata*) was recorded in winter and spring within Control Wood 2.

Terrestrial Fauna

- **2017**

  Seven mammal species were recorded during the 2017 monitoring period, with the Eastern Grey Kangaroo (*Macropus giganteus*) and Common Wallaroo (*Macropus robustus*) remaining widespread. As with 2016 monitoring, three exotic species (Rabbit, Fox and Feral Pig) were recorded during monitoring though rabbits were only present in the control zones, and pigs and foxes were only present in rehabilitation zones. Exotic species numbers have remained relatively unchanged. A tree

skink (*Egernia striolata*) was identified in Wood_04, though no other reptiles or amphibians were found. It was noted however that organic litter cover may have inhibited observations of reptiles.

- **2018**

  Two mammal species were observed during the monitoring period (the Eastern Grey Kangaroo and Common Wallaroo), though the Swamp Wallaby (*Wallabia bicolor*) was opportunistically recorded across site in 2018 (and was not recorded in 2017). No reptiles, except for two Tree Skinks (*Egernia striolata*), were spotted. In addition to the three pest species identified in 2017, the European Hare was also identified in 2018. All exotic species were identified in the Control Zones only except for the European Hare, which was opportunistically recorded in Burnt_2013.

7.3.3 Post Rehabilitation Land Uses

The overall closure goal for Canyon is for the restored landform to be capable of sustaining pre-mining land-uses.

7.3.4 Renovation or Removal of Buildings

No renovation or removal of buildings occurred during the reporting period.

7.3.5 Other Rehabilitation Undertaken

No additional rehabilitation of exploration areas, infrastructure, shafts, adits, dams, fence lines or bunds occurred during the reporting period.

7.3.6 Departmental Sign-off of Rehabilitated Areas

No departmental sign-off of rehabilitated areas was received during the reporting period.

7.3.7 Variations in Activities against MOP/RMP

Not applicable.

7.3.8 Trials, Research Projects Initiatives

No rehabilitation trials, research projects or other initiatives were undertaken during the reporting period.

7.3.9 Key Issues to Achieving Successful Rehabilitation

The key issues to achieving successful rehabilitation are:

- Landform stability (Final Void);
- Soil quality;
- Water quality;
- Pasture development; and
- Land management, including weed control.

Management measures to address these key issues, including both trigger levels and response, are described in the Closure MOP prepared by SLR Consulting Australia, and approved in September 2015 by the Division of Resources and Geoscience.

7.4 Actions for Next Reporting Period

Ongoing environmental monitoring and management, as per DA 8-1-2005 and relevant environmental management plans.

8. COMMUNITY

Whitehaven Coal maintains an open door policy for interested local groups, including local residents, landholders, schools and community groups, to visit the mine where practically possible. Furthermore, Canyon has a designated complaints line advertised on the Whitehaven Coal website and, in the event of a complaint, details pertaining to the complainant, complaint and action taken are recorded. A complaints register is maintained on Whitehaven's website.

No complaints have been received for the site since 2008.

A Community Consultative Committee (CCC) for Canyon is covered under the terms of reference of the Vickery Coal Mine CCC, which met in August and then again in October 2018.

Community contributions are managed in accordance with the Whitehaven Coal Donations and Sponsorship Policy.

9. INDEPENDENT AUDIT

The most recent Independent Environmental Audit (IEA) of CCM was undertaken by Environmental Resource Management Australia Pty Ltd (ERM) in early 2016, with the site component completed on the 23rd March 2016. Outstanding items from the 2016 Audit Action Plan, and how they are being addressed, are summarised in Table 10 below. CCM has an upcoming IEA which is set to be undertaken early in the 2019 calendar year.

Table 11 - 2016 Independent Audit - Outstanding Actions

Condition/Plan	Proposed Action	Status
Minister's Conditions of Approval DA 8-1-2005	Ensure the Transport Management Plan for the Vickery Project outlines the requirements of this consent condition for any material transported to the Canyon Mine prior to works commencing.	TMP to be updated prior to commencement of Vickery construction. Not yet triggered.
	Consider including the requirement to report volume discharged from site and the method for estimating/calculating the volume of any discharges from site into the Water Management Plan.	Water Management Plan (WMP) revised in accordance with DA 8-1-2005 Schedule 5 Condition 12. Approval of WMP not yet received from DP&E.
	Consider submitting the revised plan to DPI (Water), EPA and DP&E requesting comment. Consider including evidence of any consultation and liaison into the annex of the plan.	Consultation undertaken with the proposed parties. DPI (Water) provided recommendations which are to be addressed and then WMP resubmitted to DP&E. Consultation and liaison records not to be included in WMP.
Water Access Licence 29458	Consider including record keeping requirement for the water access licence into the Water Management Plan.	WMP updated in accordance with DA 8-1-2005 Schedule 5 Condition 12. WMP not yet approved by DP&E.
Closure Mining Operations Plan	Consider including in the references section of the Rehabilitation Monitoring Reports the list of operations records as discussed in this commitment to indicate these records have been considered.	There were no operational records utilised in the Rehabilitation monitoring report (received during the reporting period), given that there was no additional rehabilitation undertaken.
	MOP to be updated to reflect EPL surrender.	Next MOP amendment.
Rehabilitation Monitoring Program	Consider updating the Rehabilitation Monitoring Program to reflect the review recommendations once stakeholder feedback has been requested and received (see below).	Next MOP amendment.
	Consider issuing letter outlining the review to key stakeholders to ensure acceptance of the proposed changes.	Next MOP amendment.

10. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

10.1 Reportable Incidents

No environmental incidents occurred at CCM during the reporting period.

10.2 Non-compliances

Non-compliances with relevant approvals have been ranked as either administrative or low, with very limited potential for environmental harm, as addressed below:

- Schedule 3, Condition 21 of DA 8-1-2005 requires the implementation of a range of erosion and sediment controls in accordance with the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual, to minimise erosion and the discharge of sediment from the site. Efforts in previous reporting periods have been made to minimise erosion within the CCM final void with success being minimal. No further action was undertaken during the reporting period, pending the outcome of the Vickery Project which, if approved, will completely fill the final void. The final void is no-spill and thus no sediment laden water is expected to leave the site.

10.3 Regulatory Actions

There were no regulatory actions received for the Canyon Coal Mine during the reporting period.

11. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following measures will be continued, or implemented, in the next reporting period to improve the environmental or community performance of the operation:

- Maintenance of woodland and rehabilitated areas;
- Continued implementation of DA 8-1-2005 and relevant environmental management plans;
- Completion of outstanding IEA actions, as per Table 8;
- Completion of the next three yearly IEA in accordance with approval conditions, and
- The continuation of environmental monitoring and management, as per DA 8-1-2005 and relevant environmental management plans.

Appendix 1

Surface Water

Date	Time	Sample Location	pH Field	pH (Lab)	Electricity Conductivity Field (µS/cm)	Electrical Conductivity Lab (µS/cm)	Total Suspended Solids (mg/L)	Hydoxide Alkalinity as CaCO3 (mg/L)	Carbonate Alkalinity as CaCO3 (mg/L)	Bicarbonate Alkalinity as CaCO3 (mg/L)	Total Alkalinity as CaCO3 (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Aluminium (mg/L)	Arsenic (mg/L)	Manganese (mg/L)	Iron (mg/L)	Total Organic Carbon (TOC) (mg/L)	Grease & Oil (mg/L)
UPPER VOID																							
16-Feb-11	1200	VOID SMALL		8.33		264	19															2	<5
02-May-11	1240	VOID UPPER		8.66		293	<5															4	<5
17-Aug-11	1350	VOID UPPER		8.39		321	182	<1	3	114	117					17	58	0.29	0.004	0.056	0.17	5	<5
08-May-12	920	VOID UPPER		8.48		242	13															3	<5
15-Nov-12	1150	VOID UPPER		8.39		315	20															3	<5
13-Feb-13	1130	VOID UPPER	9.58	9.33	324	330	12															5	<5
01-May-13	1120	UPPER VOID	9.81	9.68	349	353	17					<0.001	0.004	0.003	<0.01							6	<5
05-Aug-13	1135	UPPER VOID	8.7	8.56	574	601	9															6	<5
04-Nov-13	1220	UPPER VOID	9.6	9.4	391	429	12	<1	88	117	205					17	71	0.42	0.005	0.017	0.31	8	<5
05-Feb-14	1130	UPPER VOID	10.3	9.22	481	533	25					<0.001	0.006	0.003	<0.01							9	<5
01-May-14	905	UPPER VOID	9.6	8.74	478	496	<5	<1	32	202	234					26	90	0.71	0.005	0.075	0.45	7	<5
05-Aug-14	940	UPPER VOID	9.5	8.98	508	522	28															8	<5
05-Nov-14	940	UPPER VOID	10.3	9.66	567	535	6					<0.001	0.004	0.003	<0.01							11	<5
17-Feb-15	900	UPPER VOID	10.2	9.34	612	626	44					<0.001	0.005	0.003	<0.01							12	<5
06-May-15	1105	UPPER VOID	9.4	8.87	633	626	<5	<1	50	231	280					31	163	0.51	0.005	0.016	0.38	4	9
12-Aug-15	1100	UPPER VOID	9.8	9.13	617	622	12															12	15
LOWER VOID																							
16-Feb-11	1250	VOID LARGE		8.19		346	14															3	<5
02-May-11	1330	VOID LOWER		8.89		395	48															7	<5
17-Aug-11	1410	VOID LOWER		8.52		451	22	<1	12	136	149					31	85	0.41	0.004	0.035	0.33	5	<5
08-May-12	940	VOID LOWER		7.98		376	8															4	<5
15-Nov-12	1230	VOID LOWER		8.68		446	18															4	<5
13-Feb-13	1210	VOID LOWER	9.02	8.79	496	512	23															5	8
01-May-13	1150	LOWER VOID	8.78	8.63	523	553	97					<0.001	0.004	0.003	<0.01							7	<5
05-Aug-13	1100	LOWER VOID	8.97	9.1	341	348	11															8	6
04-Nov-13	1200	LOWER VOID	8.8	8.54	681	776	23	<1	41	234	275					78	119	0.85	0.003	0.072	0.71	8	<5
05-Feb-14	1200	LOWER VOID	9.6	8.74	936	1070	33					<0.001	0.004	0.003	<0.01							7	<5
01-May-14	935	LOWER VOID	9.4	8.54	1100	1150	<5	<1	26	287	313					165	184	0.25	0.005	0.074	0.18	5	<5
05-Aug-14	915	LOWER VOID	8.9	8.73	1240	1320	<5															7	<5
05-Nov-14	1015	LOWER VOID	9.2	8.83	1470	1510	36					<0.001	0.003	0.003	<0.01							9	<5
17-Feb-15	935	LOWER VOID	9.4	8.5	1800	1900	37					<0.001	0.006	0.005	<0.01							11	7
06-May-15	1135	LOWER VOID	9.2	8.76	1870	1950	8	<1	71	275	346					425	425	0.53	0.004	0.037	0.42	<1	8
12-Aug-15	1025	LOWER VOID	9.3	8.71	1970	1870	46															5	9
10-Nov-15	1250	LOWER VOID	9.2	9	2180	2350	20															10	15
09-Feb-16	1205	LOWER VOID	9.5	8.95	2430	2730	111															8	<5
31-Aug-16	910	LOWER VOID	9	8.73	2730	2830	13																<5
09-Feb-17	1100	LOWER VOID	9.2	9.07	3230	3440	43																<5
03-Aug-17	1100	LOWER VOID	9.3	8.91	3620	3770	27																<5
13-Feb-18	1055	LOWER VOID	9.3	9.09	4250	4490	20																<5
09-Aug-18	1055	LOWER VOID	9.4	9.03	4670	5170	19																9

Appendix 2

Groundwater

GW-7

Date	Time	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Boron mg/L	Barium (Ba) - mg/L	Beryllium (Be) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Iron (Fe) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L			
16-Nov-05	1140	25.79	26.26		4290																				
27-Feb-06	1203	25.66	26.12																						
25-May-06	1327	25.60	26.07		4310																				
02-Aug-06	1332	25.59	26.05																						
07-Nov-06	0925	25.82	26.29		4240																				
07-Feb-07	1017	25.55	26.05																						
04-May-07	0915	25.66	26.13		4250																				
03-Jul-07																									
15-Aug-07	1530	25.68	26.16																						
10-Oct-07	1700	25.58	26.06		4270																				
15-Jan-08	1040	25.79	26.18																						
08-Apr-08	1130	25.78	26.25		4320																				
09-Jul-08	1515	25.79	26.27																						
31-Oct-08	1115	25.78	26.26		4350																				
13-Jan-09	1045	25.75	26.25																						
18-Jun-09		26.48	26.68	8	4620	19.6		<0.001		0.046	<0.001	<0.0001	<0.001	<0.001	0.008	5.22	0.002	0.029	0.004		<0.01	0.101	<0.0001		4180
28-Aug-09	1015	26.61	26.81																						
08-Dec-09	1610	26.74	26.94	8.07	4470	24.7	<0.01	<0.001					<0.005		<0.001	<0.05	<0.001	0.021	0.002			<0.005	<0.0001	8.17	4110
04-May-10	1445	26.94	27.3	7.57	5210	23.3		0.001		0.031	<0.001	<0.0001	<0.001	<0.001	0.004	3.41	<0.001	0.032	0.002		<0.01	0.021	<0.0001		4780
16-Aug-10	1415	27.13	27.48	8.14	4830	20.6																			
03-Nov-10	1240	27.19	27.54																						
16-Feb-11	1400	27.17	27.52	7.67	3900	27.5	0.01	<0.001					<0.005		0.03	0.88	<0.001	0.03	0.001			0.037	<0.0001	7.93	4680
13-May-11	1330	27.25	27.6	7.84	4785	21.3																			
31-Aug-11	1115	24.45	24.8	8.6	4175	22.8	0.26	0.002		0.063	<0.001	0.0001	<0.001	<0.001	0.014	11.6	0.003	0.081	0.006		<0.01	0.165	<0.0001	8.1	5170
05-Dec-11	1140	27.39	27.74	8.02	4180	22.5																			
12-Mar-12	1200	27.35	27.7	7.85	2480	23.9	<0.01	<0.001					<0.005		0.01	<0.05	<0.001	0.003	0.004			<0.005	<0.0001	8.06	2870
29-May-12	1215	27.4	27.75	8.01	2220	21.2																			
23-Aug-12	1150	27.27	27.62	7.94	2390	22.3	0.12	0.002		0.034	<0.001	<0.0001	<0.001	<0.001	0.02	13.2	0.004	0.184	0.003		<0.01	0.227	<0.0001	8.04	2760
22-Nov-12	1145	27.32	27.67	7.87	2440	23.1																			
11-Mar-13	1500	27.39	27.74	7.96	2600	22.6	0.04	<0.001		0.04	<0.001	<0.0001	<0.001	<0.001	0.022	9.54	0.004	0.161	<0.001		<0.01	0.165	<0.0001	8.24	2870
30-May-13	1200	27.5	27.85	8.08	2970	22.1																			
22-Aug-13	1135	27.45	27.8	8.07	2730	20.6	0.2	0.001	0.26	0.035	<0.001	<0.0001	<0.001	<0.001	0.06	5.34	0.006	0.146	0.003	<0.01	<0.01	0.189	<0.0001	8.17	3030
26-May-14	1120	27.63	27.98	8.2	2940	22.1																			
08-Sep-14	1130	27.65	28	8.2	3510	21.8	0.09	<0.001	0.23	0.025	<0.001	<0.0001	<0.001	<0.001	0.014	10.3	0.002	0.063	0.003	<0.01	<0.01	0.197	<0.0001	8.33	3900
12-Nov-14	1215	27.61	27.96	8.1	3450	22.2																			
24-Feb-15	1110	27.65	28	8.2	3270	23.1	0.13	<0.001	0.2	0.03	<0.001	<0.0001	<0.001	<0.001	0.006	3.88	0.001	0.064	0.002	<0.01	<0.01	0.089	<0.0001	7.98	3470
21-May-15	1115	27.77	28.12	8.2	3380	20.8	0.07	<0.001	0.19	0.018	<0.001	<0.0001	<0.001	<0.001	0.002	2.73	<0.001	0.028	<0.001	<0.01	<0.01	0.037	<0.0001	8.23	3960
26-Aug-15	1115	27.78	28.13	8.3	3640	20.9																			
01-Dec-15	1125	27.78	28.13	8.4	3860	22.3																			
18-Feb-16	1130	27.65	28	8.5	3720	22	0.03	<0.001	0.15	0.031	<0.001	<0.0001	<0.001	<0.001	0.033	4.39	0.003	0.04	<0.001	<0.01	<0.01	0.058	<0.0001	8.26	4060
31-Aug-16	1250	27.89	28.24																						
09-Feb-17	1155	27.89	28.24																						
03-Aug-17	12:00	27.91	28.26																						
13-Feb-18	1155	27.98	28.33																						
09-Aug-18	1205	27.97	28.32																						

Denotes Dissolved Metals

GW-7 cont.

Date	Time	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids	Comment
		Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L								
16-Nov-05	1140																			
27-Feb-06	1203																			
25-May-06	1327																			
02-Aug-06	1332																			
07-Nov-06	0925																			
07-Feb-07	1017																			
04-May-07	0915																			
03-Jul-07																				
15-Aug-07	1530																			
10-Oct-07	1700																			
15-Jan-08	1040																			
08-Apr-08	1130																			
09-Jul-08	1515																			
31-Oct-08	1115																			
13-Jan-09	1045																			
18-Jun-09		8	81	554	247	37.5	1000	<10	<1	<1	655	655	41.4	4.88	52.3				2250	
28-Aug-09	1015																			
08-Dec-09	1610	8	80	580	250	38.6	1080	0.67	<1	<1	591	591	42.3	4.6		<0.01	0.04	0.04		
04-May-10	1445	15	75	590	287	41.2	1030	43.6	<1	<1	859	859	44.2	3.54	46.9				2680	
16-Aug-10	1415																			
03-Nov-10	1240																			
16-Feb-11	1400	16	82	628	297	42.5	1050	34	<1	<1	796	797	46.3	4.32		0.04	0.16	0.2		
13-May-11	1330																			
31-Aug-11	1115	13	83	684	322	45.5	986	20	<1	<1	805	805	44.3	1.28	51.2	0.02	<0.01	0.02	2460	Under tank stand (Box thorn)
05-Dec-11	1140																			
12-Mar-12	1200	57	80	313	271	30	221	162	<1	<1	701	701	29.1	1.52		8.48	68.4	76.9		
29-May-12	1215																			Under tank stand
23-Aug-12	1150	17	87	315	283	29	275	142	<1	<1	1000	1000	30.7	2.94	0.96	<0.01	<0.01	<0.01	1660	Under tank stand (Box thorn)
22-Nov-12	1145																			Under tank stand (Box thorn)
11-Mar-13	1500	17	80	320	286	28.7	299	109	<1	<1	909	909	28.9	0.36	2.84	0.04	0.01	0.05	1690	
30-May-13	1200																			
22-Aug-13	1135	20	86	352	274	30.4	355	106	<1	<1	888	888	30	0.7	4.06				1460	
26-May-14	1120																			
08-Sep-14	1130	8	69	444	252	31.8	648	33	<1	12	767	779	34.5	4.07	9.5	0.01	1.12	1.13	1810	
12-Nov-14	1215																			
24-Feb-15	1110	10	76	439	325	34.2	508	41	<1	<1	976	976	34.7	0.77	11.2	0.06	<0.01	0.06	1940	
21-May-15	1115	8	70	495	316	35.8	523	20	<1	<1	960	960	34.4	2.02	15.6	<0.01	<0.01	<0.01	2040	
26-Aug-15	1115																			
01-Dec-15	1125																			
18-Feb-16	1130	8	75	523	301	37	747	2	<1	<1	864	864	38.4	1.81	23.9	0.02	<0.01	<0.01	2450	
31-Aug-16	1250																			
09-Feb-17	1155																			
03-Aug-17	12:00																			
13-Feb-18	1155																			
09-Aug-18	1205																			

GW-8

Date	Time	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Boron (B) - mg/L	Barium (Ba) - mg/L	Beryllium (Be) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Iron (Fe) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L			
16-Nov-05	1205	19.29	19.92		5830																				
27-Feb-06	1215	19.82	20.47																						
25-May-06	1337	20.53	21.17		6130																				
02-Aug-06	1353	20.79	21.93																						
07-Nov-06	0903	22.24	22.86		5640																				
07-Feb-07	1034	21.93	22.56																						
04-May-07	0940	21.88	22.45		4090																				
03-Jul-07	-																								
15-Aug-07	1540	22.10	22.71																						
10-Oct-07	1643	22.16	22.74		4820																				
15-Jan-08	1100	22.45	23.04																						
08-Apr-08	1150	22.67	23.28		5490																				
10-Jul-08	0930	22.89	23.51																						
30-Oct-08	1820	23.10	23.71		6010																				
13-Jan-09	0910	23.15	23.77																						
18-Jun-09	1420	23.31	23.88	6.8	6120	20.9		<0.001	1.01		<0.001	0.0001	<0.001	0.002	0.018	214	0.002	1.97	0.01		<0.01	1.38	<0.0001		5420
28-Aug-09	1142	23.29	23.89																						
08-Dec-09	1405	23.3	23.9	6.62	6010	27.3	<0.01	<0.001					<0.001		<0.001	103	<0.001	1.5	0.004			0.07	<0.0001	6.42	5100
04-May-10	1050	23.27	23.87	6.87	5940	22.7		0.009	0.733		<0.001	<0.0001	0.002	0.004	0.047	195	0.002	2.13	0.012		<0.01	0.238	<0.0001		5620
16-Aug-10	1120	23.15	23.75	7.11	5750	20.5																			
03-Nov-10	1210	23.13	23.73																						
16-Feb-11	1145		Dry																						
13-May-11	1110	22.78	23.38	6.75	5880	21.3																			
31-Aug-11	1040	22.78	23.38	6.79	5120	22.7	0.34	<0.001	0.505		<0.001	0.0047	<0.001	0.001	0.017	133	0.006	1.04	0.005		<0.01	0.226	<0.0001	6.4	6180
05-Dec-11	1110	22.45	23.05	6.81	4500	22.9																			
12-Mar-12	1130	22.4	23	7.28	1750	23.4	<0.01	<0.001					<0.005		0.006	<0.05	<0.001	0.188	0.004			0.007	<0.0001	7.68	2520
29-May-12	1145	23.26	23.86	7.36	1950	21																			
23-Aug-12	1120	22.02	22.62	7.27	2820	22.3	0.17	<0.001	0.219		<0.001	<0.0001	<0.001	<0.001	0.044	29.6	0.004	0.145	0.002		<0.01	0.164	<0.0001	7.64	3260
22-Nov-12	1110	21.99	22.59	7.24	3110	22.8																			
11-Mar-13	1500	21.98	22.58	7.21	3420	22.8	0.29	<0.001	0.243		<0.001	<0.0001	<0.001	<0.001	0.034	42.4	0.002	0.176	<0.001		<0.01	0.078	<0.0001	7.53	3750
30-May-13	1130	22.01	22.61	7.3	3540	22.2																			
22-Aug-13	1105	19	19.6	7.18	5290	20.5	0.09	<0.001	0.251	0.08	<0.001	0.0001	<0.001	0.002	0.08	13.6	0.003	0.913	0.003	<0.01	<0.01	0.992	<0.0001	7.62	6160
26-May-14	1050	33.35	33.95	6.9	5500	22.4																			
08-Sep-14	1100	35.2	35.8	6.9	5580	22.7	0.02	<0.001	0.192	0.07	<0.001	<0.0001	<0.001	<0.001	0.01	1.33	<0.001	0.024	<0.001	<0.01	<0.01	0.041	<0.0001	7.46	5850
12-Nov-14	1145	35.11	35.71	7	5590	24.2																			
24-Feb-15	1135	34.6	35.2	6.9	5490	27.4	0.01	<0.001		0.07	<0.001	<0.0001	<0.001	<0.001	0.012	0.2	0.001	0.015	0.001	<0.01	<0.01	0.06	<0.0001	7.18	5770
21-May-15	1040	23.33	23.93	6.9	5580	21.2																			
26-Aug-15	71140	23.2	23.8	7	5570	21.3	0.01	<0.001	0.178	<0.05	<0.001	<0.0001	<0.001	<0.001	0.005	1.48	<0.001	0.024	<0.001	<0.01	<0.01	0.052	<0.0001	7.28	6180
01-Dec-15	1055	34.97	35.57	7	5460	25.8																			
18-Feb-16	1100	35.17	35.77	7.3	4990	30.2	<0.01	<0.001	0.152	0.06	<0.001	<0.0001	<0.001	<0.001	0.019	<0.05	<0.001	0.011	0.004	<0.01	<0.01	0.169	<0.0001	7.68	5540
31-Aug-16	1225	20.36	20.96																						
09-Feb-17	1130	35.63	36.23																						
03-Aug-17	11:30	35.51	36.11																						
13-Feb-18	11:25	23.29	23.89																						
09-Aug-18	1125	38.98	39.58																						

Denotes Dissolved Metals

GW-8 cont.

Date	Time	Major Cations					Major Anions													
		Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L	Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids	Comment
16-Nov-05	1205																			
27-Feb-06	1215																			
25-May-06	1337																			
02-Aug-06	1353																			
07-Nov-06	0903																			
07-Feb-07	1034																			
04-May-07	0940																			
03-Jul-07	-																			
15-Aug-07	1540																			
10-Oct-07	1643																			
15-Jan-08	1100																			
08-Apr-08	1150																			
10-Jul-08	0930																			
30-Oct-08	1820																			
13-Jan-09	0910																			
18-Jun-09	1420	330	87	606	11	50.2	1910	<10	<1	<	44	44	54.6	4.17	1.34				3350	
28-Aug-09	1142																			
08-Dec-09	1405	252	98	630	10	48.4	1800	0.81	<1	<1	31	31	51.4	3.06		<0.01	0.04	0.04		
04-May-10	1050	235	107	691	17	51	1850	0.94	<1	<1	86	86	54	2.83	21				4560	
16-Aug-10	1120																			
03-Nov-10	1210																			
16-Feb-11	1145																			
13-May-11	1110																			
31-Aug-11	1040	175	110	790	17	52.6	1700	<1	<1	<1	68	68	49.3	3.21	18.2	<0.01	0.07	0.07	3720	From windmill Wilga
05-Dec-11	1110																			
12-Mar-12	1130	65	45	463	28	27.8	407	89	<1	<1	692	692	27.2	1.14		0.51	0.1	0.61		
29-May-12	1145																			
23-Aug-12	1120	56	53	545	31	31.7	732	2	<1	<1	616	616	33	2.1	15.8	<0.01	<0.01	<0.01	1670	
22-Nov-12	1110																			Windmill Wilgai
11-Mar-13	1500	52	58	575	32	33.2	912	<1	<1	<1	372	372	33.2	0.04	14.4	<0.01	0.1	0.1	1910	
30-May-13	1130																			
22-Aug-13	1105	201	151	879	15	61.1	1450	188	<1	<1	628	628	57.4	3.12	0.9				3160	
26-May-14	1050																			
08-Sep-14	1100	215	143	774	12	56.5	1370	213	<1	<1	607	607	55.2	1.12	0.42	<0.01	0.04	0.04	3120	
12-Nov-14	1145																			
24-Feb-15	1135	204	151	869	10	60.7	1260	216	<1	<1	719	719	54.4	5.42	0.51	<0.01	0.01	0.01	2960	
21-May-15	1040																			
26-Aug-15	71140	201	147	861	10	59.8	1060	242	<1	<1	724	724	49.4	9.53	0.42	<0.01	0.02	0.02	3420	
01-Dec-15	1055																			
18-Feb-16	1100	152	134	825	10	54.8	1260	235	<1	<1	456	456	49.5	4.98	0.07	<0.01	<0.01	<0.01	3460	
31-Aug-16	1225																			
09-Feb-17	1130																			
03-Aug-17	11:30																			
13-Feb-18	11:25																			
09-Aug-18	1125																			

GW-9

Date	Time	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Boron mg/L	Barium (Ba) - mg/L	Beryllium (Be) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Iron (Fe) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L			
16-Nov-05	1340	20.75	21.47		7810																				
27-Feb-06	1105	20.70	21.43																						
25-May-06	1428	20.71	21.40		11450																				
02-Aug-06	1211	20.62	21.36																						
07-Nov-06	1104	19.71	20.43		11930																				
07-Feb-07	1106	19.69	20.40																						
04-May-07	0740	19.73	20.44		12630																				
03-Jul-07																									
15-Aug-07	1500	19.77	20.45																						
10-Oct-07	1820	19.73	20.40		12940																				
15-Jan-08	1225	19.66	20.43																						
08-Apr-08	1420	19.66	20.44		12790																				
10-Jul-08	0940	19.68	20.41																						
31-Oct-08	1215	19.67	20.45		12690																				
13-Jan-09	1640	19.56	20.36																						
18-Jun-09	1205	19.65	20.29	6.6	10400	19.2		<0.001	0.055		<0.001	<0.0001	<0.001	<0.001	0.003	324	0.001	12.3	0.014		<0.01	0.041	<0.0001		10000
28-Aug-09	1055	19.71	20.39																						
08-Dec-09	1510	19.62	20.3	6.32	11810	24	<0.01	<0.001					<0.001		<0.001	386	<0.001	18.2	0.004			0.035	<0.0001	5.36	1070
04-May-10	0915	19.8	20.48	8.04	7490	21.6		<0.001	0.014		<0.001	0.0001	<0.001	<0.001	0.017	52.8	0.004	4.1	0.009		<0.01	0.099	<0.0001		7490
16-Aug-10	0915	19.52	20.17	7.42	6670	18.6																			
03-Nov-10	0915	19.33	19.98																						
16-Feb-11	0950	24.69	25.34																						
13-May-11	0920	21.37	22.02	6.7	7465	20.1																			
31-Aug-11	0900	19.78	20.43	7.16	6110	19.7	1.69	<0.001	0.05		<0.001	<0.0001	0.003	0.002	0.022	43.1	0.003	2.91	0.01		<0.01	0.133	<0.0001	7.35	7420
05-Dec-11	0900	19.33	19.98	6.8		21.6																			
12-Mar-12	1000	18.35	19	8.35	1140	22.6	<0.01	<0.001					<0.001		<0.001	<0.05	<0.001	0.284	0.001			<0.005	<0.0001	7.9	1240
29-May-12	0930	18.47	19.12	8.19	3410	19.8																			
23-Aug-12	0915	18.42	19.07	7.4	4750	19.5	0.79	<0.001	0.028		<0.001	<0.0001	<0.001	<0.001	0.047	46.5	0.001	1.29	0.002		<0.01	0.117	<0.0001	7.75	5370
22-Nov-12	0915	18.5	19.15	7.62	5560	21.5																			
11-Mar-13	1500	18.96	19.61	7.58	6240	21.3	0.04	<0.001	0.016		<0.001	<0.0001	<0.001	<0.001	0.019	11	0.002	1.09	<0.001		<0.01	0.041	<0.0001	8.03	6930
30-May-13	0930	18.78	19.43	7.39	6740	20.6																			
22-Aug-13	0900	18.65	19.3	7.31	6710	19.4	5.54	<0.001	0.06	<0.05	<0.001	0.0001	0.1	0.004	0.126	26.7	0.008	1.16	0.01	<0.01	0.01	0.229	<0.0001	8.01	7500
26-May-14	0900		Dry																						
08-Sep-14	0915	20.85	21.5	6.8	6740	19.9	0.05	<0.001	0.032	<0.05	<0.001	0.0002	<0.001	0.001	0.349	128	0.001	4.99	0.01	<0.01	<0.01	0.361	<0.0001	7.03	6890
12-Nov-14	0945	23.56	24.21	6.8	6540	21																			
24-Feb-15	0900	19.55	20.2	6.9	6220	21.3	0.46	<0.001	0.029	<0.05	<0.001	<0.0001	0.001	<0.001	0.005	58.9	0.002	3.11	0.006	<0.01	<0.01	0.11	0.0002	7.26	6560
21-May-15	0915	18.24	18.89	7	6110	20																			
26-Aug-15	0910	19.55	20.2	7.1	6020	19.4	0.1	<0.001	0.119	<0.05	<0.001	<0.0001	<0.001	<0.001	0.004	23.1	<0.001	1.6	0.001	<0.01	<0.01	0.047	<0.0001	7.72	6570
01-Dec-15	900	18.83	19.48	7.3	5770	20.9																			
18-Feb-16	900	18.75	19.4	7.3	5450	20.8	0.04	<0.001	0.032	<0.05	<0.001	<0.0001	<0.001	<0.001	0.028	17	<0.001	1.96	<0.001	<0.01	<0.01	0.049	<0.0001	7.78	5910
31-Aug-16	1200	18.65	19.3																						
09-Feb-17	915	18.34	18.99																						
03-Aug-17	9:00	18.4	19.05																						
13-Feb-18	9:15	18.39	19.04																						
09-Aug-18	910	18.48	19.13																						

Denotes Dissolved Metals

GW-9 cont.

Date	Time	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids	Comment
		Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L								
16-Nov-05	1340																			
27-Feb-06	1105																			
25-May-06	1428																			
02-Aug-06	1211																			
07-Nov-06	1104																			
07-Feb-07	1106																			
04-May-07	0740																			
03-Jul-07																				
15-Aug-07	1500																			
10-Oct-07	1820																			
15-Jan-08	1225																			
08-Apr-08	1420																			
10-Jul-08	0940																			
31-Oct-08	1215																			
13-Jan-09	1640																			
18-Jun-09	1205	69	148	1750	44	93	3530	<20	<1	<1	3	3	99.7	3.48	18.2				6310	
28-Aug-09	1055																			
08-Dec-09	1510	80	132	1830	39	95.3	3570	1.17	<1	<1	<1	<1	101	2.81		<0.01	0.17	0.17		
04-May-10	0915	32	114	1380	33	71.7	2270	196	<1	<1	201	201	72	0.23	17.1				4640	
16-Aug-10	0915																			
03-Nov-10	0915																			
16-Feb-11	0950																			No sample, just about 20mm black sludge
13-May-11	0920																			
31-Aug-11	0900	32	104	1290	29	67	1760	380	<1	<1	288	288	63.3	2.81	13.4	<0.01	0.02	0.02	3690	Windmill-haul road
05-Dec-11	0900																			
12-Mar-12	1000	12	14	220	8	11.5	341	39	<1	<1	60	60	11.6	0.47		0.01	0.06	0.07		
29-May-12	0930																			Windmill on haul road
23-Aug-12	0915	26	72	1020	15	52	1490	193	<1	<1	101	101	48.1	3.88	0.89	<0.01	<0.01	<0.01	2780	
22-Nov-12	0915																			Windmill on haul road
11-Mar-13	1500	28	83	1360	19	67.9	1850	254	<1	<1	325	325	64	2.94	2.42	<0.01	0.04	0.04	3710	
30-May-13	0930																			
22-Aug-13	0900	23	85	1400	23	69.6	2230	126	<1	<1	230	230	70.1	0.38	2.56				3630	
26-May-14	0900																			
08-Sep-14	0915	75	110	1090	18	60.7	1430	569	<1	<1	384	384	59.9	0.65	1.23	<0.01	0.32	0.32	3360	
12-Nov-14	0945																			
24-Feb-15	0900	55	99	1260	16	66.1	1500	314	<1	<1	560	560	60	4.78	2.8	<0.01	0.03	0.03	3680	
21-May-15	0915																			
26-Aug-15	0910	35	80	1130	18	57.9	1210	184	<1	<1	476	476	47.5	9.9	3.12	<0.01	0.01	0.01	3390	
01-Dec-15	900																			
18-Feb-16	900	38	71	1070	20	54.8	1490	16	<1	<1	304	304	48.4	6.14	3.44	<0.01	<0.01	<0.01	2960	
31-Aug-16	1200																			
09-Feb-17	915																			
03-Aug-17	9:00																			
13-Feb-18	9:15																			
09-Aug-18	910																			

GW-11

Date	Time	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab - µs/cm
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Boron mg/L	Barium (Ba) - mg/L	Beryllium (Be) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Iron (Fe) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L			
15-Jan-08																									
08-Apr-08	1405	18.33	18.65		3260																				
10-Jul-08	0830																								
30-Oct-08	1635	18.25	18.56	9.5	3300		<0.02	<0.001								<0.01		16							
12-Jan-09	1625	18.14	18.48																						
18-Jun-09	1255		18.42	9.4	3740	20.4		<0.001	0.026		<0.001	<0.0001	<0.001	<0.001	0.006	1.29	0.001	0.122	0.008		<0.01	0.255	<0.0001		3560
28-Aug-09	1110	18.07	18.39																						
08-Dec-09	1450	17.99	18.31	8.35	3730	25.4	<0.01	<0.001					<0.001		<0.001	<0.05	<0.001	0.165	<0.001			<0.005	<0.0001	8.41	3450
04-May-10	1155	19.03	19.28	7.73	4060	24.1		<0.001	0.04		<0.001	<0.0001	<0.001	<0.001	0.004	2.13	<0.001	0.205	0.001		<0.01	0.214	<0.0001		3750
16-Aug-10	955	17.96	18.21	9.31	3830	19																			
03-Nov-10	950	17.95	18.2																						
16-Feb-11	1030	17.93	18.18	7.8	3300	25.7	<0.01	<0.001					<0.001		0.002	0.23	<0.001	0.336	<0.001			0.035	<0.0001	7.21	3790
13-May-11	1000	17.84	18.09	7.05	3920	20.4																			
31-Aug-11	0940	17.81	18.06	7.58	3450	21.9	0.25	<0.001	0.072		<0.001	<0.0001	<0.001	<0.001	0.004	9.91	0.001	0.466	0.002		<0.01	0.277	<0.0001	7.34	4280
05-Dec-11	0950	17.71	17.96	7.73	3540	21.9																			
12-Mar-12	1020	17.65	17.9	7.37	3350	23.1	<0.01	<0.001					<0.001		0.001	<0.05	<0.001	0.656	0.002			0.034	<0.0001	7.23	4140
29-May-12	1030	17.68	17.93	7.68	3530	20.1																			
23-Aug-12	0955	17.59	17.84	7.35	3850	21	0.19	<0.001	0.096		<0.001	<0.0001	<0.001	<0.001	0.045	21.9	0.002	0.862	0.001		<0.01	0.714	<0.0001	7.09	4260
22-Nov-12	0955	17.56	17.81	7.29	3910	22.6																			
11-Mar-13	1500	17.49	17.74	7.21	4180	22.5	0.04	<0.001	0.088		<0.001	<0.0001	<0.001	<0.001	0.027	27.6	0.002	0.854	<0.001		<0.01	0.961	<0.0001	7.51	4600
30-May-13	1020	17.53	17.78	7.12	4280	21.5																			
22-Aug-13	0940	17.45	17.7	7.34	4280	19.6	0.25	<0.001	0.098	0.08	<0.001	0.0001	<0.001	<0.001	0.074	24.8	0.003	0.887	0.002	<0.01	<0.01	0.699	<0.0001	7.33	4760
26-May-14	0940	17.38	17.63	7.2	4620	20.5																			
08-Sep-14	0955	17.35	17.6	7	4760	20.4	0.08	<0.001	0.139	0.08	<0.001	0.0001	0.001	<0.001	0.03	32.7	0.004	0.834	0.004	<0.01	<0.01	1.12	<0.0001	6.49	4920
12-Nov-14	1035	17.32	17.57	6.9	4780	21.6																			
24-Feb-15	0950	17.25	17.5	7	4650	21.5	0.03	<0.001	0.133	0.07	<0.001	<0.0001	<0.001	<0.001	0.023	17.8	<0.001	0.913	0.003	<0.01	<0.01	0.49	<0.0001	6.03	4970
21-May-15	0945	17.24	17.49	7.1	4650	20.3																			
26-Aug-15	0950	17.25	17.5	7.4	4820	19.9	0.04	<0.001	0.119	0.08	<0.001	<0.0001	<0.001	<0.001	0.002	13.5	<0.001	0.756	0.001	<0.01	<0.01	0.136	<0.0001	6.6	5280
01-Dec-15	940	17.18	17.43	7.4	4810	21.4																			
18-Feb-16	950	17.15	17.4	7.3	4580	22.4	0.05	<0.001	0.124	0.07	<0.001	<0.0001	<0.001	<0.001	0.031	13.2	0.003	0.876	<0.001	<0.01	<0.01	0.164	<0.0001	6.45	5030
31-Aug-16	1130	17.15	17.4	7.5	4760	22.1																			
09-Feb-17	0945	17.12	17.37	7.16	4790	22.8																		7.16	5200
03-Aug-17	0935	17.05	17.3	7.1	4900	20.7																		7.46	5120
13-Feb-18	950	17.05	17.3	7.1	4930	22.6																			
13-Feb-18	950	17.05	17.3	7.2	4930	22.6																		6.56	5110
09-Aug-18	945	17	17.25	7	4820	18.5																		7.99	5380

Denotes Dissolved Metals

GW-11 cont.

Date	Time	Major Cations				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids	Grease and Oil - mg/L	Comments
		Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L									
15-Jan-08																					
08-Apr-08	1405																				
10-Jul-08	0830																				
30-Oct-08	1635	31	0.012	530	10		1100	11.3				34				0.01	0.05				
12-Jan-09	1625																				
18-Jun-09	1255	32	18	678	10	32.9	1040	<10	<1	<1	68	68	30.6	3.63	4.14				1880		
28-Aug-09	1110																				
08-Dec-09	1450	49	22	667	9	33.6	1090	0.62	<1	4	50	54	31.9	2.55		<0.01	<0.01	<0.01			
04-May-10	1155	55	24	722	11	36.4	1160	<0.50	<1	<1	61	61	33.8	3.62	4.61				2390		
16-Aug-10	955																				
03-Nov-10	950																				
16-Feb-11	1030	66	30	675	10	35.3	1200	<1	<1	<1	51	51	35	0.5		<0.01	0.02	0.02			
13-May-11	1000																				
31-Aug-11	0940	92	32	724	10	39	1240	2	<1	<1	42	42	35.9	4.15	5.64	<0.01	0.01	0.01	2430		Wind mill (white house)
05-Dec-11	0950																				
12-Mar-12	1020	108	34	683	10	38.2	1240	<1	<1	<1	32	32	35.6	3.43		<0.01	0.36	0.36			
29-May-12	1030																				
23-Aug-12	0955	142	37	685	10	40.2	1320	<1	<1	<1	30	30	37.8	3.01	8.4	<0.01	<0.01	<0.01	2570		
22-Nov-12	0955																				
11-Mar-13	1500	141	38	712	11	41.4	1310	2	<1	<1	51	51	38	4.28	3.53	<0.01	0.09	0.09	2920		
30-May-13	1020																				
22-Aug-13	0940	168	40	720	12	43.3	1350	2	<1	<1	50	50	39.1	5.07	2.67				2580		
26-May-14	0940																				
08-Sep-14	0955	205	44	620	12	41.1	1440	<1	<1	<1	11	11	40.8	0.36	2.42	<0.01	0.12	0.12	2720		
12-Nov-14	1035																				
24-Feb-15	0950	220	50	676	10	44.8	1410	<1	<1	<1	7	7	39.9	5.72	1.97	<0.01	<0.01	<0.01	2950		
21-May-15	0945																				
26-Aug-15	0950	220	44	668	10	43.9	1160	<1	<	<1	26	26	33.2	13.8	2.17	<0.01	<0.01	<0.01	3340		
01-Dec-15	940																				
18-Feb-16	950	240	46	653	10	44.4	1390	<1	<1	<1	10	10	39.4	5.99	1.76	<0.01	<0.01	<0.01	3220		
31-Aug-16	1130																			<5	
09-Feb-17	0945			644			1440													<5	
03-Aug-17	0935			688			1410													<5	
13-Feb-18	950			1660			<0.2													<5	
13-Feb-18	950			677			<0.2													<5	
09-Aug-18	945			659			1600													<5	

P3

Date	Time	Depth to Ground - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																Mercury (Hg) - mg/L	pH - Lab	EC - Lab (µs/cm)
				pH - Field	EC - Field (µs/cm)	Temp - Field (°C)	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Barium (Ba) - mg/L	Boron mg/L	Beryllium (Be) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Iron (Fe) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L			
07-Nov-06	0826	19.20	20.01																						
07-Feb-07	1053	18.59	19.39																						
04-May-07	1010	18.10	19.90		6320																				
03-Jul-07																									
15-Aug-07	1605	19.53	20.32																						
10-Oct-07	1607	19.66	20.46		7560																				
15-Jan-08	1140	20.16	20.95																						
08-Apr-08	1330	20.64	21.43		9630																				
10-Jul-08	0850	22.76	23.57																						
30-Oct-08	1845	24.91	25.72	7.2	10480		0.03	<0.001								<0.01		270							
13-Jan-09	0845	24.53	25.33																						
18-Jun-09	1330	22.31	23.11	Insufficient water to sample																					
28-Aug-09	1123	27.36	28.86																						
08-Dec-09	1315	26.35	27.15	7.22	10300	26.7	<0.01	<0.001					<0.005		0.003	<0.05	<0.001	0.107	0.029			0.024	<0.0001	7.42	8600
04-May-10	955	25.05	25.83	7.46	9330	22		<0.001	0.317		<0.001	<0.0001	0.003	0.018	0.013	2.22	0.019	0.34	0.024		0.01	0.04	<0.0001		9650
16-Aug-10	1025	24.28	25.03	7.46	8540	20.1																			
03-Nov-10	1125	23.9	24.65																						
16-Feb-11	1115	23.39	24.14	6.88	7310	26.1	0.48	<0.001					<0.005		0.008	0.28	0.001	0.037	0.004			0.06	<0.0001	7.1	9530
13-May-11	1025	22.99	23.74	6.91	9875	20.8																			
01-Sep-11	0900	22.45	23.2	7.15	8775	21.7	19.1	0.004	0.41		<0.001	0.0001	0.027	0.048	0.026	20.6	0.036	0.764	0.05		0.04	0.081	<0.0001	7.87	11600
05-Dec-11	1020	22.5	23.25	7.02	8630	22																			
12-Mar-12	1045	22.15	22.9	7.02	7780	23.8	<0.01	<0.001					<0.005		0.004	<0.05	<0.001	0.01	0.004			0.014	<0.0001	7.68	9740
29-May-12	1100	21.89	22.64	7.12	7550	20.8																			
23-Aug-12	1020	21.51	22.26	7.15	7210	22.2	12	0.002	0.345		<0.001	<0.0001	0.016	0.018	0.028	13.5	0.019	0.309	0.022		0.03	0.151	<0.0001	7.6	8630
22-Nov-12	1020	21.35	22.1	7.04	7710	22.8																			
11-Mar-13	1500	21.31	22.06	7.17	7310	22.9	8.94	<0.001	0.332		<0.001	<0.0001	0.013	0.016	0.064	9.28	0.048	0.338	0.022		0.02	0.264	<0.0001	7.74	8280
30-May-13	1050	21.36	22.11	7.08	7560	21.8																			
22-Aug-13	1015	9.4	10.15	7.09	6790	20.5	1.27	0.001	0.171	0.09	<0.001	0.0001	0.002	0.003	0.074	2.77	0.014	0.099	0.006	<0.01	<0.01	0.258	<0.0001	7.68	7660
26-May-14	1000	21.45	22.2	7.1	7350	21.3																			
08-Sep-14	1015	21.45	22.2	7.1	8010	21.5	13.4	0.002	0.323	0.08	<0.001	0.0001	0.019	0.032	0.037	14.8	0.037	0.531	0.032	<0.01	0.03	0.213	<0.0001	7.69	8390
12-Nov-14	1100	21.44	22.19	7	8150	22.1																			
24-Feb-15	1015	21.45	22.2	7.1	8380	22.6	0.19	<0.001	0.21	0.08	<0.001	<0.0001	0.001	<0.001	0.009	0.28	<0.001	0.033	0.006	<0.01	<0.01	0.155	<0.0001	7.4	8880
21-May-15	1020	21.63	22.38	7	8760	20.4																			
26-Aug-15	1025	21.65	22.4	7.2	8910	19.7	2.24	<0.001	0.24	0.1	<0.001	<0.0001	0.004	0.005	0.005	2.54	0.003	0.097	0.007	<0.01	<0.01	0.059	<0.0001	7.53	9960
01-Dec-15	1015	21.57	22.32	7.3	8990	22																			
18-Feb-16	1015	21.55	22.3	7.2	8870	22.2	0.38	<0.001	0.237	0.08	<0.001	<0.0001	<0.001	0.001	0.01	0.58	0.002	0.058	0.003	<0.01	<0.01	0.05	<0.0001	7.57	9750
31-Aug-16	1030	21.82	22.57	7.2	7510	21.4																			
09-Feb-17	1030	21.77	22.52	7.4	8780	23.9																		7.4	9840
03-Aug-17	1010	21.85	22.6	7.2	8930	21.4																		7.6	9940
13-Feb-18	10:20	21.75	22.5	7.2	9240	23																		7.61	10200
09-Aug-18	10:15	22.01	22.76	7.2	9330	20.8																		8.03	10300

Denotes Dissolved Metals

P3 cont.

Date	Time	Major Cations					Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids	Grease & Oil - mg/L	Comment
		Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L	Total Cations - meq/L	Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L									
07-Nov-06	0826																				
07-Feb-07	1053																				
04-May-07	1010																				
03-Jul-07																					
15-Aug-07	1605																				
10-Oct-07	1607																				
15-Jan-08	1140																				
08-Apr-08	1330																				
10-Jul-08	0850																				
30-Oct-08	1845	190	0.035	1600	19		3300	170				820				0.01	0.2				
13-Jan-09	0845																				
18-Jun-09	1330																				
28-Aug-09	1123																				
08-Dec-09	1315	165	257	1640	13	101	2700	120	<1	<1	789	789	94.3	3.43		<0.01	0.19	0.19			
04-May-10	955	179	262	1540	14	97.9	2920	149	<1	<1	876	876	103	2.54	<0.10				6390		
16-Aug-10	1025																				
03-Nov-10	1125																				
16-Feb-11	1115	171	268	1540	13	97.7	2970	165	<1	<1	698	698	101	1.78		0.02	0.47	0.48			
13-May-11	1025																				
01-Sep-11	0900	183	275	1580	13	101	3410	174	<1	<1	562	562	111	4.84	<0.10	<0.01	0.39	0.39	5880		Needed small bail
05-Dec-11	1020																				
12-Mar-12	1045	180	272	1610	14	102	2990	275	<1	<1	709	709	104	1.22		<0.01	0.49	0.49			
29-May-12	1100																				
23-Aug-12	1020	157	241	1370	11	87.5	2090	399	<1	<1	659	659	80.4	4.22	<0.01	<0.01	0.9	0.9	4790		
22-Nov-12	1020																				Piezo on mine
11-Mar-13	1500	136	206	1310	12	81	2190	189	<1	<1	796	796	81.6	0.38	0.14	<0.01	1.18	1.18	4710		
30-May-13	1050																				
22-Aug-13	1015	152	186	1220	12	76.3	2010	211	<1	<1	808	808	77.2	0.65	0.06				3570		
26-May-14	1000																				
08-Sep-14	1015	151	209	1280	12	80.7	1920	154	<1	<1	797	797	73.3	4.81	0.04	<0.01	1.29	1.29	4160		
12-Nov-14	1100																				
24-Feb-15	1015	158	237	1510	10	93.3	2460	156	<1	<1	900	900	90.6	1.45	0.02	<0.01	0.72	0.72			
21-May-15	1020																				
26-Aug-15	1025	164	243	1500	10	93.7	1920	198	<1	<1	859	859	75.4	10.8	0.2	<0.01	0.72	0.72	5690		
01-Dec-15	1015																				
18-Feb-16	1015	193	256	1540	11	98	2880	171	<1	<1	782	782	100	1.25	0.06	<0.01	0.46	0.46	6160		
31-Aug-16	1030																			<5	
09-Feb-17	1030			1440			2760													<5	
03-Aug-17	1010			1640			2750													<5	
13-Feb-18	10:20			1660																<5	
09-Aug-18	10:15			1540			1600													<5	